

Public Written Comments Submitted to PCAST

from August 25, 2010 to October 20, 2010 (starting on page 2).

Oral Public Comment Submitted to PCAST

Written statements of the oral public comments given to the PCAST during the November 2010 meeting (starting on page 422). To view oral comments please visit the video webcast at

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Public Written Comments Submitted to PCAST

from August 25, 2010 to October 20, 2010

From: Oliver Manuel [<mailto:omatumr@yahoo.com>]
Sent: Thursday, August 26, 2010 6:21 PM
To: Friends
Subject: NEUTRON REPULSION IN THE SUN'S CORE

Dear friends,

Attached as a pdf file is a review paper on *Neutron Repulsion* - the source of energy that powers the Sun and the cosmos.

The first half of the paper reviews the politics of science that blocked consideration of experimental findings against the standard solar model for the past 50 years.

Comments would be appreciated. If I am able to convert this into an html document, I will resend this message with the link.

With kind regards,

Oliver K. Manuel

<http://www.omatumr.com/>

Neutron Repulsion

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(Received)

Neutron repulsion was discovered in nuclear rest mass data in 2000 as the overlooked source of nuclear energy that tied together many puzzling space-age observations of the previous four decades, like the keystone crown on an arch that locks the other pieces of the puzzle together. Members of the space, climate, and nuclear science communities neglected neutron repulsion, as they did three earlier, crucial discoveries about Earth's heat source that might have avoided the recent scandal over supposedly scientific predictions about Earth's climate: a.) The Sun gave birth to the solar system in a supernova explosion and then reformed on the collapsed supernova core (Fig. 1); b.) Excess ^{136}Xe from the r-process was a tracer isotope of primordial helium in meteorites and planets at the birth of the solar system (Fig. 2); and c.) Mass fractionation in the Sun (Fig. 3) enriches lightweight elements and lightweight isotopes of each element at the solar surface. Together these four findings are the framework that may explain why: 1.) Energy and neutrinos continuously pour from the iron-rich Sun and similar stars; 2.) An ordinary-looking star like the Sun formed on the neutron-rich core of a precursor star; 3.) Solar hydrogen from neutron-decay in the Sun induces mass fractionation and generates solar neutrinos by fusion on its journey to the H-rich surface before departing to interstellar space; and 4.) The cosmos fragments and expands as neutron repulsion overcomes gravitational attraction to produce violent stellar explosions or steady neutron-emission and neutron-decay into the hydrogen that departs stars as a waste product.

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Introduction

This review of events that led to the discovery of neutron repulsion and the implications of neutron repulsion for space and solar sciences was prepared for publication at this time as an expression of gratitude for a half century of discoveries and as an invitation to other scientists, world leaders and administrators of public research organizations—like the UN's Intergovernmental Panel on Climate Change (IPCC), the US National Academy of Sciences (NAS), the International Inter-Academy Panel on International Issues (IAP), the International Inter-Academy Council (IAC), the US Department of Energy (DOE), the US Environmental Protection Agency (EPA), etc.—to examine the empirical evidence of neutron repulsion for themselves and decide if this natural source of nuclear energy might advance understanding in their own disciplines.

As noted in the abstract, the discovery of neutron repulsion in 2000 was the triumphant arch through which many puzzling observations over the previous four decades could finally be viewed as pieces of a surprisingly simple mosaic of the origin, chemical composition and source of energy for the Sun and its planetary system.

The remarkably singular event that gave birth to the solar system and its elements is depicted in Fig. 1: Stellar debris¹⁻³ from the axial explosion of a star that had evolved along the path described in 1957 by B2FH⁴. This scenario was shown at 1976 AGU⁵ and ACS⁶ meetings, and the 1977 Welch Cosmochemistry Conference⁷, and discussed in these 1970's papers¹⁻³.

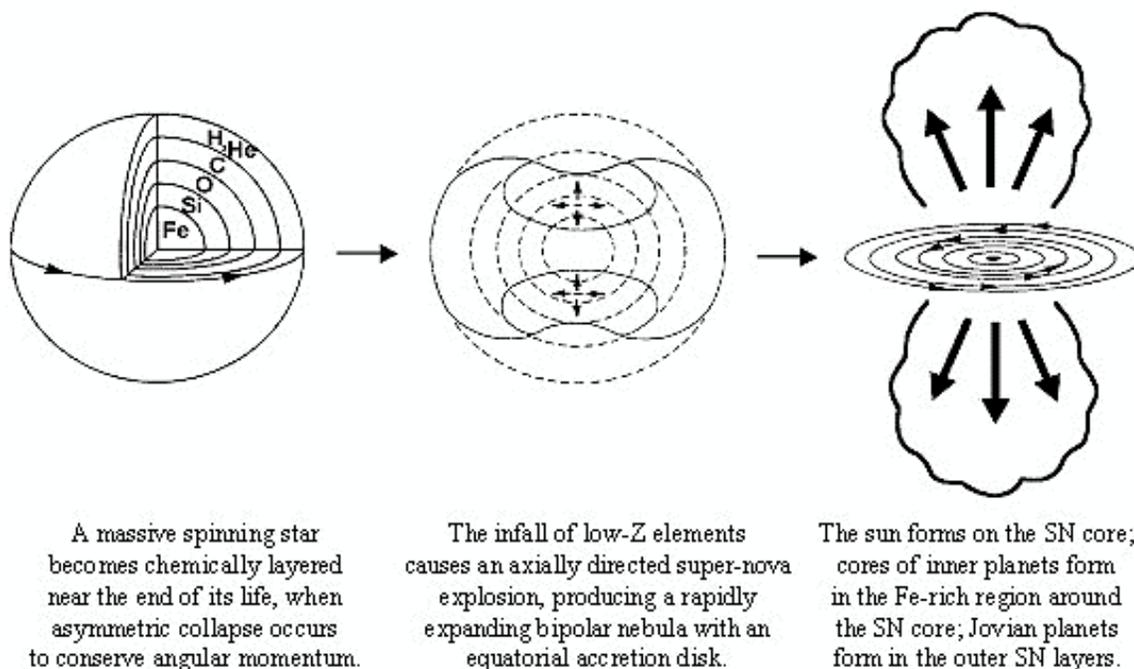


Fig. 1. The Sun and its planetary system formed directly from the debris of a precursor star that exploded axially and produced a planetary disk in the equatorial plane, orbiting the remnant neutron-rich core on which the Sun reformed.

The simple scenario in Fig. 1 for the origin of the solar system addressed these puzzling space-age findings⁸⁻²⁸ and led to recognition that mass solar fractionation¹⁴⁻²⁰ is maintained by the upward flow of hydrogen as a by-product of neutron-emission from the solar core.

- Decay products of extinct, short-lived radioactivities (¹²⁹I, ²⁴⁴Pu, ¹⁰⁷Pd and ²⁶Al) in meteorites⁸⁻¹¹, and the decay products of two of these short-lived radionuclides (¹²⁹I and ²⁴⁴Pu) in the Earth¹²⁻¹³ itself. [The first report of radiogenic ¹⁰⁷Ag from ¹⁰⁷Pd decay was wrong; radiogenic ¹⁰⁷Ag was rediscovered in meteorites 18 years later.]
- The abundances of many isotopes of noble gases in meteorites, terrestrial and lunar samples had been severely altered by mass fractionation¹⁴⁻²⁰ in unknown site(s).
- Excesses of some isotopes were unexplained by mass fractionation but matched the products of specific stellar nucleosynthesis reactions described earlier by B2FH⁴;
 - a) Excess ¹²⁴Xe from the p-process²⁰,
 - b) Excess ¹³⁶Xe from the r-process²⁰, rather from than spontaneous fission of an extinct super-heavy element²¹⁻²⁵, and
 - c) Excess ¹⁶O from helium burning or the α -process²⁶,
- Inclusions in iron meteorite formed as early and trapped as much short-lived radioactivities as "primitive" meteorites²⁷; and
- Excess ¹³⁶Xe from the r-process of nucleosynthesis⁴ was a "marker isotope" for primordial helium that accompanied only "strange" xenon²⁰ (**Xe-2**) in meteorites¹⁻³.

Fig. 2 shows the experimental observation that required radical change in the standard model for the formation of the solar system from an interstellar cloud of mostly hydrogen and helium: Meteorites sampled two primordial reservoirs of xenon (**Xe-1** and **Xe-2**), but all primordial helium was in the reservoir with "strange" **Xe-2**; none was with "normal" **Xe-1**.

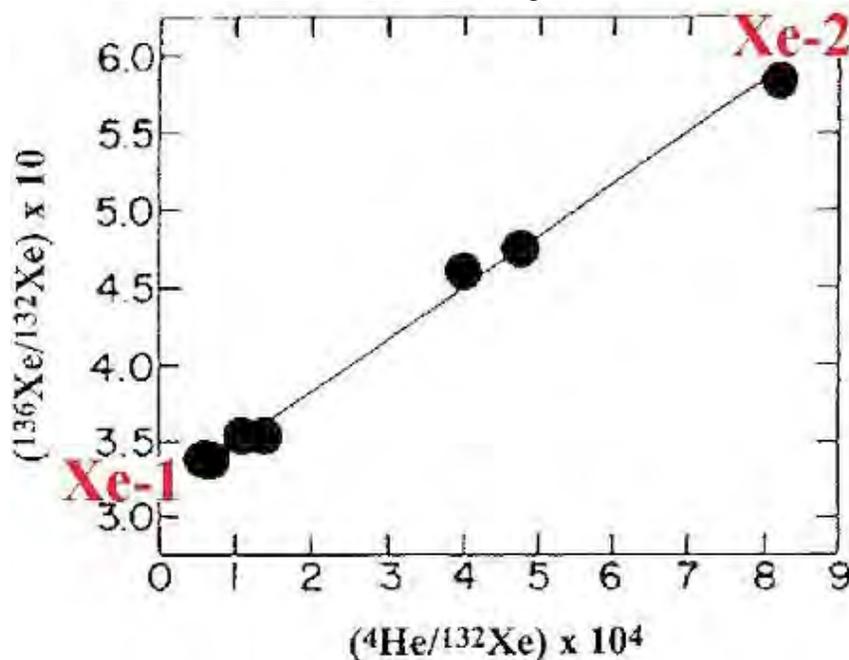


Fig. 2. The initial association of all primordial helium with excess ¹³⁶Xe in "strange" xenon²⁰ (**Xe-2**)—and its absence from "normal" xenon (**Xe-1**)—was the first indication that elements and isotopes never completely mixed in the supernova debris that formed the solar system¹⁻³.

Science^{2,28} published the debates between advocates of superheavy element fission²¹⁻²⁵ and nucleosynthesis^{1-3,5-7,20} as the source of excess ¹³⁶Xe in meteorites. Evidence was soon reported of nucleogenetic isotopic anomalies in many other elements, but advancement was hindered by those who mistakenly²⁹ assigned mass fractionated forms of neon³⁰⁻³³ to nucleosynthesis and by others who simply ignored the link^{1-3,34} between major elements and specific types of nucleogenetic isotopic anomalies—e.g., the close association of lightweight elements like primordial helium with r-products (Fig. 2)—and suggested that nucleogenetic isotopic anomalies could be explained by injecting a small amount of anomalous material from a nearby supernova³⁵ or by the presence of interstellar carrier grains in meteorites^{31,36}.

Despite these distractions, measurements continued to reveal new nucleogenetic isotopic anomalies linked to the chemical composition of the carrier grain, as expected from the scenario shown in Fig. 1 for the birth of the solar system from poorly mixed stellar debris:

- Researchers at the University of Chicago identified six different classes of meteorites and planets by the amounts of excess ¹⁶O in their oxygen isotopes³⁷.
- Researchers at the University of Chicago³⁸ and Caltech³⁹ collaborated on studies to show correlated nucleogenetic isotopic anomalies in dissimilar elements, O and Mg.
- Research at the University of California-Berkeley confirmed the ancient age reported earlier²⁷ for inclusions in iron meteorites⁴⁰.
- The primordial link reported earlier¹⁻³—of anomalous xenon (Xe-2) with helium from the outer part of a supernova—was confirmed in diverse types of meteorites⁴¹.
- As measurement after measurement continued to accumulate on one side of the debate over the formation of the solar system (Fig. 1), it seemed that the debate might be finally settled in 1983 with the publication of three reports⁴²⁻⁴⁴:
 - a) Professor Anders and another researcher at the University of Chicago joined researchers from the University of California-San Diego to publish evidence⁴² in *Science* **against** the superheavy element fission hypothesis²¹⁻²⁵.
 - b) Under a banner news report, "*The demise of established dogmas on the formation of the Solar System*", *Nature* reported⁴³ that new findings ". . . led the principal defendants in the argument . . . to concur in favor of the supernova hypothesis."
 - c) By correcting element abundances in the photosphere for the mass fractionation observed across isotopes of elements in the solar wind, the interior of the Sun was shown⁴⁴ to consist mostly of elements—Fe, O, Ni, Si, S, Mg and Ca—elements produced near the core of the supernova shown in Fig. 1.
- But these 1983 reports did not convince administrators of federal research agencies and mainstream scientists to consider seriously the solar system's supernova birth¹⁻³ (Fig. 1), excess ¹³⁶Xe as a tracer isotope¹⁻³ for primordial helium (Fig. 2), solar mass fractionation⁴⁴ (Fig. 3), or the prediction⁴⁴ of excess ¹³⁶Xe in Jupiter. They construed ". . . independent evidence that so-called CCF-Xe is derived from a supernova involving both p- and r-processes, as first suggested by Manuel et al. (*Nature* **240**, 99; 1972)", and concurrence ". . . in favor of the supernova hypothesis" to mean that the excess ¹³⁶Xe in meteorites came from any number of distant supernovae! This post-1983 consensus view on diverse supernova sources for isotopic anomalies is well illustrated by this 2002 report⁴⁵ from Harvard and the references cited there.

- Twelve years later xenon isotope data, collected as the Galileo probe entered Jupiter's He-rich atmosphere, confirmed⁴⁶⁻⁴⁷ the link of excess ¹³⁶Xe with primordial helium (Fig. 2) and predictions of the iron-rich Sun and solar mass fractionation⁴⁴.
- A renowned geologist and space scientist at a first-class research university⁴⁸ challenged the dogma that iron meteorites formed by planetary differentiation.
- University of Tokyo studies⁴⁹⁻⁵⁰ showed that massive iron meteorites solidified before isotopes of molybdenum from the r-, p- and s-processes of nucleosynthesis mixed.
- Measurements showed more abundant heavy elements⁵¹ and heavy isotopes⁵² in solar flares than in the solar wind: Flares by-pass ~3.4 stages of solar mass fractionation⁵².
- Many reports from other prestigious research universities and institutions worldwide, too numerous to list and discuss separately, confirmed that isotopic and elemental anomalies from nucleosynthesis are commonplace in material that solidified to form meteorites almost immediately after a supernova explosion, e.g., references⁵³⁻⁶⁸.
- Excess lightweight s-products in the solar photosphere independently confirmed⁶⁹ solar mass fractionation⁴⁴ (Fig 3) and the dominant presence of Fe, O, Ni, Si, and S in the Sun from rapid nuclear reactions⁴ near the core of a supernova (Fig. 1).

Fig. 3 compares the abundance pattern of elements in the solar photosphere⁷⁰ with the empirical patterns of mass fractionation measured across twenty-two (22) noble gas isotopes (A = 3-136 amu) in the solar wind⁴⁴ and across seventy-two (72) s-products⁴ (A = 25-207 amu) in the solar photosphere⁶⁹.

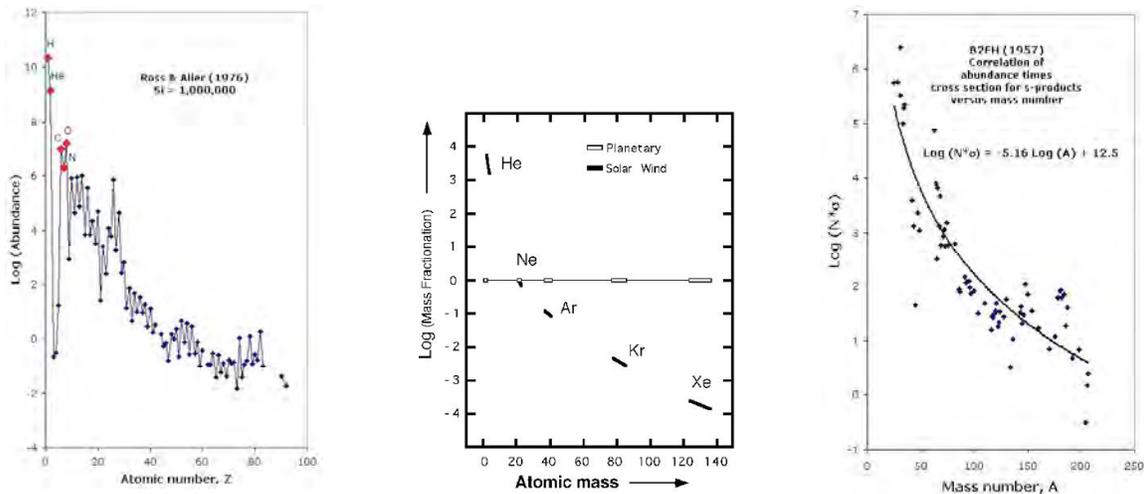


Fig 3. Lightweight elements⁷⁰ (left), lightweight isotopes⁴⁴ (center), and lightweight s-products⁶⁹ (right) from slow neutron capture⁴ are enriched at the surface of the Sun by solar mass fractionation. The more abundant elements in the interior of the Sun are identified as Fe, O, Ni, Si and S when the abundance pattern of elements in the photosphere⁷⁰ (left) is corrected for the empirical mass fractionation observed across isotopes in the solar wind⁴⁴ (center) or across s-products in the photosphere⁶⁹ (right). Both show that the Sun consists mostly of the same elements found the Earth and in ordinary meteorites⁷¹.

In summary, Fig. 1 shows the scenario for the birth of the solar system that fit experimental observations up to 1976 and has continued to fit new experimental observations since then.

Fig. 2 shows evidence from 1975 measurements²¹ that indicated excess ^{136}Xe from the r-process was a tracer isotope of primordial helium at the birth of the solar system. Primordial helium is conversely a tracer⁴¹ for excess ^{136}Xe from the r-process. That fact made possible the 1983 prediction⁴⁴, and confirmation by Galileo probe measurements⁴⁶⁻⁴⁷ in 1995, of excess ^{136}Xe from the r-process in the helium-rich atmosphere of Jupiter. Fig. 3 shows experimental evidence that mass fractionation enriches light elements and the lightweight isotopes of each element at the surface of the Sun, but the interior of the Sun consists mostly of the elements found in ordinary meteorites⁷¹ and rocky planets—Fe, O, Ni, Si and S.

Nuclei of Fe, O, Ni, Si and S all have high nuclear stability and were according to B2FH⁴ synthesized near the core of a supernova. Neutron repulsion in the remnant supernova core is the source of solar energy that ties together the above experimental findings and explains solar luminosity, solar neutrinos, and solar hydrogen that pour from the Sun today.

Neutron Repulsion

Neutron repulsion is an empirical fact and a powerful source of nuclear energy. Neutron repulsion is recorded in the nuclear rest mass data of every nucleus⁷²⁻⁷⁴ with two or more neutrons. It was overlooked as a source of nuclear energy until 2000, when five students - Cynthia Bolon, Shelonda Finch, Daniel Ragland, Matthew Seelke and Bing Zhang - enrolled in Advanced Nuclear Chemistry (Chem 471) helped the author develop three-dimensional (3-D) plots and extrapolate trends in values of M/A , mass or potential energy per nucleon, versus Z/A , charge per nucleon for the rest masses of every nucleus⁷² known at the time. The graphs shown in Fig. 4 represent ~2,850 nuclei. These graphs offered a rational explanation for the current operation of the Sun that is consistent with information shown above for its origin and composition (Figs. 1-3). Many of the experimental observations prior to the discovery of neutron repulsion were summarized here in a 1998 review paper⁷⁵.

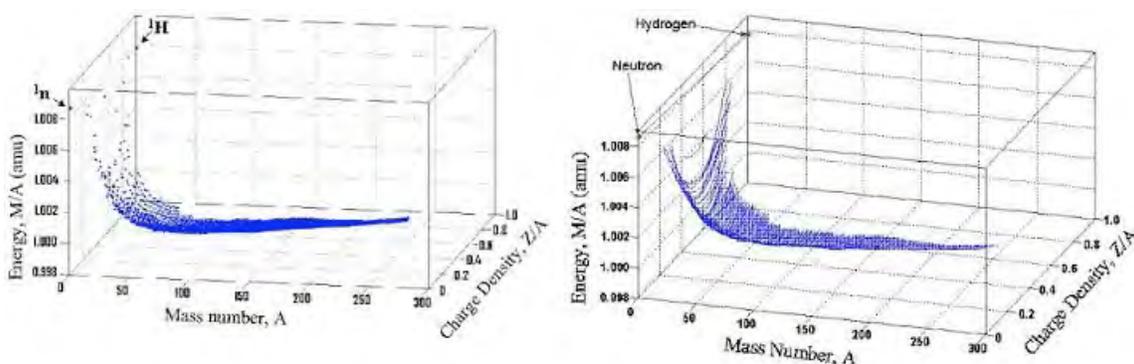


Fig 4. The author and five students in an advanced nuclear science class developed the "Cradle of the Nuclides" on the left in the Spring semester of 2000 [M = Mass in atomic mass units (amu); Z = Atomic number; A = Mass number]. The vertical axis is mass (potential energy) per nucleon (M/A), the horizontal axis is mass number (A), and the depth axis is charge density (Z/A) or charge per nucleon. Mass parabolas were fitted to the data points at each mass number (A) in the graph on the left to produce the graph on the right. When these parabolas were extrapolated to the front panel, neutron repulsion was revealed as excess mass equal to ~10 MeV/nucleon.

The potential energy (mass) per nucleon from repulsive interactions between neutrons can be seen more clearly in Fig. 5 as intercepts of empirically defined mass parabolas with the front panel at $Z/A = 0$. Intercepts with the front panel show what the values of M/A would be if each nucleus were composed entirely of neutrons. Likewise intercepts of the same mass parabolas with the back panel at $Z/A = 1$ show the higher potential energy (mass) per nucleon generated by all repulsive interactions between protons. Differences between the values of these intercepts at the front and back panels are caused by Coulomb repulsion between positive charges on assemblages of protons, as explained here earlier⁷⁴.

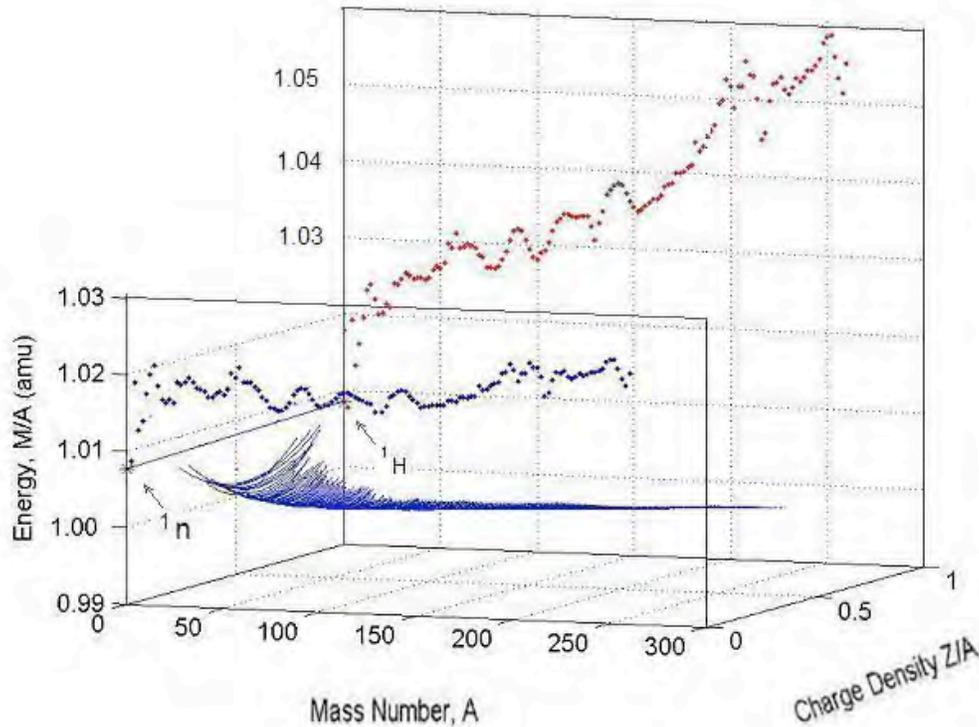


Fig 5. The potential energy per nucleon (M/A) from repulsive interactions between neutrons is shown as intercepts with the front panel at $Z/A = 0$ for mass parabolas fitted to nuclear rest mass data of ground state nuclides⁷². Coulomb repulsion between positive charges on protons explains⁷⁴ quantitatively why values of intercepts with the back panel at $Z/A = 1$ become increasingly higher as the mass number, A , increases.

Before using information on neutron repulsion from Figs. 4 and 5 to illustrate the energy source that powers the neutron star at the core of the Sun, it may be helpful to point out that other researchers⁷⁶ have independently concluded that useful information on neutron stars can be obtained by extrapolating atomic mass data out to "*homogeneous or infinite nuclear matter (INM)*" (ref. 76, page 1042). It may also be helpful to display the information shown in Figs. 4 and 5 on a conventional, two-dimensional (2-D) graph that compares the values of potential energy per nucleon (M/A) for ordinary nuclei with those calculated for homogeneous, infinite nuclear matter (INM) at the intercepts where $Z/A = 0$ and $Z/A = 1$. This is shown in Fig. 6

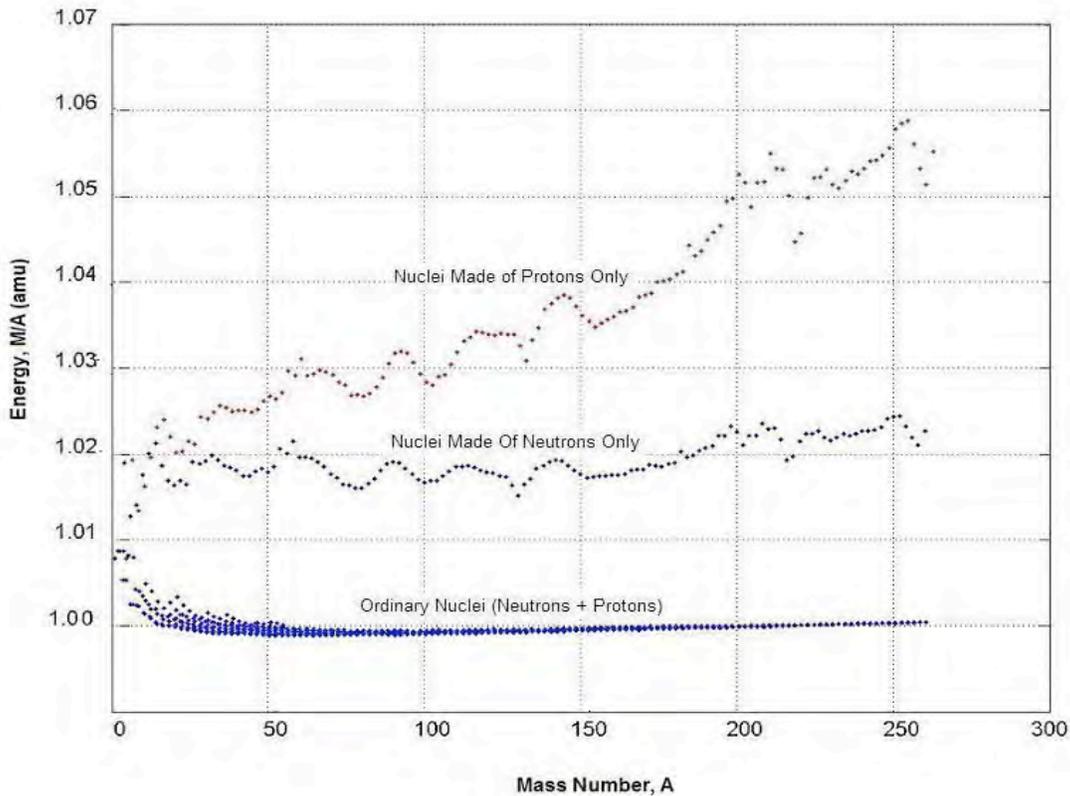


Fig 6. Most ordinary nuclei with $Z/A \sim 0.5$ lie along the lower part of this diagram and have values of $M/A \sim 1.00$ amu/nucleon. Light fusible nuclei have values of $M/A \sim 1.00-1.01$ amu per nucleon. Material in the massive neutron cores proposed⁷⁷⁻⁷⁸ over seventy years ago for stars have $Z/A \sim 0$ and consist of neutrons with $M/A \sim 1.02-1.03$ amu/nucleon⁷⁴. Neutron emission from such objects are expected to release $\sim 10-22$ MeV of energy⁷⁴. Data calculated for nuclei made of protons only ($Z/A \sim 1$) are of little practical interest. Coulomb repulsion prevents the formation of proton-only nuclei heavier than the hydrogen atom.

Nuclear fission involves small changes in nuclear stability in the lower part of Fig. 6 and typically release $\sim 0.1\%$ of the rest mass as energy. Fusion of hydrogen into helium releases $\sim 0.7\%$ of the rest mass as energy. Complete fusion of hydrogen into iron releases $\sim 0.8\%$ of the rest mass as energy. A far greater nuclear energy source powers the Sun: Neutron repulsion triggers neutron emission and a series of reactions that together produce solar luminosity, solar mass fractionation, solar neutrinos, and solar-wind hydrogen^{73-74,79-88}:

1. Neutron emission: $\langle {}_0^1\text{n} \rangle \rightarrow {}_0^1\text{n} + \sim 10-22 \text{ MeV}$
2. Neutron decay: ${}_0^1\text{n} \rightarrow {}_1^1\text{H}^+ + \text{e}^- + \text{anti-}\nu + 0.782 \text{ MeV}$
3. Upward migration of H^+ & fusion: $4 {}_1^1\text{H}^+ + 2 \text{e}^- \rightarrow {}_2^4\text{He}^{++} + 2 \nu + 27 \text{ MeV}$
4. Escape of excess H^+ in solar wind: $3 \times 10^{43} \text{ H}^+/\text{yr} \rightarrow \text{Depart in solar wind}$

The flux of solar neutrinos observed⁸⁹ and total solar luminosity suggest that neutron emission (*Rx 1*) from the core of the Sun releases ~12 MeV of energy per nucleon and generates ~60% of solar luminosity. Neutron decay (*Rx 2*) releases ~1 MeV of energy per nucleon and generates ~5% of solar luminosity. Upward migration and fusion of hydrogen (*Rx 3*) releases ~7 MeV of energy per nucleon and generates ~35% of solar luminosity and 100% of the solar neutrinos observed⁸⁹. The solar wind (*Rx 4*) releases ~1% of the hydrogen produced by neutron decay and accounts for ~100% of the solar wind hydrogen.

Thus, the four processes listed above offer a reasonable explanation for solar luminosity, solar mass fractionation, solar neutrinos, and solar wind hydrogen observed coming from the iron-rich Sun. They are also consistent with literally hundreds of space-age measurements since 1960 that suggest the Sun is a plasma diffuser⁸⁷ that separates atoms by mass, sending the most lightweight element, hydrogen, to the top of the Sun's atmosphere and giving the illusion that the Sun might be a giant ball of hydrogen described by the standard solar model.

Opposition to the concept of neutron repulsion as the primary source of solar energy source usually takes these forms:

- a) Solar neutrinos measurements have confirmed the standard solar model.
- b) The mass of the Sun is less than the minimum mass of a neutron star.
- c) Neutrons repulsion is impossible because neutrons do not have a charge.
- d) Anti-neutrinos have not been observed coming from the Sun.
- e) The density of the Sun precludes a neutron star at the solar core.

Brief replies to the first four concerns are these:

- a) Measurements continue⁹⁰ on possible solar neutrino oscillations.
- b) There is no minimum mass on neutron stars that emit neutrons^{73-74,79-88}.
- c) Neutron repulsion is an empirical fact⁷²⁻⁷⁴ recorded in nuclear rest mass data. Neutron repulsion and proton repulsion are in addition to Coulomb repulsion⁷²⁻⁷⁴ (Figs. 5 & 6). Interactions between nucleons are unlike Coulomb interactions (Figs. 5 & 6).
- d) It is difficult to measure low-energy (<0.782 MeV) neutrinos coming from neutron-decay in the Sun. The author noted the need for this measurement⁸⁴ and encouraged use of the solar neutrino detector in the Homestake Mine to look for inverse β -decay induced by low-energy anti-neutrinos from the Sun: Cl-35 \rightarrow S-35. The facility was flooded before measurable levels of 87-day S-35 accumulated in the Homestake Mine,

The last and most widespread concern—that the density of the Sun precludes the existence of a small, dense neutron core—is difficult for the author to grasp because the internal structure and outer edge of the Sun are unknown. This was briefly addressed in a recent paper⁸⁸ noting that the Earth and the other planets orbit inside the Sun's outer layer—the heliosphere. Cyclic and abrupt changes in Earth's climate reflect changes that occur in the Sun^{83,88}.

Average density is the total mass divided by the total volume, but one could arbitrarily consider and calculate the average density of the Sun from the top of the photosphere inward, ~1.4 g/cm⁻³. Those who believe that this density value precludes a solar neutron core have

not explained why this puzzle is more difficult than that faced by Rutherford⁹¹ and Bohr⁹² when their α -scattering experiments suggested that almost all of the mass of an atom is contained in an incredibly tiny, incredibly dense core. For example, in the hydrogen atom the average density determined from measurements on liquid hydrogen is $\sim 0.07 \text{ g/cm}^3$, and the density of the proton at its core is $\sim 10^{15} \text{ g/cm}^3$. This analogy of the Sun with an atom is not meant to convey the impression that the fractions of the total masses in the cores of atoms and stars are necessarily the same.

There is another intriguing analogy between stars and atoms. Observations with the Hubble telescope of stellar explosions, e.g., Supernova 1987 A and the Planetary Nebula Eta Carrina, show that fresh stellar debris is frequently shaped like two dumbbells on the opposite sides of a doughnut hole, as was shown earlier in the panel on the right side of Fig. 1 for the supernova debris that formed the solar system.

Fig. 7 (below) compares the shape of the $3d(z^2)$ orbital of the electron in the hydrogen atom (left) with a recent photograph of stellar debris from Supernova 1987A. Both show two dumbbells on opposite sides of the hole of a doughnut. From this point of view, the Sun and other quiescent stars are shaped like the $1s$ orbital of the electron in the ground state of the hydrogen atom, and exploding stars like SN 1987A are shaped like the $3d(z^2)$ orbital of the electron in the hydrogen atom: Two dumbbells, centered on opposite sides of a doughnut.

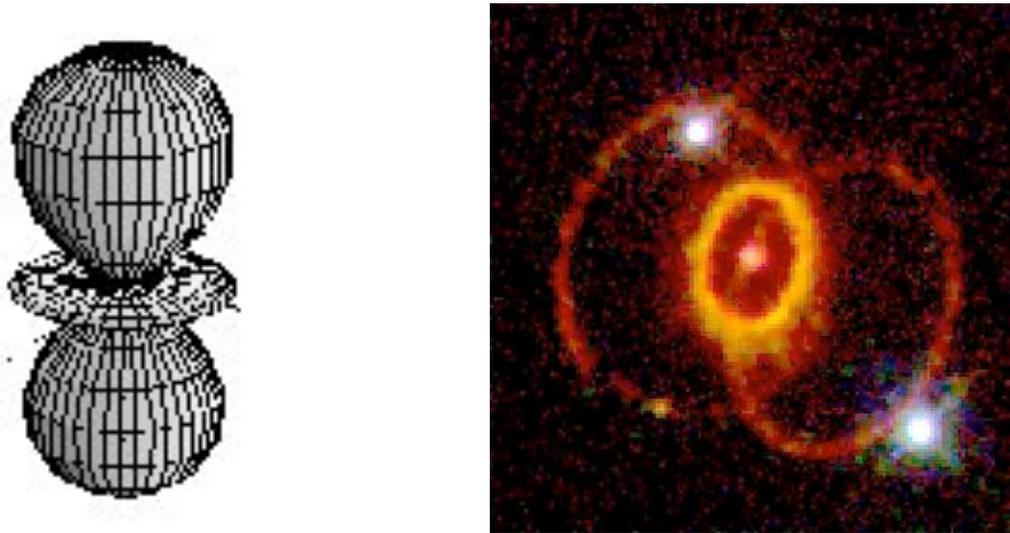


Fig 7. The image of Supernova 1987A (right) is from NASA. The drawing of the shape of the d_{z^2} orbital (left) is from the web page of Iori Fujita⁹³, who noted the remarkable similarities in the shapes of exploding and stable stars to wave functions for the electron in the excited ($3d_{z^2}$) and ground ($1s$) states of hydrogen atom in a recent news story⁹⁴ on the shape of SN1987A. The shape of the d_{z^2} orbital on the left of Fig. 7 is also like the drawing on right side of Fig. 1 for the stellar debris that formed the solar system¹⁻³.

Several others have noted similarities between stars and nuclei. Brown⁹⁵⁻⁹⁷ and Brown and Gritz⁹⁸ discuss evidence of repeated fragmentation in the cosmos to produce galaxies and stars. Harutyunian⁹⁹ notes that the steady decay and violent fragmentation of heavy nuclei, like the actinide elements, is similar to the steady production of stellar luminosity and the violent fragmentation of cosmic matter into clusters of stars and galaxies. These and a few other papers on similarities of nuclei and stars are given here¹⁰⁰. Neutron repulsion is an obvious candidate for the energy source that drives cosmic fragmentation.

Conclusions

Neutron repulsion—an enormous source of nuclear energy that probably powers the Sun and the cosmos—is an empirical fact⁷²⁻⁷⁴ recorded in nuclear rest mass data. Neutron repulsion may prevent the collapse of neutron stars to black holes, cause violent fragmentation of massive ones, and steady emission of neutrons through the gravitational barrier of others. In this respect the gravitational barrier acts like the Coulomb barrier in ²³⁸U, ²⁵²Cf, etc. Details of the internal structure of the Sun are not well known, but it appears that neutron repulsion in the neutron star from the birth to the solar system (Fig. 1) triggers: (i) Neutron emission; followed by (ii) Neutron decay to hydrogen; (iii) Fusion of most hydrogen during its upward journey; and (iv) Release of excess hydrogen in the solar wind. These processes are consistent with information collected from space-age measurements on the early solar system (Fig. 1), and they offer viable explanations for the current discharge from the Sun of solar luminosity, solar neutrinos, solar mass fractionation, and solar wind hydrogen.

Thus observations suggest that nuclear matter is mostly dissociating and expanding locally, rather than fusing together and shrinking in volume, as material "evaporates" from the central neutron star by neutron emission, "expands" in volume by ~15 orders-of-magnitude during neutron decay, "shrinks" only slightly when hydrogen fuses to helium, and then the products (excess hydrogen and helium) depart the Sun carrying trace levels of heavier elements with them. Steady neutron emission and neutron decay may occur in other stars that discharge hydrogen and helium to interstellar space as voluminous products of this basic process:

Compact nuclear matter =(*dissociates*)=> Dispersed atomic matter

The origin of the precursor star was not addressed here, but measurements suggest that the precursor star operated much like the current Sun, as a plasma diffuser that sorts atoms by mass⁸⁷. Nucleogenetic and mass fractionation-produced isotopic anomalies were often found together in solids that formed early in the solar system. This puzzling discovery in 1977 resulted in the name "FUN" (Fractionation Unknown Nuclear) isotopic anomalies³⁷⁻³⁸.

From the above consideration we can see that nuclear matter here seems to be dissociating rather than coalescing (fusing together) in our small corner of the universe, and the volume is expanding on the particle scale by a factor of ~10¹⁵. Dynamic competition between gravitational attraction and neutron repulsion appears to maintain the Sun, sustain life on Earth, and likely also powers the cosmos.

Acknowledgements

The discovery of neutron repulsion would not have been possible without the loving support of my wife, Caroline Annette Howk Manuel, other family members and literally hundreds of friends, colleagues and former students. I am especially grateful for the kindness of students near the end of my career that helped: a.) Demonstrate mass separation of s-products in the Sun⁶⁹; b.) Develop the "Cradle of the Nuclides" (Figs. 4-6)—the key to solar luminosity; and c.) Decipher isotope data from the Galileo probe of Jupiter's atmosphere⁴⁶⁻⁴⁷ that confirmed ¹³⁶Xe as a tracer isotope for primordial helium (Fig. 2) across planetary distances and mass fractionation⁴⁴ in the Sun: Cynthia Bolon, Shelonda Finch, Lucie Johannes, Cara Lietz, Adam Nolte, Marcel Pleess, Daniel Ragland, Matthew Seelke, Ken Windler, Bing Zhang and Joshua Zirbel. This paper is dedicated to my mentor in nuclear chemistry, the late Professor Paul Kazuo Kuroda (1917-2001), who reached out to the author when I was an angry graduate student in 1960, shared early reports that showed meteorites formed almost immediately after element synthesis, and convinced me to start research on the origin of the solar system and its elements. Another of Dr. Kuroda's former students, the late Dr. Dwarka Das Sabu, helped develop the ideas in early papers on the formation of the Sun from supernova debris^{1,2,5,6,20}. In view of the current climate of tyranny that pervades the scientific community, the rest of my acknowledgements will be limited to anonymous or deceased supporters who helped when further progress seemed impossible: The former editor of *Science*, the late Dr. Philip H. Abelson, for publishing our unpopular views²; my research advisor in geophysics, the late Professor John H. Reynolds; two Chancellors at the University of Missouri-Rolla, the late Drs. Raymond L. Bislinghoff and Gary Thomas; and the late Nobel Laureate Professor Glenn T. Seaborg, who became an active opponent of tyranny in space sciences near the end of his life and agreed to co-chair the 1999 ACS Symposium on the Origin of Elements in the Solar System^{48,50,52,66-67}. Support is gratefully acknowledged from the University of Missouri-Rolla (UMR) and the Foundation for Chemical Research, Inc. (FCR). FCR granted permission to reproduce figures from earlier grant reports.

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From: "Brien Seeley"
Date: Sun, August 29, 2010 1:56 am
Re: PCAST for 9/2/10: NASA GFC Supporting document link

Dear Dr. Stine et al:

Please accept and distribute the link below as the final version of the White Paper that supports my upcoming Public Comment about NASA's Green Flight Challenge and Pocket Airports.

The previous link contained an incomplete essay and this one is much better.

http://cafefoundation.org/public/2010_08_16/P8.Essay.Final.pdf
(Please allow 1.5 minutes for the 58 MB download)

I shall bring 25+ hard copies to the meeting next Thursday.

Thank you.

Brien

Brien A. Seeley M.D., President
CAFE Foundation
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Office: 707-544-0141
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Cell: 707-484-8721

From: "Lydia Hines"

Date: Tue, August 31, 2010 11:05 pm

Re: The US and foreign aid for science education - for the recipients to read, please

Dear Drs. Alberts, Zerhouni, and Zewail:

I read with interest the C&EN article, "Science Diplomacy" (August 9, 2010, p. 26-27) about your being sent by the Obama administration to Muslim countries to accomplish ambassadorial functions in the area of science education, to report your observations and to make recommendations. The president is to be commended for selecting such high-profile individuals! However, I am highly surprised to read your comments concerning the United States' lack of commitment to helping in these countries' educational development {in science areas}, that our government should increase the availability of scholarships for science students in Muslim countries to come to the US to study, and that money should be set aside from research-funding agencies to ensure that such scientists could predictably rely on "that support".

Despite my personal conviction that the US government should make it a priority to *truly educate* our *own young people K-12 *(i.e., change the current culture in which "education" steers students to "**feel* successful" to one in which students "learn so they can *be* successful", thus making our students competitive with the rest of the world) rather than to finance educational programs and initiatives in the countries you visited, I would like to alert you that many of Osama bin Laden's siblings *were educated in the United States* (his family is quite scattered around the world - information from the book "The Bin Ladens: an Arabian Family in the American Century", by Steve Coll). We educated them, and their *gratitude was expressed in the most unusual of ways. *Indeed they "should* *be* *our best ambassadors", but their choice was to be the opposite; also, consider the increasing information on "homegrown terrorists" - we can do without such "good ambassadors". At some point we also need to grapple with the difficult reality that *the United States is NOT and should not be *considered the world's "sugar daddy" - please do not perpetrate the myth that money "grows on trees" in America.

I appreciated Dr. Alberts' reported comment that he has as his personal goal "to convince skeptics of 'the program' that there needs to be science envoys in all countries" - even though in the article he is not quoted as stipulating what that means in terms of function, funding, length of term, etc.

The above comments are not meant to preclude the scenario that each of you, as beneficiaries of the American system of education, may want to encourage, through mentoring and monetary support, Muslim countries' students' enthusiasm for their education in science; but as a matter of National Policy of goodwill? Please, NO. Everyone wants someone else's money (OUR

money = tax revenue) to be used for his/her own "betterment" - we have enough need in our educational system here (*functional STEM education *here should become a* *high priority) that we can let the Muslim countries' leaders set priorities in spending their finances if they, too, truly see the needs you have noted; however, as you also noticed (and, hopefully, not been surprised about) "hindrances from government interference are serious problems" in how science is performed in the Muslim countries you visited.

Sincerely,

Lydia E. M. Hines, Ph.D.

From: Bob Johnson [<mailto:rjohnson@bbandainc.com>]
Sent: Thursday, September 02, 2010 9:44 AM
To: Stine, Deborah D.
Cc: Larson, Phillip P.
Subject: FW: re Engineers coming to Des Plaines Library for Exhibition

Attention OSTP

Dear Ms. Stine:

You might be interested in what follows especially those of your contacts I involved in S.T.E.M. education!

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=====

PLEASE excuse this intrusion into your cyberspace.....

But the following information should/could to of interest to you

I've been seeing, hearing , reading lots lots of the poor performance of our students, schools especially as it pertains to **S.T.E.M.** education (**Science-Technology-Engineering-Math**)

If this e-mail is an intrusion into your cyberspace or just simply you do not choose to receive these announcements PLEASE let us know and you will be dropped from our mailings. Still we believe the following news might be of interest to you.

Let me offer the following

Sincerely,
Robert B. Johnson, SE, PE
SEAOI
134 N. LaSalle Suite 1910
Chicago, IL 60602
tel: 312-726-4165 x200
e-mail: office@seaoi.org

Contributor to: www.engology.com; volunteer to
www.futurecitychicago.org (registration of teams commences)

=====

PLEASE POST

Contact: HEATHER IMHOFF 847.376.2792
DONNA CHILDS (312) 726-4165 ext. 200

FLYER Available: CLICK HERE FOR THE OFFICIAL FLIER
<http://www.dppl.org/images/ScienceExpo2010.jpg>

Engineers Expo at Des Plaines Library

Structural Engineers to explore engineering with students

The Des Plaines Public Library has scheduled an Open House for Saturday, October 16, 2010 [12:00 Noon – 4:00 P.M.] at 1501 Ellinwood Street, Des Plaines IL. This program includes activities that are free and open to the public. The target audience is 3-8 grades, though high school students and parents will come a way with a nd appreciation and understanding of engineering. You are invited to explore engineering with members of the Chicagoland engineering community. This event promises to be something very special and marks the 2 year of this event. Last year's program attracted upwards of 300 visitors.

The Expo will feature interactive displays and presentations that are fun and educational, designed to enhance children's interest in math, science, and of course engineering.

The science/tech and engineering program is a joint effort among professional engineering and scientific societies, area national laboratories and businesses.

Structural engineers Bob Johnson, Chas Hague, and others are expected to introduce budding young engineers to standing room only at the SEAIOI (Structural Engineers Association of Illinois - www.seaioi.org) exhibit.

Mr. Johnson's structural engineering models and 'toys' provide a n enriching hands-on practical application of structural engineering principles. You can expect a lively exchange between Johnson and the students as he delves into engineering principles explaining how Chicago skyscrapers stand tall.

Ref: http://farm3.static.flickr.com/2105/2418317042_4cae2f99af.jpg?v=0
http://farm4.static.flickr.com/3610/3317076502_7468e93c41.jpg
http://farm4.static.flickr.com/3382/3316258213_db13e33f9c.jpg

Mr. Hague's display on bridges provides students and adults insight into their design.

Ref: <http://www.flickr.com/photos/41494787@N03/3850997064/in/pool-asceprecollegeoutreach>

Buildings to Shake- Rattle and Roll!

For this upcoming Engineering/Tech Expo in addition to our usual "bag of tricks" Structural engineer Larry Novak will give a lecture on **High-Rise Building Design**. Novak will exhibit an earthquake shake table for LEGOTM buildings which allows the students to utilize their own creativity to build and test their designs to destruction (one can actually see the model buildings sway and oscillate under the earthquake simulation). The concept is to utilize the application of creative hands-on demonstrations to encourage young minds

to pursue math, science and engineering. Parents, the public will come away with a greater understanding of how engineers turn ideas into reality.

Check the following: <http://www.flickr.com/photos/10752828@N05/4394559467/in/set-72157623535202638/>

This 'EXPO' is the extraordinary opportunity to introduce students of all ages and their parents to the current state of technology and advances being made throughout engineering industry. For more information, please visit <http://www.dppl.org/home/index.shtml> or call: (847) 827-5551

The event is open to the public and **free of charge**.

Additional pictures: <http://www.flickr.com/photos/41494787@N03/>

=====

Bob Johnson with his cardboard model of the John Hancock Center used to visually show the function of the X-Braces in the Hancock Building



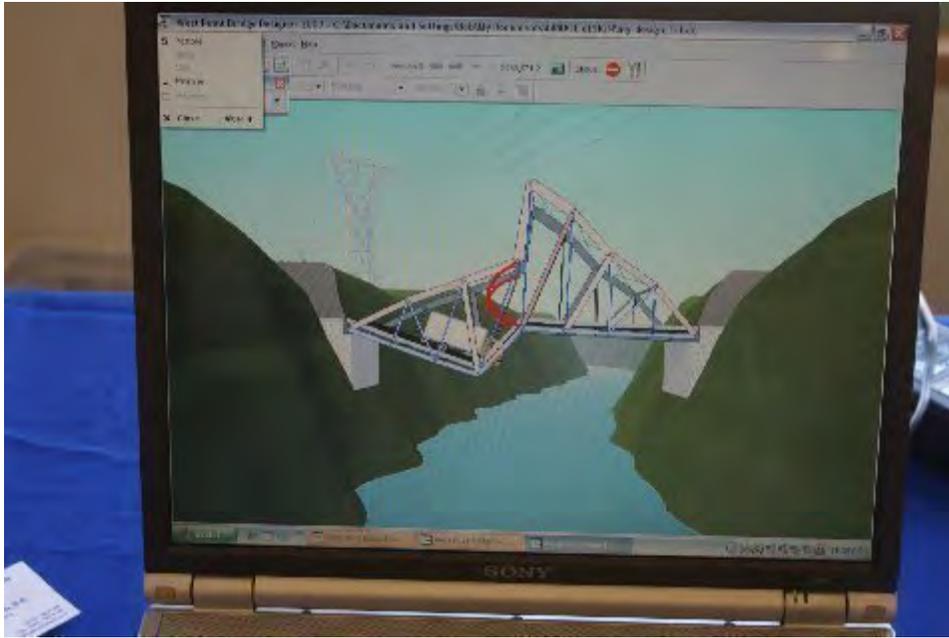
Bob Johnson (left) with Heather Imhoff (Des Plaines Library) and David Eckstrom (right) showing plans of Sears (ooopps Willis) Tower at last year's expo!



While here structural engineer Ken Nizamuddin shows of the "Bundled - Tube" support for Willis Tower.



There will be a computer demonstration on bridge design
Children can design their own bridges!!!!



This one didn't make it!

Dozens of hands-on demonstrations for children of all ages !!
Can you get a simple piece of paper to hold up a pen?

Here Carrie O'connor while mother Elizabeth O'connor looks on!



Chas Hague gives a Demonstration of Deflection in Bridges!!!!



SEAOI is NOT the only engineer association to exhibit

At the **American Society of Civil Engineers exhibit**, Children can build their own paper skyscrapers for testing!



This picture from the recent presentation @ Arlington Heights library , Larry Novak gives lectures on High-Rise Building design utilizing this LEGOr Shake Table



Amazing!! *TRULY*

AMAZING

As the movement in the shake table increases it will be the shorter building that tips over while the taller building survives the simulated earthquake. Expect a similar demonstration of the Des Plaines ENGINEERING Expo !



So will you be attending????

Contact: HEATHER IMHOFF 847.376.2792

DONNA CHILDS (312) 726-4165 ext. 200

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From: Laird, David A [AGRON] [dalaird@iastate.edu]
Sent: Friday, September 03, 2010 3:02 PM
To: daniel_schrag@harvard.edu; Jochum, Gera M.
Cc: debbie@biochar-international.org; Johannes Lehmann; Kleber, Markus; Laird, David A [AGRON]
Subject: RE: PCAST follow-up -- Biochar
Attachments: PCAST Feedback Final 9-3-10.docx

September 3, 2010

Dear Drs. Schrag and Jochum:

Thank you for the opportunity to attend the August 19, 2010 workshop on The Science of Carbon Offsets sponsored by the President's Council of Advisors on Science and Technology (PCAST). As follow up to those discussions, we have prepared the attached document which includes; general comments, a list of research goals, a framework for potential federal action, and an exemplary list of scientific references.

Regards,

David Laird,
Johannes Lehmann
Markus Kleber
Debbie Reed

Presenter written comments on the August 19, 2010 Workshop on The Science of Carbon Offsets sponsored by the President's Council of Advisors on Science and Technology

Respectfully submitted September 3, 2010 by:

David Laird, Professor, Department of Agronomy, Iowa State University, Ames IA 50011.
Phone: 515-294-1581; e-mail: dalaird@iastate.edu

Johannes Lehmann, Associate Professor, Department of Crop and Soil Sciences, Cornell University Ithaca, NY 14853. Phone: 607-254-1236; e-mail: CL273@cornell.edu

Markus Kleber, Assistant Professor, Department of Crop and Soil Science, Oregon State University Corvallis, OR 97331. Phone 541-737-5718; e-mail: markus.kleber@oregonstate.edu

Debbie Reed, Executive Director, International Biochar Initiative, 640 Brook Run Dr. Westerville, OH 43081. Phone: 571-431-6626; e-mail: debbie@biochar-international.org

General Comments:

Soil biochar applications are amenable to a C offset credit system, because the conversion can be easily monitored, the amount of biochar C added to a soil can be readily quantified and the best evidence to date indicates that soil biochar C will be about two orders of magnitude more stable in soils than uncharred biomass C. The amount of C in soil applied biochar and emissions reductions stemming from energy generation are anticipated to contribute more than two thirds of the total net reduction in GHG emissions resulting from a pyrolysis-biochar industry. Additional reductions in GHG emissions are anticipated to result from increased net primary production and reduced N₂O emissions for biochar amended soils, and increased nutrient and water use efficiency in agricultural production. These ancillary reductions in GHG emissions will, however, be difficult to quantify.

Based on the research published to date (see exemplary list below), we see nothing that would preclude the rapid development of an enabling framework for a U.S. pyrolysis-biochar industry, and the evidence suggests that such an industry would substantially reduce net GHG emissions, enhance soil quality and agricultural productivity, reduce dependence on imported fossil fuel, improve water quality in both agricultural and urban watersheds, and promote rural economic development. Research on the pyrolysis-biochar platform, however, is still very limited. Many of the underlying hypotheses have only been tested in a limited number of laboratory and small plot studies. Critically missing are large-scale agricultural field trials and life-cycle assessments for pilot scale pyrolysis plants. As such, we urge the committee to recommend an aggressive research program designed to test all aspects of the pyrolysis-biochar platform at a scale large enough to accurately predict the GHG, environmental, agronomic, and economic impacts of a national pyrolysis-biochar industry. Investigations of policy options for enabling development of a U.S. pyrolysis-biochar industry are critically needed. Considering the complexity of any biomass industry, a well-coordinated and cross-sectoral program is required to both avoid unintended consequences and to fully explore the biochar potential.

Potential Federal Actions:

- 1) DOE should support design, construction, and operation of a minimum of six fully instrumented pilot-scale pyrolyzers (10 - 50 tons biomass per day) and six farm-scale pyrolyzers (2-10 tons of biomass per day). The pilot scale pyrolyzers should be strategically located close to major partner universities and in major agro-ecological regions that have significant potential sources of biomass feedstock. The pilot pyrolyzers should be designed to accommodate diverse feedstocks, to operate under a range of conditions, and to produce multiple bio-energy products, including thermal energy, bio-oils, and producer gas. The pilot plants should be scaled for the appropriate feedstock and energy carriers.
- 2) A USDA-DOE funded pyrolysis-biochar research institute should be established with satellite research centers located at partner universities for the pilot pyrolyzers. This institute should operate under a limited statute for a defined period of time. The pyrolysis-biochar research institute should fund and advise on interdisciplinary and vertically integrated research including: feedstock development; soil quality, water quality and agronomic impacts of soil biochar applications; agricultural engineering related to feedstock logistics and soil biochar applications; techno-economic analysis, macro- and microeconomic analysis, land use, social and societal impacts of a pyrolysis-biochar industry; environmental risks; pyrolysis plant and process engineering; and full system LCAs. Such an institute is critical to the full evaluation of the biochar platform and will also reduce risks of failures, since it will not only ensure interdisciplinary research but also multi-sectoral evaluation through private-public partnerships.
- 3) DOE should establish a partnership with a major petroleum refining company to design and build a pilot plant for hydrocracking of bio-oil produced at pilot pyrolyzers.

Pyrolysis and Biochar Research Goals:

- 1) Assess the economic, logistic and environmental viability of developing a pyrolysis-biochar industry within the United States.
- 2) Assess the potential impact of a pyrolysis-biochar industry on net U.S. greenhouse gas emissions, domestic production of renewable power, thermal energy, syngas and liquid transportation fuels from biomass, production of food and biomass crops on U.S. farms, land use within the U.S., global economic incentives and land use, soil, water, and air quality, creation of jobs, rural economic development, and U.S. balance of trade.
- 3) Assess policy options for enabling the development of a pyrolysis-biochar industry in the U.S., including appropriate mechanisms for sustainable development, industrial standards and certification, and a grading system for biochar that reflects agronomic applications, environmental enhancement potential, and safety concerns.
- 4) Develop and test pyrolysis plant technology at scales large enough to facilitate comprehensive LCAs assessing GHG, energy, environmental, and economic impacts of the pyrolysis plants, to evaluate the scaling of pyrolysis plant technology and feedstock logistics, and to produce sufficient quantities of energy for both on-farm and energy-sector testing and biochar for agronomic testing.
- 5) Determine the optimum pyrolysis technology platform and scale for representative regions considering local biomass feedstocks, soils, infrastructure, and energy needs.
- 6) Assess the feasibility of industrial scale energy conversion to drop-in liquid fuels, electricity and pipeline-grade gases (such as fuel cell technology, hydrogen or methane generation, hydrocracking of bio-oil and the potential to process hydrogenated bio-oil in existing petroleum refineries).

Exemplary List of Peer-reviewed Scientific References:

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From: "Mehmet Okonsar" <okonsar@gmail.com>
Date: Wed, September 15, 2010 5:41 am
Re: Special Music Project for the Qatar Foundation

Mehmet Okonsar
pianist, composer,
conductor and musicologist
www.okonsar.com
Mesnevi S. 46/15
TR-06690 Ankara - Turkey
okonsar.management@gmail.com

My name is Mehmet Okonsar.

I am a Turkish-Belgian pianist-composer-conductor and musicologist, State Artist of the Turkish Republic.

I have prepared a very special project on a large scale International Music Research and Education Project for the Qatar Foundation.

It can be read here: <http://www.okonsar.com/Documents/QatarFoundationProject.pdf>

I will be happy if you can look at it and give me your feedback. Or forward it to anyone who might be interested.

I also present you with my background, biography and my works.
Thank you for your kind attentio

Chronological Biography

- * Born in 1961 in Istanbul, Turkey
- * 1969 to 1972 lived in Paris, France
- * 1974 Started formal musical education, piano and composition at the National Conservatory of Ankara
- * 1977 moved to Brussels, started studying piano with J. Cl. Vanden Eynden, Royal Conservatory of Brussels
- * Continued studies with Alexis Weissenberg.
- * 1982 Won First Prize at the "Young Virtuoses" competition in Antwerp, orchestral debut with the Antwerp Philharmonic (now The Royal Philharmonic Orchestra of Flanders, Het Koninklijk Filharmonische Orkest van Vlaanderen).
- * 1986 graduated "Diplome Supérieur de Piano, Avec la plus Grande Distinction, Premier Nommé", and started studying composition and orchestration with Mme. Jacqueline Fontyn
- * 1989 graduated from the composition-orchestration class. Won the Premio Etruria, Rome Chopin Academy
- * 1991 Laureate of the Gina Bachauer International Piano Competition, Salt Lake City, Utah

* Performed, among others, with: Utah Symphony, Poznan and Lublin Philharmonic Orchestras, Brussels Opera Orchestra (La Monnaie), Antwerp Philharmonic, Presidential Symphony (Ankara), Istanbul State Symphony, Izmir State Symphony...

* Performed, among others, with the conductors: Joseph Silverstein, Charles Dutoit, Sylvain Cambreling, Ingo Metzmacher, Christof Escher, Alexander Schwink, Lucas Pfaff...

* 1992 Nominated State Artist by the Turkish Government, moved to Turkey

* 2000 Nominated one of the "2000 Outstanding Musicians of the XXth. Century" by the Cambridge Biographical Center

* 2010 London Recital début, Royal Opera House

For details please visit my website [<http://www.okonsar.com>] or you may look at Wikipedia [http://en.wikipedia.org/wiki/Mehmet_Okonsar]

My Discography (all CD's available for full audition through my website):
[<http://www.okonsar.com/Recordings.html>]

* J.S.BACH The Goldberg Variations (piano) [LMO-Records]

* J.S.BACH The Well-Tempered Keyboard (piano) (complete in 3 CD set) [LMO-Records]

* J.S.BACH The Art of Fugue (Organ and Harpsichord) [LMO-Records]

* J.S.BACH The Musical Offering (electronic instruments) [LMO-Records]

* Mehmet Okonsar Live at Salt Lake City. [LMO-Records]. Original and unedited recordings of the Gina Bachauer International Piano Competition (1991).

* TANGO Best tangos by A. Piazzolla transcribed for the piano by Mehmet Okonsar.
[Rec-by Saatchi]

* Shadowy Arcade Free style improvisations by Mehmet Okonsar (piano). [LMO-Records]

* Mehmet Okonsar Plays Gershwin Complete piano music and original transcriptions (piano). [Rec-by Saatchi]

* TRT Youth Choir 20th. anniversary CD. Specially commissioned work "Two Seascapes" for a capella choir.

* TRT Chamber Orchestra Fall Concert CD. Bach keyboard Concerti Fm. BWV1056 and Gm.BWV1058

My Compositions: [<http://www.okonsar.com/composer.html>]

* "Shir Ha Shirim" מִירִישָׁה רִישׁ For soprano and large orchestra (2010).

* "Tehillim-Zebur" מִילֵהֶת For solo voice and small orchestra (2010).

* "Kaleidoscopes" (2006-2009)

o N1. for Piano Premiered by the composer in Ankara. Watch on Youtube™

o N2. for Chamber Strings Orchestra, Marimba and PianoPremiere conducted by Hakan Şensoy in Istanbul. Watch on Yahoo™ videos

o N3. for Viola and Piano. Premiered by Çetin Aydar (viola) and the composer in Ankara. Watch on Youtube™

* "Percussion X" (2005) For three percussionists. Premiered in Ankara by Trio SaNeNa. Watch on Youtube™

* "Temples of Kyoto" (2004-2010) Three pieces for Piano

o N1. Kinkaku-ji 金閣寺, Temple of the Golden Pavilion. Premiered in Tokyo by

the composer (dedicated to the memory of Mrs. Yasuko Fukuda)

o N2. Tetsugaku no Michi 哲学の道, Philosopher's Walk (dedicated to Reiko and Masatsugu Sasaki)

o N3. Ginkaku-ji 銀閣寺, Temple of the Silver Pavilion

* "Two Seascapes" (2000) for a-capella mixed choir, commissioned by the Turkish National Broadcast (TRT). Premiere conducted by Prof. Mustafa Apaydın, Ankara.

* "Rhythm Studies for Piano Solo" series 1 (1999) and 2 (2000). Inspired from the "Schillinger System of Musical Composition"

* "Oannés" & "Mr. Dunne" (1990) Two improvisational charts of appreciatively 7 minutes each, for one or several pianos. Premiered in Brussels by the composer.

* "Unknown" (1989) for Bass Clarinet and Percussion. Premiered in Brussels.

* "Mandel Fractal Studies" (1997) Five pieces for Piano based on fractal iterations and Strange Attractors.

* "Emulation" (1989) Five Pieces for Piano. Premiered by the composer in Istanbul.

* "Chameleon" (1987) Three Pieces for Piano. Premiered by the composer in Brussels.

Musical scores for many of them can be viewed from my website as .pdf (Acrobat™) files. [<http://www.okonsar.com/composition-samples.html>]

My Writings (in English) [<http://www.okonsar.com/writer.html>]

* Ligeti and Micropolyphony.

* Debussy "Etude Pour les Quartes".

* Stockhausen Klavierstück N.9.

* Structure and Spectra.

* Jewish Music, A Concise Study.

* Conlon Nancarrow.

* Masonic Signs in Music.

They can be perused also from my publishing company's site:

[<http://www.inventor-musicae.com>]

My Lectures: [<http://www.okonsar.com/writer.html#lectures>]

* Free Software – Free Society General presentation on the software technology, methodology and philosophy known as “Free Software”.

* LISP and Algorithmic Music Composition Techniques Specific presentation on the “Common Music” composition software environment, its methodology and benefits to the contemporary composer.

* Structuralism in Music General presentation on the XXth. Century music language, its methodology and philosophy, more specifically on the musical composition school known as the “Darmstadt School” i.e. P. Boulez, K. Stockhausen etc.

* Jewish Music Extensive presentation on “Jewish Music” ranging from musicological archeology gathered from Biblical texts, Dead Sea scrolls and recent researches up to contemporary creations.

* György Ligeti's Micro-Polyphony Analysis of Atmosphères by G. Ligeti with

audio samples. The revolutionary orchestral writing will be analyzed. A new theory of orchestration will be outlined.

I thank you for your attention and I hope getting your feedback and ideas.

Sincerely yours,
Mehmet Okonsar

<http://app.streamsend.com/private/Ut2Z/M4q/ySIYIGf/unsubscribe/12582767>

From: "J. Michael McCarthy"
Date: Mon, September 20, 2010 5:44 am
Re: Prepare and Inspire

Colleagues,

Prepare and Inspire identifies the need for STEM education and presents recommendations focused on Standards, Schools, Classrooms, Technology, Teachers, and Students. Reading this report, I was looking for what we are coming to realize is critical for the education of Engineering students in college, and that is project-based learning.

Unfortunately, when Educational Technology is considered simply to be a computer, we separate our students from the world around them when what they really need is a deeper experience of the actual world, not a simulation of it.

I was encouraged by the recommendation:

"The Federal Government should develop a coordinated initiative, which we call INSPIRE, to support the development of a wide range of high-quality STEM-based after-school and extended day activities (such as STEM contests, fabrication laboratories, summer and afterschool programs, and similar activities). The program should span disparate efforts of science mission agencies and after-school programs supported through the Department of Education funding."

This nod to project-based learning is appreciated, but centering it outside the traditional school day, shows that it is not integral to the STEM education experience. This is the opposite of what we are experiencing. Our students who are already successful K-12 STEM students, fail to grasp the mathematics and science that lies at the foundation of the knowledge presented in the classroom, if there is not a significant physical experience that connects this knowledge to the reality around them.

For over 20 years, shop classes in high schools have deteriorated to the point that they are now mostly museums to a past age of technological prowess, and inhabited by students who are shuffled off the college-bound track. No self-respecting college-bound students would be involved in any shop activity. However, this is exactly the grounding necessary to be successful in Engineering occurs. This infrastructure is in place but fading fast.

I strongly urge you to consider all forms of manufacturing technology, where students experience the demands of strength, dexterity, timing, measurement and concentration necessary to use the properties of materials and physical processes to obtain a desired outcome. This ranges from woodshop to metalshop, includes music, art, and even sewing and cooking all of which should be considered part of the educational technology required for STEM education.

Michael McCarthy
Professor
Department of Mechanical and Aerospace Engineering
UCI

From: "Mehmet Okonsar"

Date: Tue, September 21, 2010 4:01 am

Re: email address change - important (Mehmet Okonsar, pianist-composer) mehmet@okonsar.com

Mehmet Okonsar
pianist, composer,
conductor and musicologist
www.okonsar.com
Mesnevi S. 46/15
TR-06690 Ankara - Turkey
mehmet@okonsar.com

(I mailed you a short time ago and I am really sorry to bother you again but I think this is..)

Important:

change of email address (Mehmet Okonsar, pianist-composer)

from now please use ONLY

mehmet@okonsar.com

@gmail addresses ARE NOT VALID ANY MORE

if you kindly replied to me during last week's last days
your message is lost.

I will be very happy if you take the pain to connect again with me.

I will greatly appreciate you update your address book

I am sorry for bothering you with this unfortunate change which
happened beyond my will.

During my internet searches your email address showed up in connection
with Qatar.

This is the reason I mailed to you once and then I have been forced to
send this corrective notice.

If you have no connection with Qatar please accept my
apologies and my greetings.

Reminder:

My name is Mehmet Okonsar.

I am a Turkish-Belgian pianist-composer-conductor and musicologist, State Artist of the Turkish Republic.

I have prepared a very special project on a large scale International Music Research and Education Project for the Qatar Foundation.

It can be read here: <http://www.okonsar.com/Documents/QatarFoundationProject.pdf>

I thank you for your attention and I hope getting your feedback and ideas.

Sincerely yours,
Mehmet Okonsar

From: "Kathryn Culbertson" <culbertsonk@triangle-coalition.org>
Date: Thu, October 14, 2010 5:14 pm
Re: Letter from the Einstein Fellows

Dear Dr. Holdren and Dr. Lander;

Attached is a letter drafted by one of our current Einstein Fellows, John Moore, in response to the work the PCAST's Committee on Education has conducted over the past year regarding K-12 STEM Education. The preliminary report released in September has been the topic of many a conversation over the past two weeks amongst the Fellows.

John also received significant support from other Fellows serving this year - the letter includes twenty-one additional signatures of 2010-11 Fellows. In addition, a number of alumni Fellows are very interested in working with the current Fellows to establish a Teacher Advisory Council. Many of the Fellows have won awards and recognitions for their teaching excellence in addition to being selected as Fellows. I am certain you will find them to be professional, reasonable and brimming with thoughtful possibilities for enhancing all aspects of STEM education in the United States. In fact, you have already worked with several of the Fellows, both past and present, in the drafting of your preliminary report.

We look forward to hearing back from you regarding the letter and the proposal within. I have attached John's contact information as well as mine. If you are available to speak to the Fellows about the report and your vision for engaging teachers in the conversation about STEM education reform efforts I will be happy to help arrange such a meeting. I know the Fellows would enthusiastically attend.

Respectfully,

Kathryn G. Culbertson

Kathryn G. Culbertson

October 14, 2010

VIA E-MAIL DELIVERY

Dr. John Holdren
Co-Chair
Dr. Eric Lander
Co-Chair
President's Council of Advisors on Science and Technology

Re: **Proposed Teacher's Advisory Committee For PCAST STEM Education Initiatives**

Dear Dr. Holdren and Dr. Lander;

I am writing today in response to your presentation of the Education Committee's Report, "Prepare and Inspire: K-12 Education in Science, Technology, Engineering and Math (STEM) for America's Future", discussed at the most recent PCAST meeting, September 4, 2010. I applaud you for clearly identifying the many issues that our nation faces and in response would like to propose an idea that may assist you as you face the challenges of your work ahead. I would like to suggest that the PCAST utilize the collective experiences and enthusiasm of the Einstein Fellows to develop a plan for a Teacher Advisory Committee (TAC) to assist with highlighting the excellent work of STEM Educators throughout the nation.

During the 2010-2011 school year, 32 Albert Einstein Distinguished Educator Fellows are serving in various federal agencies in the Washington DC metro area. These Teacher Fellows were selected through a rigorous review process from a national pool of applicants. In addition to the current Fellows serving in Washington, the Einstein Fellowship just celebrated its 20th Anniversary and almost 200 Fellows Emeritus are located throughout the US. Many of the former Fellows hold educational leadership positions in local, state and federal arenas, several here in Washington. Fellows serve at the Department of Energy, NASA, NOAA, NSF, the Department of Education, and on Capitol Hill. Einstein Fellows are Master K-12 STEM educators possessing a wide range of expertise pertaining to local, regional, and national STEM related education issues and initiatives. As you might imagine, our experiences in our individual placements add considerable strength to the group as we collaborate and strive to work together on issues that impact our agencies, and our great nation. The logistics are in your favor to engage this group of seasoned and highly qualified teachers: there would be virtually no expense assembling a subcommittee or task force to interact with you.

From a teacher's perspective, there is a simple, no cost initiative that the PCAST can begin immediately by continuing to promote the great work and service teachers provide across the nation. The recent PCAST YouTube video is a great beginning. How can we continue in this direction? While it is often pointed out that many teachers lack strong content knowledge, the truth is that most classroom teachers are hard working and dedicated to their profession, seek ways to grow professionally, and would walk through fire to help students achieve all that they can. To back that statement up, it is still true that students from around the world seek out an American education – not just at the university level -- and it is not unusual for students to return to their home countries and take with them an understanding of what a world-class education entails. I humbly suggest to you, that PCAST should begin a dialog that seeks to determine what it is that students come here to do.

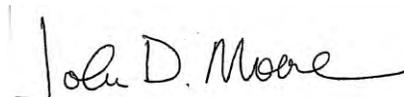
You mentioned in your report that a possible strategy, supported by Secretary of Education Arne Duncan, was to locate and identify "pockets of excellence". We strongly support this idea. The Einstein Fellows can,

and continue to, be a valuable resource in identifying current and future pockets of excellence either encountered personally through the networking undertaken during our year in Washington within our respective agencies, or collaboratively as members of the Fellowship.

Finally, as you begin preparing for your next committee work focusing on higher education's role in STEM Education, we strongly encourage you to look at these initiatives jointly. While it is understood that these represent very separate entities, what happens in each community has dramatic impacts on the other. For example, creating innovative courses and opportunities for pre-college students requires articulation with institutions for higher learning. When we are successful in *preparing* and *inspiring* K-12 students, there must be a coordinated effort to "hand off" these students to institutions that have common objectives, strategies, and outcomes.

In closing, we are very fortunate to be here in Washington serving as Einstein Fellows this year. The access and influence we have here in Washington on STEM education policy and the ability to transmit our understanding to colleagues, administrators, parents and students throughout the country is unprecedented. We would be honored to assist the PCAST in finalizing the K-12 Report with a broad perspective and embark upon a clear conversation about how to effectively tie into the needs and issues in higher education.

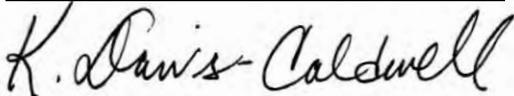
Sincerely,



John D. Moore
Albert Einstein Distinguished Educator Fellow 2009-11
Teacher of Environmental and Geospatial Technologies

cc: Deborah D. Stein, PhD, Executive Director

2010-11 Fellows in Support of this Letter:



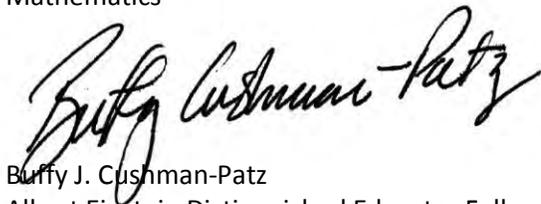
Kisha Davis-Caldwell, NBCT
Albert Einstein Distinguished Educator Fellow 2010-2011
Teacher of Gifted and Talented
Mathematics



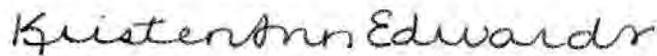
Brenda Gardunia
Albert Einstein Distinguished Educator Fellow 2010-2011
Teacher of Mathematics 9-12



Eduardo Guevara
Albert Einstein Distinguished Educator Fellow 2009-11
Teacher of Science Composite Teacher (Chemistry,
Physics, Biology, Ecology)



Buffy J. Cushman-Patz
Albert Einstein Distinguished Educator Fellow 2010-2011
Middle/High school Math/Science teacher; Geoscientist



Kristen Ann Edwards
Albert Einstein Distinguished Educator Fellow 2009-2011
Teacher of Anatomy & Physiology and Biology

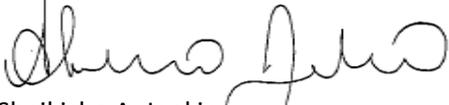


Matthew Inman
Science & Math Teacher
National Board Certified Teacher - Physics
Albert Einstein Distinguished Educator Fellow 2010-11

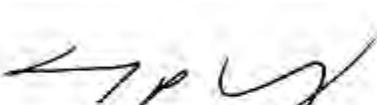
Fellows in Support of this Letter (cont'd):



Arundhati Jayarao, PhD
Albert Einstein Distinguished Educator Fellow 2009-2011
Teacher of Physics, AP Chemistry & Chemistry



Sheikisha A. Jenkins
Albert Einstein Distinguished Educator Fellow 2010-2011
Teacher of Biology



Mike Kennedy
Albert Einstein Distinguished Educator Fellow 2010-2011
Teacher of Physics and Mathematics



Tina King
Albert Einstein Distinguished Educator Fellow, 2010-2011
Teacher of Geosciences



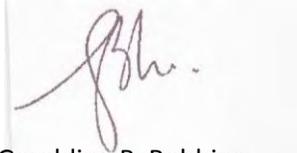
Lindsay Knippenberg
Albert Einstein Distinguished Educator Fellow 2010-2011
Teacher of Biology and Environmental Science



Dave Oberbillig
Albert Einstein Distinguished Educator Fellow 2010-2011
Teacher of Biology



Staci Richard
Albert Einstein Distinguished Educator Fellow 2010-2011
Biology Teacher and Science Department Chair



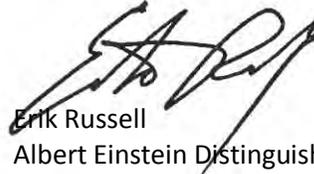
Geraldine B. Robbins
Albert Einstein Distinguished Educator Fellow 2010-2011
Mathematics Teacher / Calculus and Pre-Algebra



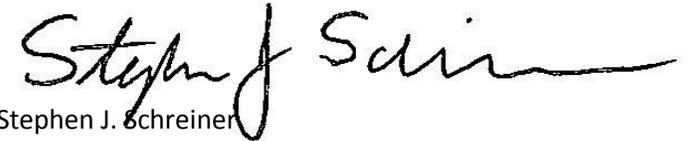
Jenay Sharp Leach
Albert Einstein Distinguished Educator Fellow, 2010-2011
Teacher of Physics and K-6 General Science



Jean Pennycook
Albert Einstein Distinguished Educator Fellow 2010-2011
Environmental and Climate Change Educator



Erik Russell
Albert Einstein Distinguished Educator Fellow 2010-2011
Teacher of Elementary Education - STEM



Stephen J. Schreiner
Albert Einstein Distinguished Educator Fellow 2010-2011
Teacher of Project-Based Science



Kevin Simmons
Albert Einstein Distinguished Educator Fellow 2009-11
Teacher of Chemistry, Physics and Aerospace Science



Nancy K. Spillane
Albert Einstein Distinguished Educator Fellow 2009-2011
7th – 12th Grade Life Science, Physical Science and
Chemistry Teacher



Mike Town
Albert Einstein Distinguished Educator Fellow 2010-2011
Teacher of Environmental Science

From: "Timothy Young" <timothymyoung@hotmail.com>
Date: Thu, October 14, 2010 2:30 pm
Re: Documents Attached for Review

The President's Council of Advisors on Science and Technology,

Please find attached the documents that are entitled "Protecting the Community of La Conchita in Ventura County during Mudslides" and "Protecting Lives and Municipalities in Washington State during a Lahar."

In addition to being emailed to the general email of PCAST, these documents were also emailed to Ms. Deborah Stine, PhD (Executive Director of PCAST), such that Dr. Stine may have these documents as a source of reference.

If I can be of further assistance to PCAST, please contact me.

Truly,
Tim Young

Important Notice:

Any use or reuse of original or altered documents by the recipient, agents of the recipient, or other parties, without the review and written approval of the Resolutions Group, shall be at the sole risk of the recipient. Furthermore, by receipt of these files, the recipient agrees to defend, indemnify, and hold the Resolutions Group and its employees harmless from all claims, injuries, damages, losses, expenses, and attorney's fees and from any and all liability arising out of the modification or reuse of these materials.

The attached materials are not to be further distributed without the prior written consent of the Resolutions Group. The Resolutions Group retains all common law, statutory and other reserved rights, including the copyright thereto.

Protecting the Community of La Conchita in Ventura County during Mudslides

An Unsolicited Proposal

**Submitted by:
The Resolutions Group**

Protecting the Community of La Conchita in Ventura County during Mudslides

An Unsolicited Proposal

**Submitted by:
The Resolutions Group**

Revision 0.11

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The Resolutions Group
PO Box 182
Cumberland, VA 23040

October 14, 2010

The Office of Science and Technology Policy (OSTP)
The Executive Office of the President
725 17th Street, Room 5228
Washington, DC 20502

Subject: Cover Letter of Document

The Office of Science and Technology Policy,

Please find attached the unsolicited proposal entitled "Protecting the Community of La Conchita in Ventura County during Mudslides."

This document is being submitted by the Resolutions Group, which is a small business that specializes in disaster prevention consulting services.

This document was sent to Ms. Deborah D. Stine, PhD (Executive Director of the President's Council of Advisors on Science and Technology (PCAST)) and to the general email of PCAST, such that the Office of Science and Technology Policy (OSTP) will gain knowledge of this document.

The reviewer(s) of this document is to have the understanding that this paper does not address all of the issues that surround the proposed structure that is mentioned herein. This was done to limit the size of this paper.

For any topics that are mentioned briefly or not covered within this document the reviewer(s) of this paper is encouraged to contact the following individual:

Contact: **Mr. Stiles L. Bartley, AIA**
Firm: Stiles L. Bartley Architects
Telephone: (804) 743-7002
Email: stilesinva@aol.com

All parties receiving this document would include (refer to K. Points of Contact, Individuals Receiving Document; pages 15-19):

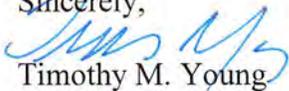
- The La Conchita Community Organization
- The Office of Supervisor Steve Bennett
- The Office of Assemblymember Pedro Nava

- The Office of State Senator Tony Strickland
- The Ventura County Sheriff's Office of Emergency Services
- The Governor's Office of Planning and Research
- The Office of US Congresswoman Lois Capps
- The Office of US Senator Dianne Feinstein
- The US Army Corps of Engineers (South Pacific Division)
- The Structural Engineer's Association of California
- The International Research Committee on Disasters
- The Alliance for Science & Technology Research in America
- The National Science Foundation
- **The President's Council of Advisors on Science and Technology**
- The Ventura Life Magazine

Mr. Young has accepted the duty of representing and contractually obligating the offeror of this document and by signing below he realizes this responsibility.

Any effort on the part of the PCAST and the OSTP that will lead to the implementation of the structure that is described within this document is greatly required.

Sincerely,



Timothy M. Young
The Resolutions Group

Protecting the Community of La Conchita in Ventura County during Mudslides

An Unsolicited Proposal

Use and Disclosure of Data

The intended recipients of this unsolicited proposal must exercise extreme care to ensure that the information within this proposal is not disclosed to an individual who has not been authorized access to this document. This document is not to be duplicated, used, or disclosed in whole or in part for any purpose other than evaluation of the proposal, without the written permission of the Resolutions Group.

Technical Information

A. Concise Title and Abstract

The Introduction

The title of this unsolicited proposal is “Protecting the Community of La Conchita in Ventura County during Mudslides.”

The purpose of this proposal is to describe a proposed structure that is to protect the community of La Conchita, California from future mudslides and landslides.

The purpose of the proposed structure is to capture and contain mudslides and landslides that threaten the community of La Conchita; this structure is to prevent deadly slides, such as the massive mudslide that occurred on January 10, 2005. This mudslide killed 10 persons and injured 14 persons. This mudslide buried four blocks of the community in over 30 feet of earth, destroying 15 houses and causing 16 more houses to be tagged by Ventura County as being uninhabitable.

The Significance of Problem

Not listing the mudslide of January 10, 2005, cited below are other notable landslides that have impacted the community of La Conchita:

- On March 4, 1995, a mudslide destroyed or severely damaged 9 houses.
- On March 10, 1995, a debris flow occurred in the canyon west of the March 4 slide, damaging 5 homes.

The reason for reviewing these events is to bring to the forefront the number of deaths, those who were injured, and the destruction of property that was associated with past mudslides that impacted the community of La Conchita. The implementation of the proposed structure is will greatly reduce similar occurrences from impacting this community.

Note:

In 2005, Dr. Larry D. Gurrola, of the University of California in Santa Barbara, concluded that landslides will be a continuing occurrence for the community of La Conchita. Dr. Gurrola reports that this is due to several factors, such as, rapid tectonic uplift, steep topography and the presence of aquatic springs^a.

The Serious Need for Immediate Action

Those that died in the community of La Conchita due to the mudslide of January 10, 2005, should alone justify the implementation of a structure that will protect this community from future mudslides and landslides.

Notes:

With an understanding that each house in the community of La Conchita had an average assessed value of \$158,700 in 1995, the 14 houses that were destroyed or seriously damaged from the occurring mudslide of this year would total \$2,221,800.

Having the understanding that all of the automobiles of the 14 houses were also destroyed from the occurring mudslide of 1995, and that each automobile had an estimated cost of \$23,757 and that each household had two (2) automobiles, the estimated cost of these automobiles would be \$665,196.

With an understanding that each house in the community of La Conchita had an average assessed value of \$297,000 in 2005, the 31 houses that were destroyed or seriously damaged from the occurring mudslide of this year would total \$9,207,000.

Having the understanding that all of the automobiles of the 31 houses were also destroyed from the occurring mudslide of 2005, and that each automobile had an estimated cost of \$23,432 and that each household had two (2) automobiles, the estimated cost of these automobiles would be \$1,452,784.

Concerns of the Author

It is this author's understanding, that a great majority of the houses that are closest to the hill along Vista del Rincon Drive are in danger of being destroyed from future mudslides and landslides, and thus the author recommends that all houses within this area be removed for the purpose of saving lives.

After taking the appropriate actions by Ventura County which will lead to acquiring the land that is closest to the hill on Vista del Rincon Drive, the County will be able to initiate the required procedures that will lead to the construction of the proposed structure.

^a A brief discussion of this study can be found at the University of California, Santa Barbara website; refer to www.ia.ucsb.edu/pa/display.aspx?pkey=1356.

The Proposed Structure

The proposed structure that is to be placed between the community of La Conchita and the hill known for its landslides is a mass concrete gravity retaining wall, which is to be freestanding, not holding back any earth or other material. This structure is to be parallel with Vista del Rincon Drive; at its ends are wing walls that are constructed into the hill.

Using the hill as a natural barrier the walls of the retaining wall will form the other sides of a “bowl” that will capture and contain all occurring mudslides and landslides that threaten the community of La Conchita.

The height of the retaining wall from finished grade is approximately 50 feet, and its top and base widths are approximately 8 feet and 30 feet, respectively; these dimensions are subject to change due to the design requirements set forth by Ventura County^b.

Found throughout the length of the retaining wall, slightly above finished grade and spaced up the height of the wall are weep holes. Initially all of the weep holes are capped except for those close to ground level, as the enclosed area fills with earth and debris (e.g. trees and rocks) from slides, the caps are removed from the retaining wall which is at a height that is below the newly deposited material.

Planted in front of the retaining wall facing Vista del Rincon Drive are trees (e.g. Valley Oaks), which are used to obscure the structure from the view of the community.

There are also a network of sensors, which will continually monitor for frequencies that are associated with mudslides and landslides^c. If a slide is detected by these sensors, cameras viewing the area of interest will be activated to record the event.

The Handling of Economical Restraints

It is hoped that the community of La Conchita will seek and receive the required funding through Ventura County, the State of California and possibly the Obama’s \$850 billion infrastructure spending plan, such that the proposed structure can be built for the purpose of saving lives and protecting property during mudslides and landslides.

^b As an example, Ventura County may desire a larger structure, such as a retaining wall measuring 75 feet in height from finished grade, and having top and base widths of 12 feet and 40 feet, respectively.

^c The majority of landslides begin with a low-frequency (<50 Hz) rumble that is accompanied by and eventually replaced by, a broadband hiss. The hiss has a nearly flat power spectrum from 1 to 3000 Hz. Mudslides typically exists in the frequency range of 0.01 Hz to 10 Hz.

Points to Keep in Mind

This document is an unsolicited proposal, not a culmination of construction documents and engineering calculations, which shows the placement and the design of the proposed structure. The development of these documents (e.g. engineering calculations and construction drawings) will be furnished when the structure is determined appropriate for the community of La Conchita. Such designs are not provided within this document to protect the interest of the Optimize Engineering Company, LLC and its partners.

The Nontechnical Objectives

There are a few processes of development that are not technical objectives that must take place within the government^d in order to have the mentioned structure constructed in the community of La Conchita, one such objective is:

- The government is to determine the placement of the mentioned structure with the assistance, if necessary, by the chief engineering firm^e. Since the government does not own the land needed to construct the retaining wall, the government is to acquire the needed land by purchasing it by declaring Eminent Domain.

Note:

After a determination is made regarding the placement of the structure, a study will be conducted to insure that its placement will not endanger animals under the Endangered Species Act.

B. Technical Objectives and the Work Plan

Technical Objectives

The Objectives

There are several technical objectives that must take place, when the proposed structure is to be constructed to protect the community of La Conchita. Listed below are several of these objectives in the order that they are to occur:

- Preparation of conceptual plans. Under the direction of chief engineering firm, this task will be completed.
- The government selects a conceptual plan of the mentioned structure that best fits the needs of the community of La Conchita. Modifications are made, if desired.
- A detailed design (e.g. engineering calculations and construction drawings) of the selected conceptual plan is completed^f, which is reviewed by the government. Under the direction of chief engineering firm, this task will be completed.
- The government approves the construction documents, with applicable modifications, if any.

^d Hereinafter the term “government” is used to mean the community of La Conchita, Ventura County and/or the State of California.

^e This engineering firm is understood to be the Optimize Engineering Co., LLC (located in Farmville, VA).

^f The structure will also be designed to withstand seismic forces.

- The project is advertised for bid. The government is to complete this task.
- The acceptance of the bid proposals is followed by the selection of a contractor by the government. The government is to complete this task with assistance, if needed, from the chief engineering firm.
- The contractor completes the construction phase. Under the direction of the chief engineering firm, this task is monitored.
- The government and the chief engineering firm accept the completed structure.

Development of the Engineering Calculations, Plans and Specifications

Under the direction of the chief engineering firm all engineering calculations and construction documents (e.g. plans and specifications) of the mentioned structure are completed. This also includes the preparation of the conceptual plans, which shows the orientation of the proposed structure to the community of La Conchita.

This process of development will be approximately 15 weeks. This process is to occur after the government selects a conceptual plan with modifications, if desired.

The Construction of the Structure

Under the direction of the chief engineering firm, the contractor will construct the structure that is indicated within the construction documents. The activities of the contractor are monitored and inspected on a continual basis by the government, the chief engineering firm and/or an appointed representative (the structural/geotechnical engineering firm).

The limit of the construction phase is to be approximately 20 weeks.

The Work Plan

The Project Implementation

For the construction of the retaining wall to be implemented, a desire must first be shown by the community of La Conchita. This is to be followed by a desire by Ventura County and the State of California to provide the needed financial support such that the structure can be built.

Carrying Out Project Activities and Qualifications

The Chief Engineering Firm - Optimize Engineering Company, LLC

This engineering firm was established in April 2000, by Richard B. Gordon, P.E. to provide a responsive multi-discipline engineering firm to serve both the public and private sectors. The staff of this professional firm is experienced in the engineering of commercial, residential, industrial and institutional structures in the United States.

This firm offers a full spectrum of engineering services, and is recognized by its new and continuing clients for its creative solutions, innovative designs and engineering excellence.

This consulting firm offers civil, structural, mechanical, electrical engineering, piping/plumbing and design services. Also, this consulting firm service includes site feasibility studies, site planning, utility design and construction administration.

To learn more about this dynamic engineering firm, please visit www.optimizeces.com.

When the government makes a determination to be a client of this firm, Mr. Gordon may choose to select a recognized structural/geotechnical engineering firm from the State of California to perform the necessary task of the development of the construction documents, perform contract administration duties and/or field observations.

Consultant: The Architectural Firm - Stiles L. Bartley Architects

Stiles L. Bartley Architects was established in February 1976, by Stiles L. Bartley, AIA to provide an architectural firm to serve both the public and private sectors that would provide unmatched client service, sustainable architecture through innovative thinking and exceptional design in the United States.

This architectural firm is well versed in the design of commercial, community/religious, education, government, healthcare, residential, restaurants and retail buildings.

This firm specializes in architecture, interior design, master planning and sustainable design and consulting.

This architectural firm will serve as a design consultant to the chief engineering firm as to matters that relate to the aesthetics of the mentioned structure.

Consultant: The Structural/Geotechnical Engineering Firm

Under the direction of the chief engineering firm, the selected structural/geotechnical engineering firm must be capable of leading other engineering firms (e.g. electrical and mechanical) and design consultants to the successful completion of all engineering calculations, plans and specifications of the described structure.

This firm will oversee the construction of the mentioned structure by conducting scheduled and unscheduled inspections during the construction phase, and submit progress reports every two weeks. This is to insure that the contractor is following the construction methods as indicated within the construction documents.

The success of this firm must be documented, such as in letters of reference by the owners of previous projects.

When necessary, the structural/geotechnical engineering firms are interviewed; from this process a firm is selected.

In addition to overseeing the development of the construction documents, other duties of this firm which relate to contract administration and field observations will be preformed, some of these additional duties may include, but are not limited to:

- Participate in progress meetings with the client (La Conchita, California).
- Review of contractor's submittals.
- Review of contractor's applications for payment.
- Provide technical assistance for resolving unanticipated field conditions.
- Provide construction cost tracking.
- Provide change order processing and negotiation.
- Review contract close-outs (e.g. the warranty information).

The Contractor

The contractor is to have a successful track record of managing subcontractors, such that the construction phase of the mentioned structure is completed within the established budget and within the allotted time period; the allotted time period is to be approximately 20 weeks.

The success of the general contractor must be documented, such as in letters of reference by the owners of previous projects.

The Activities of the Proposed Project

This portion of the unsolicited proposal cites the goals that are found within the technical objectives (refer to B. Technical Objectives and the Work Plan, Technical Objectives, The Objectives; pages 6, 7). The cited activities are to occur shortly after the government begins the process of acquiring the land that is needed to construct the structure.

Under the direction of the chief engineering firm, the conceptual plans which show the orientation of the mentioned structure in relationship to the community of La Conchita are completed and are shown to the government.

The government selects a conceptual plan that best fits the needs of the community of La Conchita. Modifications are made, which are based on the desires of the government.

Based on the selected conceptual plan, under the direction of the chief engineering firm, the engineering calculations and the construction documents are completed, which are reviewed by the government. Modifications are made, if required.

After the construction documents reflect the desires of the government and these plans are approved, the project is advertised for bid.

The government receives the bid proposals from the contractors.

Shortly after a contract is signed between the contractor and the government, the construction phase begins, and is completed within approximately 20 weeks. As stated earlier, the activities of the contractor are monitored and inspected by the government, the chief engineering firm and/or its representative (the structural/geotechnical engineering firm) on a continual basis.

After all permits are approved, both the government and the chief engineering firm accept the completed structure.

C. Who Will Benefit, Uniqueness of the Project, Etc

Who Will Benefit

The community of La Conchita would benefit from the mentioned structure, because the retaining wall will be engineered to have the means to capture mudslides and landslides that threaten to inundate this community.

The Uniqueness of the Project

The author believes that the mentioned structure is unique; because it has the capacity of preventing mudslides and landslides of an established height (e.g. 50 feet) from inundating areas within the community of La Conchita.

Deserving of Attention

Because past mudslides are known to have claimed lives, caused injuries and have destroyed property in the community of La Conchita, the author believes that the proposed structure deserves the attention of this community, Ventura County and the State of California.

Related Work

The Resolutions Group has found no evidence that the described structure has been presented to the community of La Conchita, Ventura County or to the State of California, as a means to capture mudslides and landslides that threaten to inundate areas within the community of La Conchita.

Relationship with Future Research and/or Development

The mentioned structure does not have a relationship to future research and/or development.

D. Outcome

The Immediate and Long-Range Results

It is hoped that the immediate result will be that the community of La Conchita would have an interest in the proposed structure, and encourage Ventura County and the State of California to review this document with the hope of having the proposed structure constructed.

It is hoped that the long-range result will be that the proposed structure will be built to protect the community of La Conchita from mudslides and landslides.

E. Support for the Proposed Structure

The Support from Professional Firms

Due to the purpose and function of the Resolutions Group, to accomplish the described tasks that are mentioned herein (e.g. the completion of the engineering calculations, plans and specifications) the following professional firms have shown an eagerness to participate in the advancement of the structure that is described within this unsolicited proposal:

The Chief Engineering Firm

The Optimize Engineering Co., LLC (Farmville, VA)

The Architectural Firm (Consultant)

Stiles L. Bartley Architects (Richmond, VA)

In addition, these professional firms have contributed in creating the concepts of the mentioned structure and these firms are thoroughly familiar with the aspects of this proposal.

Supporting Information

F. Estimated Costs

The Estimated Cost

The individual costs that are listed below are merely an estimate and must be viewed as such.

Acquisition of Land

Estimated cost for land to construct structure: \$5,818,000

The general contractor is to determine the actual construction cost for the structure at the time of bidding.

Rather than give a line item estimate of the proposed structure, which is controlled by the desires of the government, listed below is an estimate of several key components, which are to lead to the completion of the structure:

Demolishing Houses and Clearing of Land

Estimated cost of demolition and clearing land: \$450,000

Excavation for Retaining Wall

Estimated cost of excavation: \$105,000

The Retaining Wall

Estimated cost of retaining wall: \$17,850,000

The sum of these estimated quantities yields \$18,405,000. Thus, it can be understood that the proposed structure will cost less than 20 million dollars.

G. Period of Time Unsolicited Proposal is Valid

The Period of Being Valid

This unsolicited proposal is valid for a period of 90 calendar days.

Unless otherwise previously stated, the starting date of the review is the date that appears within the Cover Letter; refer to page 1 of this unsolicited proposal.

The Time Extension

When a time extension is needed to conclude the review of this unsolicited proposal, please notify the Resolutions Group by mail or email. This request is to be received before the 10th day of which this proposal remains valid. The mailing address of the Resolutions Group is:

The Resolutions Group
PO Box 182
Cumberland, VA 23040

Such a request could also be sent by way of email to Mr. Timothy M. Young at:

timothymyoung@hotmail.com

Note:

The time which this proposal remains valid may be lengthened by its author without notification to the reviewer(s).

H. Contracts Preferred

The Contracts Preferred

When a contract is awarded as a result of or in connection with the submission of this unsolicited proposal, the preferred contract is to be a fixed-price contract.

This contract is to be made between the government (Party A), and the partnership of the Optimize Engineering Co., LLC and the Resolutions Group (Party B) in the amount of 10% of the construction cost.

In addition, the previously stated partnership is requesting that all expenses that relate to the traveling (e.g. airplane tickets, hotel stays and car rentals) of its employees to the site of the structure during the construction phase be reimbursed.

For the contractor, the contract is to be a fixed-price contract. This contract amount is to be based on the contractor's bid proposal.

A 20 year contract will be pursued between the government (Party A) and the Resolutions Group (Party B) in the amount of \$166,400 per year to manage the maintenance operation of the mentioned structure.

The Phases of Service and the Allocation of Fees

The phases of service and the allocation of fees are broken down below, which are to be based on the previously stated fee, as the lump sum (refer to H. Contracts Preferred, The Contracts Preferred; page 13).

- Phase 1: Schematic Design: 15%
- Phase 2: Design Development: 15%

- Phase 3: Contract Documentation: 40%
- Phase 4: Bidding and Negotiation: 5%
- Phase 5: Contract Administration: 25%

I. Time Durations

The Individual Time Durations

The individual time durations are as follows:

- The preparation of the construction documents, with feedback from the government: 15 weeks (approximate)
- The government approves the construction documents: 5 weeks (approximate)
- The construction project is advertised for bid and the bids are received: 5 weeks
- The contractor is selected and the contractor’s contract is signed: 5 weeks (approximate)
- The construction of the structure: 20 weeks (approximate)

J. Brief Description of the Resolutions Group

The Mission Statement

The mission statement of the Resolutions Group is to “seek out unexplored avenues that will protect mankind from the threats brought on by naturally occurring forces and by the willful acts of man.”

The Work of the Resolutions Group

The Resolutions Group has made an ongoing effort to describe systems that have the capability to safeguard lives and protect the environment. The chosen method of the Resolutions Group is to submit an unsolicited proposal to a source that is capable of implementing such a system.

The Recent Work of the Resolutions Group

As of recent times, the Resolutions Group has submitted the unsolicited proposals that are briefly described below:

Protecting Lives and Municipalities in Washington State during a Lahar

The purpose of this unsolicited proposal is to describe a proposed system that is to divert lahars[§] to an uninhabited space, such that the municipalities near the Carbon River (Carbonado, Wilkeson), those near the Puyallup River (Fife, Orting, Puyallup, Sumner and Tacoma) and those near the Nisqually River (Ashford, Elbe) do not become inundated from lahars in the event Mount Rainier erupts.

[§] A wet mass of volcanic fragments flowing rapidly downhill.

Providing a Way of Escape from a Tsunami's Run-Up

The purpose of this unsolicited proposal is to describe a structure that is to protect individuals, who find themselves in a low-lying coastal area that is in the path of a tsunami's run-up.

Protecting Items within a Municipality during a Flood

The purpose of this proposal is to describe a structure that is to be placed in an area, which has a history of flooding; such flooding could be the result of a riverine flood, an estuarine flood or a coastal flood.

This structure is to provide a place of protection for cargo containers, automobiles that belong to the government and that of motorists. Also, this structure is to serve as a place of protection for the temporary storage of government owned documents, hazardous chemicals (e.g. pesticides and gasoline) and mail that is being transported by the US Postal Service.

K. Points of Contact

Individuals Receiving Document

The following individuals have received this unsolicited proposal:

Organization: The La Conchita Community Organization

Recipient: **Mr. Mike Bell**

Position: Chairperson

Phone: (805) 652-1722

Email: bmbell@charter.net

Office: Ventura County Supervisor Steve Bennett

Recipient: **Mr. Steve Offerman**

Position: Assistant

Phone: (805) 654-2703

Email: steve.offerman@ventura.org

Office: State Senator Tony Strickland

Recipient: **Senator Tony Strickland**

Phone: (805) 306-8886

Email: senator.strickland@senate.ca.gov

Office: US Congresswoman Lois Capps

Recipient: **Mr. Jonathan Saur**

Position: District Representative

Phone: (805) 730-1710

Email: jonathan.saur@mail.house.gov

Office: US Senator Dianne Feinstein
Recipient: **Ms. Molly O'Brien**
Position: Field Representative
Phone: (310) 914-7300
Email: molly_o'brien@feinstein.senate.gov

Office: Assemblymember Pedro Nava
Recipient: **Mr. John D. Mann**
Position: Principal Assistant
Phone: (916) 319-2035
Email: john.mann@asm.ca.gov

Government Department: The US Army Corps of Engineers (South Pacific Division)
Recipient: **Mr. Kelley J. Aasen, P.E.**
Position: Chief of Emergency Management
Phone: (415) 503-6610
Email: kelley.j.aasen@usace.army.mil

Government Department: Governor's Office of Planning and Research
Recipient: **Mr. Scott Morgan**
Position: Acting Director of the State Clearinghouse and Planning Unit
Phone: (916) 322-2318
Email: scott.morgan@opr.ca.gov

Organization: The Ventura Life Magazine
Recipient: **Ms. Dina Pielaet**
Position: Publisher
Phone: (805) 641-9303
Email: dina@451media.com

Government Department: The Ventura County Sheriff's Office of Emergency Services
Recipient: **Ms. Laura D. Hernandez**
Position: Manager of Emergency Services
Phone: (805) 654-2552
Email: laura.hernandez@ventura.org

Organization: The Structural Engineer's Association of California
Recipient: **Mr. Lee Adler, S.E.**
Position: Executive Director
Phone: (916) 442-0820
Email: lee@seaoc.org

Organization: The International Research Committee on Disasters
Recipient: **Mr. Michael K. Lindell, PhD**
Position: Editor
Phone: (979) 862-3969
Email: mlindell@tamu.edu

Organization: The Alliance for Science & Technology Research in America
Recipient: **Mr. Robert Spurrier Boege, J.D.**
Position: Executive Director
Phone: (202) 872- 6160
Email: rboege@comcast.net

Government Agency: The National Science Foundation
Division Contacted: The Division of Civil, Mechanical and Manufacturing Innovation
Recipient: **Mr. Dennis Wenger, PhD**
Position: Program Director
Phone: (703) 292-8606
Email: dwenger@nsf.gov

President's Office: The Office of Science and Technology Policy
Council Contacted: The President's Council of Advisors on Science and Technology
Recipient: **Ms. Deborah D. Stine, PhD**
Position: Executive Director
Phone: (202) 456-6006
Emails: dstine@ostp.eop.gov; pcast@ostp.gov

Notes:

This unsolicited proposal was sent by way of email to Mr. Bell (Chairperson), such that the contents of this document will be known by the La Conchita Community Organization. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, May 26, 2010.

This unsolicited proposal was sent by way of email to Mr. Offerman (Assistant), such that the contents of this document will be known by Ventura County Supervisor Steve Bennett. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, May 26, 2010.

This document was sent by way of email to State Senator Tony Strickland, such that the contents of this document will be known. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, May 26, 2010.

This document was sent by way of email to Mr. Saur (District Representative), such that the contents of this document will be known by US Congresswoman Lois Capps. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, May 26, 2010.

This document was sent by way of email to Ms. O'Brien (Field Representative), such that the contents of this document will be known by US Senator Dianne Feinstein. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, May 26, 2010.

This document was sent by way of email to Mr. Mann (Principal Assistant), such that the contents of this document will be known by Assemblymember Pedro Nava. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Monday, June 07, 2010.

This unsolicited proposal was sent by way of email to Mr. Aasen (Chief of Emergency Management), such that the contents of this document will be known by the US Army Corps of Engineers (South Pacific Division). This email was sent by Mr. Timothy M. Young of the Resolutions Group on Saturday, June 19, 2010.

This unsolicited proposal was sent by way of email to Mr. Morgan (Acting Director of the State Clearinghouse and Planning Unit), such that the contents of this document will be known by the Office of Governor Arnold Schwarzenegger. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Saturday, June 26, 2010.

This document was sent by way of email to Ms. Pielaet (Publisher of the Ventura Life Magazine), such that the contents of this document will be known by Ventura County. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, July 20, 2010.

This unsolicited proposal was sent by way of email to Ms. Hernandez (Manager of the Ventura County Sheriff's Office of Emergency Services), such that the contents of this document will be known by Ventura County. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Saturday, August 14, 2010.

This document was sent by way of mail to Mr. Adler (Executive Director), such that the contents of this document will be known by the Structural Engineer's Association of California. This document was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, August 24, 2010.

This document was sent by way of email to Mr. Lindell (Editor of the International Journal of Mass Emergencies and Disasters), such that the contents of this document will be known by the International Research Committee on Disasters. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Monday, September 13, 2010.

This document was sent by way of email to Mr. Boege (Executive Director of the Alliance for Science & Technology Research in America), such that the contents of this document will be known by the ASTRA and its Partners. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Monday, September 20, 2010.

This document was sent by way of email to Mr. Wenger (Program Director of the Division of Civil, Mechanical and Manufacturing Innovation), such that the National Science Foundation may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, October 12, 2010.

This document was sent by way of email to Ms. Stine (Executive Director of the President's Council of Advisors on Science and Technology (PCAST)) and to the general email of the PCAST (pcast@ostp.gov), such that the Office of Science and Technology Policy may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Thursday, October 14, 2010.

End of Unsolicited Proposal

Protecting Lives and Municipalities in Washington State during a Lahar

An Unsolicited Proposal

**Submitted by:
The Resolutions Group**

Protecting Lives and Municipalities in Washington State during a Lahar

An Unsolicited Proposal

**Submitted by:
The Resolutions Group**

Revision 0.16

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The Resolutions Group
PO Box 182
Cumberland, VA 23040

October 14, 2010

The Office of Science and Technology Policy (OSTP)
The Executive Office of the President
725 17th Street, Room 5228
Washington, DC 20502

Subject: Cover Letter of Document

The Office of Science and Technology Policy,

Please find attached the document entitled "Protecting Lives and Municipalities in Washington State during a Lahar."

This document is being submitted by the Resolutions Group, which is a small business that specializes in disaster prevention consulting services.

This document was sent to Ms. Deborah D. Stine, PhD (Executive Director of the President's Council of Advisors on Science and Technology (PCAST)) and to the general email of PCAST, such that the Office of Science and Technology Policy (OSTP) will gain knowledge of this document.

The reviewer(s) of this document is to have the understanding that this paper does not address all of the issues that surround the proposed system that is mentioned herein. This was done to limit the size of this paper.

For any topics that are mentioned briefly or not covered within this document the reviewer(s) of this paper is encouraged to contact the following individual:

Contact: **Mr. Richard B. Gordon, PE**
Firm: The Optimize Engineering Co., LLC
Telephone: (434) 574-6138
Email: grichardpe@aol.com

All parties receiving this document would include (refer to K. Points of Contact, The Individuals Receiving Proposal; pages 20-27):

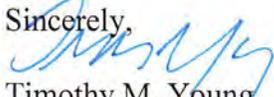
- The Alliance for Science & Technology Research in America
- The City of Orting
- The City of Tacoma

- The Mount Rainier National Park
- The National Science Foundation
- The Office of Governor Chris Gregoire
- The Office of State Representative Phyllis Gutierrez Kenney
- The Office of State Representative Dan Roach
- The Office of State Representative Matt Shea
- The Office of State Senator Lisa Brown
- The Office of State Senator Pam Roach
- The Office of US Congressman Norm Dicks
- The Office of US Congressman Rick Larsen
- The Office of US Congressman Dave Reichert
- The Office of US Congressman Adam Smith
- The Office of US Senator Maria Cantwell
- The Office of US Senator Patty Murray
- The Port of Tacoma
- **The President's Council of Advisors on Science and Technology**
- The Public Works Board of the Washington State Department of Commerce
- The Seattle District of the US Army Corps of Engineers
- The US Department of Agriculture
- The Washington State Department of Agriculture (the Homeland Security Program)
- The Washington State Department of Archaeology and Historic Preservation
- The Washington State Department of Transportation
- The Washington State Historical Society
- The Washington State House Committee on Community, and Economic Development and Trade
- The Washington State House of Democrats
- The Washington State Senate Democratic Caucus

Mr. Young has accepted the duty of representing and contractually obligating the offeror of this document and by signing below he realizes this responsibility.

Any effort on the part of the PCAST and the OSTP that will lead to the implementation of the system that is described within this document is greatly required.

Sincerely,



Timothy M. Young
The Resolutions Group

Protecting Lives and Municipalities in Washington State during a Lahar

An Unsolicited Proposal

Use and Disclosure of Data

This unsolicited proposal does not include data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed—in whole or in part—for any purpose other than to evaluate this proposal.

All Government personnel and the members of other parties that receive this unsolicited proposal must exercise extreme care to ensure that the information in this proposal is not disclosed to an individual who has not been authorized access to this document. This document is not to be duplicated, used, or disclosed in whole or in part for any purpose other than evaluation of the proposal, without the written permission of the Resolutions Group.

Technical Information

A. Concise Title and Abstract

The Introduction

The title of this unsolicited proposal is “Protecting Lives and Municipalities in Washington State during a Lahar.”

The purpose of this proposal is to describe a system that is to be connected to the Carbon River, the North and South Puyallup Rivers, and the Nisqually River, which will serve as the path for lahars^a as it travels, under its own power, to an uninhabited space.

The purpose of this system is to divert lahars, such that the municipalities near the Carbon River (Carbonado and Wilkeson), those near the Puyallup River (Fife, Orting, Puyallup, Sumner and Tacoma) and those near the Nisqually River (Ashford and Elbe) do not become inundated from lahars in the event Mount Rainier erupts.

After reviewing this proposal, it is hoped that the government^b will begin implementing the processes that will lead to the construction of the proposed system, such that the previously cited municipalities will be protected from lahars.

It is hoped that the cited municipalities and Washington State will seek and receive the required funding through the Obama’s \$850 billion infrastructure spending plan, such that the system, which is described within this proposal can be constructed for the purpose of saving lives and protecting the cited municipalities from lahars.

^a A wet mass of volcanic fragments flowing rapidly downhill.

^b This term is used hereinafter to mean the agencies of the federal government, the State of Washington and that of the cited municipalities.

It is also hoped that the government will have the same convection to implement the proposed system that is described within this proposal, as this government has had in the past to implement systems of a lesser cause (e.g. the Deer Island Waste Water Treatment Plant and the National Ignition Facility); refer to the second note found on page 17.

The Significance of the Problem

The City of Armero, Colombia was destroyed by lahars on November 13, 1985. More than 23,000 persons were killed in Armero when lahars swept down from the erupting Nevado del Ruiz volcano.

On May 18, 1980, approximately 50 persons were killed in Washington State when lahars swept down from an erupting Mount St. Helens. In addition, these lahars destroyed about 250 homes, 47 bridges, 185 miles of highway and 15 miles of railway.

Today there are several volcanoes that are considered to be particularly dangerous due to the risk of lahars; one of these is Mount Rainier in Washington State. The municipalities that are considered to be at great risk would include Ashford, Carbonado, Elbe, Fife, Orting, Puyallup, Sumner, Tacoma (of interest the Port of Tacoma) and Wilkeson.

The Serious Need for Immediate Action

Because it is believed that lahars will be swept down from an erupting Mount Rainier, the US Geological Survey (USGS) has set up lahar warning sirens in Pierce County, so that people can flee an approaching lahar. *But what will save those individuals that chose not to observe or unable to heed this warning and that will protect the cited municipalities, and the Port of Tacoma from lahars?*

As a means to save lives, protect the cited municipalities and the Port of Tacoma from lahars this unsolicited proposal has been written.

Notes:

According to a 2000 census, the census-designated place of Ashford had a population of 267. If this area was completely inundated by a lahar, the cost of reconstruction may possibly be \$4.73 billion.

According to a 2000 census, the Town of Carbonado had a population of 621. If this town was completely inundated by a lahar, the cost of reconstruction may possibly be \$1 billion.

According to a 2000 census, the census-designated place of Elbe had a population of 21.

According to a 2000 census, the City of Fife had a population of 4,784, the City of Puyallup had a population of 33,011 and the City of Sumner had a population of 8,504.

If the City of Fife was completely inundated by a lahar, the cost of reconstruction may possibly be \$12.60 billion.

If the City of Puyallup was completely inundated by a lahar, the cost of reconstruction may possibly be \$27.23 billion.

If the City of Sumner was completely inundated by a lahar, the cost of reconstruction may possibly be \$15.08 billion.

According to the City of Orting, this municipality has a population of about 6,075.

If the City of Orting was completely inundated by a lahar, the cost of reconstruction may possibly be \$6.08 billion.

The Port of Tacoma is the seventh largest container port in North America, which handles more than \$28 billion in annual trade. For the year of 2009, the Port of Tacoma had a value of foreign trade totaling \$25.27 billion and a value of domestic trade totaling \$3.5 billion^c.

Preexisting System: The Lahar-Detection System

When the USGS lahar-detection system determines that ground vibrations^d are being generated by a lahar or at a time that is determined by the US Geological Survey of being imminent to an eruption, this system (the lahar bypass) is to be used.

The System: The Lahar Bypass^e

This system is to be considered outside the limits of Mount Rainier National Park.

This system (the lahar bypass) is to begin at the Carbon River^f, the North Puyallup River, the South Puyallup River and the Nisqually River valleys^g.

Appearing on both sides of the bank of the rivers is a reinforced concrete wall (approximately 300 feet long), which purpose is to contain the lahar as it travels down the river valley into the bypass.

The first element of the bypass, which the lahar will encounter are steps (constructed in the area of the rivers) that the lahar must travel down. These steps are critical for the energy dissipation of the traveling lahar.

Where the rivers meet the reinforced concrete rectangular channels there is a gravity dam; each having dam gates.

^c This data can be seen at the Port of Tacoma website. The webpage of interest is www.portoftacoma.com/Page.aspx?nid=86

^d This flow is predominantly detected in the frequency range of 30-80 Hz.

^e This structure is planned to go through the counties of Pierce, Lewis and Pacific.

^f The bypass will begin here because lahars typically travel within a river valley.

^g The elevation of these points of intersection is approximately 2,000 ft feet above sea level.

When there is no lahar warning these gates are opened, this will allow the water to flow through the dam. However, at the time of a warning these gates are closed. In front of the gates (perpendicular to the flow of the river) there are mass gravity walls, which are used to prevent large objects (e.g. boulders and trees) that are being forcibly carried by the lahar, from impacting the gates. These mass gravity walls are spaced within close proximity (approximately 5 feet) from the gate that it is protecting.

Between the rivers there is a rectangular channel (constructed of reinforced concrete) that will serve as the route for the lahar from the four river valleys to merge into one lahar; the width and height of this channel is approximately 550 feet and 30 feet, respectively.

Where these rivers come into contact with the rectangular channel there is a raised lip, which will help prevent the water flow of the rivers from entering into the channel when the rivers are at their normal flow rates.

Shortly after intersecting with the Nisqually River, a transition is made to a dirt trapezoidal channel; here the direction of this channel type will be west. This type of channel will be used up to approximately 300 feet from the shoreline.

At a distance this is approximately 300 feet from the shoreline a transition is made back to a rectangular channel (constructed of reinforced concrete). At the end of this channel (approximately 500 feet into the Pacific Ocean), at an elevation of about ten (10) feet above sea level there are outlets, which will allow the lahar to be deposited, under its own power, into the Pacific Ocean.

After observing that the vast amount of the lahar (or mudflow), has deposited itself into the lahar bypass and the ocean, clean-up operations are to begin. This operation is to result in the removal of the debris in the rivers and the cleaning of the area in front of the dam gates, such that the dams can be opened.

The Standby Electrical System

As long as the main electrical source is uninterrupted, the electricity needed to operate the mechanical equipment (e.g. the machinery used to open/close the gates, the surveillance equipment and sirens) will come from this source. In the event this source is interrupted, the emergency generator system will provide electricity for the operation of these items.

Notes:

The lahar bypass will be engineered to exert minimal influence over the kinetic energy of the lahar. The bypass will simply contain and redirect the lahar to the ocean.

Warning signs will be in place to inform unauthorized personnel (trespassers) not to enter within the area of the channels. During a lahar, sirens will be activated in the area of the channels.

At the time the dam gates are closed surveillance cameras are activated, in order that the lahar can be observed within the bypass. The video feed will be assessable to the government.

To insure that the proposed system is working adequately tests are conducted every six (6) months. This will help ensure that the system is functional when it is needed and that the channels remain in good repair (e.g. no growth of tall vegetation). After the event of a lahar, the bypass is inspected, such that remedies can be documented concerning any needed repairs.

As stated previously, appearing on both sides of the bank of the rivers is a continuous reinforced concrete wall; these walls will have buttresses that will serve as stiffening elements to help resist the bending moments that are produced by the lahar. This wall will also be used in the area of the dams; the purpose of this wall is to help trap the lahar into the lahar bypass.

Pedestrian bridges will used, which will span the over the lahar bypass, such as in the area of the beach. Cable-stayed bridges will be used, because of the structure's ability of spanning over long distances.

The Channels

The Reinforced Concrete Channels

Connected to each of the mentioned rivers is a reinforced concrete rectangular channel.

While the flow rate of a lahar is hard to predict, it is understood that this flow rate will be four times the maximum known flow rate of the river being considered. Thus, for the Carbon River the lahar flow rate is understood to be 48,000 cu ft/s, for the Nisqually River the lahar flow rate is understood to be 20,880 cu ft/s and for the Puyallup River the lahar flow rate is understood to be 228,000 cu ft/s.

It is understood that the minimum velocity of the lahar while in the restriction of the channels is 20 mph (29.33 ft/s) and that the maximum height of a lahar flow within the channels is 30 feet.

Because of the possibility of soil erosion between the walls of this channel type, a reinforced concrete slab is used; the thickness of the slab is approximately 10 inches.

The Channel for the Carbon River

For a rectangular channel to handle the given flow rate (48,000 cu ft/s) using a channel height of 30 feet, the channel width must be at least 54.55 feet. However, a channel width that is larger than that of the river will be used. Thus, the width of this channel is understood to be 550 feet. Calculating the lahar flow rate of this sized channel is approximately 483,945 cu ft/s.

The Channel for the Nisqually River

For a rectangular channel to handle the given flow rate (20,880 cu ft/s), using a channel height of 30 feet, the channel width must be at least 23.73 feet. However, a channel width that is larger than that of the river will be used. The channel used will have the same dimensions as that used for the Carbon River, thus the lahar flow rate of this sized channel is approximately 483,945 cu ft/s.

The Channel for the North and South Puyallup Rivers

The lahar flow rate that was given was for the Puyallup River, not for the North and the South Puyallup Rivers. Thus, the maximum flow rate of the lahar while within these rivers is understood to be 114,000 cu ft/s.

For a rectangular channel to handle the given flow rate (114,000 cu ft/s), using a channel height of 30 feet, the channel width must be at least 129.56 feet. For this channel, a width of 550 feet will be used. Having the same dimensions as the previously sized channels, the lahar flow rate is approximately 483,945 cu ft/s.

The Dirt Trapezoidal Channel

Connecting to the end of the reinforced concrete channels is a dirt trapezoidal channel.

This channel type is understood to handle a lahar flow rate of approximately 296,880 cu ft/s and a lahar having a maximum height of 30 feet.

The excavated portion of this trapezoidal channel will have a bottom width of approximately 467 feet and a top width of approximately 550 feet. The height of earth removed is approximately 15 feet^h.

Rather than hauling away the dirt and rock from this excavation, it is to be used to form a continuous mound on both sides of this channel type. At the surface of the natural grade, the bottom width from mound to mound will be approximately 550 feet and the top width from mound to mound will be approximately 632 feet. The height of the mounds is approximately 15 feet; refer to the footnote on the previous page.

With the understanding that the lahar will be able occupy both the open area of the dirt channel and the area between the mounds, a lahar flow rate of approximately 483,505 cu ft/s can be calculated for this channel.

Mount St. Helens

If the mentioned trapezoidal channel was in place to intercept the lahar during the eruption of Mount St. Helens on May 18, 1980 at the Columbia River, this channel type would have removed the 3.9 million cubic yards (105,300,000 cubic feet) of material in approximately 3.63 minutes, if the flow rate of the lahar matched the capacity of the trapezoidal channel (483,505 cu ft/s).

^h The depth of dirt to be removed and the height of the mound are to equal 30 feet.

Please recall that this lahar killed approximately 50 persons, destroyed about 250 homes, 47 bridges, 185 miles of highway and 15 miles of railway.

Note:

The US International Trade Commission has determined in a study, which was requested by the United States Congress that this eruption cost an estimated \$1.1 billion (\$2.74 billion in 2007 dollars). In addition, a supplemental appropriation of \$951 million for disaster relief was voted by Congress. The largest share of this appropriation went to the Small Business Administration, US Army Corps of Engineers and the Federal Emergency Management Agency.

Points to Keep in Mind

Upon knowing the desires of the government, the exact placement of the lahar bypass will be determined.

This document is an unsolicited proposal, not a culmination of site plans and engineering calculations, which shows the placement and the design of the lahar bypass. The development of these documents (e.g. engineering calculations and construction drawings) will be furnished when the government desires the proposed system. Such designs are not provided within this document to protect the interest of the Optimize Engineering Company, LLC and its partners.

With an excavation that is controlled, a desired slope can be maintained that will allow the lahar to flow into the ocean. The desired passage of the lahar bypass is through the Counties of Pierce, Lewis and Pacific. The government is to make the final determination concerning its path. There is no way to route the proposed system to avoid populated areas.

Because the lahar bypass will be outside the limits of Mount Rainier National Park, it is believed that a lahar will lack the force to carry large boulders (those measuring approximately 30 feet across with a weight of approximately 60 tons) to the lahar bypass where blockage may be of concern; this means that a lahar must push such a massive object about 4 miles. In addition, due the flow rate capacities of the sized channels blockage is not considered to be a concernⁱ.

The Nontechnical Objectives

There are a few processes of development that are not technical objectives that must take place, in order to have the system (the lahar bypass) constructed, several of these are:

- The residents of the Counties of Pierce, Lewis and Pacific are to be informed of the benefits surrounding the construction of the system (the lahar bypass), such that the residents will welcome the processes (e.g. the purchase of land) that will lead to the construction of the bypass.

ⁱ If the proposed system is also desired by the National Park Service, discussions will be pursued to allow the removal of all the trees that are within 275 feet from the centerline of the mentioned rivers up to the system.

- Shortly after a conceptual plan is selected by the government, the required land that is needed to construct the system on is purchased. The land is to be acquired by declaring Eminent Domain.

B. Technical Objectives and the Work Plan

Technical Objectives

The Objectives

There are several technical objectives that must take place, when the system is to be constructed in order to save lives and to protect the previously cited municipalities. Listed below are several of these objectives in the order that they are to occur; only the main objectives are shown:

- Preparation of conceptual plans. Under the direction of chief engineering firm^j, this task will be completed.
- The government selects a conceptual plan that best fits the needs of the area under consideration. Modifications are made, if desired.
- A detailed design of the selected conceptual plan is completed^k, which is reviewed by the government. Under the direction of chief engineering firm, this task will be completed.
- The government approves of the construction documents, with applicable modifications, if any.
- The project is advertised for bid. The government is to complete this task.
- The acceptance of the bid proposals, this is followed by the selection of a general contractor^l by the government. The government is to complete this task with assistance, if needed, from the chief engineering firm.
- The general contractor completes the construction phase. Under the direction of chief engineering firm, this task is monitored.
- Both the government and the chief engineering firm accept the completed system.

Note:

After a determination is made regarding the possible routes of the system, a study will be conducted to insure that the actual placement of the system will not have an adverse impact on wetlands or animals of the Endangered Species Act.

^j This engineering firm is understood to be the Optimize Engineering Co., LLC (located in Farmville, VA).

^k The structure will also be designed to withstand seismic forces.

^l This term is used also to mean general contractors. Due to the size of the described project, a joint venture between a few contractors may be desired.

Development of the Engineering Calculations, Plans and Specifications

Under the direction of the chief engineering firm all engineering calculations and construction documents (e.g. plans and specifications) of the system are completed. This includes the preparation of the conceptual plans, which shows the orientation of the system to the western border of the Mount Rainier National Park and its passage through the Counties of Pierce, Lewis and Pacific.

This process of development will be approximately 15 weeks. This procedure is to occur after the government selects a conceptual plan with modifications, if desired.

The Construction of the System

Under the direction of the chief engineering firm, the general contractor will construct the system that is indicated within the construction documents. The activities of the general contractor are monitored and inspected on a continual basis by the government (e.g. the US Army Corps of Engineers), the chief engineering firm and/or an appointed representative (a local structural/geotechnical engineering firm).

The limit of the construction phase is to be approximately 65 weeks.

The Work Plan

The Project Implementation

For the construction of the system to be implemented, a desire must first be shown by the government as the means of diverting lahars for the purpose to save lives, and to protect the municipalities near the Carbon River (Carbonado and Wilkeson), those near the Puyallup River (Fife, Orting, Puyallup, Sumner and Tacoma (of interest the Port of Tacoma)) and those near the Nisqually River (Ashford and Elbe) in the event Mount Rainier erupts.

Carrying Out Project Activities and Qualifications

The Chief Engineering Firm - Optimize Engineering Company, LLC

This engineering firm was established in April 2000, by Richard B. Gordon, P.E. to provide a responsive multi-discipline engineering firm to serve both the public and private sectors. The staff of this professional firm is experienced in the engineering of commercial, residential, industrial and institutional structures in the United States.

This firm offers a full spectrum of engineering services, and is recognized by its new and continuing clients for its creative solutions, innovative designs and engineering excellence.

This consulting firm offers civil, structural, mechanical, electrical engineering, piping/plumbing and design services. Also, this consulting firm service includes site feasibility studies, site planning, utility design and construction administration.

To learn more about this dynamic engineering firm, please visit www.optimizeces.com.

When the government makes a determination to be a client of this firm, Mr. Gordon may choose to select a recognized structural/geotechnical engineering firm from Washington State to perform the necessary task of the development of the construction documents, perform contract administration duties and/or field observations.

Consultant: The Architectural Firm - Stiles L. Bartley Architects

Stiles L. Bartley Architects was established in February 1976, by Stiles L. Bartley, AIA to provide an architectural firm to serve both the public and private sectors that would provide unmatched client service, sustainable architecture through innovative thinking and exceptional design in the United States.

This architectural firm is well versed in the design of commercial, community/religious, education, government, healthcare, residential, restaurants and retail buildings.

This firm specializes in architecture, interior design, master planning and sustainable design and consulting.

This architectural firm will serve as a design consultant to the chief engineering firm as to matters that relate to the aesthetics of the system.

Consultant: The Structural/Geotechnical Engineering Firm

Under the direction of the chief engineering firm, the selected structural/geotechnical engineering firm must be capable of leading other engineering firms (e.g. electrical and mechanical) and design consultants to the successful completion of all engineering calculations, plans and specifications of the described system.

This firm will oversee the construction of the system by conducting scheduled and unscheduled inspections during the construction phase, and submit progress reports every two weeks. This is to insure that the general contractor is following the construction methods as indicated within the construction documents.

The success of this firm must be documented, such as in letters of reference by the owners of previous projects. In addition, this firm will be well versed in the design of dams.

When necessary, the structural/geotechnical engineering firms are interviewed; from this process a firm is selected.

In addition to overseeing the development of the construction documents, other duties of this firm which relate to contract administration and field observations will be preformed, some of these additional duties may include, but are not limited to:

- Participate in progress meetings with the client (e.g. Washington State and the Army Corps of Engineers).
- Review of contractor's submittals.
- Review of contractor's applications for payment.

- Provide technical assistance for resolving unanticipated field conditions.
- Provide construction cost tracking.
- Provide change order processing and negotiation.
- Review contract close-outs (e.g. the warranty information).

The General Contractor

The general contractor is to have a successful track record of managing subcontractors, such that the construction phase of the system is completed within the established budget and within the allotted time period; the allotted time period is to be approximately 65 weeks.

The success of the general contractor must be documented, such as in letters of reference by the owners of previous projects.

Note:

If a joint venture between a few contractors is desired, such a venture must have had occurred before and the success of this undertaking must be documented.

The Activities of the Proposed Project

This portion of the unsolicited proposal cites the processes that are found within the technical objectives (refer to B. Technical Objectives and the Work Plan, Technical Objectives, The Objectives; page 10). The cited activities are to occur shortly after the government begins the process of acquiring the land on which the system is to be constructed.

Under the direction of the chief engineering firm, the conceptual plans which show the orientation of the system are completed and are shown to the government.

The government selects a conceptual plan that best fits the needs of the area under consideration. Modifications are made, which are based on the desires of the government.

Based on the selected conceptual plan, under the direction of the chief engineering firm, the engineering calculations and the construction documents are completed, which are reviewed by the government. Modifications are made, if required.

After the construction documents reflect the desires of the government and these plans are approved, the project is advertised for bid.

The government receives the bid proposals from the general contractors.

Shortly after a contract is signed between the general contractor and the government, the construction phase begins, and is completed within approximately 65 weeks. As stated earlier, the activities of the general contractor are monitored and inspected by the government (e.g. the US Army Corps of Engineers), the chief engineering firm and/or its representative on a continual basis.

After all permits are approved, both the government and the chief engineering firm accept the completed system.

C. Who Will Benefit, the Uniqueness of the Project, Etc

Who Will Benefit

The federally recognized tribe of the Puyallup Tribe of Indians would benefit from the proposed system, because it will prevent the area of this tribe from becoming inundated by a lahar. Thus, the proposed system (the lahar bypass) will protect the interest of the Bureau of Indian Affairs and ultimately that of the US Department of the Interior.

The proposed system benefits the US Geological Survey, by providing the means which will minimize the loss of life and that of property from lahars in the event Mount Rainier erupts.

The municipalities of Ashford, Carbonado, Elbe, Fife, Orting, Puyallup, Sumner, Tacoma and Wilkeson will benefit greatly from the implementation of the proposed system, because it will prevent these municipalities from becoming inundated by lahars due to an erupting Mount Rainier; refer to the notes found on pages 4, 5.

The seventh largest container port in North America, the Port of Tacoma would benefit from the proposed system, because it will prevent this Port from becoming inundated by lahars. This will result in safeguarding the trade between the United States and its trade partners (e.g. China, Japan and South Korea).

The US government will benefit from the implementation of the proposed system, because it will greatly reduce the monetary amount for disaster relief that will be needed to restore the affected areas; recall that a supplemental appropriation of \$951 million for disaster relief was voted by Congress after the eruption of Mount St. Helens.

The Uniqueness of the Project

The author of this unsolicited proposal believes that the proposed system is distinct, because it will provide the means of capturing lahars and of depositing this material into the Pacific Ocean, such that the cited municipalities do not become inundated by lahars.

Deserving of Attention

The author of this unsolicited proposal believes that the proposed system deserves the attention of the government as the means of capturing lahars and that of being the predetermined route for lahars as it travels, under its own power, to the Pacific Ocean—where it will deposit itself (the lahar) into the ocean.

Related Work

The Resolutions Group^m has found no evidence that the proposed system exist for the preservation of lives, the Puyallup Tribe of Indians, farmland, cities, towns, homes and businesses during lahars.

Relationship with Future Research and/or Development

The proposed system does not have a relationship to future research and/or development, except toward the implementation of the described system in other areas that are at risk from lahars; these areas would include the municipalities that surround Mount Ruapehu in New Zealand and Mount Galunggung in Indonesia.

D. Outcome

The Immediate and Long-Range Results

It is hoped that the immediate result will be that the government will pursue the processes that will lead to the construction of the system that is described within this unsolicited proposal, such that the cited municipalities will be protected from lahars that are produced by an erupting Mount Rainier.

It is also hoped that the long-range result will be that others countries will purse the implementation of a similar system in areas that are considered at risk from lahars (e.g. the municipalities near Mount Ruapehu in New Zealand) by the year 2020.

E. Support for the Proposed Structure

The Support from Professional Firms

Due to the purpose and function of the Resolutions Group, to accomplish the described tasks that are mentioned herein (e.g. the completion of the engineering calculations, plans and specifications) the following professional firms have shown an eagerness to participate in the advancement of the system that is described within this unsolicited proposal:

The Chief Engineering Firm

The Optimize Engineering Co., LLC (Farmville, VA)

The Architectural Firm (Consultant)

Stiles L. Bartley Architects (Richmond, VA)

In addition, these professional firms have contributed in creating the concepts of the mentioned system and these firms are thoroughly familiar with the aspects of this proposal.

^m This business is understood to provide support for the development and construction of the proposed system that is mentioned within this unsolicited proposal.

Supporting Information

F. Estimated Costs

The Estimated Cost

The individual costs that are listed below are merely an estimate and must be viewed as such.

Land

Estimated cost for land to construct system: \$144,242,424

The general contractor is to determine the actual construction cost for the system at the time of bidding.

Rather than give a line item estimate of the proposed system, which is controlled by the desires of the government, listed below are only the estimates of the key components of the system:

Office

Estimated cost of building: \$525,792

Standby Electrical System

Estimated cost of system: \$3,500,000

Dams

Estimated cost for four (4) dams (one at each riverⁿ): \$12,000,000

Reinforced Concrete Walls

Estimated cost of walls: \$855,360

The Bypass: The Reinforced Concrete Channels

Estimated cost of excavation: \$242,908,160

Estimated cost of construction of channels: \$15,272,717

The Bypass: The Dirt Trapezoidal Channel

Estimated cost of excavation: \$1,182,720,000

Estimated cost of mounds: \$887,040,000

The Bypass: Transition at Shoreline

Estimated cost of transition: \$14,525,000

The sum of these estimated quantities yields \$2,359,347,029. Thus, it can be understood that the described system will cost less than 3 billion dollars.

ⁿ These rivers would be the Carbon River, the Nisqually River, the North Puyallup River and the South Puyallup River.

Rather than have the US government provide fully for the construction cost of the system, it is hoped that an agreement will be reached that allows the US government to contribute 50% (\$1.5 billion), the State of Washington to contribute 33% (\$990 million), and the mentioned municipalities to contribute 17% (\$510 million) for the construction cost of the system.

It is hoped that the cited municipalities and Washington State will seek and receive the required funding through the Obama's \$850 billion infrastructure spending plan, such that the system which is described within this unsolicited proposal can be constructed for the purpose of saving lives and protecting the cited municipalities from lahars.

Notes:

There are several changes that must occur to the transportation infrastructure (e.g. the placement of bridges above the lahar bypass), such as in the case of Interstate 5 and US Route 101.

For a comparison, the Deer Island Waste Water Treatment Plant (located on Deer Island in the Boston Harbor) had a construction cost of \$3.8 billion and the National Ignition Facility (located at the Lawrence Livermore National Laboratory in Livermore, California) had a construction cost of \$4.2 billion.

G. Period of Time Unsolicited Proposal is Valid

Period of Being Valid

This unsolicited proposal is valid for a period of 90 calendar days.

Unless otherwise previously stated, the starting date of the review is the date that appears within the Cover Letter; refer to page 1 of this proposal.

The Time Extension

When a time extension is needed to conclude the review of this unsolicited proposal, please notify the Resolutions Group by mail or email. This request is to be received before the 10th day of which this proposal remains valid. The mailing address of the Resolutions Group is:

The Resolutions Group
PO Box 182
Cumberland, VA 23040

Such a request could also be sent by way of email to Mr. Timothy M. Young at:

timothymyoung@hotmail.com

The time which this proposal remains valid may be lengthened by its author without notification to the reviewer(s).

H. Contracts Preferred

The Contracts Preferred

When a contract is awarded as a result of or in connection with the submission of this unsolicited proposal, the preferred contract is to be a fixed-price contract.

This contract is to be made between the Government, Washington State and the mentioned municipalities (Party A), and the partnership of the Optimize Engineering Co., LLC and the Resolutions Group (Party B) in the amount of 1.5% of the construction cost, which is not to exceed \$60,000,000.

In addition, the previously stated partnership is requesting that all expenses that relate to the traveling (e.g. airplane tickets, hotel stays and car rentals) of its employees to Washington State during the construction phase of the system be reimbursed.

For the general contractor, the contract is to be a fixed-price contract. This contract amount is to be based on the contractor's bid proposal.

Because it is desired that the maintenance cost of this system is to be shared by the cited municipalities, a 20 year contract will be pursued between these municipalities and the Resolutions Group in the amount of \$832,000 per year to manage the maintenance operation of the described system.

Phases of Service and the Allocation of Fees

The phases of service and the allocation of fees are broken down below, which are to be based on the previously stated fee, as the lump sum (refer to H. Contracts Preferred, The Contracts Preferred; page 18).

- Phase 1: Schematic Design: 15%
- Phase 2: Design Development: 15%
- Phase 3: Contract Documentation: 40%
- Phase 4: Bidding and Negotiation: 5%
- Phase 5: Contract Administration: 25%

I. Time Durations

The Individual Time Durations

The individual time durations are as follows:

- The preparation of the construction documents with feedback from the government: 15 weeks
- The government approves the construction documents: 7 weeks (approximate)
- The construction project is advertised for bid and bids received: 5 weeks
- The general contractor is selected and the contractor's contract is signed: 5 weeks (approximate)
- The construction of the system: 65 weeks (approximate)

J. Brief Description of the Resolutions Group

The Mission Statement

The mission statement of the Resolutions Group is to “seek out unexplored avenues that will protect mankind from the threats brought on by naturally occurring forces and by the willful acts of man.”

The Work of the Resolutions Group

The Resolutions Group has made an ongoing effort to describe systems that have the capability to safeguard lives and protect the environment. The chosen method of the Resolutions Group is to submit an unsolicited proposal to a source that is capable of implementing such a system.

The Recent Work of the Resolutions Group

As of recent times, the Resolutions Group has submitted the unsolicited proposals that are briefly described below:

Providing a Way of Escape from a Tsunami’s Run-Up

The purpose of this proposal is to describe a structure that is to protect individuals, who find themselves in a low-lying coastal area that is in the path of a tsunami’s run-up.

Protecting Items within a Municipality during a Flood

The purpose of this proposal is to describe a structure that is to be placed in an area, which has a history of flooding; such flooding could be the result of a riverine flood, an estuarine flood or a coastal flood.

This structure is to provide a place of protection for cargo containers, automobiles that belong to the government and that of motorists. Also, this structure is to serve as a place of protection for the temporary storage of government owned documents, hazardous chemicals (e.g. pesticides and gasoline) and mail that is being transported by the US Postal Service.

Protecting the Community of La Conchita in Ventura County during Mudslides

The purpose of this proposal is to describe a structure that is to protect the community of La Conchita, California from future mudslides and landslides.

The purpose of the proposed structure is to capture and contain mudslides and landslides that threaten the community of La Conchita; this structure is to prevent deadly slides, such as the massive mudslide that occurred on January 10, 2005. This mudslide killed 10 persons and injured 14 persons. This mudslide buried four blocks of the community in over 30 feet of earth, destroying 15 houses and causing 16 more houses to be tagged by Ventura County as being uninhabitable.

K. Points of Contact

Individuals Receiving Document

The following individuals have received this unsolicited proposal:

Department: The Washington State Department of Agriculture (the Homeland Security Program)
Recipient: **Mr. Dave Hodgeboom; Homeland Security Coordinator**
Phone: (360) 725-5508
Email: dhodgeboom@agr.wa.gov

Agency: The Mount Rainier National Park (the National Park Service)
Recipient: **Mr. Chuck R. Young; Chief Ranger**
Phone: (360) 569-2211 Ext. 3300
Email: chuck_young@nps.gov

~~Office: The Office of Governor Chris Gregoire~~
Recipient: **Mr. Antonio M. Ginatta; Executive Policy Advisor**
Phone: (360) 902-0490
Email: ~~antonio.ginatta@gov.wa.gov~~

City: Orting, Washington
Recipient: **Mr. Mark Bethune; City Administrator**
Phone: (360) 893-2219 Ext. 115
Email: mbethune@cityoforting.org

City: Tacoma, Washington
Recipient: **Mr. Jeff Jensen; Deputy Chief (Tacoma Fire)**
Phone: (253) 591-5798
Email: jjensen@cityoftacoma.org

~~Office: The Office of US Senator Patty Murray~~
Recipient: **Ms. Mary McBride; Regional Director**
Phone: (253) 572-3636
Email: ~~mary_mcbride@murray.senate.gov~~

Office: The Office of US Congressman Adam Smith
Recipient: **Mr. Matt Perry; Field Representative**
Phone: (253) 593-6600
Email: matt.perry@mail.house.gov

Office: The Office of US Congressman Dave Reichert
Recipient: **Mr. Thomas B. Young; Deputy District Director**
Phone: (206) 275-3438
Email: tom.young@mail.house.gov

Office: The Office of State Senator Pam Roach
Recipient: **Mr. Brian Lohr; Legislative Assistant**
Phone: (360) 786-7660
Email: lohr.brian@leg.wa.gov

Office: The Office of State Representative Dan Roach
Recipient: **Ms. Tammi Lewis; Legislative Assistant**
Phone: (360) 786-7846
Email: lewis.tammi@leg.wa.gov

Office: The Washington State House of Democrats
Recipient: **Mr. Loren J. Stern; Policy Analyst**
Phone: (360) 786-7224
Email: stern.loren@leg.wa.gov

Committee: The Washington State House Committee on Community, and Economic
Development and Trade
Recipient: **Ms. Terra Rose; Legislative Assistant**
Phone: (360) 786-7818
Email: rose.terra@leg.wa.gov

Office: The Office of US Congressman Norm Dicks
Recipient: **Mr. George Behan; Chief of Staff**
Phone: (202) 226-1175
Email: george.behan@mail.house.gov

Office: The Washington State Senate Democratic Caucus
Recipient: **Mr. Gary Wilburn; Policy Counsel**
Phone: (360) 786-7477
Email: wilburn.gary@leg.wa.gov

Office: The Office of State Senator Lisa Brown
Recipient: **Ms. Kimm Hill; Legislative Assistant**
Phone: (360) 786-7604
Email: hill.kimm@leg.wa.gov

Department: The Public Works Board of the Washington State Department of
Commerce
Recipient: **Mr. John LaRocque; Assistant Director/Executive Director**
Phone: (360) 725-3166
Email: john.larocque@pwb.wa.gov

Office: The Office of State Representative Matt Shea
Recipient: **Mr. Jim Robinson; Legislative Assistant**
Phone: (360) 786-7984
Email: robinson.jim@leg.wa.gov

Office: The Office of US Representative Rick Larsen
Recipient: **Mr. Luke Loeffler; Community Representative**
Phone: (425) 252-3188
Email: luke.loeffler@mail.house.gov

Office: The Office of US Senator Patty Murray
Recipient: **Mr. Sean J. Murphy; South Sound Regional Director**
Phone: (253) 572-3636
Email: sean_murphy@murray.senate.gov

Department: The Washington State Department of Archaeology and Historic Preservation
Recipient: **Mr. Greg Griffith; Deputy State Historic Preservation Officer**
Phone: (360) 586-3073
Email: greg.griffith@dahp.wa.gov

Society: The Washington State Historical Society
Recipient: **Mr. David L. Nicandri; Director**
Phone: (253) 798-5900
Email: dnicandri@wshs.wa.gov

Department: The Washington State Department of Transportation
Recipient: **Mr. John Himmel; Safety and Emergency Operations Manager**
Phone: (360) 705-7973
Email: himmelj@wsdot.wa.gov

Department: The Washington Department of Fish and Wildlife
Recipient: **Mr. Bruce Bjork; Chief and Assistant Director**
Phone: (360) 902-2373
Email: bruce.bjork@dfw.wa.gov

Agency: The Seattle District of the US Army Corps of Engineers
Recipient: **Mr. Douglas T. Weber, P.E.; Acting Chief of Emergency Management**
Phone: (206) 764-3406
Email: douglas.t.weber@usace.army.mil

Office: The Office of Governor Chris Gregoire
Recipient: **Mr. Jay Manning; Chief of Staff**
Phone: (360) 902-4111
Email: jay.manning@gov.wa.gov

Office: The Office of US Senator Maria Cantwell
Recipient: **Ms. Katharine Lister; Chief of Staff**
Phone: (202) 224-3441
Email: katharine_lister@cantwell.senate.gov

Government Agency: US Department of Agriculture
Office Contacted: Office of Homeland Security and Emergency Coordination
Recipient: **Ms. Sheryl K. Maddux; Deputy Director**
Phone: (202) 720-7654
Email: sheryl.maddux@osec.usda.gov

Port: The Port of Tacoma
Recipient: **Mr. Lou Paulsen; Senior Manager of Risk and Terminal Security**
Phone: (253) 383-9449
Email: lpaulsen@portoftacoma.com

Organization: The Alliance for Science & Technology Research in America
Recipient: **Mr. Robert Spurrier Boege, J.D.; Executive Director**
Position: Executive Director
Phone: (202) 872-6160
Email: rboege@comcast.net

Government Agency: The National Science Foundation
Division Contacted: The Division of Civil, Mechanical and Manufacturing Innovation
Recipient: **Mr. Dennis Wenger, PhD; Program Director**
Phone: (703) 292-8606
Email: dwenger@nsf.gov

President's Office: The Office of Science and Technology Policy
Council Contacted: The President's Council of Advisors on Science and Technology
Recipient: **Ms. Deborah D. Stine, PhD; Executive Director**
Phone: (202) 456-6006
Emails: dstine@ostp.eop.gov; pcast@ostp.gov

Notes:

This unsolicited proposal was sent by way of email to Mr. Hodgeboom (Homeland Security Coordinator), such that the Washington State Department of Agriculture may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, January 27, 2010.

This unsolicited proposal was sent by way of email to Mr. Young (Chief Ranger), such that the National Park Service may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, January 27, 2010.

~~This unsolicited proposal was sent by way of email to Mr. Ginatta (Executive Policy Advisor), such that Governor Gregoire may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, January 27, 2010.~~

This unsolicited proposal was sent by way of email to Mr. Bethune (City Administrator), such that the City of Orting may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, January 27, 2010.

This unsolicited proposal was sent by way of email to Mr. Jensen (Deputy Chief), such that the City of Tacoma may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, January 27, 2010.

~~This unsolicited proposal was sent by way of email to Ms. McBride (Regional Director), such that US Senator Murray may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, January 27, 2010.~~

This unsolicited proposal was sent by way of email to Mr. Perry (Field Representative), such that US Congressman Smith may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, January 27, 2010.

This unsolicited proposal was sent by way of email to Mr. Young (Deputy District Director), such that US Congressman Reichert may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, January 27, 2010.

This unsolicited proposal was sent by way of email to Mr. Lohr (Legislative Assistant), such that State Senator Roach may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, January 27, 2010.

This unsolicited proposal was sent by way of email to Ms. Lewis (Legislative Assistant), such that State Representative Roach may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, January 27, 2010.

This unsolicited proposal was sent by way of email to Mr. Stern (Policy Analyst), such that the Washington State House of Democrats may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, January 27, 2010.

This unsolicited proposal was sent by way of email to Ms. Rose (Legislative Assistant), due to a request by State Representative Kenney, such that the Washington State House Committee on Community, and Economic Development and Trade may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, February 03, 2010.

This unsolicited proposal was sent by way of email to Mr. Behan (Chief of Staff), such that US Congressman Dicks may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, February 03, 2010.

This unsolicited proposal was sent by way of email to Mr. Wilburn (Policy Counsel), such that the Washington State Senate Democratic Caucus may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Thursday, February 11, 2010.

This unsolicited proposal was sent by way of email to Ms. Hill (Legislative Assistant), such that State Senator Brown (Senate Majority Leader) may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Thursday, February 11, 2010.

This unsolicited proposal was sent by way of email to Mr. LaRocque (Assistant Director/Executive Director), such that the Public Works Board of the Washington State Department of Commerce may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, February 16, 2010.

This unsolicited proposal was sent by way of email to Mr. Robinson (Legislative Assistant), such that State Representative Shea may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, February 17, 2010.

This unsolicited proposal was sent by way of email to Mr. Loeffler (Community Representative), such that US Representative Larsen may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Wednesday, February 24, 2010.

This unsolicited proposal was sent by way of email to Mr. Murphy (South Sound Regional Director), such that US Senator Murray may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Friday, March 05, 2010.

This unsolicited proposal was sent by way of email to Mr. Griffith (Deputy State Historic Preservation Officer), such that the Washington State Department of Archaeology and Historic Preservation may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, March 09, 2010.

This unsolicited proposal was sent by way of email to Mr. Nicandri (Director), such that the Washington State Historical Society may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, March 09, 2010.

This unsolicited proposal was sent by way of email to Mr. Himmel (Safety and Emergency Operations Manager), such that the Washington State Department of Transportation may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Friday, March 12, 2010.

This unsolicited proposal was sent by way of email to Mr. Bjork (Chief and Assistant Director), such that the Washington Department of Fish and Wildlife may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, March 30, 2010.

This unsolicited proposal was sent by way of email to Mr. Weber (Acting Chief of Emergency Management), such that the Seattle District of the US Army Corps of Engineers may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, June 08, 2010.

This unsolicited proposal was sent by way of email to Mr. Manning (Chief of Staff) without having a request from this party, such that Governor Gregoire may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, June 08, 2010.

This document was sent by way of email to Ms. Lister (Chief of Staff) without having a request from this party, such that US Senator Cantwell may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, June 08, 2010.

This document was sent by way of email to Ms. Maddux (Deputy Director of the USDA Office of Homeland Security and Emergency Coordination), such that the US Department of Agriculture may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Saturday, August 07, 2010.

This document was sent by way of email to Mr. Paulsen (Senior Manager of Risk and Terminal Security), such that the Executive Department of the Port of Tacoma may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, September 07, 2010.

This document was sent by way of email to Mr. Boege (Executive Director of the Alliance for Science & Technology Research in America), such that the ASTRA and its Partners may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Monday, September 20, 2010.

This document was sent by way of email to Mr. Wenger (Program Director of the Division of Civil, Mechanical and Manufacturing Innovation), such that the National Science Foundation may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Tuesday, October 12, 2010.

This document was sent by way of email to Ms. Stine (Executive Director of the President's Council of Advisors on Science and Technology (PCAST)) and to the general email of the PCAST (pcast@ostp.gov), such that the Office of Science and Technology Policy may gain knowledge of this document. This email was sent by Mr. Timothy M. Young of the Resolutions Group on Thursday, October 14, 2010.

End of Unsolicited Proposal

From: Franco Vitaliano [francov@exqor.com]
Sent: Sunday, October 17, 2010 10:57 AM
To: Stine, Deborah D.; Jochum, Gera M.; ericschmidt@google.com; president@rpi.edu; Chopra, Aneesh; chadnano@northwestern.edu; Kalil, Thomas A.; Judith Estrin
Subject: Re: Follow-up to PITAC/PCAST Meeting on June 22

This brief lecture and video animation would be of interest to anyone thinking about future possibilities for the US educational system, enabling a new economy, and novel paradigms for technological infrastructure.

<http://www.youtube.com/watch?v=zDZFcdGpL4U>

Regards

Franco Vitaliano
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ExQor Technologies, Inc.
4 Longfellow Place Suite 2105
Boston MA 02114-2818 USA
Tel 617 742 4422
francov@exqor.com
<http://www.exqor.com>

October 18, 2010

The Honorable John Holdren
Co-Chair
President's Council of Advisors
on Science and Technology
White House
1600 Pennsylvania Ave., NW
Washington, DC 20500

The Honorable Eric Lander
Co-Chair
President's Council of Advisors
on Science and Technology
Professor, MIT
Director, Broad Institute, MIT
7 Cambridge Center
Cambridge, MA 02412

Dear Drs. Holdren and Lander:

On April 19, 2010, thirty-four scientific societies representing the spectrum of behavioral and social sciences wrote to PCAST to make the case that children need to be equipped with a foundation in *all* sciences in order to address the challenges that they will face in this century. We write today to convey that we remain seriously concerned that the STEM education reform initiatives envisioned will fall short in important ways and perhaps fail to reach the very students that we all seek to engage in science.

We commend PCAST on identifying key areas for improving K-12 STEM education in the recently released report, *Prepare and Inspire: K-12 Education in Science, Technology, Engineering, and Math (STEM) for America's Future*. However, the PCAST report omits entire areas of science at the K-12 level, and we remain perplexed as to why PCAST specifically carved out the behavioral and social sciences as inappropriate for K-12 STEM education. We note specifically the paragraph in chapter 1 that states:

Box 1-1: What is STEM education?

"STEM education," as used in this report, includes the subjects of mathematics, biology, chemistry, and physics, which traditionally formed the core requirements of many state curricula at the K-12 level. In addition, the report includes other critical subjects, such as computer science, engineering, environmental science and geology, with whose fundamental concepts K-12 students should be familiar. The report does not include the social and behavioral sciences, such as economics, anthropology, and sociology; while appropriately considered STEM fields at the undergraduate and graduate levels, they involve very different issues at the K-12 level."

In that small space, PCAST expands the “traditional” boundaries for science education to include non-traditional areas in science. However, it also excludes other major scientific areas where the same case can and should be made. We write because the behavioral and social sciences belong in the K-12 curriculum as much as the other areas of science mentioned.

We raise this issue with you for the following reasons:

1. A principal purpose for the PCAST report was to identify ways to prepare and inspire *all* students to learn STEM. Excluding compelling areas of science and scientific phenomena limits the possibilities for engaging children and teaching them the scientific method.
2. A major goal of the report was to prepare a well-educated citizenry and workforce. We agree and reiterate that all children should leave elementary and secondary schooling with at least a rudimentary understanding of what it means to be human, live in a social world, and interface with an increasingly technologically-driven, resource-limited, global environment.
3. Similar to today, the next generation will face challenges that will be resolved only with a thorough understanding of what motivates human behavior. Developing a pipeline of bright students to tackle these problems is no less important than in any other area of science. Indeed, many of these students will be working across traditional boundaries, and efforts to integrate the sciences at all education levels will move this nation forward in significant ways.
4. Integrating core components of the behavioral and social sciences into a coherent vision of science is as important for the future of these children and our country as with any area of science. Science learning is likely to be most engaging and successful when the principles and methods of discovery embrace an exposure to all phenomena amenable to such inquiry.
5. This is the time. The opportunity to transform science education to reflect both the full richness of science and the grand challenges of the present and future is underway. Our children, indeed our nation, stand to lose with a narrow vision of science, and it may be a decade or more before the opportunity and momentum is there to make systemic changes.

Recognition of the importance of the behavioral and social sciences can be seen in numerous places throughout the federal government and at the National Academy of Sciences. PCAST even acknowledges these sciences as an important part of STEM, except at the K-12 level. It is simply not clear to those in our scientific communities why the behavioral and social sciences are not appropriate or “involve very different issues at the K-12 level,” especially given the reasons we cite above.

Therefore, we hope PCAST will reconsider its apparent exclusion of these sciences. Your correspondence may be sent to Paula Skedsvold at pskedsvold@fabbs.org and Felice Levine at flevine@aera.net who will share it with the leadership and scientists in the societies that join this letter.

Sincerely,

American Educational Research Association
American Political Science Association
American Psychological Association
American Sociological Association
American Statistical Association
Association for Behavior Analysis International
Association for Psychological Science
Association of American Geographers
Association of American Law Schools
Association of Population Centers
Behavior Genetics Association
Cognitive Science Society
Consortium of Social Science Associations
Federation of Associations in Behavioral & Brain Sciences
Human Factors and Ergonomics Society
International Society of Developmental Psychobiology
Law and Society Association
Linguistic Society of America
Massachusetts Neuropsychological Society
National Academy of Neuropsychology
National Communication Association
Population Association of America
Psychonomic Society
Rural Sociological Society
Society for Behavioral Neuroendocrinology
Society for Computers in Psychology
Society for Industrial & Organizational Psychology
Society for Judgment and Decision Making
Society for Personality Assessment
Society for Personality and Social Psychology
Society for Psychophysiological Research
Society for Research in Child Development
Society for the Psychological Study of Social Issues
Society of Experimental Social Psychology
Society of Multivariate Experimental Psychology

Cc: PCAST Members



October 20, 2010

Chairman John P. Holdren
President's Council of Advisors on Science and Technology
The White House
1600 Pennsylvania Avenue, NW
Washington, DC, 20500-0004

Chairman Eric S. Lander
President's Council of Advisors on Science and Technology
The White House
1600 Pennsylvania Avenue, NW
Washington, DC, 20500-0004

Re: Meeting of the President's Council of Advisors on Science and Technology
on November 4, 2010

Dear Chairmen Holdren and Lander:

On behalf of the nearly 100,000 bipartisan members and donors of the American Association of University Women (AAUW), I am pleased to share AAUW's comments for the President's Council on Advisors of Science and Technology (PCAST) meeting on November 4, 2010. Since its founding in 1881, AAUW has been breaking through barriers for women and girls.

AAUW supports promoting and strengthening science, technology, engineering and math education, especially for girls and other underrepresented populations. These efforts will help increase America's competitiveness by reducing gender barriers that deter women from pursuing academic and career goals in these fields.

AAUW supports many of the recommendations in PCAST's September 2010 report, *Prepare and Inspire: K-12 Education in Science, Technology, Engineering, and Math (STEM) for America's Future*.¹ We look forward to the council's upcoming reports on STEM education at community colleges, four-year colleges, and universities.

The recent National Academy of Sciences, National Academy of Engineering, and Institute of Medicine report, *Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5*, presents a dim view of America's approach to science and math, noting that the overall school system has shown "little sign of improvement, particularly in mathematics and science" since the release of the 2005 report.² The report lays out a vision of what is needed to reform America's educational and manufacturing sectors, and AAUW agrees with many of these

recommendations. AAUW supports improving STEM education and increasing America's competitiveness by reducing gender barriers.

Improving U.S. Competitiveness

Science, technology, engineering and math play an important role in America's future by fostering innovation and global competitiveness. The shortage of American scientists and workers engaged in scientific endeavors threatens our nation's ability to compete and innovate in the coming years, especially as the outsourcing of jobs to, and importing of science from, other nations continues to grow. As the council itself has stated, "There is a large interest and achievement gap among some groups in STEM, and African Americans, Hispanics, Native Americans, and women are seriously underrepresented in many STEM fields. This limits their participation in many well-paid, high-growth professions and deprives the Nation of the full benefit of their talents and perspectives."³

However, if women and members of other traditionally underrepresented groups joined the STEM workforce in proportion to their representations in the overall labor force, the domestic shortage of these professionals would disappear.⁴

Currently, women make up only 25 percent of the labor force in science, engineering and technology fields.⁵

The Need to Engage Women and Girls in STEM

The statistics of women engaged in the science, technology, engineering and math fields are quite grim. Women comprise more than half of college students and graduates,⁶ but earned only 23 percent of all bachelor's degrees granted in engineering and engineering technologies in 2006, and a decreasing share of bachelor's degrees in computer science.⁷ Women earned only 18 percent of computer and information sciences degrees in 2008 compared to 37 percent of computer science degrees in 1985.⁸ In 2006, 29 percent of all male freshmen planned to major in a STEM field, while only 15 percent of female freshmen planned to study these fields.⁹ Overall, women earned 38.4 percent of science and engineering¹⁰ doctoral degrees in 2006.¹¹ While still less than half, this is nearly five times the percentage they earned in 1966.¹² Progress is being made, but not in all fields and not at acceptable speeds.

There are a number of reasons why there are not more women in STEM fields. AAUW's recent report, *Why So Few? Women in Science, Technology, Engineering, and Mathematics*, presents key research findings that point to environmental and social barriers – including stereotypes, gender bias and the climate of science and engineering departments in colleges and universities – that continue to block women's participation and progress in science, technology, engineering and math. However, there are a number of legislative and regulatory actions that can help improve the climate of STEM fields for women.

Legislation to Improve STEM Education

Some bills pending before Congress that could significantly improve U.S. STEM education are the reauthorization of the Elementary and Secondary Education Act (ESEA) and the America COMPETES Act.

Reauthorizing the Elementary and Secondary Education Act (ESEA) provides a tremendous opportunity to improve STEM education in our nation's schools. In order to close the gender gap in the STEM fields, AAUW supports efforts that train teachers to encourage girls and other underrepresented groups to pursue STEM careers, and recommends a grant STEM program from which schools can cover a number of expenses including mentoring, after-school programs, summer programs, internships, field trips, etc. In addition, schools should be held accountable for students' achievement in science. This will provide schools with necessary information on how well students are progressing and the improvements that still need to be made. By measuring student performance and disaggregating data by gender, race, and socioeconomic status, we can obtain valuable information about student aptitude in science and better identify opportunities to improve girls' exposure to and achievement in science.

In addition to reauthorizing ESEA, reauthorization of the America COMPETES Act will also improve STEM education. AAUW urges Congress to reauthorize this bill quickly. The House-passed version of the bill includes provisions from the Fulfilling the Potential of Women in Academic Science and Engineering Act (H.R. 1144), which was introduced by Rep. Eddie Bernice Johnson (D-TX). The provisions create workshops that will educate program officers, members of grant review panels, university STEM department chairs, and other federally-funded researchers about methods that minimize the effects of gender bias in the evaluation of federal research grants and academic advancement including tenure and promotion. The bill also directs the Director of the Office of Science and Technology Policy to develop a uniform policy to extend the period of grant support for federally-funded researchers who have care-giving responsibilities and provide funding for interim technical staff support who take a leave of absence for care-giving responsibilities. The legislation requires more thorough data collection regarding federal research grant awards and faculty hiring and tenure practices. These efforts will help increase America's competitiveness by reducing barriers that deter women from pursuing academic and career goals in these fields.

In addition to the above ESEA and America COMPETES Act recommendations, AAUW recommends requiring agencies to broadly and proactively conduct Title IX compliance reviews. For example, federal agencies such as NASA, Department of Energy, and Department of Defense should regularly conduct Title IX compliance reviews at grantee institutions. All agencies are required to ensure they are not violating Title IX, however very few Title IX reviews are conducted outside of the Department of Education – and those that are conducted are often not thorough enough.

The administration should make it a government-wide priority that agencies use their contracting and grant-making authority to ensure that institutions that receive federal funding are complying with Title IX. Title IX reviews often uncover policies, procedures, and practices that discourage women from pursuing STEM fields. These reviews should consider a number of factors, such as admissions, recruitment, outreach, retention, faculty advising, career counseling, research participation, classroom experiences, treatment of students and faculty on the basis of parental and marital status, and safety policies. STEM Title IX reviews could uncover sexual harassment, chilly environments or practical obstacles, such as lab equipment that is too heavy to move, that discourage women from pursuing STEM fields. A thorough, government-wide review of Title IX compliance would make STEM fields much more welcoming to women and girls.

AAUW believes that the federal government has a critical role to play in improving America's competitiveness in science, technology, engineering and math education and industry. We applaud the administration for making this issue a priority.

Thank you for the opportunity to submit comments on this important issue. I look forward to working with you on women and girls' participation in STEM fields. If you have any questions, please feel free to contact me at 202-785-7720, or Beth Scott, regulatory affairs manager, at 202-728-7617

Sincerely,



Lisa M. Maatz
Director, Public Policy and Government Relations

cc: President's Council of Advisors on Science and Technology

¹ President's Council of Advisors on Science and Technology. *Prepare and Inspire: K-12 Education in Science, Technology, Engineering, and Math (STEM) for America's Future*. (2010). Accessed October 15, 2010 from <http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-stemed-report.pdf>

² National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2010) *Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5*. Accessed October 15, 2010 from <http://www.nap.edu/catalog/12999.html>

³ Ibid.

⁴ Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development. (2000). *Land of Plenty: Diversity as America's Competitive Edge in Science, Engineering and Technology*. Retrieved December 29, 2008 from http://www.nsf.gov/pubs/2000/cawmset0409/cawmset_0409.pdf.

⁵ National Center for Women & Information Technology. (2009). *By the Numbers*. Retrieved June 29, 2009 from <http://www.ncwit.org/pdf/BytheNumbers09.pdf>.

⁶ U.S. Department of Education, National Center for Education Statistics. (2009). *The Condition of Education 2009*. (NCES 2009-081). Retrieved June 29, 2009 from <http://nces.ed.gov/pubs2009/2009081.pdf>.

⁷ National Science Foundation, Division of Science Resources Statistics. (2009). *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2009, NSF 09-305*. Retrieved July 17, 2009 from <http://www.nsf.gov/statistics/wmpd/pdf/nsf09305.pdf>.

⁸ National Center for Women & Information Technology. (2009). *By the Numbers*. Retrieved June 22, 2009, from <http://www.ncwit.org/pdf/BytheNumbers09.pdf>.

⁹ Corbett, Christianne, Catherine Hill & Andresse St. Rose. (2010). *Why So Few?: Women in Science, Technology, Engineering, and Mathematics*. AAUW. Washington, D.C.

¹⁰ The category “science and engineering” includes the fields of biological, earth, physical, and computer sciences, in addition to engineering, mathematics, and social sciences.

¹¹ National Science Foundation. *Table 25: Women as a percentage of all doctoral degree recipients, by major field group: 1966-2006*. Retrieved June 29, 2009 from <http://www.nsf.gov/statistics/nsf08321/pdf/nsf08321.pdf>.

¹² Ibid.

Comments from OpenPCAST

<http://pcast.ideascale.com/>

The main cause of all chronic diseases

The suppressed skin eruptions are the main cause of all chronic diseases.

There are suppressed eruptions in behind of all chronic diseases.

Because of that, don't suppress any skin eruption. Treat it -properly, -by the help of pure homeopathy.

Comments (2)

1. [pdfernhout](#) said:

In the industrialized world, it seems more likely that the main cause of chronic disease is vitamin D deficiency from not getting enough sunlight or supplements (see Dr. John Cannell of the Vitamin D Council .org) and also general nutrient deficiency from not eating enough whole foods like vegetables, fruits, legumes, nuts, seeds and whole grains (see Dr. Joel Fuhrman who wrote "Eat to Live"). One can discuss what to do when one is sick, but prevention is far better than cure, and if you eat better and get the right amount of sunshine or supplements, detoxifying by whatever means is not as important. Taken together with some other lifestyle issues (including lack of exercise, lack of sleep, and excessive stress, see the AARP Blue Zones project for some other alternatives), these can be blamed for much of heart disease, strokes, cancer, diabetes, obesity, dementia, and maybe even autism (vitamin D deficiency has been linked to that), the first few of which make up the bulk of all US deaths and medical expenses. We in the USA could literally save a trillion dollars a year in medical expenses by getting people to take vitamin D supplements and to eat mostly vegetarian (heavy on the vegetables), but there is little profit for that in the medical, pharmaceutical, and pre-made and animal food product industries (which have essentially captured US policy making on this). "Let's Move" is a step in the right direction, but still just a timid step. So, we need more grassroots action on all that to inspire government leaders to get out and lead on that. :-)

1. [shawnboike](#) said:

Skin Eruptions? This is not the main cause of all chronic disease. I like some homeopathic & vitamin, herbal remedies because many are still practiced in Asia with success, but this isn't the full medical fields only focus.

Beware of Poisons

Now that which we are eating, water which we are drinking, that air we are breathing in, all are more or less poisoned.

Everyday in this way we are becoming poisonous. Now it is difficult to understand that who is ill and who is healthy. Doctors those who are treating us, also they are not free from poisons. Knowingly or unknowingly day after day gradually we are becoming attacked by sever diseases due to poison. Treatments are becoming impracticable.

So many poisons are there to destroy mankind. Except deadly insecticides and bacterial poisons, many more poisons are active to make us poisonous. Influence of many electromagnetic fields and radiation are able to effect of poisoning. Daily used utensils, especially cooking utensils are cause of slow poisoning (Metal poisoning). Poisoning is being occurred regularly by different kind of chemicals.

Above all the mental pollution and mental poisons are making our life bitterer and unbearable. Are you informed about internal secretion of poison? It occurs due to mental pain, excitement and mental pollution, except this intemperance —irregularity is another cause of it.

If there will not happen any sudden accident, the poison will be the cause of destruction of mankind.

Visit- <http://www.universal-treatment.webs.com>

The need for FOSS intelligence tools for sensemaking etc.

This suggestion is about how civilians could benefit by have access to the sorts of "sensemaking" tools the intelligence community (as well as corporations) aspire to have, in order to design more joyful, secure, and healthy civilian communities (including through creating a more sustainable and resilient open manufacturing infrastructure for such communities). It outlines (including at a linked elaboration) why the intelligence community should consider funding the creation of such free and open source software (FOSS) "dual use" intelligence applications as a way to reduce global tensions through increased local prosperity, health, and with intrinsic mutual security.

I feel open source tools for collaborative structured arguments, multiple perspective analysis, agent-based simulation, and so on, used together for making sense of what is going on in the world, are important to our

democracy, security, and prosperity. Imagine if, instead of blog posts and comments on topics, we had searchable structured arguments about simulations and their results all with assumptions defined from different perspectives, where one could see at a glance how different subsets of the community felt about the progress or completeness of different arguments or action plans (somewhat like a debate flow diagram), where even a year or two later one could go back to an existing debate and expand on it with new ideas. As good as, say, Slashdot is, such a comprehensive open source sensemaking system would be to Slashdot as Slashdot is to a static webpage. It might help prevent so much rehashing the same old arguments because one could easily find and build on previous ones.

OpenPCAST itself could benefit through using such tools.

Such technologies have already been pioneered by SRI and others in SEAS, Angler, and the broader Genoa II project.

Related by (the, sadly, late) Tom Armour on Genoa II:

http://www.darpa.mil/darpatech2002/presentations/iao_pdf/speeches/armour.pdf

And a public memorial that mentions Tom Armour's loss to brain cancer (cancer being one of the biggest real killers of US Americans historically, along with strokes, heart disease, and diabetes):

http://www.cognitive-edge.com/blogs/dave/2007/02/in_memorandum_tom_armour.php

If only those intelligence systems had also been able to help prevent or treat brain cancer (as well as other disasters, from the plague of obesity through the still ongoing BP Gulf oil leak disaster).

For example, we are beginning to understand how curing vitamin D deficiency and eating more fruits, vegetables, and legumes can help with prevention of many cancers and a host of other diseases, such as through the work of Dr. John Cannell and Dr. Joel Fuhrman and others in connecting the dots about vitamin D and nutrition and health. But why should such dedicated people trying to help all Americans (and other people) not have access to the best sensemaking tools tax dollars are creating to help with their work?

So, beyond national security implications, better FOSS intelligence tools for sensemaking might also help improve medical research and specific medical recommendations, to prevent more such tragedies and the loss of such vital and wise people to what might become more generally preventable diseases, if we could only make sense of what we know as it applies to current needs. Likewise, such tools might help in designing better products or even healthier and more joyful communities.

As with that notion of "mutual security", the US intelligence community needs to look beyond seeing an intelligence tool as just something proprietary that gives a "friendly" analyst some advantage over an "unfriendly" analyst. Instead, the intelligence community could begin to see the potential for a free and open source intelligence tool as a way to promote "friendship" across the planet by dispelling some of the gloom of "want and ignorance" (see the scene in "A Christmas Carol" with Scrooge and a Christmas Spirit) that we still have all too much of around the planet. So, beyond supporting legitimate US intelligence needs (useful with their own closed sources of data), supporting a free and open source intelligence tool (and related open datasets) could become a strategic part of US (or other nation's) "diplomacy" and constructive outreach.

Now, there are many people out there (including computer scientists) who may raise legitimate concerns about privacy or other important issues in regards to any system that can support the intelligence community (as well as civilian needs). As I see it, there is a race going on. The race is between two trends. On the one hand, the internet can be used to profile and round up dissenters to the scarcity-based economic status quo (thus legitimate worries about privacy and something like TIA). On the other hand, the internet can be used to change the status quo in various ways (better designs, better science, stronger social networks advocating for

some healthy mix of a basic income, a gift economy, democratic resource-based planning, improved local subsistence, etc., all supported by better structured arguments like with the Genoa II approach) to the point where there is abundance for all and rounding up dissenters to mainstream economics is a non-issue because material abundance is everywhere. So, as Bucky Fuller said, whether it will be Utopia or Oblivion will be a touch-and-go relay race to the very end. While I can't guarantee success at the second option of using the internet for abundance for all, I can guarantee that if we do nothing, the first option of using the internet to round up dissenters (or really, anybody who is different, like was done using IBM computers in WWII Germany) will probably prevail. So, I feel the global public really needs access to these sorts of sensemaking tools in an open source way, and the way to use them is not so much to "fight back" as to "transform and/or transcend the system". As Bucky Fuller said, you never change things by fighting the old paradigm directly; you change things by inventing a new way that makes the old paradigm obsolete.

For more details, see this document and others it links to in turn:

<http://groups.google.com/group/openmanufacturing/msg/2846ca1b6bee64e1>

This project could be done in conjunction with this other one I suggested:

"A global effort to develop self-replicating space habitats"

<http://pcast.ideascale.com/a/dtd/A-global-effort-to-develop-self-replicating-space-habitats/76206-8319>

--Paul Fernhout

<http://www.pdfernhout.net/>

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The biggest challenge of the 21st century is the irony of technologies of abundance in the hands of those thinking in terms of scarcity.

A global effort to develop self-replicating space habitats

My suggestion for a "Game Changing" project is that NASA (possibly in partnership with NIST) could coordinate a global effort towards designing and deploying self-replicating space habitats that can duplicate themselves from sunlight and asteroidal ore (developed under free and open source non-proprietary licenses as progress towards "open manufacturing").

NASA showed the basic technological feasibility of this with work in the late 1970s on space habitats, and also in a 1980 study called "Advanced Automation for Space Missions".

In a long-term space mission or a space settlement, a self-sustaining economy must be created and supported. Therefore, addressing the problem of technological fragility on Earth due to long supply lines and the inaccessibility of key manufacturing data (because it is considered proprietary) is an essential step in the development of the development of human settlement in space. Addressing such fragility would have immediate benefits to improve intrinsic and mutual security globally, and would help humanity survive in the face of plagues, wars, global climate change, asteroid strikes, earthquakes, and whatever other disasters might strike unexpectedly. As the loss of New Orleans showed, Mother Nature remains a formidable adversary even when people are not fighting amongst themselves over perceived scarce resources.

A NASA-coordinated effort to organize manufacturing information and use it to design such habitats (or seeds that would grow such habitats), as well as improve the state-of-the-art in collaboration software, could thus help meet needs both currently on Earth and in the future in space.

Nothing NASA is doing now compares with this at all in terms of gaining the excitement and participation of the world's technologists and technically-minded youth, given this project would have the scale of the entire FOSS movement applied to manufacturing (and simulation). Achieving this goal of a self-replicating space habitat could justify literally trillions of dollars in effort to create a technological infrastructure that could support quadrillions of human lives in space, making nonsense of current worries of "Limits to Growth" or "Peak Oil" or "Overpopulation" or whatever else.

While NASA could coordinate this effort, many other organizations including NIST (and its SLIM program), DARPA, universities, and manufacturers globally could also participate in this effort.

As a whole, this project would help increase US security as a sort of public outreach by helping the global security community transcend ironic and outdated visions of what security means, given that so much abundance is possible through modern technology and this NASA effort would demonstrate that:

"Recognizing irony is key to transcending militarism "

<http://www.pdferrnout.net/recognizing-irony-is-a-key-to-transcending-militarism.html>

See here for more details:

<http://groups.google.com/group/openmanufacturing/msg/a46a99643754a574?>

This effort could also be done in conjunction with this other proposal I made:

"Build 21000 flexible fabrication facilities across the USA "

<http://pcast.ideascale.com/a/dtd/44897-8319>

Faster and Greener--Pocket Airports

This link provides a White Paper on this important topic:

http://cafefoundation.org/public/2010_08_16/P8.Essay.Final.pdf

Electric propulsion will finally enable aircraft that are quiet enough to land close to destination.

Comments directed to PCAST from the general OSTP Contact Us page

<http://www.whitehouse.gov/administration/eop/ostp/contactus>

From: Angela Corrieri

Sent: 08/30/2010 - 10:23am

Organization: Mobile Digital Systems, Inc.

Folks...STEM Education efforts are expanding throughout our country. Few are sustainable, with a huge customer. STEM education in Northeastern Maryland is expanding significantly to meet the needs of a growing Army base at APG-- a huge customer. Other objectives can be met with the STEM expansion, including an increase in innovative, small technology business start ups. The attached STEM Education White Paper -- sent to you for your consideration and support--- documents current STEM efforts, proposes expansion of current programs, and porposes a Research Park in Northeastern Maryland. We know that there is discussion around the State of Maryland to establish a Research Quadrangle, and this may be a way to contribute to that objective. Please feel free to contact me at your convenience.
http://edit.whitehouse.gov/sites/default/files/webform/MDS_WP_STEMEducationinNortheasternMaryland08132010.pdf



White Paper

STEM Education in the Northeastern Maryland Region

August 13, 2010

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This White Paper is donated by the Participants including Mobile Digital Systems, Inc. to benefit the current and future generations of students in STEM studies in the Northeastern Maryland Region.

This White Paper was developed in collaboration with the Northeastern Maryland Technology Council (NMTC). Valued Contributors are acknowledged in the "Acknowledgements" Section. This White Paper was presented to the NMTC as of July 7, 2010. The NMTC version supports K-12 STEM efforts. Publication of excerpts of this White Paper are allowed with the condition that credit is presented to the author, Angela Corrieri, member of NMTC and NMTC STEM Education Committee.

INTRODUCTION

This White Paper investigates the STEM Education needs and opportunities being presented to the Northeastern Maryland Region as a result of the increase in activity at Aberdeen Proving Ground (APG) due to the Base Realignment and Closure Law of 2005 (BRAC).

This White Paper places central focus on the APG need for a workforce with Engineering, Scientific, and Technology skill sets, known as STEM skill sets. Also in significant demand is a workforce skilled in Management disciplines, including Procurement, Logistics, and Program Management.

Industry / Business is also affected by the need for a STEM- and Management- skilled workforce.

The time frame for the increase in the need for a STEM- and Management- skilled workforce is immediate and will grow for the next 20 years.

Both APG and Industry/ Business are acting quickly to meet those demands by recruitment and by supporting STEM- and Management-related programs in the Region with all of the school systems.

In this White Paper

This White Paper presents numerous efforts by all Education entities in the Northeastern Maryland Region occurring, expanding, and newly underway. These efforts provide STEM- and Management- related opportunities for pre-k-14 students.

This White Paper proposes a three step Project for addressing the Education needs of pre-k-20, thereby fulfilling the long term needs of APG, Industry/ Business, and the Community:

- a **Consortium of Northeastern Maryland** to draft a
- **Comprehensive Region-Wide STEM Coordinating Program** to coordinate and support all STEM Education efforts in the Region, and a
- **University Education and Research Park (UERP)**.

In supporting our Warfighter, the scope of the APG changes provides unprecedented demands on, and opportunity and benefit to all Stakeholders: the Community, Education, Military/ Government, and Industry/ Business. This affects Northeastern Maryland and the Region surrounding Northeastern Maryland.

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A. DESCRIPTION OF PROBLEMS, REQUIREMENT

1) What are the problems, requirement that justify the project?

a) Need to fill a growing and sustained demand for a workforce that is skilled in STEM- and Management- related disciplines and that is Security Cleared, in the Northeastern Maryland Region due to increase in activities at Aberdeen Proving Ground (APG), for Military, Civilian Government, and Industry/ Business. Disciplines include:

- Engineers and Scientists – including Electrical, Computer, Communications, Biological/ Chemical, Mechanical, Environmental.
- Logistics, Support, and Maintenance
- Administration and Business

The growing demand is evidenced by the increase in direct and indirect jobs from APG activities estimated at 43,200. ¹

“...14,000 jobs are directly related to APG and Contractors. Nearly 90% of those jobs are in the [above] fields...” ²

Workforce demand is currently being met by the hiring of skilled candidates:

- currently residing in the Region and who commute outside the Region to work. These represent 45% of the Region’s workforce; and
- from outside the area.

An unknown number of these currently hold a security clearance.

There is an insufficient pipeline of the workforce to meet future needs. ³

b) Need to Recognize a sense of urgency to address the needs of APG.

Changes are occurring quickly. BRAC is to be completed by September 15, 2011. There is an urgent need for Army and all Stakeholders in the Region to work together to achieve operational readiness to successfully support our Warfighter.

c) Need for A Comprehensive Region-Wide STEM Coordinating Program to coordinate and support current and future STEM Education and Research efforts.

d) Need to expand current STEM Education in pre-k-14 school curriculums.

e) Need for a Research Park anchored by a 4-Year Higher Education Institution to address pre-K-20 needs, and with a focus on Engineering, Research, and Technology, and offering Baccalaureate and Post-Graduate Degree Programs

f) Need for supporting Sustained Innovation by providing a growth and sustaining environment for small business technology startups. The increase in APG activities present an opportunity to build and sustain the Northeastern Maryland Region’s global competitiveness in all disciplines of technology. This directly contributes to supporting our Warfighter, and benefiting the community.

The geographical area affected is Region-Wide, which, according to the Chesapeake Science and Security Corridor (CSSC), includes counties in the Northeastern Maryland Region including Harford and Cecil Counties, plus Baltimore County and the City of Baltimore. Also, counties in the States of Delaware and Pennsylvania are affected and which are located within a 50 mile radius of APG. ⁴

The increasing demand for a skilled Workforce is being experienced with many military installations affected by BRAC, including Ft. George Meade located in Anne Arundel County, MD, 50 miles southwest of APG. Competition for skilled workforce between the two installations will be inevitable as they both share similar needs for the same skill sets.



Figure 1: Northeastern Maryland Region: STEM / Workforce Needs

2. What are the current efforts to meet the need?

Presented below are Current STEM and STEM-supported Programs and Efforts to meet APG's needs. These Programs and efforts need enhancement, expansion, support, and coordination. Where appropriate, specific "**Next Steps**" notes are provided for Expansions of current Programs, and Implementation of New Programs.

SMA is a significant STEM Program...

a) Education:

i. Science and Math Academy (SMA): This is a significant STEM program offered to students in Harford County Public Schools. Coordinated by Ms. Donna Clem, the first freshman class of 50 students started in 2004. The SMA provides talented students with advanced STEM curriculums and mentors, and supports 200 students per year, approximately 50 students in each grade level, 9-12. Ms. Clem assisted and has been a major force in the design, implementation, and success of the SMA. Ms. Clem provides a total environment for students, including enlisting excellent teaching and support staff, enlisting mentors for the students from the scientific community and ensuring SMA participation in the Capstone Program. SMA is currently able to accept only one in eight applicants.⁵

Next Steps: The SMA Program must be expanded in order to provide additional students with this comprehensive learning and practicum environment.

The Region's STEM teachers must be given regular opportunities to improve and update their STEM knowledge

ii. The Region's STEM Teachers:

Cecil County Public Schools (CCPS) Teachers go above and beyond for CCPS students. CCPS ensures their teachers are afforded as many opportunities as possible to update their STEM knowledge and skills, including attending a STEM workshop at MIT, and knowledge on careers which incorporate STEM disciplines in the workplace.

Through a National Science Foundation grant, the University of Delaware, School of Engineering, has been able to include 6 Cecil County high school math and science teachers in the opportunity to participate in the Research Experience for Teachers (RET). RET is a 6 week long summer program designed to help teachers apply Math and Science knowledge and skills across different disciplines.

Next Steps: The Region's STEM Teachers must be given regular opportunities to improve and update their STEM knowledge. These Professionals must be given the time and opportunity to confer with each other and others on improving teaching approaches for STEM courses, whether the conference is in-Region or outside the Region.

Next Steps: The Region's non-STEM Teachers should be further included in STEM course discussions to increase their awareness of the STEM programs. Also, non-STEM Teachers must be offered the opportunity to pursue STEM or STEM-related knowledge to allow them the choice of teaching those courses.

The Region's Community Colleges fulfill a vital role...

iii. The Region's Community Colleges have STEM and STEM-related degree programs, curricula toward Associates Degrees in Engineering and all of the Sciences, including Physics, Chemistry, and Biology, as well as Mathematics, Computer Assurance, and Technology. Both Colleges have articulation agreements with 4-year institutions for STEM student transfers with Maryland Public and Private Universities.

The Community Colleges fulfill a vital role for the community, especially for students and employers. That a student attends Community College at any time is a credit to the student as well as the community. There are various reasons that a student may choose to attend Community College, including: inability to afford the expense of attending a 4-year institution, family obligations, work obligations, or the students decide to place themselves in position to better achieve at a 4-year institution.

Both Colleges in the Region have expended much effort and commitment to offer students up-to-date and forward looking programs including STEM- and Management-related Programs...

Both Colleges in the Region have expended much effort and commitment to offer students up-to-date and forward-looking programs, including STEM- and Management- related programs, to prepare them for the workforce or further University studies. The Colleges currently have several programs to assist students to transition to work, including Internship programs with Government and Industry.

Both Colleges have partnered with their respective Community Public School System by supporting STEM efforts at all levels, from the President to Faculty, including: supporting grant requests for expanding STEM programs, supporting students with STEM career awareness, and providing Faculty as mentors to students. Faculty also provide classroom science demonstrations at local public and private schools, and more.

Cecil College (CC) offers STEM-related curricula toward Associates Degrees in Government Contracting, Supply Chain Management, and Logistics. CC has collaboration with Salisbury University and Wilmington University, with non-STEM Degree programs. ⁶

CC has built a facility on campus to provide accommodations for teaching, support staff, and research activities for the Universities above. CC is pursuing additional grant funds to expand programs and facilities.

Harford Community College (HCC) also offers numerous noncredit certification courses in technical areas including Fiber Optics Technology and Microsoft Certifications. ⁷

To accommodate significant increases in enrollment in the STEM program over the past two years, HCC recently completed a \$14Million renovation and addition to the Science Building, with state-of-the-art facilities including laboratories.

HCC has used MHEC (Maryland Higher Education Commission) BRAC grant funds to purchase electronics lab equipment and developed courses in Engineering Technology and noncredit certification in Electronics Technology.

Next Steps: The Region's Community Colleges should be provided with greater collaboration by APG and Industry/ Business, and additional funding to expand programs.

All Cecil County High Schools have a STEM Academy...Harford County implemented the SMA in 2006 and is planning to implement STEM Programs in all the schools...

iv. Community Public School Systems

Cecil County Public Schools with 17,000 students: All Cecil County High Schools have a STEM Academy, with a total enrollment of 318 students in 5 high schools. Admission is not selective, the only criterion being that students must have passed Geometry by the 8th grade. The pre-Engineering Program has an enrollment of 527 and the Bio-Medical Pathway has 136 students.⁸

Cecil County pre-K-8 / Elementary Schools are expanding their **eSTEM Program** for students in elementary grades, including Kindergarten. An engineering curriculum will be introduced in Kindergarten classrooms during the 2010-2011 school year, to coach and encourage problem-solving through every day examples. Through a collaboration of the Science and Math Department, a 5th grade Science, Math, Innovation, Learning Event (SMILE) was successfully piloted at Gilpin Elementary School in May, 2010. Eighth grade Honors Science continues to be a success in the middle schools. Since 2006 there has been an increase in middle school students completing geometry prior to high school- a pre-requisite for participation in the STEM academy.⁹

All of the STEM Education courses have a business outreach component through Advisory Committees that are comprised of all disciplines in STEM industries. **Currently, CCPS is recruiting STEM Mentors for CCPS High School Seniors to assist students with Capstone projects.**

Harford County Public Schools with 30,000 students: besides the Science and Math Academy (SMA), STEM efforts in the pre-k-12 are being planned and implemented at this time. A Homeland Security curriculum has been implemented at Joppatowne High School. A program: "The Earth Science Excavated and Life Science Animated Academy" began in Summer 2010, and will continue through 2012. Also phasing in through 2012 is a program: "Engineering is Elementary" and includes Engineering disciplines: Chemical, Agricultural, Mechanical, Materials, and Electrical.

The newly formed Harford County STEM Advisory Board is supporting these efforts and implementing additional STEM Programs.¹⁰

Harford Technical High School (HTHS) has provided a full education curriculum and productive hands-on vocational training to prepare students for immediate job performance and productivity upon graduation. HTHS' curriculum includes applicable STEM programs as well as signature programs in the Bio-Medical fields. Additional programs in Cyber-Security and Comp-Sci are being discussed.¹¹

Next Steps: The Region's Community Public Schools should be provided with greater collaboration by APG and Industry/ Business, and additional funding to expand programs.

v. Summer Science Camps:

Cecil College offers four 2010 summer camps for students, two of which offer STEM and STEM-related courses: Cecil Science Institute (CSI) and Cecil Summer Scholars Program. for ages 13-18, from June 28 – August 13. ¹²

Harford Community College offers a wide selection of 2010 summer STEM courses in the HCC Continuing Education and Training Program- Youth and Summer Camp Programs from June 21 - August 28. ¹²

University of Delaware, a valued Partner of the Community Colleges and APG, College of Engineering offers a 2010 Summer Science and Engineering Program: "Engineering Cool Stuff 2010" for ages 12-16, in two sessions running July 12-23. ¹²

Next Steps: Summer Camp Programs should be expanded and provided increased funding.

Next Steps: Regional STEM Programs. There is a need for Regional STEM Programs. This would increase participation, for instance through new Regional STEM competitions for students.

Next Steps: Expand Participation in National and International Activities and Competitions, for example, the Army's eCybermission, FLL LEGO Competition, Robotics competitions, and more.

Science Cafés..for all residents of the Region, especially Parents of Students, and non-Science residents...

vi. Local Community- Wide Engagement- Science Cafés

For all residents of the Region, especially Parents of Students, and non-Science residents of the Region, the NMTC is implementing 'Science Cafes' to inform high school students, their parents, and the community-at-large of contemporary topics and issues in science and technology, the impact that science has on our day-to-day lives, and career possibilities and opportunities that Science can offer students.

This is a concept and plan implemented by Dr. Nina Lamba, Chief Scientist and President of CCL Biomedical, Inc, of Havre de Grace, MD, and NMTC Board Member.

vii. The Higher Education and Conference Center (HECC) in Aberdeen, Harford County, is a 26,000 square foot facility containing state-of-the-art classrooms, conference rooms, computer labs, wet lab, office suites, and other facility amenities. HECC provides vital support for instructional needs in the Region by providing classrooms and lab facilities for instruction, and is at capacity weekdays after 5pm.

Six Universities based outside the Region in Maryland offer classes for over 2,000 students annually. Students represent graduates from the Region's Community Colleges, as well as employees of APG and Industry/ Businesses in the Region. HECC is managed by Harford Community College, and has been approved to receive funding to expand its facilities and services offerings to meet the growing needs of the Region. ¹³

viii. Harford Senior Science Society (HSS): coordinated and supported by Harford Community College and NMTC, is comprised of science minded professionals, who are retired or semi-retired scientists, for the purpose of augmenting science programs in Harford County Schools by providing students with scientific advice as well as cooperative mentoring and encouragement. This Senior Science program has significant potential to provide students with real-world experience.¹⁴

Next Steps: Attention and awareness of this Program should be increased and the Program expanded. STEM Awards and Citations should be issued and publicized for participation milestones.

Outreach efforts enable APG to communicate its needs to the Schools and the Community, and to assist school programs...

b) APG efforts for Outreach to Education and Other in Community are significant. Outreach efforts enable APG to communicate its needs to the Schools and the Community, and to assist school programs by providing mentors, classroom demonstrations, and funding for needed equipment, and materials. APG, especially RDECOM, has significantly increased its collaboration with the School Systems in providing scientist-mentors, and career information.

i. Deputy to the Commander of RDECOM, Mr. Gary Martin participates in Community outreach activities, including participation in an October, 2009 Maryland Governor's Higher Education Summit, providing information on the status of APG activities and APG needs.

ii. University Collaboration: APG has Agreements with several Universities and Schools based outside the Region to help meet the needs of our Warfighter:

Army-RDECOM has signed a CRADA Agreement with the University of Delaware for Research and Development of Composite Materials and Antenna Technologies.

Army, RDECOM-CERDEC has signed a CRADA agreement with Morgan State University for Research Activities.

APG- Edgewood (ECBC) offers an International Baccalaureate Degree. ECBC is hosting 2 science teachers from Cecil County Public Schools to join engineers at the Mathematics STEM Learning Modules workshop.

iii. Community Public Schools Collaboration:

ARMY-RDECOM- CERDEC is conducting 5 summer camps in their 2010 Summer Science Program for students. CERDEC also conducted a 4-technology workshop for students on June 23, 2010 in collaboration with Cecil County Public Schools.

Army-RDECOM has significantly increased the number of Scientist-mentors it sponsors for the STEM programs in the Public Schools and the Colleges.

Baltimore Polytechnic Institute (Poly) / The Army Research Laboratory (ARL) at APG has begun a 3 year experimental outreach program to this engineering-focused high school via a cooperative research program that supports the school's Capstone engineering course known as the **Senior Engineering Practicum**. Students chosen for this course have shown the ability to function at the university level in their problem solving and engineering design abilities.

The objective of this (ARL-Poly) outreach program is to introduce students not only to the different fields of engineering but also to the analytic tools and techniques that the profession uses.

Next Steps: APG efforts should be further encouraged through increased funding to enable increased efforts by Command and Management staff, and Scientists. STEM Awards and Citations should be issued for participation milestones, and publicized.

c) Industry / Business and Professional Organizations' support of STEM Programs is significant and growing. These organizations provide funding for STEM Programs, Employee and Corporate time, and scholarships for students in STEM Programs, and include: *The Cecil County and Harford County Chambers of Commerce; Northeastern Maryland Technical Council (NMTC); Army Alliance, Inc.; National Defense Industry Association (NDIA); Armed Forces Communications and Electronics Association (AFCEA); Association of the United States Army (AUSA); Professional Associations Network (PAN); Sabre Systems, SAIC, Mitre, Battelle, Booz Allen Hamilton, CACI, and others.*

All Industry / Business in Northeastern Maryland, including those moving to the area should regularly be given opportunities to participate in STEM programs throughout the Region.

Support for Entrepreneurship to advance innovation and ramp-up for global competitiveness...

d) Support for Entrepreneurship must be increased at all levels. This includes Community- Based Businesses, as well as those with Military/ Government customers, and National and International Markets. These start-up and emerging businesses become a vehicle for meeting the growing needs of the local community, advancing innovation, as well as productizing/ commercializing innovation for specific markets. Those who benefit are ultimately the Warfighter, APG, Industry/ Business, and the Community.

This evolution of focus is supported by lessons learned by Research Triangle Park, North Carolina.¹⁵

The Harford County Business Incubation Center (HBIC) has recently been established and is offering facilities to businesses, including to those which are re-locating to Harford County from other areas. The HBIC, funded primarily by the Harford County Office of Economic Development, needs additional support for expansion of its ability to encourage entrepreneurship for building new companies, and provide coaching for business building.¹⁶

Cecil County: There is a need to consider a Technology Business Incubator in Cecil County.

The Region Small Business Development Centers (SBDC), are located in both Harford and Cecil Counties, are supported by the State and the respective College in each County. The SBDCs of the Region have assisted entrepreneurs in at least 1200 sessions annually and small business demand is growing. ¹⁷

Next Steps: Increased Effective Business Collaboration. There is a need for effective collaboration between and among business/ industry in the Region. Certainly, this is hindered by the security level of activities, competition for contract dollars, and competition for skilled labor force.

However, in the long term, our Warfighter and APG suffer because there is not enough innovation brought to projects.

There is a need for increased, effective business collaboration between large contractors and small business.

e) Other Needs. Transportation improvements for the Region's growth and quality of life are critical.

The Transportation infrastructure needs to be significantly augmented including roads, commuter rail, and other. This is being addressed through efforts of individuals and organizations in the Region, including the Chesapeake Science and Security Corridor (CSSC), State and Federal agencies, and is not addressed in the Project presented in this White Paper

f) The State of Maryland Higher Education Commission (MHEC) has provided guidance and grant funding for the expansion of education efforts including STEM Education in the Region. The MHEC is a valued partner in the efforts of all the school systems, and would be a major partner in the implementation of this Project. ¹⁸

g) The Maryland Lieutenant Governor's BRAC Sub-Cabinet, through Executive Director Asuntha Chiang-Smith has provided support with Transportation issues and Education funding. ¹⁹

Our Warfighter, APG, and all Stakeholders who participate will benefit...

6) How Will The Problem, Need Or Value Change Through This Project?

Through this project, our Warfighter and APG will benefit. Also, all Stakeholders in the Region who participate will all benefit. This Project will also benefit Government, Education, the Community, Industry/ Business, Community based non-technology Business, and Technology-based Entrepreneurs in the Region.

Direct benefits will occur through a sustained supply of a STEM- and Management-educated and skilled workforce.

- a) Our Warfighter will benefit through improved technology.
- b) APG will benefit through the close proximity of scientists, researchers, and technologists affecting scientific discovery in nearby facilities.
- c) The Community will have access to higher paid jobs, and contributing to a higher tax base.
- d) Industry/ Business will benefit by the cost savings of recruitment and hiring.
- e) Small Business and Technology Start-up businesses will benefit through greater access to resources that enable them to grow: Customers, Capital, Coaching.
- f) Any markets which are addressed by the businesses in the Region would be better served.

Global Markets addressed by the businesses in the Region would be better served...

All of these benefits would occur through all of the Stakeholders' commitment to support our Warfighter.

B. OVERVIEW OF THE ORGANIZATION

The organization to lead this effort is the **Consortium of Northeastern Maryland (CNM)**. *The Northeastern Maryland Technology Council would be invited to be a partner member of the CNM.*

The CNM will be comprised of representatives from Military, Government, the School Systems, Universities, and Industry/ Business. These members have a history and commitment to serving the Warfighter and who are committed to increasing the pipeline of a quality-skilled workforce in STEM- and Management-related disciplines.

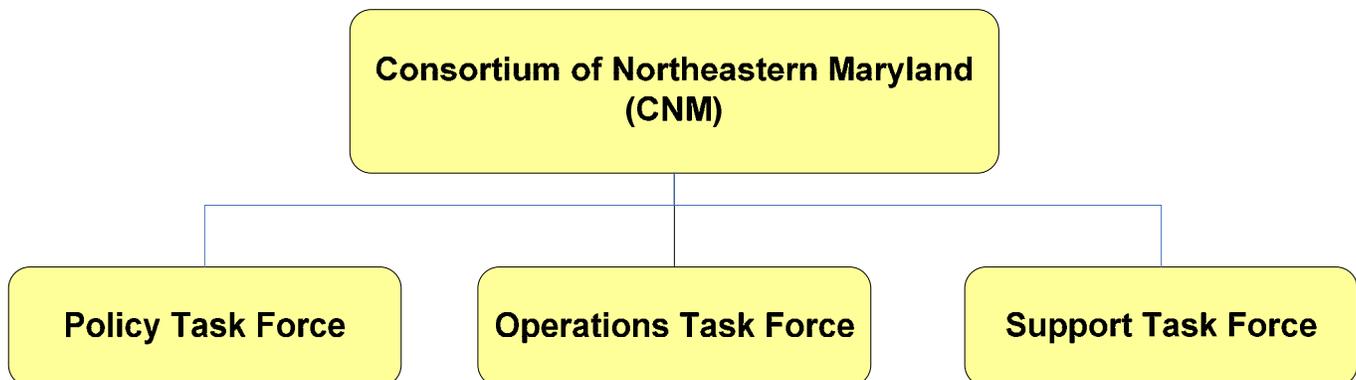
This Consortium would perform four roles:

- 1) Be a Supporter and Coordinator of STEM Programs in the Region;
- 2) Produce the Comprehensive Region-Wide STEM Coordinating Program Plan;
- 3) Assemble the resources needed to compose the Project Plan, presented on following pages;
- 4) Work with funding sources and Stakeholders to implement the Project Plan, including to build a *University Education Research Park*.

All members of the CNM are required to be *participating* members, providing funding or service hours or both, for achieving the goals of the CNM.

The CNM structure includes:

- a. A Policy Task Force
- b. An Operations Task Force
- c. A Support Task Force



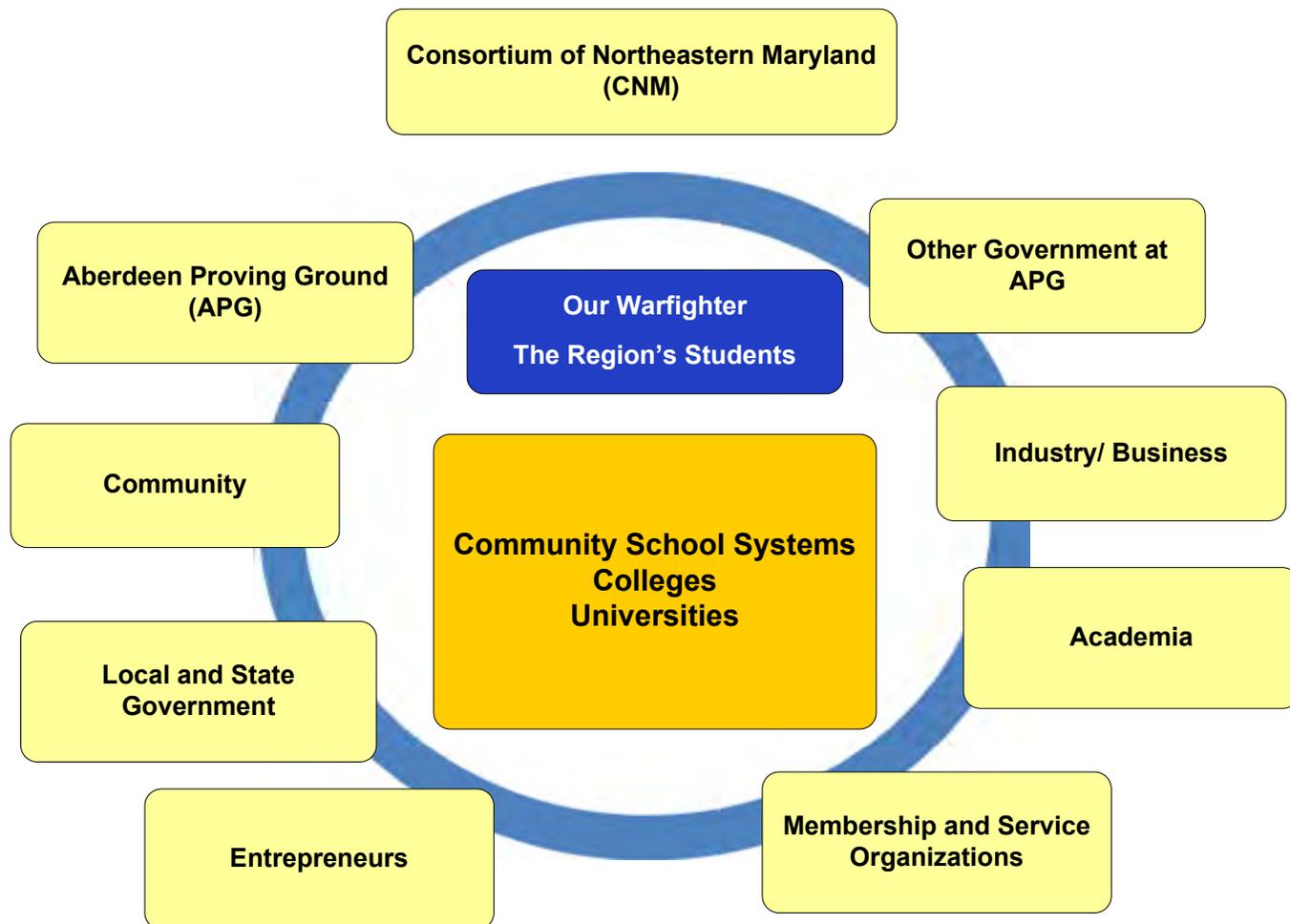
C. OVERVIEW OF PROPOSED PROJECT

1. What is the basic purpose of the project?

a) The Purpose of this Project is to provide a sustained pipeline of quality STEM- and Management- educated and skilled workforce to meet the long-term needs of our Warfighter, APG, and other Stakeholders in the Northeastern Maryland Region.

b) The Vision is to engage every member of the community, and calls on Research Park Technology Cluster models, and lessons learned from other successes, including:

- Research Triangle Park- North Carolina
- MIT/ Harvard/ Route 128
- Stanford / Silicon Valley
- XEROX PARC



c) The Goals of this Project are:

i. Build the Consortium of Northeastern Maryland (CNM):

ii. Create and Implement a **Comprehensive Region-Wide STEM Coordinating Program** to support, coordinate, and expand all STEM- and Management- education related efforts in the Region.

iii. Compose and Implement the Project Plan which major Goal is to **Build a University Education and Research Park (UERP)**, a World Class University Educational Campus and Research Park for fulfilling:

A. APG's Research needs for Scientific discovery and Engineering to benefit our Warfighter.

B. Quality Innovation for our Warfighter.

C. The Workforce: Increasing the Pipeline and graduates with STEM- and Management-related skills for APG and Industry/ Business.

D. Local World Class Education: Enabling students graduating from the local school systems and attracting those from outside the Region to be able to earn Baccalaureate and Advanced Degrees locally, and have access to APG as a possible employer, as well as to the Businesses serving APG.

We propose this UERP be a joint venture/partnership among all Stakeholders:

APG, The Region's communities, the Region's Public School Systems, the Community Colleges, Several Universities including an Engineering and Technology - Centered University such as the Massachusetts Institute of Technology (MIT), Industry/Business, including large, small, and start-ups, and Local, State and Federal Governments.²¹

The University(ies) selected would adopt priorities germane to APG, the community, and Stakeholders, including the fostering of Innovation by encouraging and coaching technology business start-ups.

We propose this UERP be a joint venture/partnership among all Stakeholders...

Example: Research Triangle Park (RTP), North Carolina²²

Some similarities and differences exist between the Northeastern Maryland Region and Research Triangle Park (RTP), North Carolina.

The biggest difference is that the Northeastern Maryland Region has a significant existing and growing customer with significant and growing needs, which RTP did not have at its inception.

Another difference is that RTP devotes significant efforts to encouraging and supporting technology business start-ups and collaboration among businesses, which is not readily apparent in Northeastern Maryland.

The most significant similarity is that there is unanimous agreement that Education and Stakeholder participation are the Vehicles to increase the supply of quality STEM- and Management- skilled workforce.

viii. Technology Business Start Ups:

For Innovation to reach and benefit our Warfighter, there needs to be encouragement and support for entrepreneurs who start and grow technology business start-ups in a win-win environment. ¹⁸

Example: The Maryland Biotechnology Center planned for Montgomery County, MD ²³

MIT and other Universities have been valued partners in the formation and success of numerous technology business start-ups along Massachusetts Route 128, Silicon Valley, and other locations globally. ²⁴

Technology Business Start-Up companies must understand the risks they are about to, and should assume for operating and growing, including identifying their markets, funding, team building, product development, and selling to local, national, and global markets. And for assuming that risk, understand that there could be the corresponding reward to return to them.

These companies must have ready access to funding through Angel and Venture Capital as well as government and industry grants for development and technology transfer.

Several comments in the media by our legislators and others have suggested that Northeastern Maryland is in a position to become the next Silicon Valley. Technology Business Start Ups will help make that happen.

2. Who will benefit from it? Describe the geographic area and population to be served.

Several populations will benefit from the estimated increase in jobs:

- a) Our Warfighter, through the APG/ Military, and Other Government Agencies in the Northeastern Maryland Region.
- b) The local population of the area, numbering over 700,000, and specifically students in pre-K-20 and beyond.
- c) Industry/ Business: Large, Small, and Start-ups with increased revenues through larger and additional contracts due to their ability to hire additional knowledgeable workforce.
- d) The nation will benefit through the area's developing global competitiveness.

3. How is this project unique? Is it similar to other programs but covers a different area? Does it employ a new approach?

a) Unique: This project is unique in several ways:

i. Opportunity and Mission: This Project presents an unprecedented opportunity to address the needs of our Warfighter, Military/ Government, as well as to transition technology to other markets, and with a vision toward global competitiveness.

ii. Sustainable: APG is located in the Region and represents a ready-made opportunity to serve a large customer.

While there are many STEM Programs around the country, most rely on continued grant funding without a plan for self sustainment nor for a progression to subsequent knowledge and hands on experience.

This project provides for an immediate beginning of a return on investment in the form of: immediate employment of an increasing number STEM students in intern and summer positions made possible by the increase in contract dollars. This Return on Investment increases annually, as increasing number of students qualify for employment and add to the tax base.

b) Similar and Unique: This project is the same as those models mentioned in C.1.b above, in that priority is placed on Education for the purpose of producing an educated workforce and innovation to meet the needs of a customer. Those models do not concentrate their efforts on meeting the needs of our Warfighter/ Military/ Government.

There are other STEM projects and programs, but few have the sustainability as this project proposes.

4. Why does this project deserve prioritization more than others competing for attention?

a) The need is immediate. Our Warfighter deserves uninterrupted, quality support. DOD's timeline of the BRAC initiatives is to complete moves of significant U.S. Army and other activities to APG by September 15, 2011.

b) The Stakeholders are numerous, motivated, and currently participating in bringing about solutions.

c) Return on Investment would be immediate.

d) Perfect Location for a/n UERP. There are unique characteristics of the area:
i. A community which is knowledgeable of the presence of, and needs of Army.

ii. Increasing diversity of the Community-- proven as one of the best attributes for supporting a successful environment.

iii. Available Land. A plentiful supply of Land is available in both Harford and Cecil Counties. Planning must consider the traffic implications of the UERP. One consideration is to utilize the Bainbridge Center in Cecil County for the UERP.

The need is immediate. Our Warfighter deserves uninterrupted, quality support.

5. What is the plan: product, cost, promotion, place and position?

a) We propose a two step process spanning 20 years, executed by way of the Activities on the following page.

i. Compose the Project Plan.

Cost of the Compose Project Plan: \$6.7 Million over 1 year.

iii. Implement the Project Plan.

Cost of the Implement Project Plan: estimated at \$1.3 Billion.

This \$1.3 Billion figure was estimated from two sources:

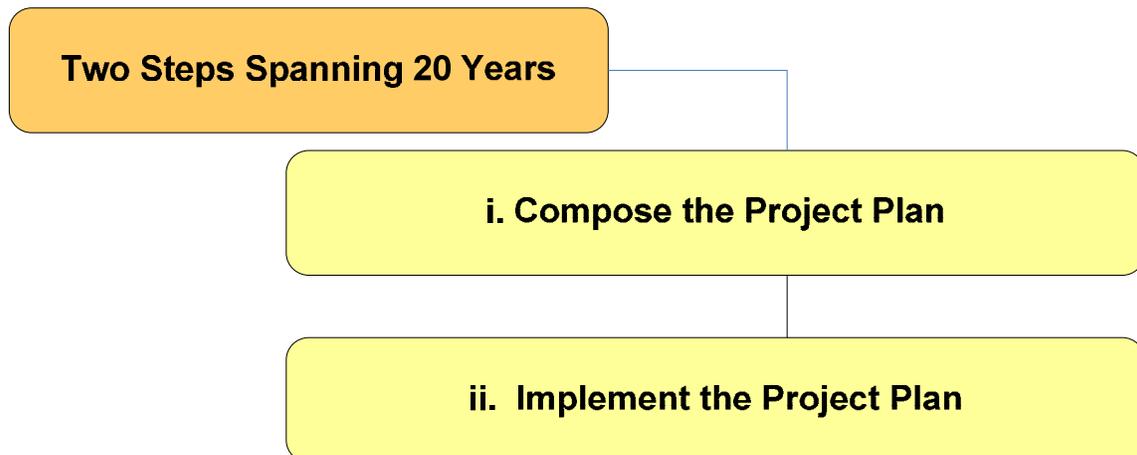
- 1) The planned Montgomery County, MD Bio Park for which \$1.3 Billion has been allocated.
- 2) The cost of Research Triangle Park for the years 1984 through 2006 at \$620 Million. In those 22 years, the funds made possible the purchase of 1,334 acres of land, and the building of 2.7 million square feet in 25 buildings. ¹⁵

In comparing land and labor costs between North Carolina and Maryland, we found that Maryland costs are at least 100% higher than in North Carolina, therefore the \$1.3 Billion estimated cost.

b) The resulting products are:

- i. A sustained supply of an educated and motivated workforce for Military / Government and Industry/ Contractors.
- ii. Sustained quality innovation to meet the needs of our Warfighter.
- iii. A higher quality of life for the Community.
- iv. Stimulation of Entrepreneurism: for the transformation of scientific discovery and intellectual assets into capital formation and business development.

The place is the Northeastern Maryland Region.



D. Project Activities and Timeline

1. What exactly must be done in order to achieve the desired outcomes?

This Project is a multi-year engagement and requires the commitment and active participation of all the Stakeholders.

Implement Project Plan- UERP Activities and Timeline:

Year 1: Structure: Use the CNM – Consortium of Northeastern Maryland, comprised of all Stakeholders. Ensure a flat organization to facilitate effective communication and performance.

- a. Comprise the CNM Task Forces: Policy, Operations, Support.
- b. Gain acceptance and commitment of participation from the Stakeholders.
- c. Compose the Project Plan.

Year 2 After Approval and Funding:

Education:

Forge an agreement with an Engineering/Technology-based University such as MIT.

- a. Build partnerships with local School Systems, the SMA, Military/ Government, and Industry/ Contractors.
- b. Conduct sustained outreach to students and parents.
- c. Conduct advanced training for teachers at all levels.
- d. Prioritize programs: for employers, start up business support.
- e. Plan for and enlist Professors, Researchers and staff.
- f. Plan curriculums.
- g. Build a campus with plans for growth.
- h. Admit students. Begin instruction.

Other Stakeholders:

Further determine specific needs of APG and other Stakeholders: Military/ Government, Industry, Community including School Systems, Start Up Businesses. Ensure that needs are communicated to the UERP Consortium, prioritized, and addressed in a timely manner. Other engagement:

- a. Military/ Government: continue Education and other Community Outreach.
- b. Community: conduct informational Cafes, including Science, Technology, status of this Project, the Community's opportunities, other.
- c. School Systems: inform, survey, and engage the School Systems.
- d. Industry: inform, survey, and engage Industry in this Project.

Industry: Create a Foreign Trade Zone to facilitate export activities.

- a. Engage the Departments of Commerce and Treasury.
- b. Construct and lease Office/ Warehouse/ R&D space.

Start Ups: Attract motivated and impassioned entrepreneurs.

- a. Expand the HBIC in Harford County.
- b. Establish a Technology Business Incubator in Cecil County.
- c. Provide assistance and guidance with integrity.
- d. Guide and engage start ups in selling to their target markets.
- d. Attract Venture Capital to the Region.

Years 3 - 20:

Continue engagement of Stakeholders for executing, evaluating, modifying this Project when needed.

2. When will this project be implemented? Will it occur over a discrete time period or be an ongoing service?

The One-Year Project Planning Stage can begin immediately after funding - FY10- 11. Project Implementation could begin within FY 2011, and continue in stages over a 20 year period.

To assist the Planning and Implementation Stages, lessons can be learned from many examples without conflict or confusion, including the Maryland Biotechnology Center and Research Triangle Park, North Carolina.

3. Who will carry out project activities? What are their qualifications?

The Consortium of Northeastern Maryland, which is comprised of the Stakeholders and additional Advisory members as needed.

Should the first stage of this project be approved and funded, these groups will be activated to Compose the Project Plan, obtain approval and funding, and then Implement the full Project.

4. Additional Stakeholders and Participants.

Coordinate with Stakeholders on the State and Federal level, including the MD Office of the Governor; U.S., State, and Local Legislators; MD Governor's BRAC Subcabinet; MD Governor's Education Task Force; the MD State Department of Education; the Maryland Higher Education Commission (MHEC); the MD Governor's Workforce Investment Board; the MD Department of Business and Economic Development (DBED); the MD Technology Development Corporation (TEDCO); the President's Commission on Science and Technology Policy; the U.S. Department of Education.

E. OUTCOMES

1. What immediate and long-range results are expected? Will these results help the institution and others? Change children's lives, the educational community and the world?

The results will benefit our Warfighter and all other Stakeholders through a sustained supply of a quality STEM- and Management- educated workforce; students in the Community will *have a choice* of obtaining an excellent continuing Education locally or travel to other institutions and return to obtain jobs in the Region; the Community will benefit through access to well paying jobs, an increase in the tax base, and its ability to attract additional quality Merchants, Medical, First Responders, Housing, and other infrastructure which improve quality of life.

2. How serious are the need and necessity for immediate action?

The need is serious and immediate. Not only will there be an increase of 43,200 direct and indirect jobs, but also, 50% of APG current employees are due to retire within 5 years, exacerbating the demand for skilled and security cleared workforce.⁷

**The need is serious and immediate.
Our Warfighter deserves uninterrupted, quality support.**

F. EVALUATION

1. By what criteria will the success or failure of this project be measured?

Evaluation Criteria will include one or more appropriate of: Goals Based, Process Based, Outcomes Based, PERT, and Critical Path techniques. Full evaluation criteria will be formulated during the Compose Project Plan stage, and will include:

- Participation of all Stakeholders
- Cost/ Benefit to the Stakeholders
- Quality of Life in the Region
- Results achieved via Timeline/ Resource Allocation

2. Who will do the evaluation? When and how often will they do it?

An independent agency will be selected during the Compose Project Plan stage.

3. How will evaluation results be used? Who will see evaluations?

Evaluation results will be used to improve the program, including making decisions to increase, decrease, eliminate, or add activities. Since Public Funds are anticipated, the information will be available to the Public.

G. FUNDING

1. What is the anticipated total budget for this project? Give a complete budget breakdown.

a) Compose UERP Project Plan: estimated \$6.7 Million will be needed to compose a Project Plan over a one year period.

Compose Project Plan: University Education and Research Park (UERP)

Needs Assessment	\$ 4,000,000.00
Workforce	
Education	
Curriculum	
Facilities	
Funding	
Community:	
Businesses	
Housing	
Land	
Develop Initial Draft Plan	1,500,000.00
Present to Stakeholders	500,000.00
Modify Draft Plan	500,000.00
Acceptance	200,000.00
Total Project Plan	\$ 6,700,000.00

b) Implement UERP Project: the Budget is anticipated at \$1.3 Billion over a 20 year period. Justification for this figure is made on the basis of purchase of land, construction of buildings, outfitting buildings with STEM- and Management- related and other needed Research facilities and offices, salaries for teachers and support staff, and other which would be detailed in the Implement Project Plan. Consideration is made that this is a 20 year plan and allowances are made for the time value of money, and changes in costs. ¹⁵

2. Where will the funding come from?

a) Compose Project Plan- UERP: would be funded by: Federal and State Government and Military sources.

b) Implement Project Plan- UERP: would be funded from multiple sources, including:

i. During the first five years:

- A. Federal and State Government
- B. Industry
- C. Foundations

ii. After five years:

- A. A small share of Tech Business Start Ups when successful in the marketplace.
- B. Industry.
- C. Student endowments.
- D. Increased local revenues from taxes resulting from higher paid jobs.

Conclusion and Next Steps

This STEM Education White Paper accurately describes the need to ensure a highly educated STEM- and Management- educated workforce in support of our Warfighter and our national defense, through Aberdeen Proving Ground, while providing enriching benefits to the Region and State of Maryland economy by building a **World Class University Education and Research Park (UERP)** in Northeastern Maryland.

The Northeastern Maryland Technology Council and other Organizations are invited as partners in the Consortium of Northeastern Maryland leading to the building of a World Class University Education and Research Park. The membership of the Organizations is comprised of Representatives from Education, Government, and Technology companies both defense related and private sector. They have excellent working relationships with county governments, valued advisory roles to local education in grades K-14, and successful relationships with Aberdeen Proving Ground. These existing attributes of the members would contribute to a successful Consortium of Northeastern Maryland, and a successful, World Class University Education and Research Park.

These existing attributes of the members would contribute to a vibrant Consortium of Northeastern Maryland, and a successful, World Class University Education and Research Park.

Acknowledgements

Many thanks are extended to the following Participants and Contributors for providing valued information and guidance for this White Paper. The author attempted to include as many people as possible and is grateful to those who participated.

All statements in this White Paper may not be endorsed by all participants.

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Dr. Asuntha Chiang-Smith, Executive Director

U.S. Army:

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<http://www.ccps.org>

Cecil County High School STEM Curriculum Information
<http://www.ccps.org/science/stem.html>
- 9 Cecil County pre-K-8 / Elementary Schools eSTEM Program, Cecil County Public Schools, Cecil County, Maryland, Ms. Kathleen Kunda and Mr. Frank Cardo
- 10 Harford County Public Schools STEM Program
and Harford County STEM Advisory Board
Mr. Anthony Renulli, Supervisor Science, Harford County Public Schools
- 11 Harford Technical High School, Harford County Public Schools, Harford County, Maryland
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Cecil College
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<http://ecorner.stanford.edu/>
<http://www.gsb.stanford.edu/ces/GSBAumniEntrepreneurBootcamp.html>

From: Mr. Garrett Hord
Sent: 09/13/2010 - 1:57pm
Organization: Unemployed

Who is the overall authority within the nation on technical publications and or directives that are discrepant?

<http://edit.whitehouse.gov/sites/default/files/webform/AuditComm.pdf>

Monday, September 13, 2010

To: Honorable Esteemed Notable Assistant to the President for Science and Technology, Director of the White House Office of Science and Technology Policy, and Co-Chair of the President's Council of Advisors on Science and Technology (PCAST) Doctor John P. Holdren; and The Honorable Esteemed Notable White house Cybersecurity Chief Howard A. Schmidt

Subject: Policy for Internal Controls within the National Infrastructure

From: Mr. Garrett Hord; AAS Computer Information Systems, Computer Scientist, Computer Security Specialist, Computer Programmer, Association of Certified Fraud Examiners Associate Member #134230, Association of Contingency Planners International Associate Member #292323

Dear, Honorable Esteemed Notable Assistant to the President for Science and Technology, Director of the White House Office of Science and Technology Policy, and Co-Chair of the President's Council of Advisors on Science and Technology (PCAST) Doctor John P. Holdren; and The White house Cybersecurity Honorable Esteemed Notable Chief Howard A. Schmidt

In regards towards the United States Presidential Statement “To help build a new foundation for the 21st century, we need to reform our government so that it is more efficient, more transparent, and more creative.” I, Mr. Garrett Hord; am asking you and your esteemed staff of assistants to explain or provide whom and or what governing body of jurisprudence of scope has the role of promulgating the Internal Controls especially the executive management governance. With the inception of The United States White House Office of Cybersecurity that is under the Strategic Operational Command and or Control of The Honorable Notable Esteemed Nobel Laureate President of The United States of America Mr. Barack Obama; whom, has the Mission Statement or Vision to proliferate reformation within our national governmental systems. I am asking both the Honorable Esteemed Notable Director of the White House Office of Science and Technology Policy, and The Honorable Esteemed Notable White House Cybersecurity Chief Howard A. Schmidt what agency or agencies have the

scope of overseeing discrepancies which; are duly annotated or noted during audits within Information Assurance Engineering Science. This comes in wake of myself trying to ascertain who or what governing entity has the responsibility of standard upkeep, and rework of Technical Directives and or Technical Publications when they are discrepant and obsolete. This issue needs to be addressed immediately since it hinders the overall Business Impact Analysis (BIA) indicative of risk mitigation of any form within the National infrastructure. I am also asking would this kind of auditing be performed by the Committee on National Security Systems (CNSS) whom, I am speculating is the overall cognizant authority on Internal Auditing especially within the jurisprudence of scope involving Internal Controls as an Internal Audit Committee.

Very Respectfully

Mr. Garrett Hord

Computer Scientist, Computer Security Specialist

From: Janet Hugo, Ph.D.

Sent: 09/14/2010 - 12:37pm

Organization: National Consortium of Specialized Secondary Schools of Mathematics, Science and Technology

As a past president of NCSSSMST, I believe it is important for the PCAST board to hear from experts in the field of K-12 STEM education. The 100+ institutional members of NCSSSMST have created the model for excellence in curriculum and instruction in these disciplines.

I find it troubling that all of the PCAST members are from either higher educational institutions or businesses. Those of us who have developed or administer or teach in specialized STEM schools could provide a great deal of information and expertise regarding preparing teachers and students to excel in STEM courses and fields of study.

The consortium also has in its membership approximately 120 of the top colleges and universities in the country where you will find our graduates.

I think it would be beneficial for this body to hear from NCSSSMST. After all, it is time consuming to reinvent the wheel. Please consider using our expertise and willingness to be part of this important and most necessary initiative.

Thank you for your attention.

From: Dr. Lloyd S. Etheredge
Sent: 09/17/2010 - 12:14pm
Organization: Policy Science Center

I am forwarding a proposal, recently published in Lancet, that you may wish to review for the President. It is a promising idea for US leadership [using global Internet technology and (eventually) high speed computing] from which 250 million people, including Americans, are likely to benefit.

<http://edit.whitehouse.gov/sites/default/files/webform/2010.0802.Lancet.%2BTime.pdf>

The case for a global rare-diseases registry



Rare diseases are a clinically heterogeneous group of about 6500 disorders,¹ and in fewer than 200 000 individuals in the USA.² They are commonly diagnosed during childhood, often inherited, and can have deleterious long-term effects. Although any one condition is rare, their cumulative public health burden is substantial, with 6–8% of people having a rare disease at some point during life.³

Because of the rarity, no single institution, and in many cases no single country, has sufficient numbers of patients to do generalisable clinical and translational research. Geographic spread of patients has been a major impediment to recruitment into clinical trials. Most rare diseases do not have a specific International Classification of Diseases code, which hampers research that uses existing databases.³ Before the USA, the European Union, and Asian countries passed orphan-drug legislation more than 20 years ago, the drug industry gave little attention to the development of drugs for these diseases. Although these laws increased the pace of orphan-drug development,⁴ most rare diseases still have no medical therapy.

In recognition of these barriers and the moral and public health imperatives to advance knowledge on the best ways to improve the health and wellbeing of patients with rare diseases, recent conferences in the USA⁵ and Europe⁶ called for wide expansion of access to registries for such patients. The US meeting called for the creation of the infrastructure for a global registry.

Once the population has been defined, various data types can be added. Data can be entered by patients, clinicians, researchers, or be imported from electronic health records. Scientists and drug companies are more likely to research a rare disease if they find a registry in place. Registries enable the formation of infrastructures for various types of research, education, and outcomes improvement (panel).^{7,8}

Less than a fifth of rare diseases have registries, and most of these are operated by patients' organisations or researchers.⁶ Although most registries are country-specific, there are a few international efforts (eg, in cystic fibrosis⁹ and neuromuscular diseases¹⁰) that are showing the benefits of combining data across international boundaries.

We believe that now is the time to design and develop the infrastructure to foster global rare-disease registries. The increasing mobility of populations and the globalisation of lifestyles and food products make it clear that disease knows no boundaries.¹¹ Some rare diseases occur so infrequently (<1 per 1 000 000 population) that only by forming international populations can sufficient numbers of patients be accrued. Because funding has been a key obstacle to establishing and maintaining registries, economies of scale that can be developed by forming a global rare-disease infrastructure would improve access to registries for many patients.

Registries are infrastructure, not research projects, and as for so many global concerns, there is no single funding source. A federated model in which several registries for the same disease are linked will most probably be needed to form a global infrastructure. A federated model requires that individual registries are developed or, for those already in existence, transformed to ensure that they are interoperable (ie, data are defined in the same way, use the same standards, and are stored in the same vocabularies).

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6736(10)60680-0

Panel: Research functions to enable a patients' registry for rare diseases

- **Knowledge dissemination:** distribution of information to patients and their clinicians on new therapies, best practices, and safety issues
- **Patients' recruitment:** providing patient-population information for designing trial protocols that optimise size and length of trials
- **Clinical epidemiology:** population descriptive statistics, natural history of disorders, medical practice variation
- **Clinical effectiveness:** evaluation of the effects of preventive, diagnostic, and curative interventions delivered in real-world settings
- **Safety monitoring:** orphan drugs are generally not tested in large phase 3 studies, which makes the need for postmarketing safety surveillance via registries even more important than with conventional drugs⁴
- **Quality and outcomes improvement:** enhancing patients' outcomes by standardising practice and reducing practice variation
- **Genotype/phenotype association studies:** the registry provides phenotypic data which can be linked to genetic and other exposure data
- **Linkage to biospecimens and biorepositories:** to detect phenotypic correlates of cell and tissue biology

For registry developers, there is no established forum for sharing experiences. Each time a new registry is developed, it starts from scratch.⁶ Information on best informatics practices and common data templates would go a long way toward reducing the start-up costs associated with developing a registry. Some data elements might be common to all rare diseases (eg, sociodemographics, diagnosis, genetics, growth, medications, services), which raises the possibility of creating a core dataset that can be incorporated into all rare-disease registries.

A single individual, group, or even country will not lead the movement toward formation of a global rare-disease registry. As in the open-source software community, an open-science community for rare diseases is needed. Such a community would ensure that the conditions necessary for data exchange are addressed by defining common datasets, data standards, and vocabularies, and would provide a forum for exchange of experiences and knowledge. The biggest hurdle to our vision of a global registry is not technical, but rather the cultural obstacles to collaboration and data sharing across academic institutions and international boundaries.

Overcoming these hurdles is extremely important. A global infrastructure for a rare-disease registry will inject new energy into the effort to deliver more fully on the promise of orphan-drug legislation. Such a registry will draw new interest in rare diseases from academic researchers and the drug industry because it will enable the design of more effective clinical trials and effectiveness studies and the recruitment of patients much faster and at much lower cost.

**Christopher B Forrest, Ronald J Bartek, Yaffa Rubinstein, Stephen C Groft*

Children's Hospital of Philadelphia, Philadelphia, PA 19104, USA (CBF); Department of Pediatrics, University of Pennsylvania School of Medicine, Philadelphia, PA, USA (CBF); Friedreich's Ataxia Research Alliance, Springfield, VA, USA (RJB); and Office of Rare Diseases Research, National Institutes of Health, Bethesda, MD, USA (YR, SCG)

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We declare that we have no conflicts of interest.

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TIME Magazine. Saturday, Aug. 21, 2010

Is It Time We Paid More Attention to Rare Diseases?

By Frances Perraudin

When Hannah Ostrea was five months old, she was diagnosed with Gaucher's disease, a genetic condition in which the body lacks the enzyme needed to break down a fatty waste product called glucocerebroside, leaving it to accumulate in the body's organs. The disease is painful, with the excess glucocerebroside impairing mobility and delaying growth. Hannah's form of the disease, Neuronopathic Gaucher's disease, also causes brain damage and eye movement disorders and makes swallowing difficult. Neuronopathic Gaucher's affects less than 1 in 100,000 live births and the life expectancy of a sufferer is between two and 20 years — Hannah is now two. But because the medical community won't dedicate time or money to an illness that affects so few, there is no cure on the horizon. "Unless you have a celebrity who has a personal interest in your disease or you have a 'popular' rare disease ... there are no big foundations, large fundraisers, or even any interest in assistance," says Hannah's mother Carrie. "It's so hard knowing that there is so little research out there for my daughter, and that because of this, we will likely lose her sooner rather than later."

Everybody has heard of the world's biggest killers: cancer, HIV, malaria. But what about Xeroderma pigmentosum, which causes sufferers to react violently to direct exposure to sunlight? Or Jeune Syndrome, a potentially fatal bone-growth disorder that restricts the expansion of organs. An estimated 250 million people worldwide suffer from rare diseases — the term for about 6,500 disorders, each of which, according to the official U.S. definition, affects fewer than 200,000 Americans. Around 8% of people will become afflicted with a rare disease at some point in their lives. Treating these diseases puts a burden on health services and living with them can destroy families — losing a loved one is a tragedy, no matter if it's to cancer or Kawasaki disease, which causes the inflammation of the blood vessels. But because of the rarity of each condition, the number of patients in any one country is too small for experts to use for effective clinical research or raise significant awareness. (See how to prevent illness at any age.)

There have been efforts to address this problem before. The Orphan Drug Act passed in the U.S. in 1983, for example, gives tax incentives to companies that choose to develop such drugs, and grants them the right to sell the drugs without competition for seven years. But this is hardly a comprehensive fix. In the hopes of finally giving rare diseases the attention they deserve, Dr. Christopher Forrest of the University of Pennsylvania and colleagues from the Office of Rare Diseases Research at the National Institutes of Health recently put out a call for the establishment of a global rare-diseases registry. The idea would be to allow patients, clinicians and researchers who are scattered around the world to enter their own data on new therapies and practices, all in

one place. The registry would also provide more accurate patient-population statistics, so that instead of trying to study a handful of sufferers in one country, scientists and drugs companies would have access to information from thousands of people affected by the same rare disorder, making it much easier to conduct research into their causes and cures. "Disease knows no boundaries," Dr. Forrest tells TIME in an email. "Some rare diseases occur so infrequently that only by forming international populations can sufficient numbers of patients be accrued."

Dr. Forrest says the registry's primary goal would be to create an infrastructure to start tackling rare diseases — a necessary first step before trying to raise funding — and prod drug development. Persuading pharmaceutical companies to invest in developing orphan drugs has always been a struggle. Legislation similar to the 1983 U.S. law has been passed in the E.U., Australia and Japan. But developing new drugs can be expensive, and because rare diseases affect so few people, companies see little incentive in doing the necessary research. (See "The Year in Health 2009.")

Recently, though, there have been signs that there could be money in orphan drugs. In early August, multi-national pharmaceutical company Sanofi-Aventis proposed a takeover of Genzyme, the world's third-largest biotechnology company and specialist in orphan drugs. Sanofi reportedly offered \$20 billion, but Genzyme is said to be unlikely to accept anything below \$22 billion. The move shows that Big Pharma is beginning to see potential in a long-neglected market. "The rare disease market can be profitable in and of itself," says Gary Pisano, a biotechnology industry expert at Harvard Business School. "Genzyme proved this. They were the first to recognize the commercial potential of these markets that had long been ignored because of the apparently small size."

That sounds like good news for rare-disease sufferers. Still, the fact is that profits from orphan drugs are high partly due to the astronomical prices companies can demand for their treatments — with little or no competition, there's no reason for them to keep prices down. Hannah's parents rely on Cerezyme, Genzyme's Gaucher disease drug, to treat their daughter's illness. Costing more than \$200,000 for a year's supply, it is one of the most expensive drugs in the world and last year generated sales of \$1.2 billion for Genzyme. With Carrie's husband unemployed since February and Carrie having to stay home to look after Hannah, they are burning through their savings to pay for the medication. Billion-dollar deals are no help to them. But if the rare-diseases registry becomes a reality, that could be a big step towards tackling disorders that are devastating for the few who suffer from them. "Deep down I wish the general public would just recognize what families like ours live through on a daily basis," Carrie says. "And how rare disease affects each and everyone one of us down to the core."

From: Emomeri Albert
Sent: 09/18/2010 - 3:25am
Organization:

I have an innovative idea that that could prove to be revolutionary in the field of renewable energy. However, its functionality is not certain and I need assistance in the construction of a prototype and technical advice. I can send the documents containing the invention over to you.

Thank you.

From: Ronald J. Ogden

Sent: 09/27/2010 - 9:26am

Organization: Wings of Eagles Discovery Center

We are building our STEM programs to serve middle and high school students in the southern tier of New York and the northern tier of Pennsylvania. This is a rural, seriously-underserved and economically challenged region. We seek expert guidance in program formulation and management with a view to effectively programming for our widely-dispersed audience. Thank you! Ronald Ogden, Director of Development, WEDC

From: Brian L. Dyak
Sent: 09/29/2010 - 4:06pm
Organization: Entertainment Industries Council, Inc.

Please add Mr. Dyak to your distribution List serves, thank you for your cooperation.

From: Mr. Donovan Porterfield
Sent: 09/30/2010 - 12:31am
Organization:

My comments on the PCAST STEM report of September 2010 follows:

Box 6-1: Online courses for students I agree we should enable students who may not be able to attend one of the STEM-focused schools the resources to pursue their own interests to achieve an excellent STEM education. While the role of teachers is of great importance I don't believe we can afford as a nation in relying solely on that resource to provide STEM education to our youth.

Box 6-2: Games and simulations While the use of games and simulations may be of lesser cost I believe we should make the investment, where appropriate, to achieve more than a simulation. I believe the iLab platform being developed by MIT and Northwestern could be used to provide more than simple simulations. However, it needs the resources to take it to a wider implementation.

Recommendation 7-1: While I agree with the importance of the direct experience aspect of STEM education I believe there are also simpler avenues to achieve this. I'm concerned while impressive the cost of providing sophisticated fabrication capabilities would limit such resources to few students. I believe that simpler direct experience avenues should be assisted. For example, inexpensive kits through which students can enhance their STEM education and end up with a useful item (e.g. an open source MP3 player) would be of great value. Such a strategy could even assist our US economy by using US made components instead of exclusively depending on foreign sources for everything electronic.

I believe there is also a role for professional STEM organizations in organizing such activities.

From my participation as a judge in Intel Science & Engineering Fairs I think that venue is an important direct experience tool.

Recommendation 8-2: I believe our network of National Laboratories can be an important component of making such connections. Many of these institutions have programs that involve many students in summer STEM experiences.

Rewarding and Professionalizing Great STEM Teaching I agree that there should be such recognition. As a leader in a local professional STEM organization one of our most rewarding activities is collaborating with another STEM organization to recognize excellent STEM teachers from across the state.

Mr. Donovan Porterfield

PO Box 1417

Los Alamos, NM 87544

From: Pierre Bierre
Sent: 09/30/2010 - 12:20pm
Organization: AlgoGeom.org

Our team is teaching a pilot course in Algorithmic Geometry for 12th grade high school. This course exposes kids to the way spatial math problems are solved in the software industry. Students solve a problem on paper, then immediately write a numerical algorithm in Java that automates the solution. By piggybacking math solutions over many levels, students can understand how 21st century applications work, such as 3D graphics, robotics, and GPS receivers.

We are very frustrated that our credible proposals to feasibility-test this approach to Math have been turned down at NSF (3 times) and Dept. of Ed. (1 time).

These programs are heavily biased toward the view that Math is not changing, and that the only fundable research should be interventions that raise test standard test scores. You realize that NAEP and SAT have no plans to modernize the way Math is assessed to reflect changes in our economy!!

In the current environment, there is almost no accountability for the freshness and relevance of educational content. The "accountability" paradigm is willing to "freeze" educational content at the 20th century (because it can be tested reliably).

The challenge we need PCAST's help with is getting NSF and Dept. of Ed. to consider that the most modern, cutting-edge educational content will not have long-reestablished standard tests available for comparing student outcomes. But do we really want to erect obstacles to content modernization based on this criteria?? To do so is to make strategic blunder based on today's tactical thinking.

Please plan to do a review of these grant programs:

NSF / EHR / DRK12 (NSF's only program for k12 new course development)

Dept. of Education / IES / Mathematics and Science (Dept Ed's only program for k12 new math course development).

If you look at the awards being granted by these funds, you will see that cutting-edge content is not being funded, nor solicited. The emphasis is all on "closing the gap" with conventional (20th century) core content.

In terms of global competitiveness a decade from now, the stakes couldn't be higher.

Under the current educational research priorities, we'll end up with the best teachers for 20th century paper-and-pencil math, while other nations excel at software-based algorithmic math, and we'll cede our leadership in software high-tech as a result.

Can we count on your help in reshaping these grant programs toward new content development, dissemination , and assessment tool development?

<http://edit.whitehouse.gov/sites/default/files/webform/AlgorithmicGeometryProspectus.pdf>

Preparing students for 21st century math problem-solving: **Algorithmic Geometry**

Why? Computers and software have fundamentally changed the way geometric problem-solving is practiced in the real world. Examples can be seen all around us in 3D graphics, GPS receivers, robotics, Google earth, and computer vision. Under this new paradigm, the math and computer science are blended seamlessly, enabling the problem-solver to develop an *automated algorithm* for each problem solved. The power of this approach is vested in the ability to piggyback solutions over many levels, rapidly surpassing the limitations of paper and pencil math.

The Bureau of Labor Statistics estimates that 71% of STEM jobs going forward will require an understanding of computing and software. Yet, high school teachers and students remain untouched by the advent of algorithmic math. To wit, the geometry problems given on SAT-I Math look just the same as they did 50 years ago! How does inspiring students to choose high-tech college majors advance by keeping the pizzazz of semi-automated math under the radar?

What? Biotech computer scientist Pierre Bierre has developed an Algorithmic Geometry course designed for 11-12 grade accelerated math students. The first high-school students and credentialed math teacher have been successfully tutored. Pierre has built an educational research project team (Spatial Thoughtware) ready to undertake the first public school pilot course in the East Bay of Silicon Valley starting Fall 2010 (San Ramon Valley Unified School District). Web site: <http://www.AlgoGeom.org>

Course catalog description: This course introduces accelerated math students to 2D and 3D vector geometry, working in the medium of Java computer graphics programming. No previous programming experience is required. Students create problem solution sketches on paper, then translate their solutions into numerical algorithms written in Java. The power of this approach is the ability to piggyback off all previously-solved problems, enabling a rapid ascent into complex, real-world applications. Course projects offered include molecular modeling, computer vision, GPS positioning, 3D CAD rendering, robot arm motor coordination, 3D optics, and interstellar navigation. Prerequisite: Precalculus with Trigonometry

UC college credit has been applied for (3 hr. math elective).

Impact Each student takes away from the course their own high-power geometry software library and graphics workspace for testing algorithms. This repository of reusable solutions is server-archived, guaranteeing the student continued access for developing 2D & 3D graphic simulations during college and career.

The feedback from initial students could be summarized as follows: Delegating all the gruntwork to the computer via programming is “way cool”, leaving more time and energy for creative problem-solving. The representations scale up intuitively going from 2D → 3D, and are elegant compared to classical textbook geometry/trig. Projects such as GPS positioning and robot-arm motor-coordination develop an “insider” relationship with 21st

century technologies. Java programming experience is highly valued. And, college-level Linear Algebra, Multivariate Calculus, and engineering/physics are easier to digest having mastered vector math in high school.

Vision The vision we are chasing is high-stakes: A technological nation such as the U.S. depends upon mathematical know-how being widely understood. Current geometry standards were established *prior to the computing revolution*. The decision before us now: Shall the advanced math skills that undergird high tech society be passed along to the few, or to the many? The latter choice posits significant competitive advantages for the U.S. in coming decades. This is the vision of the Algorithmic Geometry project. We hope you share it, and will contribute proactively to reinventing 9-12 geometry education. Our mantra? Failure is not an option.

Opportunity There is likely a range of philanthropic and commercial opportunity for investors passionate about reinventing math education.

Contact Pierre Bierre, project director. 925-200-1558. AlgoGeom.org

From: Michael A. Morgan, PhD
Sent: 09/30/2010 - 4:00pm
Organization: The Tauri Group

I'de be interested in volunteering my expertise or time to some of your ongoing efforts at PCAST.

From: David Valentine

Sent: 10/01/2010 - 11:34am

Organization: Ohio Technology and Engineering Educators Association

Please see the attached pdf file as a response to your report to President Obama and how you can improve the quality of your recommendations. I was very disappointed that you did not include any T & E educators or standards, in your recommendations for improving STEM.

This report will appear in the next issue of The Ohio Technology and Engineering Educators Association's quarterly update.

I would appreciate your consideration of America's technology and engineering educators in your recommendations to improve STEM education. Please take a look at some quality high school technology programs and you will see much of what you are suggesting as high quality math and science engagement.

<http://edit.whitehouse.gov/sites/default/files/webform/InTouchSept10.pdf>

"I get no respect, no respect I tell you..." Just like Rodney Dangerfield, technology and engineering educators seem to be getting no respect.

1. In June I traveled to Louisville, KY to the American Society of Engineering Educators (ASEE) where much of the talk was directed to math and science teachers. Programs and training were directed at helping math and science teachers begin implementing projects that support more hands-on, authentic problems which learners would apply and therefore retain deeper understanding of course content. This is what goes on everyday in each of my technology and engineering courses. *"NO RESPECT!"*
2. First week of August, I attended the American Society of Materials (ASE) year 2 teachers camp at Ohio State University, Columbus, Ohio. There the push was for schools to start a materials science course at their high school. Much of the materials covered were what was taught in our Industrial Arts courses (we called it materials technology). The focus was slightly different; they wanted learners to understand the science of the materials (crystal structure, phase diagrams, joining properties, etc.); and we (technology and engineering teachers) want learners to understand what product that material will best be used to produce and how best to produce a high quality or low cost product with a material. It would be a wonderful combination if a STEM-based course could be offered with the T & E and science educator playing vital roles in the course. At the end of the week we were given certificates for completing the week of work and two Ohio Department of Education employees attended and talked about the programs they were working on which included grants and programs for guess who?, math and science teachers. *"NO RESPECT!"* When I introduced myself and made the case for them to include technology and engineering teachers in their plans, they realized that they had indeed overlooked the T & E educators in their STEM program plan.
3. A recent report by the President's Council of Advisors on Science and Technology (PCAST) makes specific recommendations to better prepare America's K-12 students in STEM subjects and also to inspire those students -- including girls, minorities, and others underrepresented in STEM fields -- to challenge themselves with STEM classes, engage in STEM activities outside the school classroom, and consider pursuing careers in those fields. The Council includes twenty of the Nation's leading scientists and engineers, who were appointed by the President to provide advice on a range of topics. Among the recommendations in the report, "[Prepare and Inspire: K-12 Education in Science, Technology, Engineering, and Math \(STEM\) for America's Future](http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-stemed-report.pdf)" <http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-stemed-report.pdf> , are that the Federal government should:
 - * Recruit and train 100,000 great STEM teachers over the next decade who are able to prepare and inspire students,
 - * Recognize and reward the top 5 percent of the Nation's STEM teachers, by creating a STEM master teachers corps,
 - * Create 1,000 new STEM-focused schools over the next decade,
 - * Use technology to drive innovation, in part by creating an advanced research projects agency -- modeled on the famously innovative Defense Advanced Research Projects Agency (DARPA) -- for education,
 - * Create opportunities for inspiration through individual and group experiences outside the classroom,
 - * Support the current state-led movement for shared standards in math and science.

As I read through the report, there was not much which mentions technology and engineering educators, *"No Respect."* What this reports fails to do, which would lead to more successful implementation of the highest quality program and wise use of existing resources, would be to include technology and engineering educators in the

integration of STEM education planning and implementation. If a campus is without a technology and engineering instructor, the prudent budgetary item would be to include the hire into the cost of implementation. There can be a powerful synergy when teams (Science, Technology, Engineering and Mathematics) of teachers with different expertise come together. I have had the experience of working with my fellow math and science teachers at Bexley High School to plan and implement STEM projects and content support. Much like in the real world outside of schools, a team of experts share knowledge and experiences to develop the best product. It is helpful to have varied expertise in project development and authentic tasks which learners must use math and science concepts to produce a product. When math and science (or other core area) teachers realize the connections to their “core courses” that are taking place in a high quality technology and engineering course, they become supportive of efforts to participate in problem-based learning where learners are seeing application of content. The report has not maximized resources to teach the T & E; and as many other reports and programs have in the past, forgotten to include the rich resource that is the technology and engineering educator.

Issues attributing to the lack of understanding Technology and Engineering (T & E) as a valuable asset:

1. While Technology and Engineering curriculum standards are progressive and up-to-date, some T & E educators still are teaching their favorite course content without regard to today’s national and state standards and best practices.
 - ✓ We often work in self-imposed isolation rather than lead cross curricular projects at our school. Many STEM workshops and trainings are now being marketed to science and math teachers only, because we have not stepped up to the leadership role, or even a participatory role. A team approach to teaching STEM content is critical to increasing instructional value for learners.
2. Lack of understanding of what T & E is and how valuable it can be for reinforcing learning core content in a meaningful way.
 - ✓ T & E teachers must begin to showcase the work they and their students are doing. Opportunities abound for showcasing student work: OTEEA student exhibits, Ohio’s Design Challenge, Technology Student Association competitions, National Robotic Challenge, Future’s City; Real World Design Challenge, Invention Convention as well as many other opportunities abound. Focus locally to educate your community, school board, and fellow educators of the quality STEM, standards-based work being created in T & E courses. When we reach out and get involved with projects which are true STEM projects fellow teachers realize what a valuable contribution T & E has in implementing authentic application of math, science, language arts and other content standards.
3. Budgetary challenges for districts and schools.
 - ✓ T & E educators must seek out low-cost, high-value opportunities. Many of the opportunities available are low or no-cost. Many excellent software titles that can be used in T & E courses are available for free. These can be time consuming to learn for the educator, but growing numbers of users are sharing lessons and resources and that is helpful in implementation.

My recommendation for the President's Council of Advisors on Science and Technology (PCAST) is to take another look at how they can incorporate and develop the nation’s technology and engineering teachers as a resource to ensure successful integration of STEM curriculum in an engaging and motivating way for learners. Just as T & E educators teach our learners, it is OK to make mistakes if during the redesign phase we correct and improve the

product. PCAST should learn from and correct their initial design flaw of omission, and re-design a more thoughtful recommendation to our nation's leader. You owe learners this necessary step to improve the quality of your product (recommendation). The redesign (with the inclusion of technology and engineering educators) will assist implementation financially, professionally and ensure proper use of personnel in meeting the PCAST's goal: *to better prepare America's K-12 students in STEM subjects and also to inspire those students to challenge themselves with STEM classes, engage in STEM activities outside the school classroom, and consider pursuing careers in those fields.* Please pay the *respect* due to the technology and engineering educators who are currently, and have been for many years, integrating not only math and science, but also language arts, history, and cultural awareness in our national and state technology and engineering standards. You can redesign and improve the quality of your recommendation to President Obama, by including the necessary commodity known as technology and engineering educators to create a much improved plan. This message calling for inclusion of high quality T & E educators and program in funding, grants, and required/necessary courses is not only directed at PCAST, but any organization working on recommendations for high quality STEM success. Technology and Engineering educators are the T & E directly in the middle of STEM education.

Again this summer OTEEA used the Ohio State Fair to make obvious our ability to facilitate quality STEM learning into high quality products from learners. Ohio's technology and engineering educators exhibited outstanding examples of standards-based STEM projects created in technology and engineering course. If you or your school are not yet offering standards-based high quality STEM courses, get involved with your regional, state and national organizations to train and prepare yourself to be able to offer courses that are necessary for today's T & E programs. As you will see later in the TechEdge article, the works on display at the state fair have lead to a working relationship with Rob Williams at TechEdge, and a greater appreciation for the quality of STEM integrated learning that happens daily in standards-based programs. The works highlighted were impressive and warrant a look from all T & E educators as an indicator of what is possible, as well as a detailed look from any organization looking at what an excellent STEM program can achieve.

Sincerely,

Dave Valentine

Ohio Technology and Engineering Educators Association President

Bexley High School Technology & Engineering Educator

From: Dr. Ashraf Elkady
Sent: 10/05/2010 - 10:18pm
Organization: Egyptian Atomic Energy Authority (EAEA)

Dear Respectable Professors,

I send you with great pleasure my international proposal addressed to his Excellency, Mr. President Barack Obama. The proposal concerns the establishment of an International Center for Nanosciences and Molecular Medicine (ICNM) to be the base-stone for an International Nanotechnology Initiative (INI). The proposal offers the opportunity of expanding the American technology policy landscape and meets the challenge of the American advanced technology globalization. It would also significantly impact on the direction of nanotechnology research and development for a wide range of Arab and Islamic nations and companies in the area. The proposal raises new science policy questions and establishes new strategic linkages between USA and Arab countries that will have a major impact on the sustainable future of our nations for decades to come.

I hope that my proposal will find your kind care and support, because I believe that you are sincere in your endeavors for strengthening the partnership process between United States and the Arab-Islamic countries, and let us together unleash the technologies that will help in shaping the 21st century as President Obama stated in his remarks at the last Summit on Entrepreneurship!

Please accept my best regards and wishes

Respectfully yours,

Dr. Ashraf Elkady, Ph.D.,

Director of Condensed Matter & Nanosciences Research Unit, Egyptian Atomic Energy Authority (EAEA);

Member of the Partnership and Ownership Initiative, Ministry of High Education & Scientific Research

Contact information:

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elkady@isis.u-strasbg.fr

<http://edit.whitehouse.gov/sites/default/files/webform/Dear%20Mr%20President.pdf>

**To: Mr. President Barack Obama,
President of the United States of America
The White House,
1600 Pennsylvania Avenue NW
Washington, D.C. 20500**

Date: 05/10/2010

Urgent and Confidential!

To His Excellency Mr. President, Barack Obama

Dear Mr. President Barack Obama,

It gives me the greatest honor to write to your Excellency. Indeed, I write this message after long hesitation and worries of not getting a response. But, your last remarkable historical speech in Cairo that opened a new page in relations with the Arab-Muslim world and your wise policy towards complex problems in the Middle East, as well as your keen efforts exerted for bolstering science, technology, entrepreneurship in Muslim communities and establishing cooperation between USA, Islamic world, European countries and Russia encouraged me to overcome my hesitation and take the initiative to write you.

Mr. President, I was interviewed recently by some Egyptian satellite T.V. channels to talk about my scientific achievements (main achievements are also published in *Who's Who in the World*, 2010 edition; "2000 Outstanding Intellectuals of the 21st Century", International Biographical Centre, Cambridge, England), and I did not miss to mention to your Excellency's sincere noble endeavors that represent embodiment of the American Leadership will to breathe a new life into the relationships with Arab and Islamic countries. In my personal view your recent receipt of the Nobel Peace Prize for 2009 is not only an estimate for the extraordinary efforts you exerted to strengthen international cooperation, friendship and civilized dialogue between nations, but also for the new spirit of hope that you created in

the hearts of the world's have-nots for a better future, through fraternity between nations. I recall also what you have mentioned that the Nobel Prize had not just been used to honor specific achievements, but also to give momentum to a set of causes; thus the Prize could represent "*a call to action to all of us*".

As I appreciate how busy you are, I will go directly to the main issue that I want to address to your Excellency, hoping that you may kindly give me the opportunity to participate in the ongoing dialogue that you paved the way for it to take place among nations.

Your Excellency may agree with me that both developed and developing countries are facing unprecedented grand challenges and crisis in the 21st century that could only be tackled via innovative science and technology (e.g. global climate change, economic crisis, energy, emergence of new global epidemics, water, unemployment, bioterrorism ...etc). Thus, the need for international cooperation in the field of S&T became even more pressing than ever and in order to be able to address global challenges, new mechanisms for enhancing international collaboration in S&T are now highly demanding. In my viewpoint, implementing **International Research and Educational Excellence Centers** through a partnership between the developed and developing countries represents one of the powerful mechanisms that might unify S&T endeavors on a global scale for addressing humanity and civilization issues that are vital for a sustainable future of our planet.

Of special importance are the innovative solutions to global challenges and the opportunities that nanotechnology offers for future collaboration, and building bridges between several countries. Unlike any other technology, nanotechnology can find applications in virtually all areas of human life and due to its 'revolutionary' potential in creating new production routes; it provides a golden opportunity for the creation of new knowledge-based international enterprises. So, many professional investors have identified nanotechnology as the

next great technological wave that will much impact almost all industries, and it is predicted to be a US\$2.6 trillion market by 2014.

Mr. President, in your recent successful Entrepreneurship Summit you remarkably emphasized the central role that innovation plays in Entrepreneurship and the importance of unleashing the technologies that will help in shaping the 21st century. Indeed, the summit coincided also with an important event, namely the World Intellectual Property Day 2010 with a focus this year on how innovation technologies have created an interlinked and global society. As your Excellency know that doing good Science is not good enough; good Science must translate into innovative technologies at the marketplace. The beneficial interrelationship between entrepreneurship and innovation technologies that can be strengthened through collaboration between industry and academia ensures the importance of intellectual property as a foundation for business growth. Yet it is only recently that foresighted firms have embraced emerging technologies and their markets through entrepreneurial activity due to the unique and tremendous competitive opportunities they present. The ability of firms' competency-based strategies to wrest value from the opportunities inherent in emerging technologies' markets determines their robust standing and expansion in the global market. Clear evidence from USA cases showed that States with both S&T and economic initiatives had six times as many firms founded than those states without such initiatives. There is also an evidence of a first-mover advantage as states with the earliest innovation policies had higher rates of related firm foundings over time. These findings suggest that states that are most attractive to entrepreneurs not only pursue technological innovation and provide resources, but also encourage and legitimize commercial development.

Therefore, being very concerned with the holistic approach of science to global challenges, I address to your Excellency a Giant Scientific Project Proposal for establishing an **International Center for Nanosciences and Molecular Medicine (ICNM)** to serve as a good

model for international cooperation in S&T and a base-stone for an **International Nanotechnology Initiative (INI)**. The proposal offers the opportunity of expanding the American technology policy landscape and meets the challenge of the American advanced technology globalization. It is expected that several developed and developing countries would co-invest and benefit from participating in such Giant International Project and Initiative; thus it would significantly impact on the direction of nanotechnology research and development for a wide range of nations and companies in the area. Besides, **INI** would support all phases of responsible nanotechnology development in participating countries from discovery to production, and provide a sound basis for identification and prioritization of nanotechnology research needs in member countries. This would enable road-mapping nanotechnology related applications, enhancing and broadening their implementation for developing vital sectors in member states, and support the decision-making processes for policy makers and funding agencies, as well as providing an overview of needs, challenges and future opportunities of nanotechnology in member states.

If USA, Arab countries, Europe and Russia unify their nanotechnology endeavors, a new S&T questions would be raised and new strategic political and social linkages would be established between these nations. Such concerted international efforts would greatly help in the formulation of global goals for responsible nanotechnology, and would have a major impact on the future of our nations for decades to come, leading to betterment of its humanity.

Besides, the proposal will also much help in setting up clear global objectives for the usage of large scale facilities (e.g. reactor- and synchrotron radiation- based facilities) in nanosciences research, giving researchers direct access to the world's most powerful neutron and x-ray scattering probes of nanostructured materials. This would much encourage the peaceful applications of atomic energy for serving the international community in line with the United States' support for

peaceful benefits of nuclear power and technology (details are available).

It is planned to collect highly motivated distinguished scientists, engineers, doctors and scientific members representing the most prestigious universities, research institutions and academy of sciences in participating countries, who are interested in this field at ICNM. Consultants carefully chosen from the highest caliber scientists (including Nobel Prize recipients) can also contribute in the early phase realization of the center. ICNM will conduct cutting-edge research programs across a wide range of scientific disciplines, hosting several *world-class user facilities accessible to scientists from participating countries through opens calls for proposal submission* in accordance with continuously updated Research Agenda, approved by partner countries. The criteria in proposal selection will be the *scientific merit and originality* of the proposal upon a high-level committee decision, based on the foreseen high priority research activities expressing the needs of international partners from academia and industry. Special focus will be on the *transfer of discoveries and intellectual knowledge in the areas of nanotechnology to industry partners* and on the rapid application and commercialization of this technology to stimulate economic growth in member states. About fourteen educational and research programs addressing *member Nations' challenges in vital sectors* are to be fulfilled, making use of the mature American experience in the field.

Furthermore, the proposed international initiative and center would represent a fertile ground for giving a chance to specialized international organizations with an interest in nanosciences and its applications (e.g. UNESCO, IAEA, IEA, ISO, WHO, FAO) to play its vital role in fostering international scientific cooperation in nanotechnology to address global challenges and in formulizing a global integrated strategy of mutual interest to all contributing countries and professional communities. This would ensure the

required coherence between research programs in all participating countries.

Mr. President, the healthy climate in international politics that you created and the central position that multilateral diplomacy has regained due to your keen efforts, make it even possible now to discuss the possibility of establishing an independent **International Nanotechnology Organization (INO)** as an umbrella organization that unites universities/research institutions' nanotechnology research, educational programs and infrastructure under one umbrella. Such organization would join the United Nations family for carrying out the activities necessary to assist and advise partner countries in assessing their needs for capacity building in key areas of nanosciences. It would also address global focal point for nanosciences cooperation, consolidate the pillars for nanotechnology international cooperation for effective transfer and sharing of technical and managerial know-how, promote partnership building with other international organizations, inter-agency coordination for collaborative projects within the UN system and consensus-based international regulations and safeguards, as well as formulating an international "code of good conduct" for the responsible development of safe nanotechnology for the service of humankind. This would also provide an action plan for quality management international standardization and regulations' harmonization in the field of nanotechnology based on a global consensus among participating member countries (details are available).

As your honor knows that there are many humanitarian concerns that hinder developing nations, which are caught in a "vicious circle of poverty, disease and overpopulation". The developed countries are completely detached from these dilemmas and failed to meet the scientific and technological needs of the world's poor, from the perspective of people in the developing world! To date, there has not been much done for systematic prioritization of high-tech applications targeted toward the challenges faced by billions of people living in the

developing world. The United States promote a high-tech world, yet the promise of technology remains largely unfulfilled in the developing world!

Thus, science and technology must show a greater responsiveness to the specific needs of the developing world's citizens, who represent almost 80% of the world's population. Successful applications of science and technology to developing country's problems must be regarded as opportunities not constraints. Developing countries should not be viewed as obstacles but rather as resources that must fulfill their potential, along with other countries. Both the United States and developing countries have much to learn, providing opportunities for research and development questions that are still unexplored. The perspective outlook for sustainable development in the United States and the developing world will depend mainly on their ability to work together to achieve common goals for the common good of humanity.

Mr. President, nanotechnology is now in danger of repeating the unfair trends of biotechnology with respect to the international participation in the dialogue. There is a great concern that developing countries will not have a voice in the international development of nanotechnology. Therefore, encouraging a more equitable sharing of the developing world in the World Science is now highly demanding. Besides, throughout nanotechnology's ongoing assessment process, we must be mindful of the global context of both risk assessment and promises of nanotechnology as universal requirements for progress in the international debate on mutual ground.

Bridging the void and decreasing the technological inequities between the industrialized countries and developing worlds have been always a noble endeavor for several United Nations (UN) agencies. However, I think the current United States' cordial relationship with the UN won't disappoint the developing world any more! With greater responsiveness, the United States and developing countries will learn how to cooperate and work out *a more fair system of intellectual*

property rights. The United States is more able now to play a significant role in the global development of nanotechnology and to take the leadership role in making the poor of the developing world visible and mobilize science and technology to address their crises. Addressing the lack of cohesion in global nanotechnology policy and acceleration of the use of viable nanotechnologies by less industrialized countries to meet critical sustainable development challenge would much contribute to the attainment of the United Nations Millennium Development Goals.

Mr. President, nanotechnology can be harnessed to address some of the most urgent needs of developing countries. Thus, a long term and concerted plan of action for the development of this powerful emerging technology in developing countries is highly demanding now. Therefore, establishment of the proposed giant international center of excellence in a developing country like Egypt with the aid of USA and several developed countries would represent an eloquent response to the criticism against the international system led by the American S&T policy. Besides, it would also represent a starting-point for enhancing international scientific research with Egypt and other developing countries in the Middle-East area.

In order to obtain a share of the current world scientific revolution, true and concerted efforts should be pursued and we should work together for solving problems and facing challenges that could hamper our progress toward our noble aspirations. The responsible serious and sincere responsiveness of USA in engagement in long-term investment in S&T via establishing giant international scientific projects in developing countries would represent the pillar to significant improvement in many vital sectors in these countries, *allowing for sustainable socioeconomic and political stability; thus restoring the vital American leadership role in the area.*

Mr. President, the regional, cultural, and humanitarian civilization dimensions of Egypt make it a favorable environment for the

implementation of the proposed giant project. According to **Professor Ahmed Zewail** (Nobel laureate, 1998 and one of your respectable scientific advisors), the awarding of the Nobel Prize in the Sciences- a first in the history of Egypt and the Arab world-underscores what the people of this nation can achieve on the international level, if they have the proper milieu for utilizing their skills and abilities. We have already seen many developing countries scientists and engineers working in the United States and making significant contributions to science and technology.

Egypt now has the necessary infrastructure and political position necessary for achieving a great scientific and technological leap forward that would boost it into the twenty-first century. The historic and cultural dimension of the scientific renaissance in Egypt is an important element to achieve prosperity and peace in the Middle East. It is the foundation for preparing healthy generations in a society that can be guided by rationalism and can cope successfully with the age of globalization. And if we truly believe in fostering democracies around the globe, science is the best vehicle for engendering that democracy. Global science unites citizens of the world through one common language and empowers them with the critical thinking needed to overcome dogmas and misconceptions. Only with knowledge and rationality can we hope for a genuine global peace (*e.g., Ahmed H. Zewail, Egyptian Presidential Palace, December 16, 1999 and references cited hereafter*).

President Mubarak emphasized in several occasions that it is the scientific base that will help us face our present challenges and that a new project for a comprehensive technological revival is to be added to Egypt's megaprojects. This project provides for rapid and ongoing implementation of an ambitious national program to mobilize efforts by all sectors of the community to use, produce, and make indigenous technology for application in all production sites and all walks of the Egyptian life. President Mubarak also asserted that he would personally follow up vital projects and he referred to the prerequisites

for this project's success, which include preparing all sectors of Egyptian society to enter the high-tech age, intensively reforming and continually upgrading the educational system. Besides, his Excellency also declared that for his part, he will never hesitate a moment in giving maximum possible support to make this ambitious projects a success (*e.g. from Address by President Mubarak, Presidential Palace, December 16, 1999*).

The separation of science and technology from ethical and moral considerations might have unimaginable bleak and terrifying implications. Islamic culture in its original form strives to maintain the integrated spiritual vision of the sanctity of the universe in a way to help us to rediscover the importance of the mutual complementarity between the secular and sacred. This would provide the basis for developing a new relationship of understanding between all religious faiths and lead to the survival of civilized values for the benefit of our children and future generations.

Mr. President, Islamic civilization offers manifold examples of entangled transcultural transactions. During the very recent White House Iftar Dinner, Your Excellency ensured the latter fact and reminded all of us that Ramadan is a celebration of a faith known for great diversity. And that Ramadan is a reminder that Islam has always been a part of the American nation that is strengthened by millions of Muslim Americans who excel in every walk of life. In my viewpoint the good example that Your Excellency gave for the American nation- a nation where the ability of peoples of different faiths to coexist peacefully and with mutual respect for one another- should be followed in global Science and Technology as well.

The Islamic civilization offered a lot to Europe, especially during the Dark Ages. The Arab Islamic civilization, which was at sometime representing a leading economic and scientific strength in the world, had a major contribution to the European Renaissance. Today Muslim world is in need of assistance and it is fair in turn that the United

States, Europe, Japan and other developed countries, lend a hand in a modest gesture to the changing fortunes of history (*e.g. Zewail, 2004*).

Mr. President, in your last historical speech in Cairo, you bravely lauded Islam's glorious cultural and scientific past, and your Excellency showed that you are sincere about turning your noble aims into bold actions. Your indispensable support would give a chance for Arab Muslims to supplement contemporary river civilization as their ancestors did before!

In your era, Mr. President, we are expecting that the World politics will enter a new phase, in which the great divisions among humankind and the dominating source of international conflict that is mainly cultural in its nature, will be diminished. The United States must forge alliances with other cultures and spread its values wherever possible so that all civilizations can learn to tolerate each other.

Mr. President, your possible support for such proposal would much strengthen a mutual scientific dialogue concerning advanced technologies of the 21st century and their strategies between industrialized and developing countries, giving a momentum and renewed vigor to the Partnership Process between US and the Arab-Muslim world in the fields of science, advanced technology and intellectual property. Indeed, we are in urgent need for your visionary political leadership that endorses science, technology and innovation in our developing nations, because America will always be the voice for the noble aspirations of universal vision.

Mr. President, the unique success that you managed to achieve in rebuilding confidence between the United States and Arab-Muslim world would represent a fertile ground for the implementation of such long-term sustainable development projects to complement the evolutionary efforts exerted by US for achieving progress across the board in the Middle East. It would also introduce a new paradigm in international cooperation in the fields of science and technology, allowing for science diplomacy to play its vital role in one of most

harsh and conflicting areas in the world! To this end, urgent and sincere negotiations with allied governments and international organizations, sharing the same scientific outlook should be undertaken.

So, I think the matter deserves a political decision of the highest rank from your honorable side and I am pretty convinced that the United States is eligible, now more than ever to play its vital constructive role in leading the world to confront the major challenges surrounding it, with each of the other concerned nations shouldering its responsibility. I am also completely convinced that, as science shaped our history before; it will continue to define our common future in our battle for life.

Finally, I would greatly appreciate it if you kindly allow for a better chance for discussing all the necessary details of my international scientific proposal that was briefly introduced to your Excellency in this message.

With my best regards and wishes.

Respectfully yours,

Dr. Ashraf Elkady, Ph.D.,

**Director of Condensed Matter & Nanosciences Research
Unit, Egyptian Atomic Energy Authority (EAEA);
Member of the Partnership and Ownership Initiative,
Ministry of High Education & Scientific Research**

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Tel.:+2.010.28 49 049; **Fax:** +202.22 756 429
E-mail: elkady8@gmail.com; elkady@isis.u-strasbg.fr

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 38. **Ashraf S. Elkady** in "Top 100 Scientists - 2010", International Biographical Centre, Cambridge, England.
 39. A part of Nile Cultural T.V. Interview with Dr. Ashraf Elkady: <http://www.megaupload.com/?d=VXUCMBTG>

Public Written Comments Submitted to PCAST

Prior to Aug 25, 2010

From: Koenig, Scott [<mailto:KoenigS@Macrogenics.com>]
Sent: Wednesday, June 23, 2010 1:40 PM
To: Stine, Deborah D.
Subject: RE: Follow-up to PITAC/PCAST Meeting on June 22

Dear Deborah:

I am attaching a pdf of the exhibit that I had available at the meeting yesterday which I used in part to respond to the queries. I will follow up with some additional narrative regarding the government solutions. Thank you.

Best wishes,
Scott

*Scott Koenig, M.D., Ph.D.
President and CEO
MacroGenics Inc.
1500 East Gude Drive
Rockville, Maryland 20850*

Phone: 301-354-0680



Breakthrough Biologics,
Life-Changing Medicines

Golden Triangle Workshop
Scott Koenig, M.D., Ph.D.

June 22, 2010

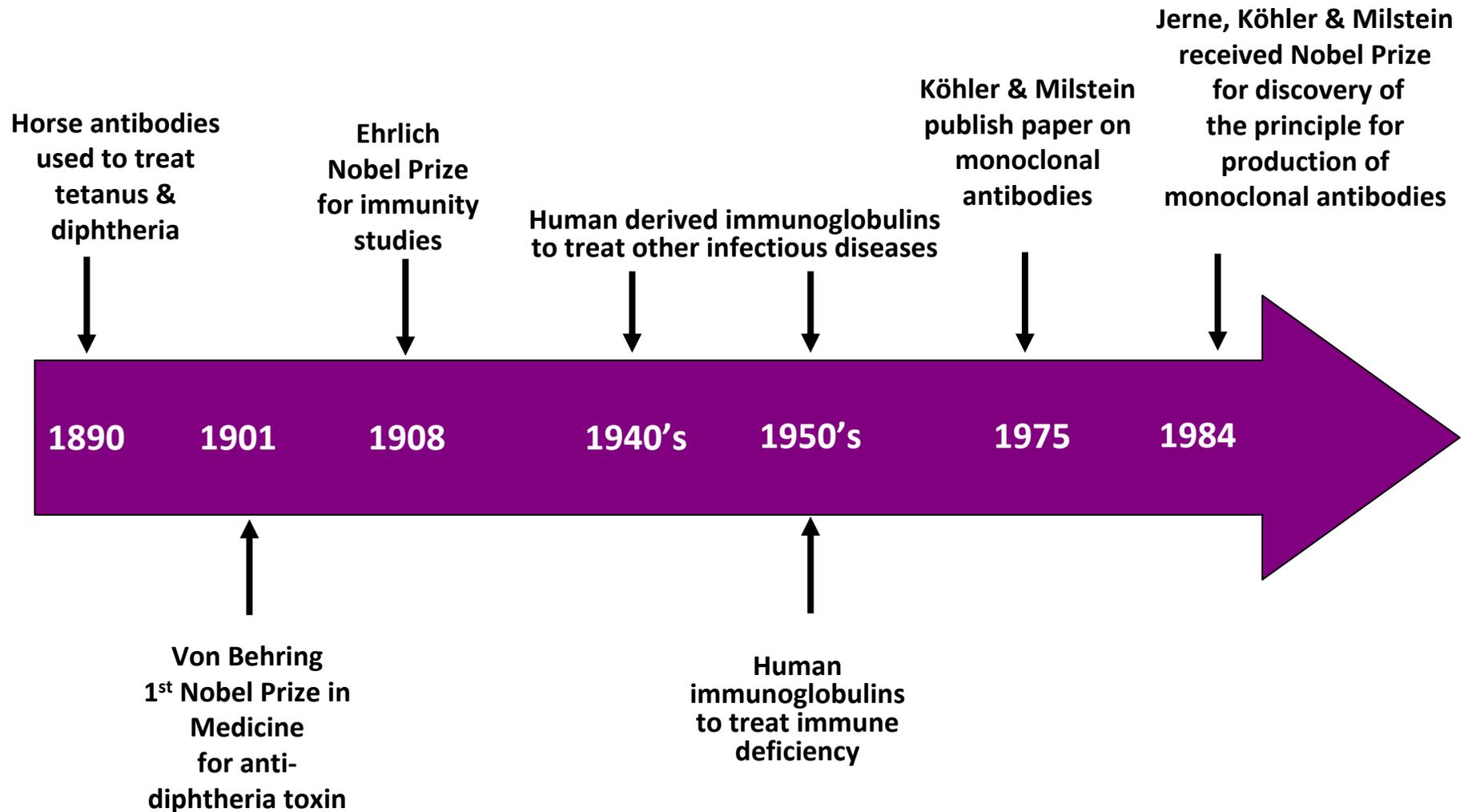


Major Impediments for Developing New Therapeutics

- Long cycle time to develop biologicals and pharmaceuticals (~8-14 yrs.)
- Low success rate to approvals (<1% preclinical candidates; 5-10% once clinical studies initiated)
- Capital intensive (average cost for single product including failures is \$1.2B) with escalating costs especially for clinical development
- Expenses required for drug development result in higher costs for novel medications which is borne by patients, payers, and government
- Every drug with salutary effects has risks and may be accompanied by untoward side effects
- Clinical endpoints for most trials, particularly for chronic illnesses, are often not standardized, require long periods of evaluation, or may not be achievable in a practical manner
 - Survival in a cancer patient
 - Prevention of infection that causes cancer (e.g. Hepatitis B, EBV, HPV)

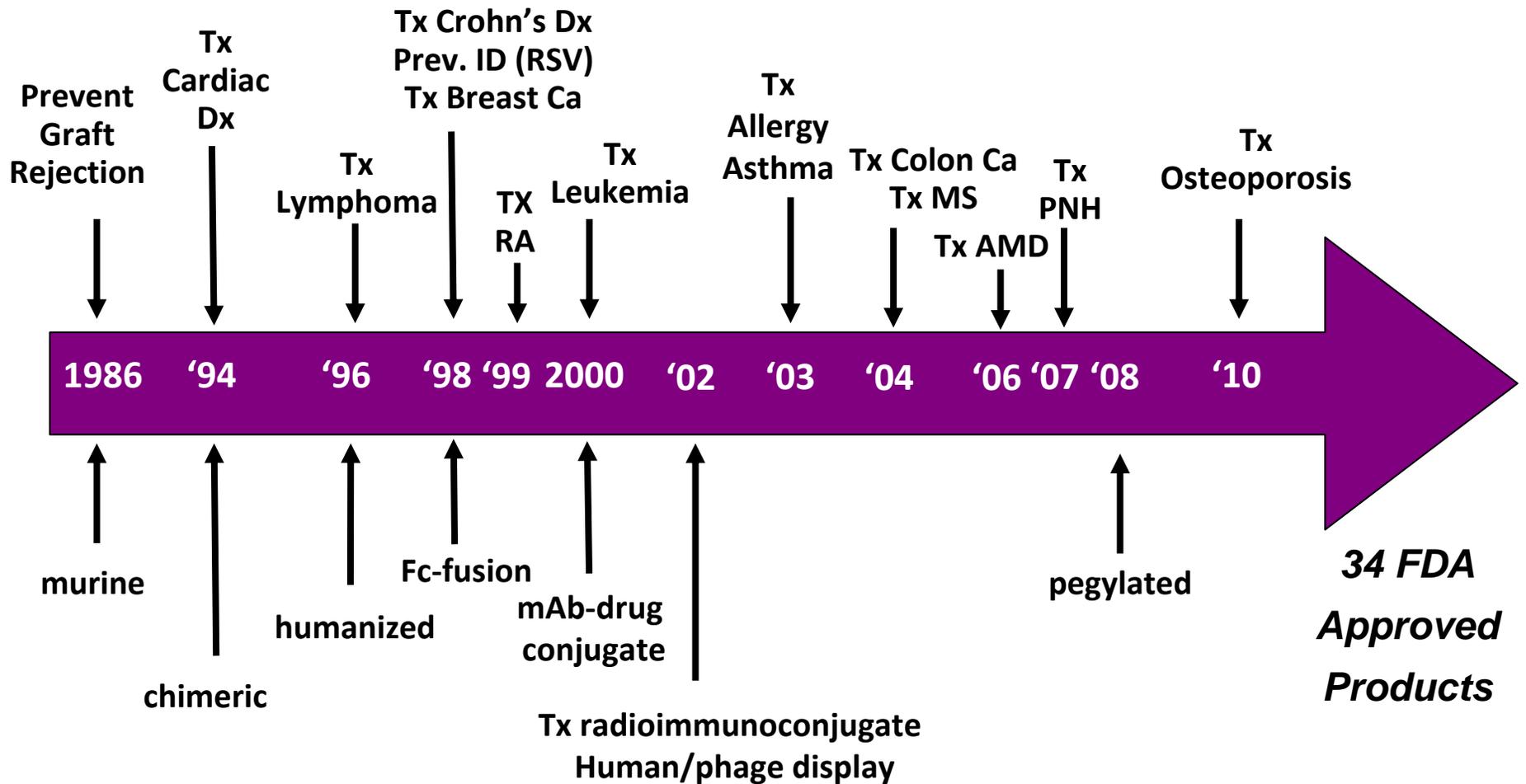
Foundation for Biotechnology and Antibody Therapy

First 85 Years



History of Monoclonal Antibodies: Last 25 Years

Year of First FDA mAb Approval in Therapeutic Area



Technical mAb Advances in Products



What Should We Expect in the Next Ten Years?

100's of mAbs being investigated clinically

Average of 3-5 approved by FDA annually

Expected Approvals of New mAb Therapeutics

- New targets: cancer (stem cells & others), metabolic diseases, central nervous, and degenerative diseases
 - Bifunctional/bispecific scaffold & alternative scaffolds
 - Fc-modified antibodies to enhance functional responses
- Expanded use of conjugates: radionuclide, toxins, enzymes, drugs, PEGylation

2010

2020

Expected Technical Advances on mAb Scaffolds

- New candidate mAb fragments with nanoparticles and others
- New targets enabled by advances in proteomics, genomics, metabolics, systems biology, informatics
- Expanded research on new synthetic materials to enhance formulation and delivery
 - Small programmable infusion systems for delivery and sampling
 - New methods to promote oral and CNS delivery of large molecules



Utility of Therapeutic Monoclonal Antibodies & Fragments

- Treatment of autoimmune disorders: Yes
- Treatment of allergic diseases: Yes
- Treatment of hematological disorders: Yes
- Treatment of hematological cancers: Yes
- Treatment of solid organ cancers: Yes
- Prevention of infectious diseases: Yes
- Treatment of infectious diseases: Maybe
- Treatment of ophthalmological disorders: Yes
- Treatment of neurodegenerative disorders: Maybe
- Treatment of toxin & drug poisoning: Maybe
- Treatment of cardiac procedures (PTCA): Yes



Government Solutions

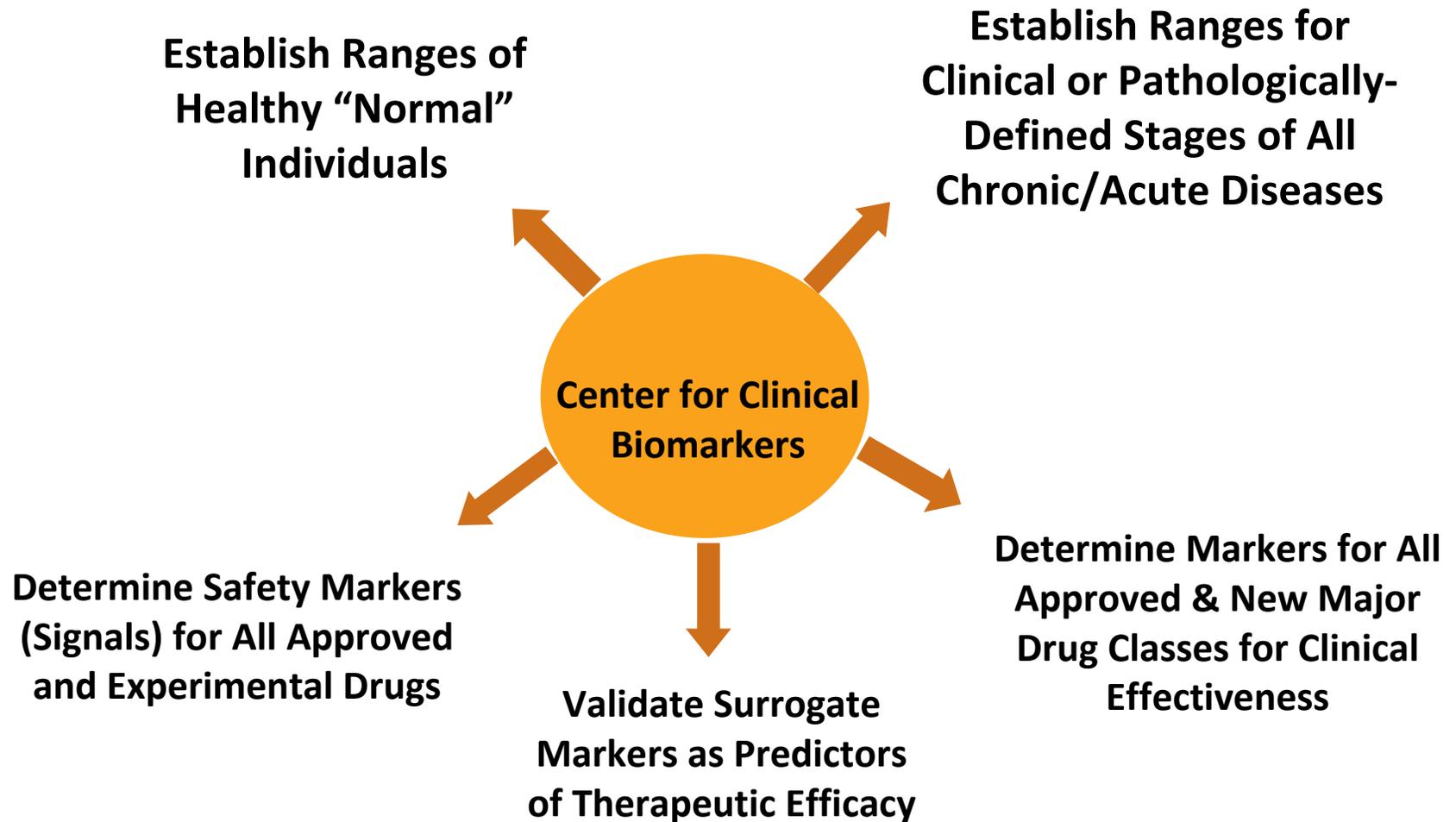
- Solutions should:
 - Enhance implementation and execution of clinical development and regulatory review
 - Facilitate cooperation among government, industry, and academic centers
 - Promote creation and support of small businesses
 - Utilize existing infrastructure when possible
- **Center for Clinical Biomarkers (see subsequent slides)**
- Expanded therapeutic efforts on orphan diseases, particularly those providing insights into that pathogenesis or treatment of diseases affecting larger populations
 - Success of canakinumab in cryopyrin-associated periodic syndromes (CAPS)
 - Imatinib in gastrointestinal stromal tumors (GIST)



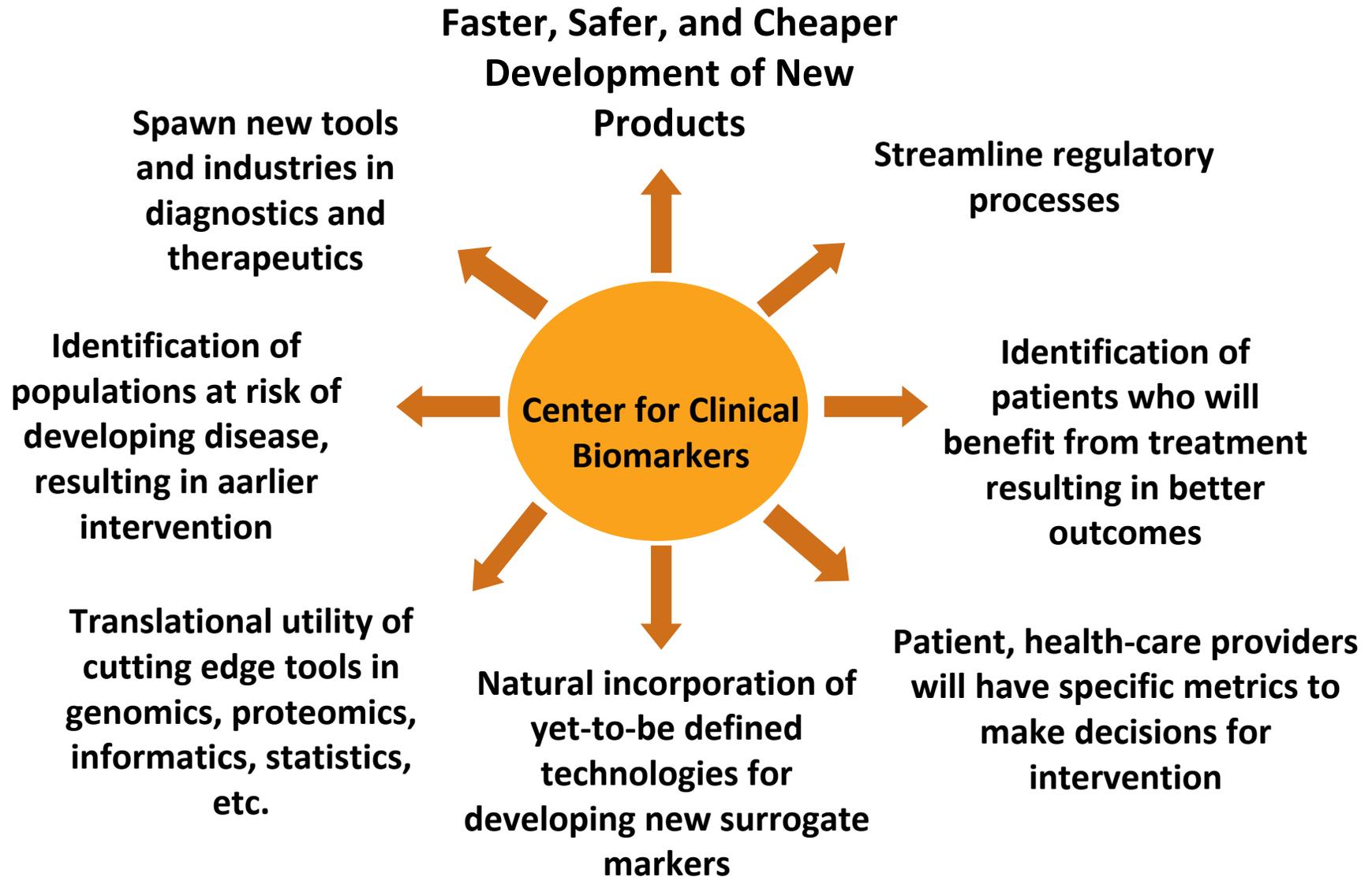
Government Solutions (continued)

- Centers of Technical Innovation
 - Modeled after NIAID intramural technology branch
 - High capital instrumentation & complex procedures
 - Examples: Next Gen sequencing, X-ray crystallography, EM, nanotechnology, etc.
 - Government staffed technical experts working on defined problems with investigators outside of government (small businesses and academics)
- Facilitate access of small businesses to capital
 - Tax incentives to large cash-rich companies that provide capital to new small businesses in areas of innovation
 - Expand SBIR grant initiatives (and resolve outstanding legislative issues related to eligibility)
 - Reduce time from initial grant reviews to award announcement
 - Establish matching innovation grant awards (government and private)

Major Government Solution: Center for Clinical Biomarkers



Consequences for Validated Biomarkers and Surrogates



From: trappaport@austin.rr.com [mailto:trappaport@austin.rr.com]
Sent: Wednesday, June 23, 2010 2:32 PM
To: Stine, Deborah D.
Subject: Re: Follow-up to PITAC/PCAST Meeting on June 22

Hello Deb, attached is a ppt of what I gave you. Best wishes, Ted (Best to use my UT email at wireless@mail.utexas.edu)

ted

President's Council of Advisors on Science
and Technology (PCAST)
President's Innovation and Technology
Advisory Committee (PITAC)

Golden Triangle Workshop
Washington, DC

June 22, 2010
Professor Ted Rappaport

Wireless Networking and Communication Group
Department of Electrical and Computer Engineering
The University of Texas at Austin

wireless@mail.utexas.edu

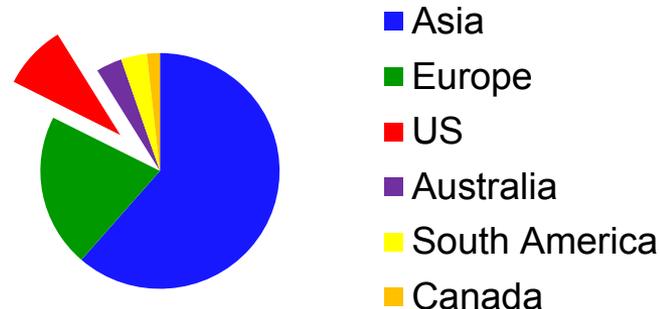
US Corporate R&D investments are leaving the US

Of 56 major information technology R&D announcements made by the 15 largest IT companies in 2002-2006:



35 in Asia
 12 in Europe
5 in US
 2 in Australia
 2 in South America
 1 in Canada

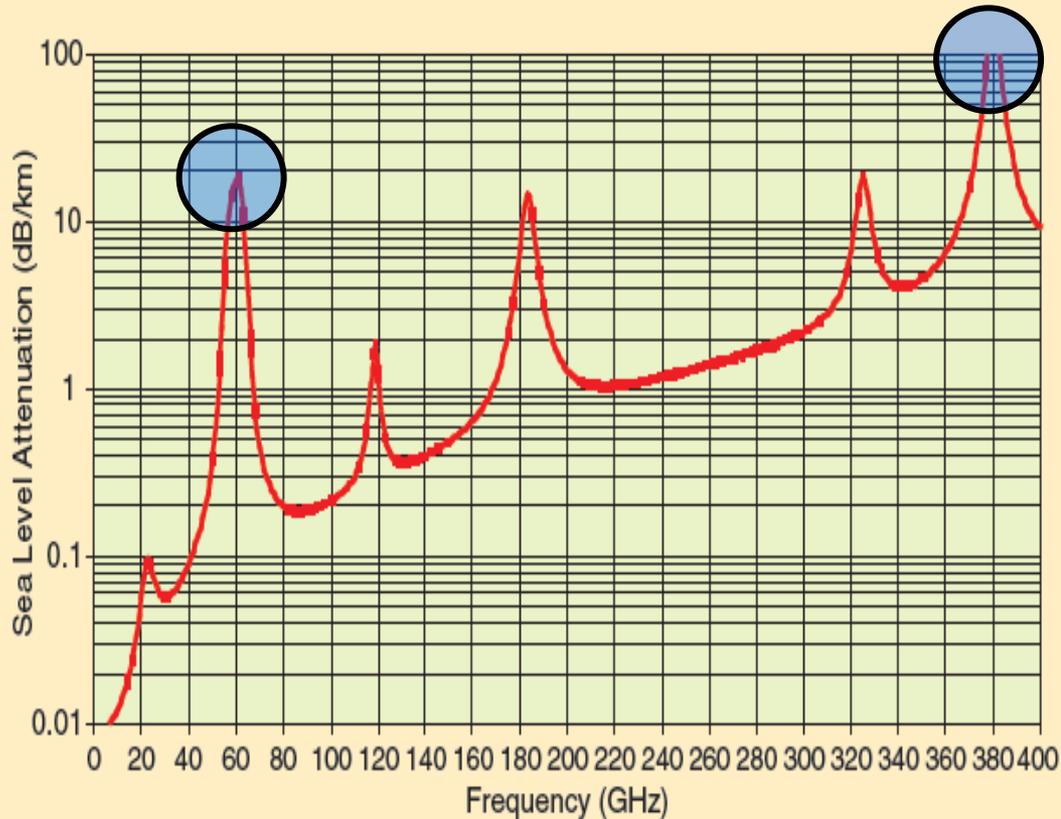
R&D Announcements



- Since 2001, R&D Investments are moving to high growth countries
- Investments are moving to countries with national initiatives and incentives
- Foreign students from high growth areas are coming to US academic programs in greater numbers than ever; Fewer US students are doing IT research -- less corporate funding
- US companies are investing less in US research facilities and are going offshore to expanding markets
- DARPA is more near-term for the Defense Complex (not like Lance Glasser's days)
- NSF has smaller projects that are peer-reviewed by academics for academics
- **The US has no IT National Convener to bring industry and academia together**

• National Academy of Engineering, The Offshoring of Engineering: Facts, Unknowns, and Potential Implications, The National Academies Press, 2008, pp. 213-218. ISBN-13: 978-0-309-11483-7 – See chapter by Prof. Rappaport, pp. 213-218.
 • See Prof. Rappaport's website for details: <http://users.ece.utexas.edu/~wireless/NAE%20Research.htm> and <http://users.ece.utexas.edu/~wireless/NAE2006.pdf>
 • National Research Council/Computer Science and Telecommunications Board, Renewing U.S. Telecommunications Research, edited by R. W. Lucky and J. Eisenberg, National Academies Press, 2006. ISBN 0-309-10265-0

mm-Wave Wireless - Atmospheric Absorption

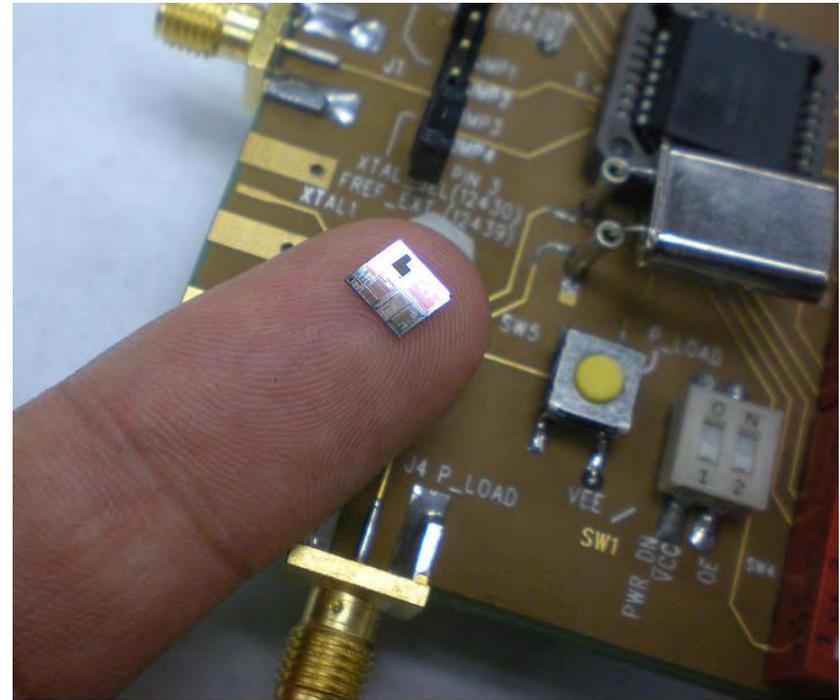


- Additional path loss at 60 GHz due to Atmospheric Oxygen – worldwide spectrum harmony within past few years
- Atmosphere attenuation allows massive personal area networks and massive bandwidths at mm-Wave frequencies
- Key for WPAN is 180 GHz, 380 GHz. FCC can establish allocations to push US semiconductor, IT complex to global leadership.

- Wells, J., "Faster than fiber: The future of multi-G/s wireless," *Microwave Magazine, IEEE*, vol.10, no.3, pp.104-112, May 2009.
- From: T. S. Rappaport, "Wireless Communication Circuit Design at Millimeter Wave Frequencies," *Virginia Tech Wireless Symposium and Summer School*, Blacksburg, VA, June 4, 2010.

Future Wireless Integrated Circuits

- Millimeter-Wave (mm-Wave) and THz signals have extremely small wavelengths (λ): 60 GHz = 5 mm; 380 GHz \leq 1 mm
- When immersed in semiconductor, λ shrinks by $\sqrt{(\text{permittivity})}$
- Moore's law applies for size/bandwidth
- Reduces fabrication costs
- Antenna sizes are smaller than integrated circuit (IC) sizes
- Enough IC area available for directional arrays
- Eliminate cable/connectors in data centers, homes, computers
- Shrink size and power in handhelds, data centers; media becomes wireless



From: T. S. Rappaport, "The Emerging World of Massively Broadband Devices: 60 GHz and Above," Keynote Speech, *Virginia Tech 2009 Symposium & Wireless Summer School*, Blacksburg, VA, June 4, 2009.

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From: Franco Vitaliano [francov@exqor.com]
Sent: Wednesday, June 23, 2010 11:05 AM
To: Jochum, Gera M.
Subject: Re: PITAC/PCAST, ExQor
Attachments: PITAC_PCAST_ExQor_Quad_Chart.pdf; ATT275350.txt

Hi Gera,

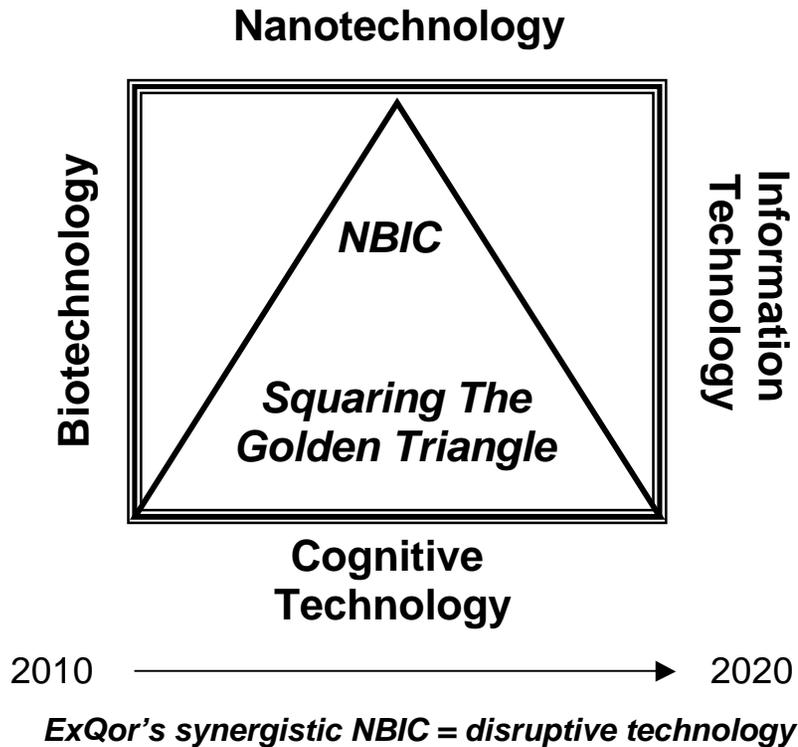
It was our pleasure to participate in yesterday's PCAST event. We hope our input was of value. The event is generating Net buzz, e.g., see <http://www.frogheart.ca/?tag=exqor-technologies-inc>

I spoke with Deborah Stine after the meeting about sending her my notes (a 1-page quad chart) I used while speaking for PCAST member dissemination, e.g., to her, Jackson, Schmidt, Mirkin, as well as to Chopra, and Kalil. Deborah struck me as someone who has her hands full, so if it's not inappropriate to ask, perhaps you could forward to them the attached file. Many thanks, and thank you again for the great opportunity!

--Franco Vitaliano

President & CEO
ExQor Technologies, Inc.
4 Longfellow Place Suite 2105
Boston MA 02114-2818 USA
Tel 617 742 4422
francov@exqor.com
<http://www.exqor.com>

ExQor's New Nanotechnologies



Bio-Nano Platform Technology (patented)

- Clathrin & Coatomer protein nanotechnology (12-60nm)
- Self-assembling, green bio-nanotech, environmentally safe
- Medical, commercial, industrial, consumer, & aerospace apps
E.g., vehicle bio-nanosensors for in situ accident triage
- 25nm Bio-nanolasers
E.g., destroy industrial and in vivo biofilms
- Intelligent bio-scaffolds for forming novel nanostructures
- Improved solar cells & batteries
E.g., new nanoscale electronic & photonic properties

ExQor Bio-Nano Platforms for IT

- Sensors, classical, and quantum information processing
QIP exponentially fast, & reversible ops = far less energy needed

ExQor Cognitive Algorithms for Classical, QIP, & Bio-Nano

- Cognitive apps that show self-awareness, uses it to adapt.
Work individually or collectively across global networks
- Highly personalized medicine, consumer devices, "clouds"

Impediments To Commercialization, Broad Use

- a) Multi-disciplinary technology confuses, scares off investors, is difficult to coordinate & implement, e.g, ExQor bio-nanolaser.
- b) For our non-medical nano-tech, lack of innovation in low cost, high volume, high quality nanotech Mfg. Processes.
- c) Nanotech engenders safety concerns, in consumers to VC's.
- d) To be commercially successful, our non-medical nanotech must be low cost commodity, but limits capital for new innovation and business expansion.
- e) To be successful in high tech sectors, non-transistor nanotech must challenge and disrupt well entrenched silicon-based industries and vendors, big barrier to market entry.
- f) Non-medical market profit margins will come from broadband goods/services that integrate cognitive technology for use in the "cloud", but broadband lacking, fair use issues, security.
- g) Global export issues: Cumbersome foreign patent process, IP protection issues in some countries, e.g, China.

Possible Federal Government Actions or Response

- a) Proactive, U.S. multi-role support of multidisciplinary Tech.
- b) New civilian "DARPA" under White House Federal Chief Information Officer; high payoff commercial sector innovation and Tech revolution. E.g., "Mission is to maintain technological superiority of U.S. and prevent technological surprise from harming our economic national security." E.g., new U.S. infrastructure in support of nano-innovation.
- c) U.S. nanotech posture moves beyond risk characterization and safety guidelines, takes pro-active risk Mgmt. strategy involving ALL stakeholders, from Reg. Agencies to VC's., e.g, EU's Nanosafe2.
- d) Tax credits, other financial incentives for nanotechnology firms.
- e) Government contract "bake-offs" of silicon-based solutions vs. new nanotech solutions, including U.S. economic payoff metrics.
- f) Broadband Internet treated as essential, Net neutral utility, be @least 100 megabit/sec + improved cyber-security & standards.
- g) Encourage single application for expedited, low cost, pan-EU patents; ensure global IP compliance on nanotech.

From: Franco Vitaliano [<mailto:francov@exqor.com>]
Sent: Friday, June 25, 2010 11:02 AM
To: Stine, Deborah D.; Jochum, Gera M.; ericsschmidt@google.com;
president@rpi.edu; Chopra, Aneesh; chadnano@northwestern.edu; Kalil, Thomas A.
Subject: Re: Follow-up to PITAC/PCAST Meeting on June 22

On behalf of Gordana and myself, I want to thank you all for the opportunity to attend the June 22 PITAC/PCAST meeting. It was an honor and a privilege, and we hope we made a meaningful contribution. As meeting follow up, I asked Gera to forward you all the quad chart I used as my presentation notes, as at the time I had not yet received Dr. Stine's e-mail with all the attendee's addresses.

Two additional follow up points.

1. As noted in my quad chart I believe new infrastructure in support of multidisciplinary nano-technologies logically comes under the purview of CTO Dr. Chopra, as it would help enable multiple government agency programs and various Executive initiatives. However, the current fiscal environment in Washington does not give great hope of government funding for such new infrastructure, even though critically needed.

One thought that comes to mind is offering tax credits, similar to tax credits given biotech companies for investments in development. But these new tax credits would be available to anyone, business or individual, who writes a check in support of this new infrastructure. Dr. Chopra noted in his recent speech at Personal Democracy Forum 2010 that the Obama administration is working to bridge the "culture gap" that exists between our experiences as consumers engaging with businesses/products and our experiences as citizens engaging with government. Perhaps writing a check for a much needed high tech initiative in support of jobs creation could be a way of engaging the public (and also provide a tax break). These new donor funds also could provide additional support for the Broadband Initiative, as this is obviously a critical infrastructure component.

2. Also as noted in my quad chart and in my presentation, ExQor has been actively engaged for more than decade in developing a new class of cognitive systems. Originally designed to work on our patented quantum information processing technologies, a software subset of our cognitive algorithms will work on traditional computers and networks and also integrate legacy and new systems, but needs to be implemented. When done, we could discuss providing the technology, potentially at minimal cost, in support of the government's goals in nanotech. If you want more information about the system's capabilities, please contact me.

Regards

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From: Erez Lieberman-Aiden [<mailto:erez@erez.com>]
Sent: Sunday, June 27, 2010 4:25 PM
To: Stine, Deborah D.
Subject: Re: Follow-up to PITAC/PCAST Meeting on June 22

Hey Deborah -

Here were my responses to the intro questions:

1. What are the new bio/nano/info technologies with which you are involved that will change the world in the next 10 years? What are the unique opportunities at the intersections of these fields?

DNA sequencing technology was designed to determine the sequence of bases that comprise a cell's genome. My collaborators and I have been working on the use of DNA sequencing to probe the spatial arrangement of cellular components, such as how the genome is folded inside the nucleus. This makes it possible to use DNA sequencing to probe a much broader array of cellular states and functions.

2. Where is the basic research taking us? What knowledge gaps remain?

We're going to get better and better at cheaply and comprehensively characterizing the physical and biochemical configuration of cellular components. But we still don't understand how this 'low-level' configuration determines 'high-level' cell function: what makes a heart cell a heart cell? A liver cell a liver cell? A tumor cell a tumor cell? cancer stem cell.

3. What are the impediments to commercialization and broad use of these technologies?

We need ways of transforming 'low-level' information about a cell's physical and biochemical configuration into 'high-level' information about cell function and even higher level information about the health of the person as a whole. We need to be able to interpret our results in the form of actionable diagnostic information about human health and disease.

4. What infrastructure is required to properly test, prototype, scale, and manufacture breakthrough technologies?

Universal, standardized electronic medical records will make it far easier to transform all kinds of personal information - such as genomic information - into actionable diagnostic information about human health and disease.

5. Where should the Federal government invest and focus its resources? What Federal policies or programs relating to these technologies are in need of review? Are new programs or policies needed in light of recent and anticipated advances in these fields?

Government leadership is needed to steer the private sector towards standardized electronic medical records. This needs to happen both at the level of financial incentives, and at the policy level.

Finally, I just wanted to note that to my mind, it seems as though venture capitalist funds, most of which only invest in a few dozen companies, can't afford to support companies whose chances are less than, for instance, 1 in 10 or 1 in 20. Perhaps creating or fomenting some kind of structure in which the portfolio was 'bigger' -more companies - would also encourage risk taking, since you could 'hedge your bets' by funding 500 companies, each with a 1 in 100 shot. I don't know if that would be a government program like SBIR, or just some kind of government incentive to reshape part of the VC sector.

Erez

From: Stephen Sherwin [<mailto:stephen.sherwin@sasbiomed.com>]

Sent: Monday, June 28, 2010 9:43 PM

To: Stine, Deborah D.

Cc: Jim Greenwood; Scott Whitaker

Subject: Re: Follow-up to PITAC/PCAST Meeting on June 22

Dear Dr.Stine,

Thank you again for the opportunity to participate in the PCAST workshop on June 22. In my capacity as the current chairman of the board of the Biotechnology Industry Organization (BIO), I am pleased to enclose the attached memoranda from BIO for consideration by PCAST as it further addresses the topic of the government's role in stimulating job creation and U.S. competitiveness in the biotech, infotech and nanotech fields. As you will note these memoranda describe in detail proposals that are in varying stages of discussion and enactment by the Obama administration and/or Congress across the major areas of endeavor in biotechnology including healthcare, advanced biofuels and biomaterials, and agriculture. In addition you will note that these proposals all fall within the general framework of targeted government investment, tax incentives, and a science-based approach to regulation that fosters innovation, as per my comments during the workshop.

I hope that these memoranda are helpful to you in preparing the meeting summary and otherwise in the future work of PCAST. In addition, Jim Greenwood, the President and CEO of BIO and a former member of Congress, would be pleased to follow up with PCAST to provide whatever support BIO can in your efforts going forward.

With best wishes,

Stephen A. Sherwin. M.D.

stephen.sherwin@sasbiomed.com

415-317-1230

Industrial Biotechnology PCAST Recommendations

June 2010

Investment in Science, Technology, and Infrastructure: Support Growth of U.S Industrial Biotechnology

Investing in synthetic biology technology to design and build novel organisms to generate products that are not made by natural systems is a significant achievement in the field of industrial biotechnology, and today United States continues to lead in industrial biotechnology as a result of this technology. The use of synthetic biology results in constructing entirely new biological systems from genes, proteins, and metabolic pathways, or redesigning existing biological systems. Synthetic biology holds promise for advances in many industrial biotechnology areas, including the development of renewable chemicals and bioproducts, carbon-neutral energy sources (biofuels), safer and improved pharmaceutical intermediates, and better environmental remediation technologies.

Advancement in synthetic biology technology to produce commercial products such as biochemicals and biofuels, require both Federal funding and private sector funding to support the research and development infrastructure which constitutes:

- a) Identifying and characterizing a set of standard parts (oligos) that have well-defined performance properties, which scientists in applications design can use in production of biofuels, enzyme design, biochemicals, pharmaceutical intermediates, and health care products. These set of standards can be used and re-used to build the desired end-product
- b) Developing and incorporating design methods and tools into an integrated engineering environment which would be readily available for synthesizing the bioproduct or biofuel
- c) Reverse engineering and re-designing building blocks (oligos) which can be accessed and programmed
- d) Reverse engineering and re-designing a simple microbe such as a bacterium for the production of useful enzymes, biochemicals and biofuels

Federal agency such as, Department of Energy (DOE) has established three Bioenergy Research Centers (BRCs), and each center is pursuing basic research underlying a range of high-risk, high-return biological solutions for biofuels, biobased products, methods, and tools that the emerging biofuels and biochemicals can use. These three BRCs include the following: BESC (BioEnergy Science Center), GLBRC (Great Lakes Bioenergy Research Center), JBEI (Joint BioEnergy Institute). The research center strategies for the three BRCs to grow industrial biotechnology in the United States are the following:

- a) Development of next-generation biofuels crops (engineer "model" plants to produce new forms of lignin)
- b) Discovery and design of enzymes and microbes with novel biomass degrading capabilities (develop a combination of enzymes and pretreatment methods to digest specific biomass for biochemicals and biofuels production)
- c) Development of transformational microbe-mediated strategies for biofuel production (use of synthetic biology to produce modified microbes that produce biofuels)

Research and development based on synthetic biology technology needs to support the design of microorganisms which serve as powerful catalysts (enzymes) capable of synthesizing an ever wider

range of biofuels (next generation and advanced biofuels) and biochemicals from renewable feedstocks. It is extremely important to develop and implement new or improved lower cost microbes (enzymes) for biorefining applications. The impeding factor in enzyme technology today is their cost and performance efficiency in converting renewable feedstocks (such as cellulose) to value-added biochemicals and biofuels; thus, even more research and development is required to improve biochemical conversion processes to improve productivity of conversion mechanisms (enzymes or fermentation organisms). Development and operating demonstration-scale and commercial-scale integrated biorefineries efficiently with multiple classes of feedstocks require enzyme discovery, characterization and modification to improve enzyme performance, as well as progress on cost effectively producing and applying enzymes to biorefinery processes.

These centers need to be adequately funded over a set period of years.

Continued Innovation and Consumer Adoption in Industrial Biotechnology: Renewable Chemicals and Biobased Products

Over the last two decades, competitive advantage for chemicals and plastics manufacturing has shifted towards the Middle East and Asia. United States employment in the chemical sector has dropped over the last decade and is projected to shrink further as capital investment for the petroleum-based industry has shifted away from the United States. Upon achieving the biotechnology industry's full potential, could create tens of thousands of high-paying green jobs in the United States within the next five years. Most recent news releases by BIO on green jobs can be found in news releases and green jobs report:

"BIO Ask Congress to Support Deployment of Biotech Chemical Platforms to Create Green Jobs," <http://www.bio.org/ind/>

"Range of Policies to Support Biorefinery Commercialization," <http://www.bio.org/ind/>

Read report, "Biobased Chemicals and Products: A New Driver for Green Jobs," <http://bio.org/ind/20100310.pdf>

To foster growth of the biobased chemicals and products sector in the United States, Federal incentives are needed such as:

- a) A production tax credit (PTC) for biobased products will drive innovation and promote investment, a production of biobased products much as the existing biodiesel and cellulosic biofuels production tax credits have done for investments in the biofuels industry. This biobased products producer tax credit legislation is aimed at incentivizing United States production of biobased products to increase energy security, develop green jobs, benefit United States economy, and grow the market for biobased chemicals and products.
- b) Open the section 48C advanced energy manufacturing credit to biobased chemicals and product biorefineries. The current 48C advanced energy manufacturing credit provides much needed assistance to developers of a wide range of renewable energy technologies, but fails to recognize biobased chemicals and products manufacturing.
- c) Grants, loan guarantees, and other financial assistance programs are needed to stimulate innovation and demonstration of new biological conversion of agricultural feedstocks to biobased chemicals and products. Much like the DOE and USDA programs directed toward next-generation biofuels development, programs focused on next

generation biobased chemicals and products technology will stimulate new feedstocks and conversion technologies.

- d) Open existing DOE and USDA loan guarantee programs to biobased chemical and product projects. Current DOE (EISA Title XVII and ARRA) and USDA (Farm Bill Sec. 9003) renewable energy loan guarantees have not been awarded to biobased chemicals and products manufacturing projects.
- e) Ensure timely implementation and eligibility of biobased products and renewable chemical intermediates in USDA BioPreferred voluntary labelling and procurement programs. These programs are major market drivers for biobased chemicals and products and must be implemented without further delay.

Promote De-risking Biorefinery Infrastructure for Biofuels and Renewable chemicals

Advanced biofuel projects risk assessment should be evaluated differently than other already commercially available renewable technologies. Unlike many renewable technologies, no commercial advanced biofuels facilities are currently operating. In addition, unlike the electricity market, the liquid fuels marketplace does not operate within a framework that lends itself to long-term, fixed-price forward contracting mechanisms. Due to these two major differences, advanced biofuels projects face unique obstacles when evaluated against more mature renewable technology projects such as nuclear power, wind and solar in regards to risk assessment, both by private lenders and the Federal Government.

As an example, the Innovative Technology Loan Guarantee Program (Title XVII of EAct) which authorizes DOE to issue loan guarantees for projects that employ new or significantly improved energy technologies such as advanced biofuels needs modification to allow for equitable evaluation of advanced biofuels projects against other renewable applicants.

- a) These loan guarantees would help facilitate the construction of facilities to produce biofuels from cellulosic biomass. Currently advanced biofuels are encountering uniquely difficult application requirements for the Title XVII LG program at DOE despite clear Congressional intent via specific language in the American Recovery and Reinvestment Act of 2009 that dedicates \$500M for “leading edge biofuel projects”. Unlike other renewable technology projects eligible for this program like nuclear, wind and solar, because the advanced biofuels industry is still in the pilot scale phase of deployment, we believe that the risk profile of these projects should not be evaluated against other renewable industries that are further along in their commercial deployment. Therefore, it is necessary to clarify that equity requirements should not be based on the ability to secure long term off take agreements or other factors that may increase the risk assessment profile of a biofuels project.
- b) It should be stipulated that equity requirements for biorefinery loan guarantees should not exceed 20% since these technologies are less mature and need more assistance.
- c) Because of the unique position of biofuels projects, we are requesting that the inclusion of the following language be added to the program:

“Loan guarantee applications for emerging technologies, such as advanced biofuels, should not be evaluated against more mature technologies, such as wind or solar. The liquid fuels marketplace does not operate within a framework that lends itself to long-term, fixed-price forward contracting

mechanisms therefore, DOE should not require these contracts as evidence of “reasonable prospect of repayment” for biofuels projects.

- a) We are also asking that the American Recovery and Reinvestment Act of 2009 dedicated funding for “leading edge biofuel projects” be made permanent to ensure that loan guarantees are indeed issued to qualifying advanced biofuels projects as intended.
- b) Finally, the loan guarantee program should be expanded to include eligibility for renewable chemicals and biobased products in addition to biofuels as they provide many of the same benefits of advanced biofuels and will be co-located and produced at many biorefineries. The most efficient and profitable way to produce advanced biofuels may be in conjunction with other biobased products such as renewable specialty chemicals or polymers.

Capture Value of Biogenic Carbon Through Climate Change and Sustainability Initiatives

Climate policy should fully recognize and incentivize the greenhouse gas benefits of industrial biotechnologies. In particular:

- a) Full credit should be provided for carbon uptake by biomass feedstocks. Biofuels and biobased products produced from renewable biomass feedstocks should be credited for the full carbon uptake of their feedstocks. Many biobased products are actually carbon negative on a lifecycle basis by sequestering atmospheric carbon within the product itself. Federal policy should recognize and reward these lifecycle GHG benefits to provide the necessary market signal to drive investment.
- b) A significant portion of revenues from the sale of GHG emissions allowances should be used to fund ongoing R&D and commercialization of biofuels and biobased products.

Integrate R&D on Industrial Biotechnology in EPA for green Chemistry and Pollution Prevention.

EPA does not have enough skilled scientists who understand industrial biotech. Industrial biotech can help actually prevent pollution before it ever occurs and it can help remediate existing pollution. EPA gives awards for green chemistry that often involve industrial biotech but EPA has not done enough with its R&D office or Pollution Prevention Office to integrate the benefits of industrial biotech into the total environmental R&D and pollution control infrastructure. EPA needs more skilled regulators with education in biotech and the need to help build the capacity of industry to deploy industrial biotech to provide solutions to pollution prevention.

Key Agricultural Biotechnology Pipeline Technologies For Global Challenges: Food Security, Energy Security, and Human Health

Biotech-derived crops, currently and those in the pipeline to be commercialized, possess traits that are beginning to address some of the most serious challenges faced by modern agriculture. In the future, genetically engineered livestock will contribute benefits to enhance global health. These key technologies will continue to grow in importance in both public and private research and development programs.

1. ***Abiotic Stress Resistance in crops (drought, heat, salt, cold, flood)***
 - Increased resistance in plants will increase crop productivity.
 - For example, field trials of drought tolerant corn show 6-10 percent yield enhancement, a gain of 7-10 bushels on average of 70-130 bushels per acre in U.S. field trials under drought stress.
 - Particularly important in developing countries and to address impacts of climate change.
2. ***Biotic stress resistance in crops(disease, insects, weeds)***
 - Second and third generation varieties are needed to avoid development of weed and pest resistance and improve crop yields.
 - For example, first generation crops have helped increase U.S. yields of corn over 30 percent, of soybeans 12 percent and cotton of about 30 percent. As with pesticides, farmers need multiple tools to avoid development of resistance.
3. ***Increased efficiency (water use, nitrogen use, photosynthesis)***
 - Alter photosynthetic pathways to increase efficiency.
 - For example, only 40-60 percent of nitrogen applied is taken up and used by the corn plant during the first year. Pipeline technologies can boost yield under normal nitrogen conditions and/or stabilize in low nitrogen environments.
 - Particularly important in developing countries.
4. ***Intrinsic Yield***
 - Increase yields for both food/feed crops and biofuel crops.
 - For example, experimental varieties of corn show 6-10 percent intrinsic yield increases.
 - Significant for developing country staple crops and trees, and biomass crops for bioenergy
 - Technology can be used to improve crop hybridization and hybrid production systems and to manage gene flow
5. ***Nutritional Enhancement of Food Crops and Feed Crops***

Improve nutritional value of plant and animal-based foods including increasing essential nutrients and producing health-promoting substances. Also the enhancement of feedstock dedicated to animal feed to improve efficiency and production.

 - Vitamin A

- Omega 3 fatty acids
- Ratio of milk proteins
- Quality of plant or animal derived protein
- Inclusion of enzyme components in crops for animal feed to improve feed conversion and animal performance

6. *Biologics*

Produce biologics in food/feed crops and in animals to treat humans directly, treat animal vectors of human diseases, and produce vaccines.

- High level expression of important biologics and oral preventatives in cereal grains and milk.
- Focus on developing countries: Malaria, Tuberculosis, Dengue fever, diarrhea, hemophilia, etc.

7. *Animal Production Efficiency*

Through genetic engineering and cloning, improve animal production efficiency through resistance to disease and insects, enhanced growth rate, and (or) reduced environmental impact.

- Resistance to agricultural diseases such as brucellosis, foot and mouth disease, mastitis, and to zoonotic diseases such as bovine spongiform encephalopathy and avian influenza.
- Resistance to cattle ticks that transmit anaplasmosis.
- Increase rate of growth per unit of feed consumed.

8. *Improved Biomass for Bioenergy*

Improving biomass quality for use in industrial processes (biofuels, bio-based materials).

- Promising crops are perennial grasses and trees, focusing on increased yields, and abiotic stress resistance.
- Improving the efficiency of use, profitability and carbon footprint of existing starch feedstock through enzyme expression.
- Improved feedstock processability for lower cost conversion to fermentable sugar

The potential of the traits listed above to fully address global food and energy needs and to make effective new contributions to human health remains limited by the slow research, development and transfer of crucial technologies into successful practice. Publicly funded research focused on these areas will greatly accelerate progress and create new solutions for both domestic and international agriculture. In addition, there is a crucial need for increased training in agricultural disciplines such as agronomy, animal science, plant and animal genetics and genomics, molecular biology, entomology and plant and animal pathology.

- Find sources of new genes that drive expression of significant traits.
- Accelerate output of DNA sequencing to enable routine total genome sequencing of crops and livestock species.

- Enable holistic understanding of gene networks and biochemical pathways in crops and livestock (systems biology, bioinformatics, mathematic modeling of networks).
- Improve tools for breeders including molecular breeding techniques and metabolomics (e.g., HTP genotyping, mapping, expression, profiling).
- Develop greater understanding of epigenetic mechanisms and implementation of epigenetic methods in plant breeding.
- Develop transgenic techniques to work with non-US-centric crops (bananas/plantains, cassava, yams, etc.) and livestock (sheep, goats, indigenous cattle) and enable the site-specific integration of transgenes.
- Investigate the relationships between plant and animal pathogens and their hosts to find ways to interrupt disease symptoms and reduce disease transmission.
- Conduct fundamental research into physiological processes in plants and animals that determine yield and efficiency (e.g., for crops: flowering control, yield maximation, and geographical adaptation; for livestock: regulation of muscle or milk protein synthesis, rate of lipid deposition, improving digestive efficiency).
- Non-destructive phenotyping (precision and high throughput mode) in greenhouses and the field enabling a highly efficient selection process.
- Improve understanding of plant cell wall structure, including balance and specific structures of cellulose, hemicelluloses and lignin to help improve biomass energy per acre and improved energy conversion efficiency.

TO: Steve Sherwin
Jim Greenwood

FR: Sharon Bomer
Food and Agriculture

RE: June 22 PCAST Workshop on Innovation

The following are suggestions to support innovation in agricultural biotechnology for the OSTP workshop on June 22. These are issues that not only BIO has been raising, but are also being highlighted by prominent Obama Administration officials, particularly Dr. Roger Beachy, USDA Chief Scientist and Director of USDA's National Institute for Food and Agriculture, and Dr. Nina Federoff, Scientific Advisor to the Secretary of State.

1) Burdensome U.S. and Global Regulations for Agricultural Biotechnology inhibit emerging company and public researchers from introducing new agricultural technology in the market.

- Although based on science, U.S. regulatory programs for the authorization of agricultural biotechnology are a deterrent to emerging companies and public researchers to seek authorization of their products. The extensive documentation and extended delays in getting authorizations is too expensive for most small companies/public researchers.
- The U.S. government should streamline its regulatory process and work aggressively with other countries to do the same. At the same time, the U.S. should develop programs to support emerging company and public researchers to obtain regulatory authorizations.

2) USDA Research Programs need to support high-risk biotechnology research programs with real-world applications.

- Large multinational ag biotech companies commit hundreds of millions of dollars in the research and development of agricultural biotechnology products. They will focus those resources on products that have probable success for a high rate of return on that investment. USDA research and research grants should focus on research and development of products that have smaller market implications or are higher risk where the private sector may not wish to risk the investment. At the same time, to make the best use of those government dollars, the research needs to support strategic goals for the country. The National Institute for Food and Agriculture has begun that process, but substantially more funding is needed.

Create and maintain incentives and increase investment in biotechnology firms through financing policy and tax reform

- 1) *Create incentives for the biotech industry such as the recently enacted grants in lieu of therapeutic discovery project credit program. This program provides “meaningful” capital support for many capital-starved emerging biotechnology companies to encourage investments in new therapies to prevent, diagnose, and treat acute and chronic diseases. The credit would help sustain research and development of new promising therapies by funding activities such as hiring researchers and scientists, and conducting clinical trials. Companies may elect to forgo their credits for a grant of up to 50 percent of their qualified expenses associated with the research and development of new therapies.*
- 2) *Ensure that broad tax legislation is favorable to emerging life science firms. Includes maintaining low long-term capital gains rates to provide incentives for long-term investments in this industry. This could also include creating a lower, “extra long term” (ie., 5 or 7 years) capital gains rate.*
- 3) *Advocate for changes to the existing tax incentives, such as R&D tax credit and qualified business stock, favorable to emerging biotechnology firms.*

Advocate for and develop policies to increase government funding for emerging biotech firms

- 1) *Achieve change in policy to allow majority venture-backed companies to participate in the SBIR program.*
- 2) *Work to increase government funding opportunities for smaller companies. This includes fully funding the newly-passed Cures Acceleration Network program that was included in the Patient Protection and Affordable Care Act.*
- 3) *Work to increase incentives for private sector investment in smaller companies, such as changes to the current qualified small business stock incentives.*

The Administration’s accelerate job and economic growth initiatives includes a one-year zero capital gains rate for new investments in small businesses. However, the current small business stock tax rules create technical challenges that make it difficult for investors in small innovative companies to utilize and navigate. Modifications are necessary to the current 50% small business-stock exclusion rules (§1202), rollover of gain exclusion (§1045) and ordinary re-characterization capital losses as ordinary losses (§1244) to accelerate innovative small business job growth and spur private sector investment in innovation.
- 4) *Develop and promote policies that will assist small biotechnology companies’ in their R&D endeavors (loan programs, grant programs, tax incentives, etc.).*

Promote growth and/or reduce costs for small biotech firms through regulatory reform on corporate governance and accounting standards

- 1) *Ensure adjustments to the treatment of small public biotech companies, such as SOX Section 404(b) compliance, as part of financial services reform legislation..*
- 2) *Change the SEC’s “small reporting company” definition under Rule 12(b)2, so cost drivers such as SarbOx, IFRS, and other elements do not hit small, pre-revenue companies.*
- 3) *Clarify the current revenue recognition rules issued by the FASB and SEC.*

Advocate for favorable policy outcome to enhance financial market operations for emerging biotechnology firms

- 1) *Ensure that policies enacted promote well-functioning capital markets, and create proper incentives for public offerings and other liquidity events for investors.*
- 2) *Ensure that government research does not tread into areas that would duplicate or compete with research done by entities in the private sector.*

Create clear expectations

- 1) *The biotechnology industry relies on scientific assessment by regulatory agencies. These agencies must execute their mission within statutory authority by evaluating the science objectively, honestly, and ethically. It is incumbent on those in leadership positions within agencies to support the integrity of the scientific process and make valid scientific assessments without political or other interference.*
- 2) *Agency decision making must incorporate data and scientific findings from peer reviewed publications. Data must be observable, so that conclusions and interpretations are based on a preponderance of the evidence, and over-reliance on non-verified theories and models to the exclusion of substantive data should be avoided. Special care should be taken and review processes should be considered to ensure scientific integrity when a clear polarization of views in the scientific community exists.*
- 3) *Moreover, regulatory transparency and clear articulation of policies and expectations can help to foster innovation. Rules and regulations must be:*
 - *timely*
 - *science based*
 - *developed through transparent processes allowing for public input*
 - *consistent and predictable*

Enhance scientific infrastructure

- 1) *Ensure that regulatory and research agencies within the government have the scientific expertise necessary to understand and develop regulatory pathways to the approval of cutting edge research*
- 2) *Fund cross-disciplinary research*
- 3) *Ensure that leaders in the executive branch involved with science and technology are of the highest quality and reputation in the appropriate scientific arena to have the trust and respect of their peers and of the public. Candidates for these leadership positions should have the knowledge, skills, and abilities in science and technology, including current experience in science, science policy or the application of the scientific process to policy development. BIO supports the selection of qualified individuals based on objective evaluation of these skills, including a proven record of professional and scientific integrity.*
- 4) *Focus on enhancing the infrastructure for projects that cannot be done by the private sector (too expensive, no market exists, requires cross-sector collaboration, etc.)*

From: Jim Hendler [\[mailto:hendler@cs.rpi.edu\]](mailto:hendler@cs.rpi.edu)

Sent: Tuesday, June 29, 2010 8:30 PM

To: Stine, Deborah D.

Subject: Re: Follow-up to PITAC/PCAST Meeting on June 22

Attached is my follow-up, a copy of my answers to the 5 questions, elaborating on points made at the meeting and adding some potential follow-up actions that could be taken by PCAST or the administration. Thanks for all your support for this meeting, and for your help finding the video (which saved me from having to remember which examples I used :-))

-Jim Hendler

1. What are the new bio/nano/info technologies with which you are involved that will change the world in the next 10 years? What are the unique opportunities at the intersections of these fields?

The World Wide Web continues to undergo exponential growth and unprecedented innovation, with new technologies such as the Semantic Web, large scale “social machines,” and an increasingly Web-enable cloud computing infrastructure. As shown by the Obama administration’s unprecedented release of government information on Data.gov and other sites, the Web can improve government transparency and citizen involvement. True innovation in areas such as translational biology and medical informatics will require new and different Web technologies that encourage the wider sharing of data with appropriate protections for privacy, intellectual property and the control of personal information. Thus, the Web continues to increase in its importance to society and to science, and we now realize that the Web is a critical infrastructure on which we as a society, and a world, fundamentally rely.

On the downside, however, the Web also has the potential to nurture hate groups and finance terrorism, to radically redefine individual privacy, and to expose our children to unprecedented levels of violence and pornography – disincentives to innovation. To protect this critical infrastructure, and at the same time to understand the threats it can generate to society, we must develop a “Web science” that provides us better models of the Web and its growth through an understanding of how the technical, architectural and social aspects of the Web interact and of how they are changing over time. The “climate” of the Web may not be as important to the future of our world as the climate of our planet, but it is rapidly becoming a close second.

2. Where is the basic research taking us? What knowledge gaps remain?

A low-level understanding of Web structures is emerging, but a deeper understanding of Web "economics" and use is still more art than science. More urgently, potential threats to the Web exist, not just in terms of cyber attack, but also in terms of fragmentation, unexpected interactions, and cultural clashes. Our ability to protect and grow this crucial innovation engine requires a science as deep as civil engineering is to our transportation network or as our understanding of electrical systems (scientifically, engineering-wise and socio-economically) informs innovation in new energy production technologies and smart grids.

3. What are the impediments to commercialization and broad use of these technologies?

The inherently interdisciplinary nature of Web modeling makes it hard to study and explore holistically, rather than in a piece-meal fashion – it is a systems science. New technology developments are often dominated by large company needs, not basic research drivers. Further, as the next decade of the Web will be driven by growth of the user communities in China and India, and by a migration of Web technologies to mobile computing platforms, the ability to understand cultural aspects of information use, privacy protection, and location-aware services becomes increasingly crucial to innovation. Unfortunately, studying the international aspects of this area exceedingly difficult given different legal, ethical and regulatory systems in place around the world. For example, we have seen American executives can be indicted in foreign countries for violation of laws that don’t apply in the States. Understanding, navigating and, most importantly, fixing these problems will be necessary to keep the Web an engine of innovation as it has been in the past decade.

4. What infrastructure is required to properly test, prototype, scale, and manufacture breakthrough technologies?

Although the situation is slowly changing, particularly with the advent of cloud technologies, the

ability to collect and use information at Web scales is prohibitively expensive for universities and small companies, giving large companies a significant competitive advantage, at the potential cost of open research. New public/private models are needed so as to bring government, university and industry, particularly including small companies, together in a tighter and faster innovation loop. Further, the realization that the Web is a national (and international) infrastructure that must be protected drives the need to create cross-agency and cross-discipline research mechanism so as to be able to model this important system and to be able to predict the effect of new policies on the Web. As an example, the equivalent

5. Where should the Federal government invest and focus its resources? What Federal policies or programs relating to these technologies are in need of review? Are new programs or policies needed in light of recent and anticipated advances in these fields?

The US government should spearhead the creation of a panel of leading Web experts from industry, university and government to prepare a "state of the Web" assessment, perhaps as part of a larger panel such as the UK's CST study on "A National Infrastructure for the 21st Century." This panel could be under the auspices of PCAST, the national academies, or similar. Beyond this, we might consider convening an international committee, such as the International Panel on Climate Change, that could look at some of the critical threats (technical and social) to the Web in the areas of cybersecurity, privacy and information control, and threats to the international order caused by the use of the Web by terrorist organizations and other hate groups. Like the climate panels, the goals of this group would not be to make specific policy suggestions, but to inform policy by a deep understanding and modeling of the future of the critical Web infrastructure.

From: Koenig, Scott [<mailto:KoenigS@MacroGenics.com>]
Sent: Tuesday, June 29, 2010 11:47 AM
To: Stine, Deborah D.
Subject: RE: Follow-up to PITAC/PCAST Meeting on June 22

Dear Deborah:

As promised, I am providing the written comments derived from the material that I sent you last week. Let me know if you need any additional information. Good luck with the summary.

Best wishes,
Scott

*Scott Koenig, M.D., Ph.D.
President and CEO
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Phone: 301-354-0680

Written Responses for Golden Triangle Workshop
Scott Koenig, M.D., Ph.D.

The quest to enable new bio/nano/info technologies related to health care has broad economic, medical, and industrial ramifications for the future of our country. We have an opportunity now to address some of the major impediments for developing new therapeutics that will emerge from these technological advances. The major obstacles confronting us include:

- Long cycle time to develop biologicals and pharmaceuticals (~8-14 yrs.)
- Low success rate to approvals (<1% preclinical candidates; 5-10% once clinical studies have been initiated)
- Capital intensive investments (average cost for a single product, including failures, is \$1.2B) with unchecked costs especially for clinical development (increasing reliance on outsourcing)
- Escalating costs for novel medications which are borne by patients, payers, and government
- Managing untoward side effects and risks which accompany the salutary properties of these interventions
- Devising medically appropriate clinical endpoints for efficacy trials, particularly those for chronic illnesses, which require long periods of evaluation, or may not be achievable in a practical manner

Solving the problems related to access to capital, reducing the long regulatory times between first clinical candidate testing to product approval, and increasing the success rate of clinical research, while reducing untoward effects of new therapeutics will have dramatic transformative effects on our nation. It will result in better, safer, and cheaper therapeutic interventions and will foster new industries that are yet to be fully defined.

In considering this from a historical, contemporary, and future perspective, one only needs to examine the emergence of monoclonal antibody therapeutics, a cornerstone of the biotechnology industry as an effective paradigm on how we can build upon the successes of the past and present with a bridge to the future. The origins of the industry date back to the 1890's when initial treatments for diphtheria and tetanus infections with horse serum were devised in Germany. While advances in the applications of antibody therapy became more widespread over the next 60 years, replacing horse serum with human serum and the increasing safety of human immunoglobulin therapy, it was not until invention of technology to create monoclonal antibodies, coupled with the advances in genetic engineering, that allowed this part of the industry to spawn. Since that invention and many others to improve critical aspects in production, purification, targeting and composition of these molecules, 34 monoclonal antibody products have been approved by the FDA and include the treatment of a wide range of disorders such as cancer, autoimmunity, and infectious diseases. Furthermore, the prospects over the next ten years are extremely bullish with hundreds of such antibody candidates already in development. New anticipated products in this timeframe include: (a) those directed to novel targets, in part advanced by discoveries in genomics and proteomics; (b) others with potent bi-functional targeting capabilities; (c) a large array of conjugate molecules

containing toxins, drugs, or enzymes; (d) monoclonals coupled to nanoparticles to produce therapeutics with slow-release properties; as well as (e) molecules with attributes that make them more effective and safer products. In the more distant future, the prospects also are favorable if we are able to interface and expand upon the existing antibody growth industry with the new emerging bio/nano/info technologies. This will facilitate dramatic growth in jobs, new aligned industries, and better medical treatments.

Given this context, how can government best facilitate the creation and implementation of the bio/nano/info technologies for both established, technology dependent industries and the ones yet to be defined? In proposing any government solution at this juncture where “big ticketed” proposals or large bureaucracies would meet with significant resistance, such participation by the government should strive to:

- Facilitate cooperation among government, industry, and academic centers
- Promote the creation and support of small businesses
- Utilize existing infrastructure when possible
- Enhance the implementation and execution of clinical development and regulatory review for health care related proposals
- Develop standardized platforms for clinical data collection and evaluation.

To this end several government solutions should be considered. They include:

1. **Facilitating the access of small businesses to capital** by:
 - a. Providing tax incentives to large, cash-rich companies to provide capital to new small businesses in areas of innovation, where this investment will also translate into a minority ownership by the investor
 - b. Expanding SBIR grant initiatives (and resolve outstanding legislative issues related to eligibility)
 - c. Reducing time from initial grant reviews to award announcement
 - d. Establishing matching innovation grant awards (government and private)
 - e. Provide special grants for advanced clinical development (beyond first-in-man studies) for promising new therapies.

2. **Creating Centers of Technical Innovation** throughout the country. If designed appropriately, they will provide access to instrumentation and technical know-how to innovators and investigators in small businesses and academic centers. There is a huge burden to maintain and acquire the cutting-edge machinery and tools to support innovation. Such an initiative could be modeled after NIAID (NIH) intramural technology branch, where core experts in a technology branch work with investigators in other intramural laboratories to enable experimentation and transfer of knowledge associated with certain technologies, ordinarily unavailable to them. In the current proposal, government technical experts would work on defined problems proposed by investigators outside of government (small businesses and academics), where the collaboration will foster and enhance the overall research. Of course, the government would be remunerated by the participating investigators at rates to recapture a significant portion of their operating costs.

3. **Create a Center for Clinical Biomarkers.** This could have the greatest impact on the product development on the future of our biotechnology and pharmaceutical industries. For many of the diseases that innovators and clinical researchers are trying to address, there is an absence of data on what constitutes “normal” values for healthy individuals or ranges for clinically or pathologically defined stages of acute and chronic diseases. We have long established “norms” for measurements such as blood counts, electrolytes, liver functions, etc., but the key tests to understand if a patient will respond to a drug in different phases of a disease, or which patient has a high likelihood to suffer side effects to a drug are sparse. If we had such tests or “surrogates of efficacy”, then the entire process of clinical drug development could be dramatically improved. Such tests or surrogates will be derived from the cutting edge bio/nano/info technologies and the consequence will be :
 - a. Streamlining of regulatory processes
 - b. Development of faster, safer, and cheaper new products
 - c. Identification of patients who will or will not benefit from treatment, resulting in better outcomes, reducing unnecessary side effects in individuals who will not benefit and overall cost savings by targeting people who will benefit most
 - d. Identification of populations at risk of developing a diseases, resulting in earlier intervention
 - e. Providing patients and health care providers with the specific metrics to make decisions for intervention
 - f. Adopting the translational aspects of cutting edge tools in genomics, proteomics, informatics, statistics, etc.
 - g. Incorporating the yet-to-be-defined technologies in this umbrella
 - h. Propagating new tools and industries in diagnostics and therapeutics
4. **Expanding therapeutic efforts on orphan diseases,** particularly those providing insights into the pathogenesis or treatment of diseases affecting larger populations. The impetus for these efforts is that orphan diseases, are mostly overlooked by industry and government with regard to the development of new therapies due to low commercial potential in the context of very expensive development costs. However, recent examples suggest that pursuits in orphan diseases can provide both potential medical and commercial benefits to patient and industry alike. The success of imatinib in treating the rare gastrointestinal stromal tumors has led to its use in a broader array of more frequent cancers. The approval of canakinumab in cryopyrin-associated periodic syndromes (CAPS), a very rare immune system disorder, is resulting in the treatment of more common inflammatory diseases. While industry has begun to expand efforts in these orphan diseases, the government can provide additional impetus through granting initiatives and cooperative centers for discovery. Emerging infections present another important example where it is not commercially viable to develop new therapies. Unlike other “orphan” diseases, the unpredictability of where cases will appear during any given season makes testing of new experimental treatments exceedingly difficult. New government–approved paradigms are needed for these diseases.

From: Andrea Thomaz [<mailto:athomaz@cc.gatech.edu>]
Sent: Wednesday, June 30, 2010 11:51 AM
To: Stine, Deborah D.
Subject: Re: Follow-up to PITAC/PCAST Meeting on June 22

Hi Deborah,

I found the PCAST meeting very interesting last week. I have some follow-up comments for the committee as they are preparing their summary report.

First, I'd like to reiterate the sentiment that went around the table time and time again, that we need to rethink how our nation's support of basic research can let people do more open-ended research. We need mechanisms for accountability that don't stifle long-term agendas.

Second, I'll include a summary of my comments to the committee with respect to robotics and its role in the US economy and the "golden triangle" in particular. And I've included a more detailed response to the question I got from Dr. Jackson during the meeting:

The technology opportunity I decided to highlight is service robotics, because they have the potential to dramatically impact such a diverse set of societal needs. Robots that are capable of working alongside people will revolutionize workplaces. A key example of this and one that has the potential to dramatically influence our economy is in manufacturing.

Robotics represents perhaps our best opportunity to achieve higher levels of domestic manufacturing agility and overall productivity needed to retain high-value manufacturing jobs in the U.S., provided that the current state of the technology can be significantly advanced. These kinds of high-value manufacturing jobs will be a key element in our ability to capitalize on the markets at the intersection of the "golden triangle".

Today's industrial robots lack the capabilities required to do more than just blindly execute pre-programmed instructions in structured environments. This makes them expensive to deploy and unsafe for people to work alongside.

There is an opportunity to usher in a new era of agile and innovative manufacturing by developing service robots as co-workers in the manufacturing domain. These capable assistants would work safely in collaboration and close proximity to highly skilled workers. For example, providing logistical support, automatically fetching parts, packing/unpacking, loading, stacking boxes, emptying bins, detecting and cleaning spills.

And these service robots are not only relevant to manufacturing, very similar logistical robotic support could help streamline the operation of hospitals, driving healthcare costs down.

In order to realize this vision, we need to move beyond robots only operating in relatively static structured environments. This presents several basic research challenges, and I think that the following three are most critical to progress.

- This requires advances in sensing and perception technology, allowing robots to keep track of a dynamically changing workplace.
- Manipulation is a key challenge as well, robots need the flexibility to be able to pickup and use objects in the environment without tedious pre-programming of specialized skills.
- Finally, an important challenge in bringing these robots to fruition is advances in human-robot interaction. We need these robots to work safely and efficiently in collaboration with human workers. People can't just be seen as an obstacle for the robot to navigate around, the robot needs to reason about and understand people as interaction partners.

Recently, over 140 robotics experts across the country have come together to articulate a national robotics initiative, a robotics research roadmap. This roadmap lays out the target areas where we think robotics research efforts need to be supported in order to bring about robot technology that will have the biggest impact on our economy and our society. This roadmap has been developed in collaboration with industry, with an eye toward how we can cross the "lab gap" to realize service robots in the U.S. economy. Our goal is that this roadmap influences the research initiatives of government funding agencies, particularly non-defense agencies that do not typically support robotics research.

The comment from Dr. Jackson was interesting, she said (I'm paraphrasing) "Aren't you leaving out the challenge of Sentience or AI needed?" At the time I said something like: yes, I think that the notion of AI cuts across all of the three areas I mentioned, but particularly human-robot interaction. In order for a robot to work side-by-side with a human partner it will need human compatible intelligence capabilities.

But my longer answer is: No, I don't think we need AI for service robots. Or I don't think that's what we should call it in order to focus the research community on the concrete goal of realizing service robots in manufacturing and other aspects of society. Yes, perception and manipulation and HRI and autonomy in general all fit under the umbrella term of AI. But the term AI is too vague and harkens to science fiction. So, particularly in settings like PCAST where the focus is on concrete objectives and job creation, I don't find it productive to lump everything under the term AI.

If instead we talk about the specific intelligence challenges, suddenly it all seems much more achievable, and we can imagine some semi-autonomous form of service robots being deployed in the not so distant future. We see that off-the-shelf sensing technology is getting better and better, and notice that academic and industrial partners are making the manipulation problem seem more achievable everyday (e.g., the Willow Garage PR2 now can plug itself in, and is on its way to opening doors generically). And in terms of AI for human-robot interaction, yes we need to make some significant advances in computational models of social intelligence before robots can truly interact with people in unstructured environments. But do we need to solve AI? I don't think so.

Thank you for the invitation to the workshop. I hope to continue to be a productive part of the conversation and in helping shape the future of technology in the U.S.

Best regards,
Andrea L. Thomaz

From: Picconatto, Carl A. [picconatto@mitre.org]
Sent: Thursday, July 01, 2010 9:03 AM
To: Stine, Deborah D.
Cc: Jochum, Gera M.
Subject: RE: Follow-up to PITAC/PCAST Meeting on June 22
Attachments: PITAC Follow-up Comments,6-10.docx; PITAC Mtg. Q&A.docx

Debbie,

Thank you very much for the invitation to participate in the recent PITAC meeting. I found the meeting extremely interesting, and I hope you got what you wanted out of the event.

As you suggested in your email, I am writing to provide you with a few follow-on thoughts. In addition, I thought I would send you the answers to the workshop questions I wrote in preparation for the meeting. Both of these are attached in Word files. Neither of these documents are very polished, but I hope they will be useful to you nonetheless.

It was a pleasure seeing you again, and I hope we will be able to collaborate again soon.

Regards,

Carl Picconatto

PITAC Meeting, 22 June 2010
Follow-up Comments
Carl A. Picconatto

- Issues and problems discussed did not seem either new or unique. While still very real, important, and challenging, the major issues surrounding the application of Golden Triangle (nanotechnology, biotechnology, information technology) pursuits and innovations to increase jobs and GDP are familiar. For example:
 - Technology transition difficulties, i.e., the “valley of death” or the less popular “Darwinian Sea” metaphor championed by Lewis Branscomb
 - The legitimacy/acceptance/support of interdisciplinary R&D in traditional academic or industrial research institutions
- As such, government policies that address these issues for the broader entrepreneurial community will also be applicable to the Golden Triangle.
- In developing such policies, however, it is important to keep in mind a few key ideas
 - The difficulty in crossing the “valley of death” or obtaining support for innovative R&D pursuit is a “feature, not a bug.” Such difficulties provide a “Darwinian” filter to help ensure only the most promising ideas receive support from our limited resources. Unfortunately, this filter is not very efficient, rejecting many good ideas and passing along many bad ones.
 - When we as a society encounter a problem, we typically ask what can the government do to address the issue or fill the gap. This is a very important and reasonable question. However, we rarely ask the equally important and reasonable question of what is the government doing to cause/exacerbate that problem and how do we get it to stop.
 - There is a dichotomy in that innovation requires, but it is also threatened by, government assistance/interference. And those two really are the same thing, differing only in the eye of the beholder. What is viewed as assistance can have unintended consequence that squelch development. For example, Government support of an activity can instead slow progress by eliminating market forces, such as competition, by the pre-selection of winners and losers by the government policy.
- There is an important role for government policy to address innovation and development issues, but the trade-off and implications need to be carefully considered.

One such area of government assistance that has widespread support from most observers is infrastructure development. Government should focus on providing the underlying resources required to enable the R&D and innovation activities.

In nanotechnology, this is largely represented by access to equipment. Fee for service facilities and multi-institution laboratories should be supported to provide researchers access to the cutting edge metrology and fabrication tools. Access to such capabilities is a key limiter in nanotechnology development. Also, nanotechnology is inherently interdisciplinary rather than stove-piped in a scientific discipline. As such, the government should adapt a “centers”

approach to funding, rather than targeting individual researchers. Fortunately, both of these activities are happening at present and they should be expanded.

In the other areas, the major stumbling blocks will be in the areas of bandwidth and energy/power sources. Both information technology and biotechnology are becoming data intensive pursuits, and the ability to share/transmit information is paramount. Also, these systems are shrinking at the same time they are growing more capable. This puts a tremendous burden on the components that power these devices. They are becoming smaller but have to deliver more. We clearly need greater development in these areas.

What are the new bio/nano/info technologies with which you are involved that will change the world in the next 10 years? What are the unique opportunities at the intersections of these fields?

On the practical side, most of my research is in the area of nanoelectronics, nano-enabled power systems, and nanosensing. I also do some work on the fundamental electrical behavior of molecules, but that is mostly pure science at present. None of these will “change the world” as we generally think about that phrase today, although that in itself is an amazing statement. For example, through Moore’s law we have come to feel that doubling the capability of our computational power, something that is equivalent to the industrial revolution, should happen every two years. In such context, the work in these areas is merely evolutionary. It will help keep us on those paths.

Where it will “change the world” over the limited timeframe of the next 10 years is in niche areas of interest to various government agencies with specialized functions. However, that is not the purpose of our meeting today.

What is relevant is where we are generally going. We have seen the rise of “physical” nanotechnology. Advances in material science, electronics, test and measurement have been dramatic and will continue. Much work still needs to be done, but we are moving into engineering.

Over the next twenty years, we will see the rise of bio-nanotechnology, where molecular and cellular biology combine with physical nanofabrication. This will launch new vistas for medicine and engineering by harness the mechanisms of the cell for manufacturing and therapies.

Ultimately, we move to a convergence of all sciences. The nanoscale is the molecular scale, and nanotechnology is the engineering of systems, of whatever size, at that scale. Essentially putting every molecule where we want it, by design. At this level all science is material science and the new properties are new properties of matter. For example, when we combine electronics and matter we get smart matter, where along with being red, solid, made of wood, the matter has a certain computational ability. Maybe it knows its point of failure, as in a structural element. Maybe it knows what it is supposed to be next too. Maybe it just sits and waits for input. When we combine biotechnology and matter we get new biological functions. For therapeutics, for diagnostics, for regeneration. But regardless, as we move toward the convergence of these disciplines, the government will need to adapt its policies, as it already has begun to do.

Where is the basic research taking us? What knowledge gaps remain?

Basic research is taking us where it always has taken us. It continues to address fundamental questions whose value will only be able to be determined in hindsight. Much of it is “wasted”. This is as it should be.

What are the impediments to commercialization and broad use of these technologies?

The present impediments to nanotechnology, beyond the Valley of Death or Darwinian Sea that awaits all new technologies, lies in engineering. For most things we are still at 6.2 work. Development of scalable manufacturing process is the key step. Metrology and other diagnostic tools are required. Great strides are being made, but much work is yet to be done.

What infrastructure is required to properly test, prototype, scale, and manufacture breakthrough technologies?

Nanotechnology is inherently interdisciplinary. The Government was wise to adopt a centers approach to bring various disciplines together. This should continue. Beyond that, the information infrastructure is the critical component. Sharing of information is paramount.

Where should the Federal government invest and focus its resources? What Federal policies or programs relating to these technologies are in need of review? Are new programs or policies needed in light of recent and anticipated advances in these fields?

Basic research should continue as is. However, federal policies in more advanced areas should focus on more of a systems engineering perspective. We can no longer do this type of work independently in our respective disciplines. The centers approach needs to be adapted from an engineering perspective.

From: Judith Estrin [<mailto:jestrin@jlabslc.com>]

Sent: Monday, July 05, 2010 7:20 PM

To: Stine, Deborah D.

Cc: eric.schmidt@google.com; president@rpi.edu; Chopra, Aneesh; Judith Estrin

Subject: Re: Follow-up to PITAC/PCAST Meeting on June 22

Deborah, I meant to send this to you last week, but was traveling - if it is helpful, I hope there is still time to get it into the summary. A few additional thoughts after the meeting:

1. Dr Jackson commented that in the past there was an urgent need (i.e. national security) that made it clear why it is important to focus on and fund the areas that we discussed at the meeting and then went on to say "What is the urgency today?" - I don't think we really answered the question at the session.

The urgent need today is economic security. There are four basic ways to regain any significant job growth in the country. Large company hiring, small business hiring, government hiring, creation of new industries and the high growth start-ups and large company spending that go along with them. Job growth in the first two can be help some through incentives and policy, but for the most part are dependent on consumer and business spending (which is dependent on job growth - so it is a cycle).

The third needs to be done, but is somewhat limited due to our deficit problems. Thus our only real hope over the long term is the fourth and that is what this meeting was all about. Unfortunately the lag time between investment and jobs is long so we wont see immediate effect - but the urgency for long term economic security of the country is now.

2. We talked a lot about what government should do and what corporations might do, but we did not talk about non-profit foundations. They definitely should play a role in funding research, basic and translational.

3. The term "Valley of Death" is used a lot to refer to the gap between a research discovery and commercialization. I think there are two gaps that we ought to be talking about. In the research lab a discovery after a discovery is made, in many cases the technology needs to be developed/refined to make sure that it works at scale before it can be used as the basis of a commercial product. That is gap 1 (Valley of Death). If we cross that gap, a company then decides (or many different companies decide - it may have multiple applications) to create a product. In certain industries we then hit gap 2 as the company needs to go through regulatory hurdles, invest in manufacturing, identify target markets (often through trial and error) and scale up to support the business. This second gap should be handled by the VC community, but in industries that take a lot of cash (biotech/pharma and some cleantech) they are not willing to take the risk.

4. Last, one thing I don't think we discussed is that there are incentives and policies in place that reinforce the status quo and therefore are barriers to moving forward in many of the area in the "Golden Triangle" - it is definitely worth having some group look at each new potential industry and identify not just new policies or regulation that can help them, but incentives, subsidies and regulations that are in place today that should be re-evaluated.

Hope this helps.

Judy

From: Franco Vitaliano [<mailto:vitaliano7@gmail.com>]
Sent: Sunday, July 18, 2010 1:06 PM
To: Stine, Deborah D.; ericsschmidt@google.com; president@rpi.edu; Chopra, Aneesh; Kalil, Thomas A.
Subject: Re: Follow-up to PITAC/PCAST Meeting on June 22

Hi,

It might be interesting for you and PCAST to see a multifunction NBI platform and some of the capabilities of Golden Triangle integration. Attached are three pdf files. Two are heavily compressed to cut down file size so please forgive any lost image quality. The three files present our same Clathrin bio-nanoplatform in three very different guises; for drug delivery, quantum computing, and as a bio-nanolaser.

Drug delivery is the furthest along, and we are excited about our potential capability for treating brain cancers in a new and powerful way. Treating degenerative neurological disorders like Parkinson's and the ravages of drug addiction are also promising areas for our bio-nanotechnology.

The quantum computing application may appear far afield from drug delivery, especially in the national defense role depicted herein. In truth, the NMR mechanisms for achieving quantum processing are much the same as those we currently use in the lab at McLean (I manage and operate the NMR systems in support of the herein described drug experiments). However, for quantum processing we will be using much more advanced NMR methods to overcome the known limitations of standard NMR techniques. Significantly, our quantum processing application also has a strong role to play in the emerging field of quantum medicine (e.g., DARPA recently announced a new program for quantum medicine applications).

Finally, there is our bio-nanolaser. The application described herein describes using the bio-nanolaser for dealing with biofilm in the energy industry, which is a multibillion dollar problem. And once again, there is a significant therapeutic application for the same technology, as biofilm in the human body accounts for 80% of all infections. The bio-nanolaser can also be used as a sensor, for communications, and as component in quantum computing.

All these application are broadly patented, with more US and International patents pending. Business wise, ExQor is a holding company for the IP, and we will be spinning out each field of Clathrin activity into separate new entities that will each ultimately go public and or be sold.

These ExQor applications can help serve to highlight and exemplify the large payoff possible via the U.S. government's NBI initiative.

Please feel free to contact me if you have any questions or comments.

Regards

Franco Vitaliano
President & CEO

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Biofilms are a multibillion dollar global problem that ranges from causing biofouling of energy production and distribution systems, to, by one estimate, 80% of all human infections. In the energy industry, biofilms are implicated in a wide range of petroleum process problems, from the production field to the gas station storage tank. In the field, sulfate reducing biofilm bacteria produce hydrogen sulfide (soured oil). In the process pipelines, biofilm activity develops slimes which impede filters and orifices. Biofilm and biofilm organisms also cause corrosion of pipeline and petroleum process equipment. These problems can be manifested throughout an oil or gas production facility to the point where fouling and corrosive biofilm organisms have even been found on the surfaces of final product storage tanks.

Methods commonly employed to prevent biofilm formation include chemical treatment of the water column by biocides or coating the surfaces with antifouling paints. As these methods invariably lead to pollution, environmentally friendly methods are desirable. Further, if these new methods were to also comprise an intelligent, "rifle shot" approach that selectively targets, disrupts, and eliminates biofilm at a very early stage it would yield significant performance benefits. One such new method could use lasers, which are known to cause bacterial mortality.

For example, it has been shown that with marine biofilms, low-power pulsed laser irradiation for a very short duration can remove a significant portion of biofilm from various types of solid surfaces. In addition, because of its ability to modulate cellular metabolism and alter the transcription factors responsible for gene expression, low level laser therapy has been found to alter gene expression, cellular proliferation, intra-cellular pH balance, mitochondrial membrane potential, generation of transient reactive oxygen species and calcium ion level, proton gradient, and consumption of oxygen.

Highly targeted, low level laser irradiation and genetic alteration of biofilms could therefore lead to a breakthrough approach for removing biofilms and disrupting their growth. ExQor Technologies, Inc., has several issued U.S. patents on a new bio-nanolaser technology that can be used in a wide variety of in vitro and in vivo applications. Via our bio-nanolasers we could achieve biofilm removal and disruption, and ultimately, very early disruption of quorum sensing, a type of collective decision-making process used by decentralized groups of biofilm bacteria to coordinate their behavior, thereby preventing biofilm from becoming a highly organized biohazard.

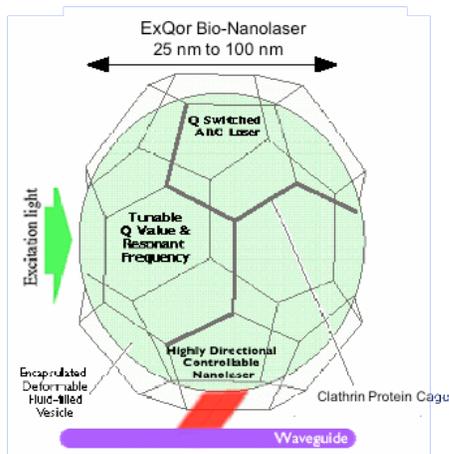
ExQor's bio-nanolasers, which range in controllable sizes from 25nm to 100nm, can operate in a wide variety of difficult and very harsh environments. The bio-nanolasers are comprised of environmentally safe clathrin protein coated vesicles, and can lase in the presence of one or more chemicals, toxins, biological agents, radioactive elements, and other environmental elements, as well as be safely used in vivo for detecting and destroying biofilm type infections.

We have shown that Clathrin protein is extremely robust and can undergo extensive functionalization without losing its ability to safely operate in vitro and in vivo. There are also many tools available to biochemists to make proteins safely accomplish a wide variety of tasks. Likewise, various types of ligands can be attached to a Clathrin nano-laser to serve as targeting and or light triggering elements. Our bio-nanolasers can also be used in communications and information processing, as well as for green technology energy harvesting and light amplification.

ExQor's bio-nano-laser is a self-assembling system, which, in one implementation, utilizes a nano-vesicle. The vesicle is encapsulated and stabilized by the Clathrin protein cage, or coat. The Clathrin coated vesicles are self-assembling at the right pH, and their formulation is well documented.

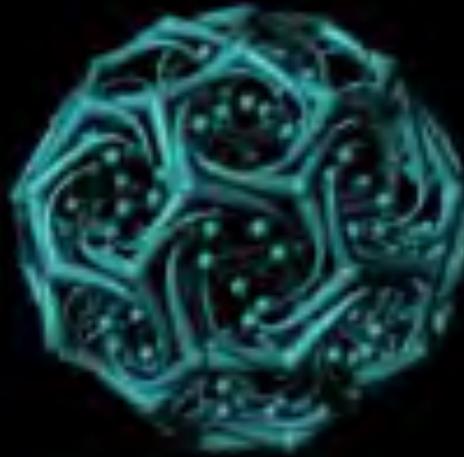
They can be used for microcavity laser and cavity quantum electrodynamics applications (QED), which operate by a very different laser physics playbook. Nanoscale photonics (significantly less than 100nm) using QED feature unique optical properties.

By forcing chromophore-nanocavity interaction, this combination would possess a high enough Q for lasing. Laser light emission from the deformable nanocavity becomes highly directional and controllable. In conventional lasers, the output power depends on the resonator length, whereas here the power of the bio-nanolaser increases exponentially with deformation. Bio-nanolasers can also carry targeted cargo, which can also be used to detect, disrupt and destroy biofilm in vitro and in vivo.



ExQor

Quantum Cognitive Sensors



ExQor Technologies, Inc.
Boston MA USA

Company Overview

2007, Three U.S. Patents Issued for ExQor's protein based bio-nanoparticles:

- Two patents for quantum bio-computing
- Patent for bio-nanolasers

2008, Fourth U.S. Patent Issued:

- Intelligent Bio-nanoparticles
@30-60nm for Biotech, Nanodevices,
and Bio-computing

2009, U.S. & International Patents Pending:

- Dynamic bio-nanoparticles @12-18nm

2007: Non-exclusive licensing agreement with McLean Hospital (Harvard University) for ExQor issued and pending patents.

- *Developing novel CNS diagnostics and therapeutics using ExQor's proprietary bio-nanoparticles.*

2009: In vivo data showing successful passage of ExQor's bio-nanoparticles into brain, requiring minimal modification (a first), and with precise targeting of selected brain regions.

2010: New McLean research projects commence (Parkinson's, etc.) using ExQor's bio-nanotechnologies.

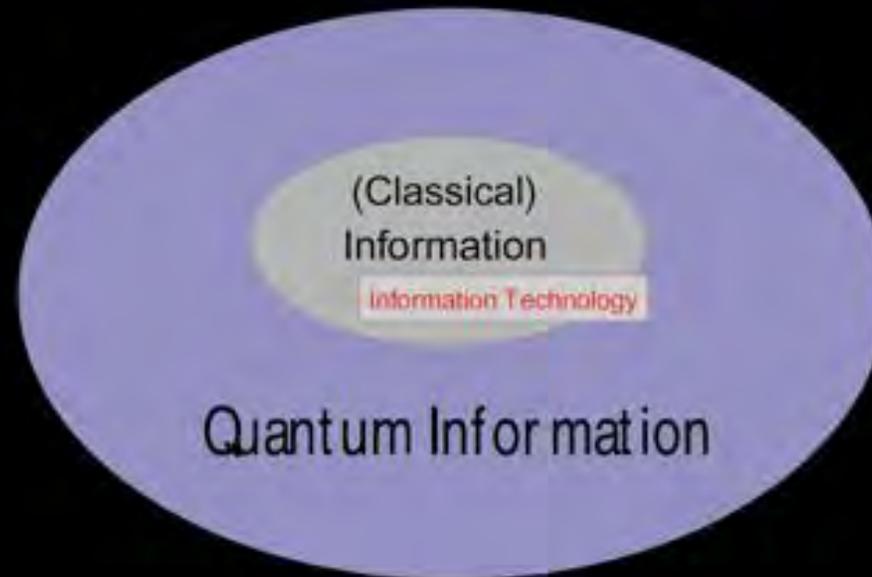
Company Overview

Since 2004, ExQor Technologies has been developing innovative systems

A multidisciplinary research & development approach that integrates:

- Nanotechnology
- Biotechnology
- Information Technology
- Cognitive Technology

Quantum Computers



Quantum information science is a generalization or an extension of classical information theory, which is used by current computer technology.

Quantum Computers

SPEED

SECURITY

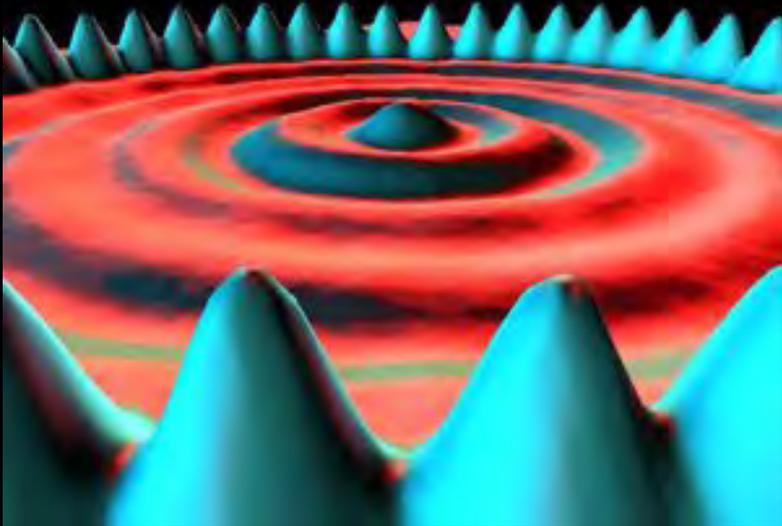
COMMUNICATIONS

Quantum Computers

- Quantum Processing — Billions of operations in a single step.
- Quantum Security — Unbreakable quantum codes; instant detection of attempted cracking or snooping.
- Quantum Communications — ‘Entangled’ quantum systems instantly aware of each other’s state. Awareness not limited by the speed of light. (“Spooky action at a distance”-- *Albert Einstein*)
- Quantum Teleportation — Photons can teleport (But Captain Kirk still has to wait a while).

BUT:

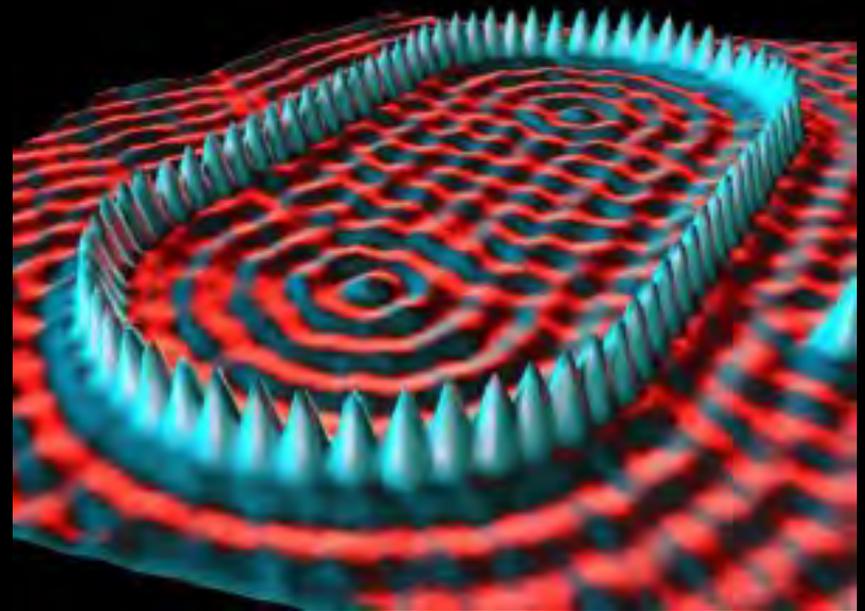
- Searching — Quadratic speedup; not exponential.
- NP-complete problems just as hard on adiabatic quantum computer as on classical computer.
- Earlier work showed equivalence between different variants of quantum computers, so likely rules out possibility of quantum computer helping with NP-complete problems.



Atomic Circular Corral: The ripples in this ring of iron atoms on copper are the density distribution of a particular set of quantum states – STM photo (IBM)

Quantum Computers

- First described in late 1970's, no one believed quantum computers had a practical use until 1994.
- 1994, Peter Shor (AT&T Bell Labs) describes quantum computer algorithm showing even most secure crypto codes can be cracked in seconds.
 - By using quantum rules there was a polynomial-time algorithm for factoring.
- Shortly thereafter, logic gates shown to be possible with quantum systems, as well as error correcting codes.
- Quantum computer race was on!



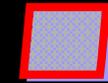
Atomic Stadium --STM Photo (IBM)

Quantum Computers

- Regular computer bit is either on *or* off.



- Each atomic quantum bit -- a 'qubit' -- in *superposition* is simultaneously on *and* off.



- Single qubit is inherently a parallel computer.

- Atomic qubits have exponential processing power, surpassing maybe even information that can be contained in our universe.

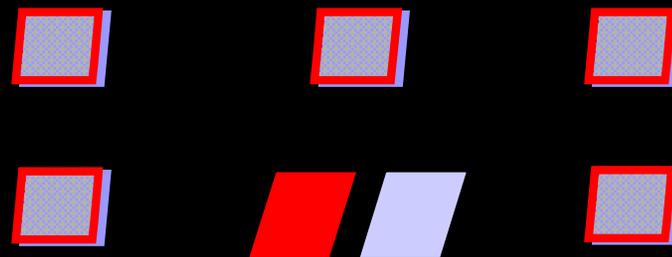


- Quantum systems are *reversible*

- Far less energy needed than regular computers, which are not typically reversible (by rewinding result back to initial state, you save energy).

Quantum System Challenges

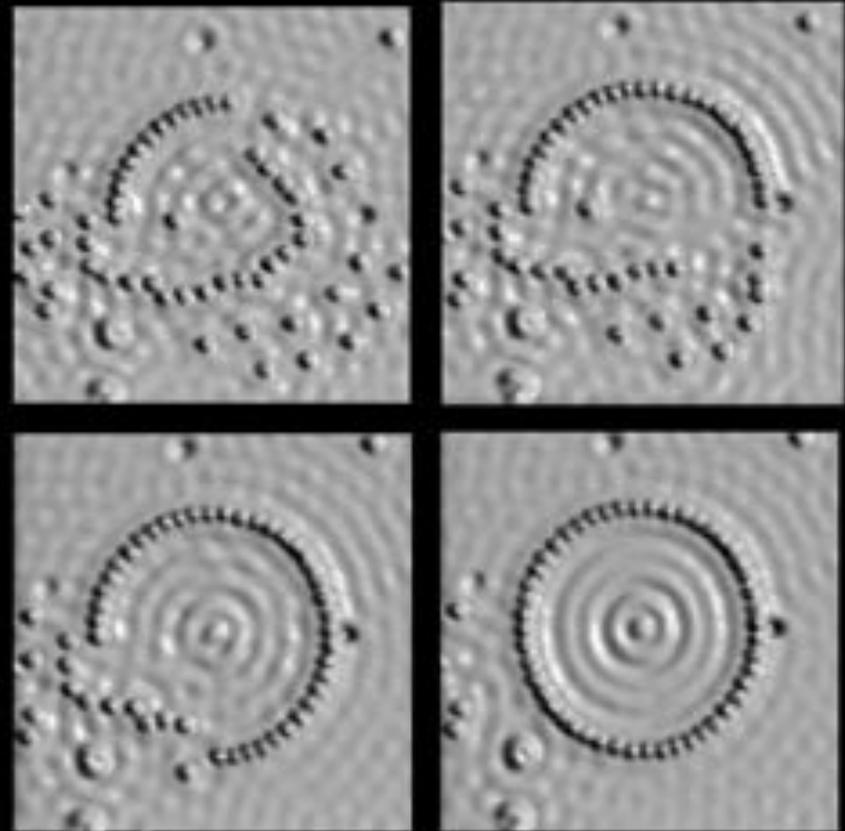
- Decoherence – Not good.
- Useful quantum processing stops, information wiped out as superposition ceases. Happens when state of quantum system is directly observed or interfered with.
- Quantum system states must be kept coherent long enough for information to be processed and transferred from one place to another, otherwise...



POOF!

Quantum System Challenges

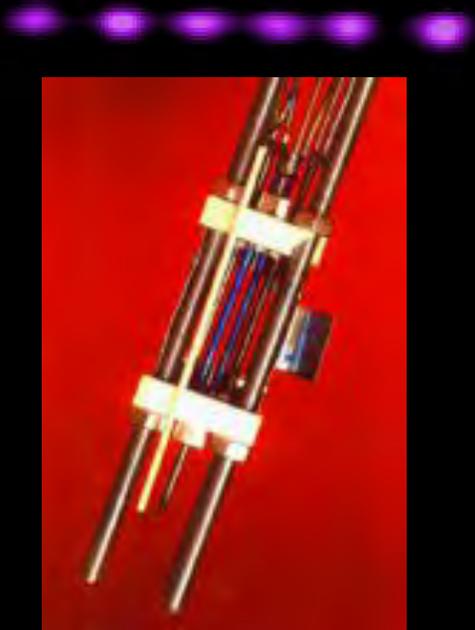
- **Creating highly reliable quantum devices.**
- **Long processing times before onset of decoherence.**
- **Single qubit spin detection. Currently, results obtained using large numbers of qubits and statistically sorted out**
- **Controlling interactions between quantum states in complex many-qubit systems.**
- **New classes of quantum algorithms to broaden quantum system utility as well as sustain coherence times.**
- **New manufacturing know-how and materials to build highly scalable, miniaturized, inexpensive quantum devices.**



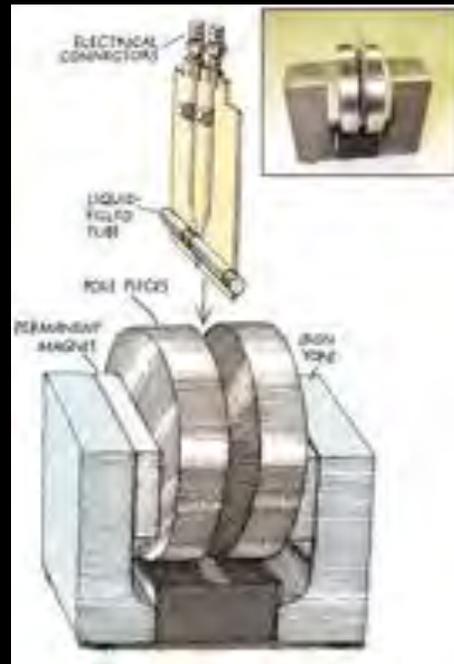
Making the atomic circular corral using iron atoms on copper -- STM Photo (IBM)

Some Quantum Computing Approaches

<i>Technology</i>	<i>Switching Time</i>	<i>Decoherence Time</i>	<i>Scalability</i>
Ion Trap	10^{-7}	10^{-1}	50 qubits?
NMR	10^{-3}	10^4	10-50 qubits?
Quantum Dot	10^{-9}	10^{-6}	1,000+ qubits?



Quantum Ion Trap
(With 6 Glowing Calcium Ions)



Desktop NMR
Quantum Computer



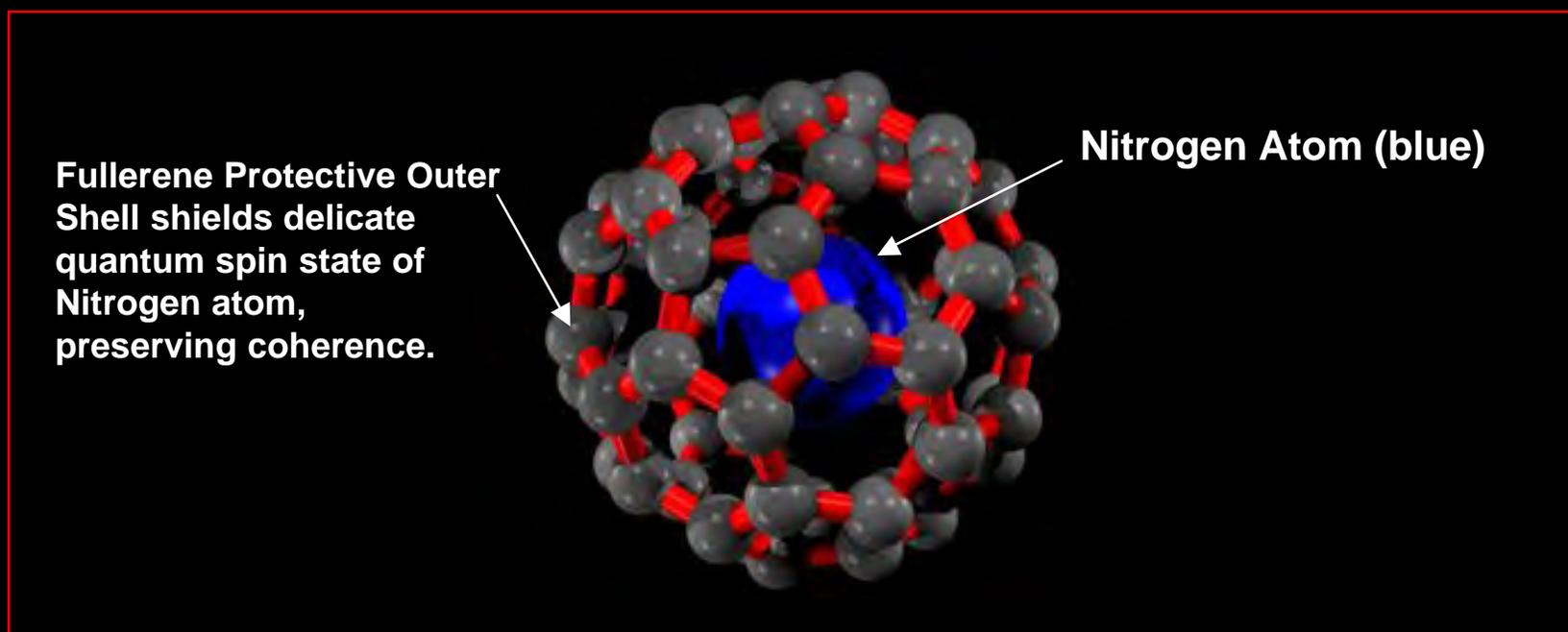
Quantum Dot
Fluorescence activated quantum dots

[A quantum dot is a "box" that holds a discrete number of electrons]

Quantum Computing Materials

One Example

Nitrogen doped, icosahedral Fullerenes for solid-state spin-based quantum computers (QIPD-DF, European Union Project Office)

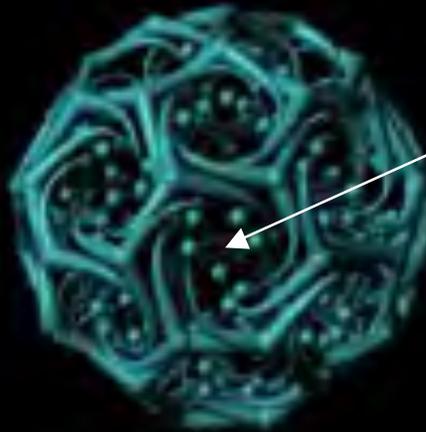


Doped icosahedral Fullerenes have long spin lifetimes and sharp resonances (good for detecting quantum states), two desirable properties for quantum computing.

ExQor *Organic* Quantum Materials

Clathrin icosahedral protein, like nitrogen-doped icosahedral Fullerenes, can be used to create organic quantum computer systems (Vitaliano, patent issued 2007).

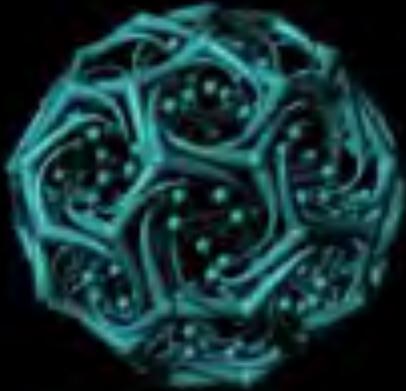
Clathrin protein, naturally occurring icosahedral cage. Automatic self-assembly in human body, and in vitro



Clathrin protective shell shields substances it contains, like vesicles and their cargo.

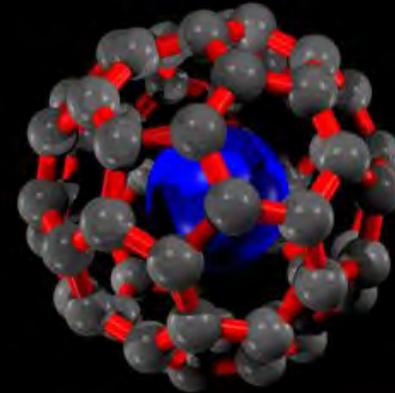
Clathrin-coated vesicles (typically 30-70 nm diameter) constantly assembled and disassembled at incredible speed for intracellular transportation of neurotransmitters and other vital substances for cellular functioning in brain and elsewhere.

Quantum-Organic vs. Quantum Non-Organic



Clathrin

- Low cost fabrication
- Naturally occurring dodecahedron
- Off the shelf Biotech tools
- Robust, Highly scalable
- Example QIP Methods:
 - Solid State NMR
 - Hyperpolarization
 - Photonic (patented nanolasers)



Doped Solid State Fullerenes

- Costly materials
- Expensive Silicon Fabs
- Exotic materials
- Special manipulation tools
- Solid state single spin detection problem
- Scalability issues
- Extremely difficult to make

Quantum Bio-Sensors

Faster, Better, Cheaper, Smarter

- A powerful *organic* quantum nano-sensor.
- Switching times as fast as solid-state quantum dots and just as scalable.
- Decoherence times as long as NMR quantum systems.
- Exponential sensor processing speed, with extraordinary new capabilities like quantum communications and quantum secure data transmission.



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COMMUNICATIONS

ExQor Quantum Cognitive Sensors

BRILLIANT

SPEED

SECURITY

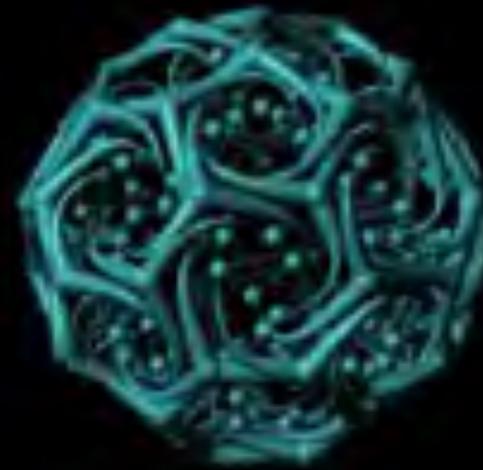
COMMUNICATIONS

ExQor

Quantum Cognitive Sensors

A New Class of Quantum Algorithms

- New cognitive algorithms based on ExQor's study of proteins and signaling in the brain.
- ExQor applying its unique knowledge to its quantum cognitive systems.
- *Breakthrough: ExQor* cognitive quantum algorithms enable instantaneous classification of huge data sets.
 - New kind of exhaustive search for *instantly* locating intrinsic “meaning” hidden in enormous data collections.



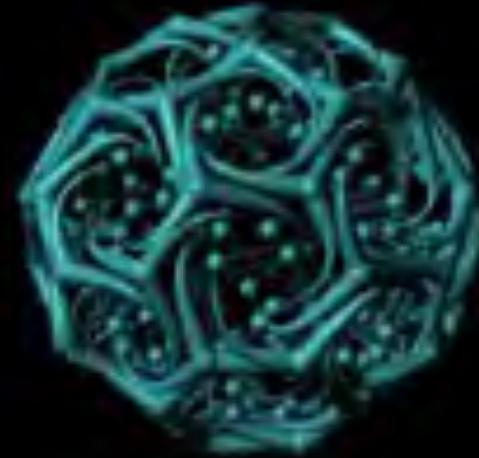
ExQor Quantum Cognitive Sensor



- **Aware of its own existence, conditions, operations, acts, etc.**
- **Capable of independent action based on its critical awareness**
- **Recognizes itself, makes critical distinctions, discerns hidden or subtle meanings**
- **Uses its intelligence as a *means* to adapt and develop new capabilities.**
- **It is not AI**

ExQor Quantum Cognitive Sensor

- Onboard sensor processing power surpassing world's largest supercomputers.
 - ❖ Self-aware sensor intelligence with powerful reasoning capabilities.
 - ❖ Instant awareness of each and every sensor system state no matter the distance.
 - ❖ Automatic distributed sensor fusion
 - ❖ Unbreakable cryptocodes
 - ❖ Totally secure communications.
 - ❖ Low cost nanotechnology
 - ❖ Extremely lightweight systems
 - ❖ Very low power requirements.





ExQor Quantum Cognitive Sensors



- **All Types of Sensors**
- **All Types of Smart Weaponry**

- **Avionics**
- **Robotics**
- **Vehitronics**
- **Unmanned Intelligent Vehicles**

- **All Power Systems**

- **C3, All Levels**
- **Multiplatform Integration**
- **Battlefield Combat ID Systems**
- **Computer and Network Security**

- **Body Armor**
- **Mechanized Armor**

- **Smoke, Fire, Chemical, Biological, Radioactivity, Explosive Detection**

- **Field Medical Assist**
- **Field Soldier Medical Diagnostics**
- **Increased Soldier Survival Rates**

- **Lowered System Acquisition Costs**
- **Lowered Maintenance Requirements**
- **Lowered Total Life Cycle System Costs**
- **And Many More Areas**

ExQor MQ-X



Disruptive Technology Example

Quantum Sensors + UAV

TV Camera
IR Camera
SAR
MTS (Multispectral Targeting System)
Carry MTS and SAR simultaneously
Acoustic Sensor
EM Sensors
Human Visual Band Sensor Processing
Chemical, Biological, Radioactivity Sensors
All Sensors Operated Simultaneously, Fusion
Auto Target Discrimination, Sort & Acquisition
Cognitive Quantum Sensors
Interoperability Existing Sensors/Data Systems
Exponential Computing Speed
Reduced Radio Transmissions
Quantum Secure Communications
Pilot Required
Two Sensor Operators Required

ExQor MQ-X

Yes
No
No



**UAV/G Force Integration
Common UAV/G Components**

Weight: Less than 2250 pounds

ExQor MQ-X



Disruptive Technology Example

Quantum Sensors, UAV + Soldier Integration

- **Fulfills need for exponential advance in war fighting and highly integrated surveillance/intelligence capabilities**
- **Low cost, modernize effectively when budgets are tight**
- **Savings from using common cross platform components**
- **Reduced training, increased combat/surveillance versatility**



**UAV/G Force Integration
Expanded Situation Awareness**

The ExQor Quantum Sensor Advantage



**Ultra Fast Air/Ground Sensor
Recognition, Interpretation, Fusion,
And Secure Attack Coordination**

ExQor Technologies Location Advantage

Many of the world's largest pharmaceutical companies operating in Greater Boston.

Largest concentration of Clathrin researchers located in Greater Boston area, much of the pioneering work done here.



Boston area universities, hospitals, research centers provide rich, constantly refreshed biotech and multidisciplinary talent pool.

In addition, other types of quantum computing developments underway at MIT, Harvard, BU, enriching local scientific community.

ExQor Quantum Systems

Company Contact

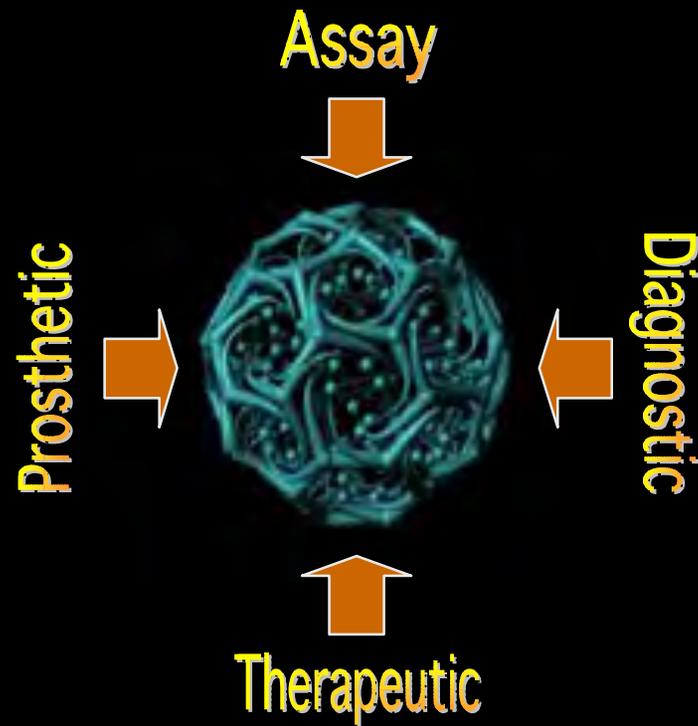
Franco Vitaliano
francov@exqor.com

ExQor Technologies, Inc.
4 Longfellow Place
Suite 2105
Boston, MA 02114-2818

voice: 617.742 4422
www.exqor.com

ExQor

A New Bio-Nanoplatform



Today's Presentation

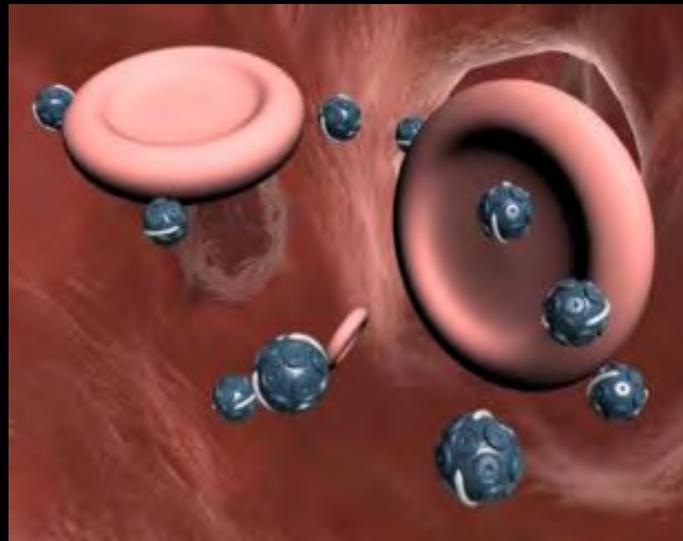
1. The Technology
2. Clathrin Overview
3. Preliminary Data
4. Our Business

Presenters:

Franco Vitaliano
Gordana Vitaliano

ExQor

ExQor is an early stage biotechnology company, founded in Boston MA, 2004.



ExQor's strategy is using its drug delivery IP to transform conventionally delivered small and large molecule therapies into nano-agents, some of which can cross the blood brain barrier (BBB).

Key Criteria For Nano-Drug Delivery

ExQor Leads

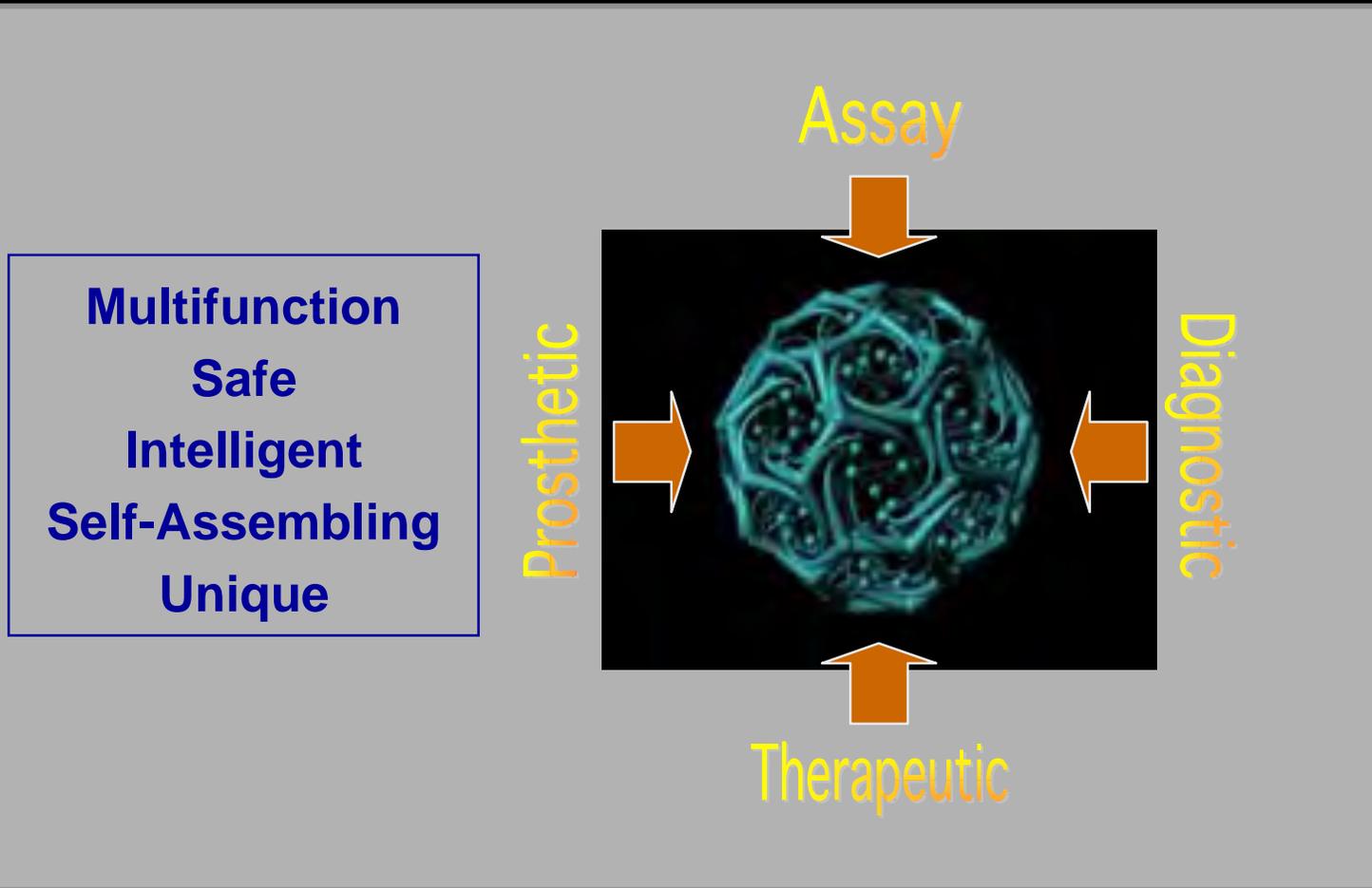
FDA approved nano-scale therapeutics

- Products using NanoCrystal technology (Rapamune, Emend)
- Liposomes (Doxil, DaunoXome)
- Microemulsions (Cyclosporine)
- Albumin-bound nanoparticles (Abraxane)

	ExQor Clathrin	Carbon Fullerenes	Solid Lipid Nanoparticles	Polymeric Micelles
Biocompatible	Yes	No	Yes	Yes
Native BBB-Passing, small and large molecule cargo	Yes	No	No	No
Diameter (nanometer)	12-100	1	80-200	5-50
Stable	Yes	Yes	Yes	Yes
Safe	Yes	No	Yes	Yes
Scalable capabilities	Yes	No	No	No
Multi-cargo capacity	Yes	No	Limits	Yes
Functionalization	High	Low	Medium	High
Natively limits opsonization	Yes	No	No	No
Stabilizes cargo	Yes	Limits	Yes	Yes
Green Nanotech	Yes	No	Yes	Yes
Intelligent	Yes	No	No	No

ExQor

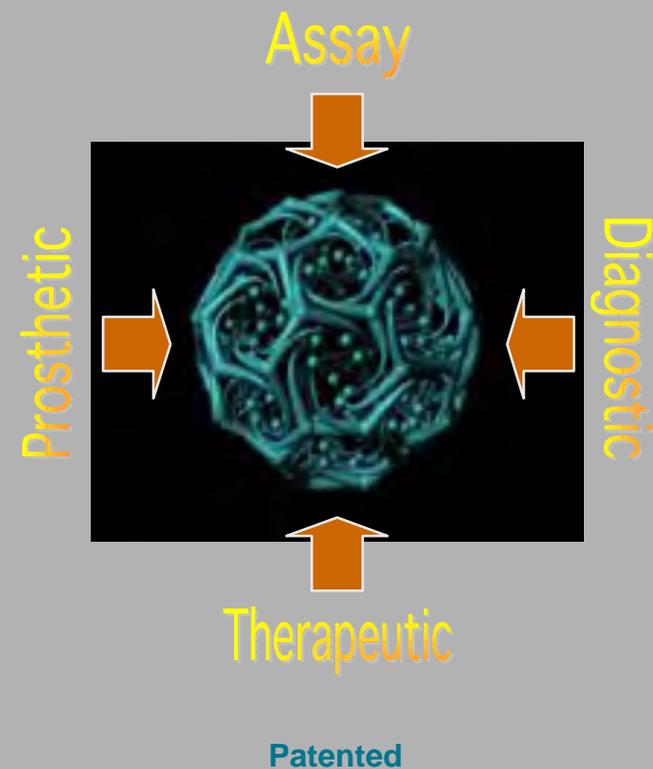
New Bio-Nano Platform



Bioengineered ExQor Clathrin

Unique Features & Capabilities

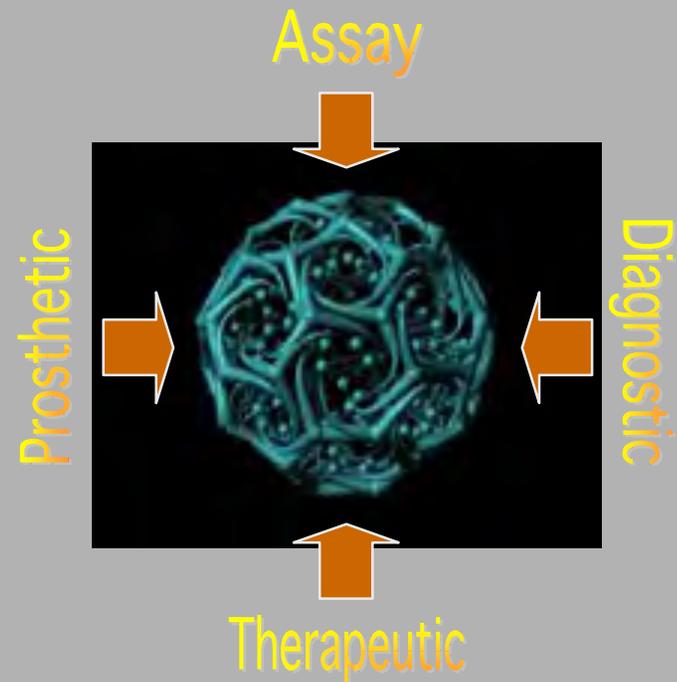
- Nontoxic and biodegradable
- No aggregation
- No opsonization
- No drug alteration
- Multi-cargo capacity
- Native BBB-passing for transport of small and large molecule cargo
- Targeted delivery



Bioengineered ExQor Clathrin

Multi-Cargo Types Carried All At Once

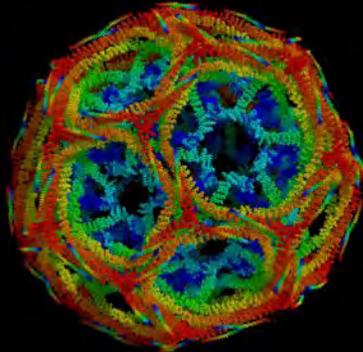
- Pharmaceuticals
- Biologicals
- Radioactive agents
- Magnetic iron oxide nanoparticles
- Nano-scale biosensors
- Nano-diagnostic systems



Bioengineered ExQor Clathrin

Cages: 25nm-75nm

Easy to make, functionalize.



Coated Vesicles: 50nm-100nm

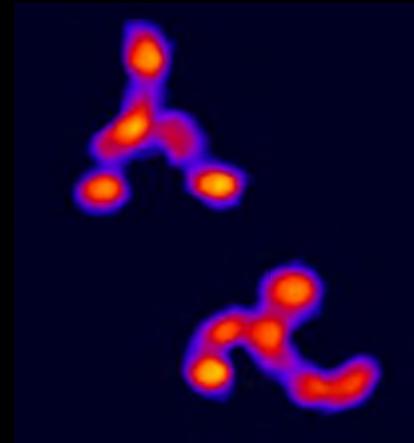
*Sequestered transport via cargo carrying vesicle
(housed inside Clathrin cage).*

*Various vesicle cargo release mechanisms, e.g.,
pH, temp., photonic triggered release (patented).*

Configurations:

- Cages
- Coated Vesicles
- Triskelia

Triskelia: 12nm-22nm

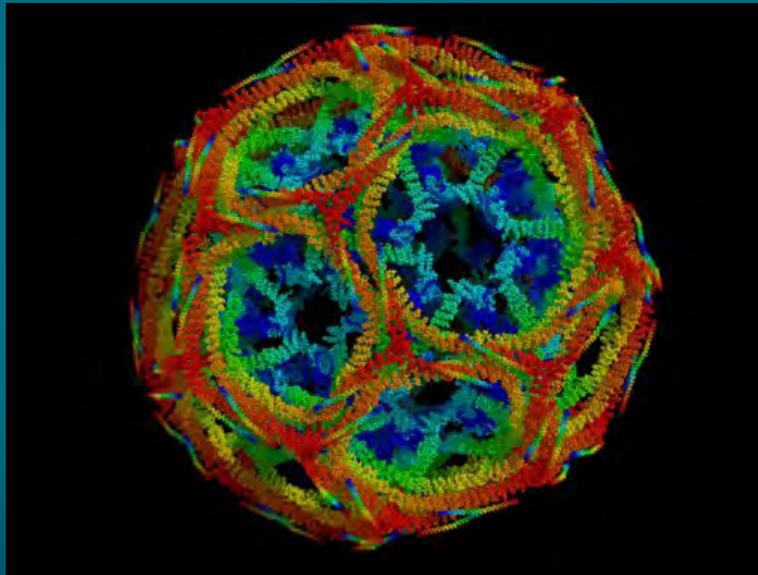


Kotova, et al

Highly effective cargo transporters.

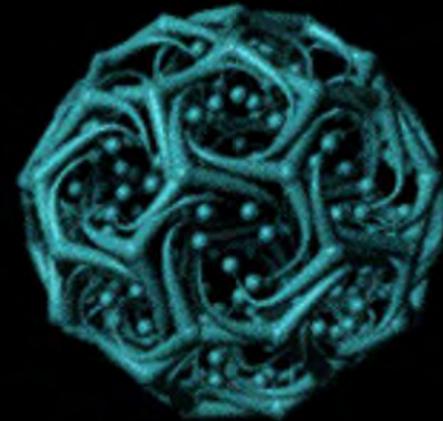
*Straightforward to produce, fewer steps than
making cages, CCV's.*

About Clathrin



An Intelligent Bio-Mechanical Scaffold

The Nano-Platform Differentiator For ExQor



Clathrin is a critical biological element.

Clathrin is a protein that plays a major role in the creation of vesicles (membrane-bound transport packages) in cells.

It forms a polyhedral (soccer-ball-shaped) scaffold lattice made up of many Clathrin molecules that coats a new vesicle (Clathrin Coated Vesicle) as it forms.

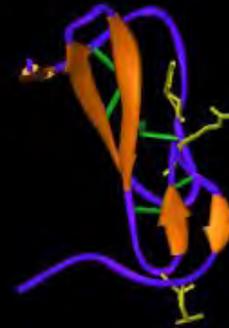
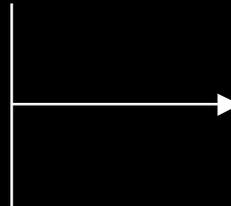
It also helps in protein sorting.

ExQor Clathrin Coated Vesicle For Drug Nano-Transport

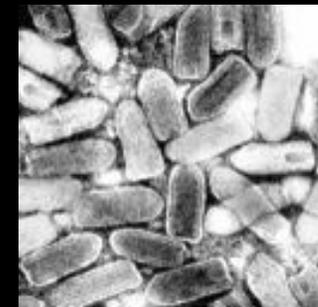
- Natural, in vivo Clathrin coats improve stability and rigidity of liposomes. These characteristics are important for long circulation times of ExQor's encapsulated agents.
- The natural, in vivo Clathrin lattice can be about 100 fold stiffer than the typical liposomal membrane. Also, CCVs have bending rigidity (285 ± 30 kBT) that is estimated to be 20 times higher than the inner vesicle.
- Clathrin-coated vesicles and Clathrin baskets are resistant to trypsin digestion. The polygonal structure acquired by Clathrin when organized into either an empty cage or a CCV has been shown to remain intact even after about 1/3 of its mass is removed by digestion with trypsin.
- Clathrin triskelia are also resistant to pH changes and are able to self-assemble into Clathrin cages and CCVs in pH ranges from 2 to 7. Clathrin coats are also shown not to change lipid membrane fluidity or composition.

Clathrin Dynamics

- Multiple ligands can enter the cell via the same Clathrin coated pit. Furthermore, the CCV's will carry them to the same receptosomes.
- The multiple ligands can be as diverse as epidermal growth factor, vesicular stomatitis virus, or alpha 2 macroglobulin.
- *Multi-cargo capabilities important for designing a drug delivery system*



Epidermal growth factor



vesicular stomatitis virus



alpha 2
macroglobulin

Some of The Ligands That Enter Cells By Clathrin Mediated Endocytosis

- *Toxins and Lectins*

- Diphtheria Toxin
 - Pseudomonas toxin
 - Cholera toxin
 - Ricin
 - Concanavalin A

- *Viruses*

- Rous sarcoma virus
 - Semliki forest virus
 - Vesicular stomatitis virus
 - Adenovirus
 - Influenza
 - West Nile

- *Serum transport proteins and antibodies*

- Transferrin
 - Low density lipoprotein
 - Transcobalamin
 - Yolk proteins
 - IgE
 - Polymeric IgA
 - Maternal IgG
 - IgG, via Fc receptors

- *Hormones and Growth Factors*

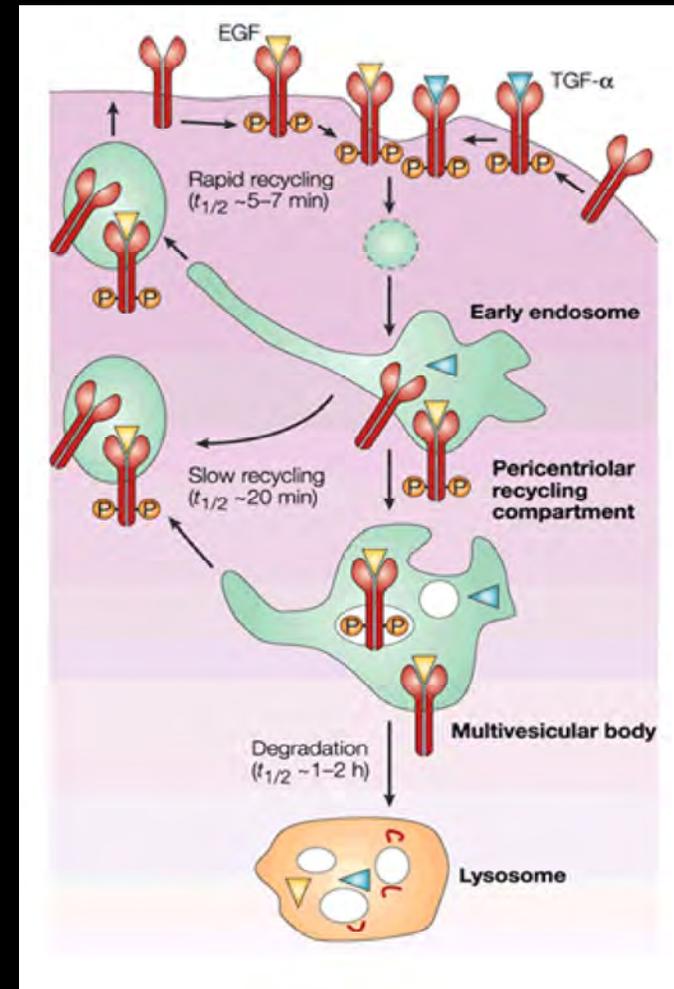
- Insulin
 - Epidermal Growth Factor
 - Growth Hormone
 - Thyroid stimulating hormone
 - Nerve Growth Factor
 - Calcitonin
 - Glucagon
 - Prolactin
 - Luteinizing Hormone
 - Thyroid hormone
 - Platelet Derived Growth Factor
 - Interferon
 - Catecholamines

- *LDL*

- *Neurotransmitters*

Cancer & Clathrin Control Of Receptor Signaling

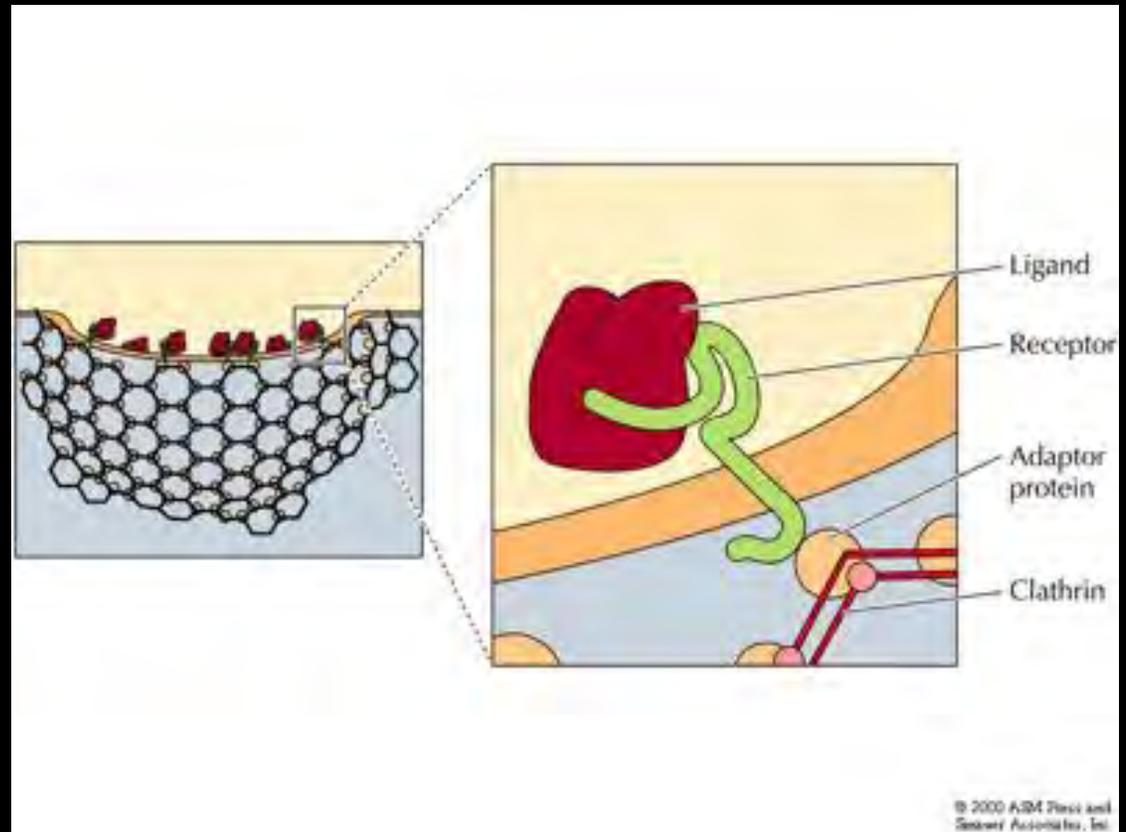
- Endocytosis is vital in controlling Epidermal Growth Factor Receptor (EGFR) related growth; when these receptors are activated, cells rapidly clear them for the surface and destroy them.
- A defect in this process will lead to uninhibited growth of cells and tumors. When too many EGF receptors are produced by the cell, excessive growth occurs.
- Control of EGF receptor signaling is performed by Clathrin-mediated endocytosis. Clathrin coats also exist on endosomes and are involved in endosomal sorting of EGFR.
- The consequence of over-expression of EGFR in tumors is uncontrolled signal transduction through the receptor which leads to increased proliferation, tumor growth and metastasis.
- EGFR expression, overexpression, or mutation is associated with cancer progression, advanced disease, drug resistance, aggressive disease, poor prognosis, and reduced survival.
- Epidermal growth factor receptor is considered one of the main proteins elevated in breast, lung, and prostate cancers, among others. Brain cancer is also implicated with overexpressed EGFR.



**Control EGFR/Clathrin signaling,
potentially control & prevent cancer.**

Clathrin Coated Pits

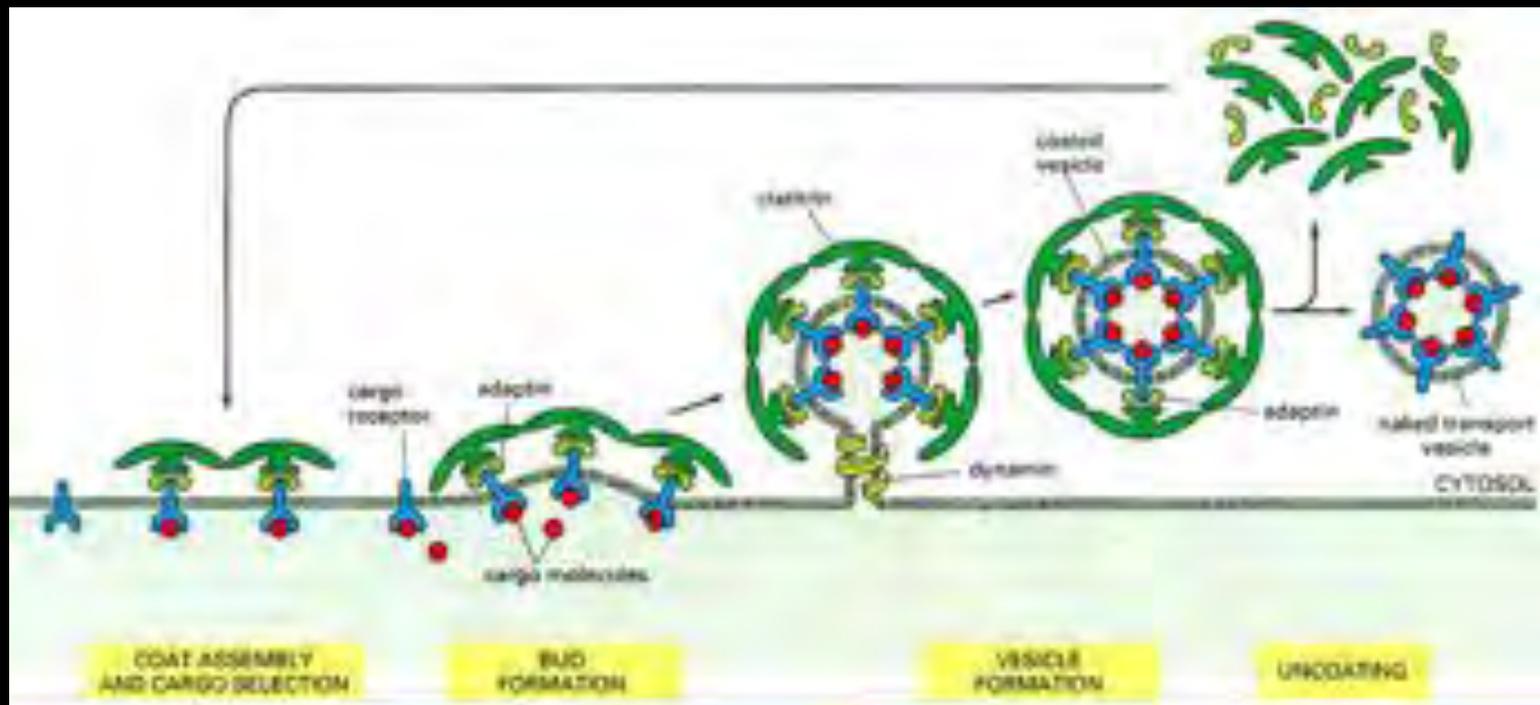
The endocytosis process begins when proteins bound to receptors accumulate in coated pits, which are specialized regions of the membrane where it is indented and coated on its cytoplasmic side with a bristle-like coat of Clathrin and protein adapters.



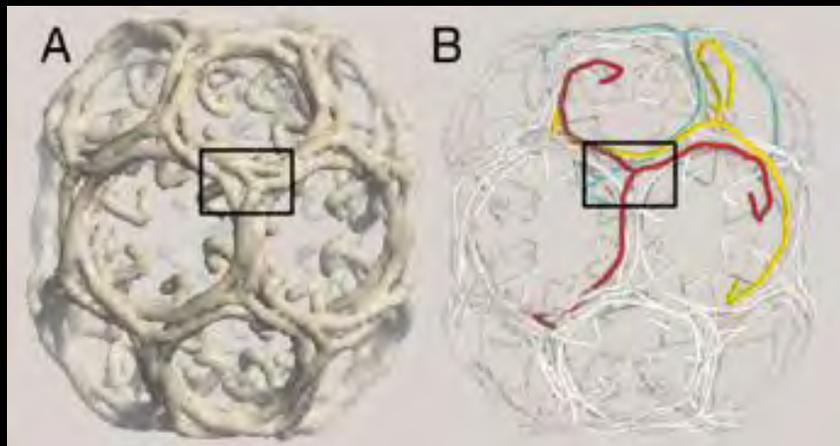
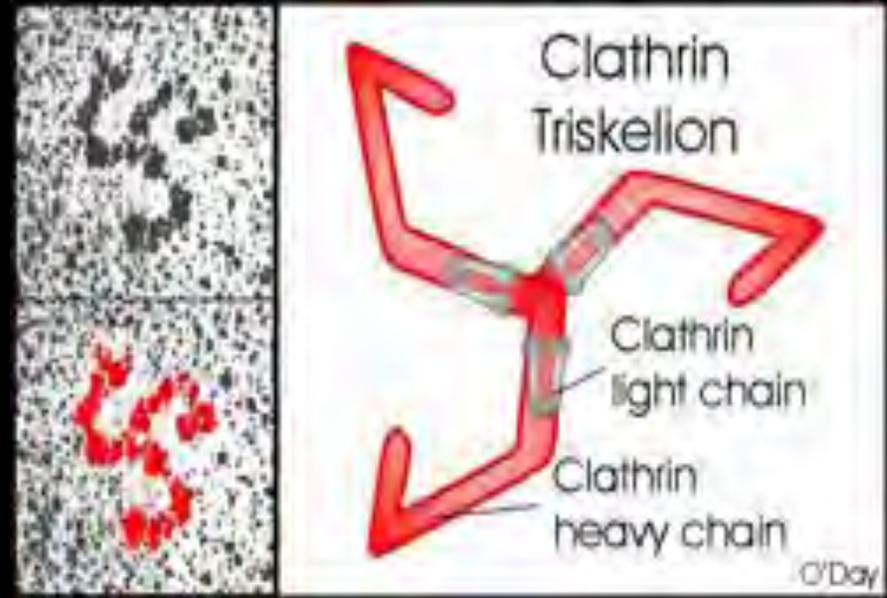
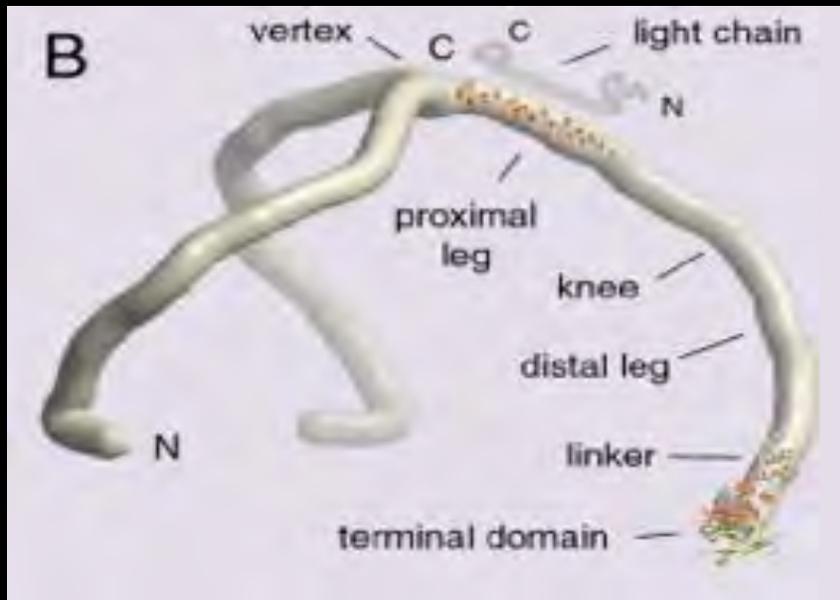
E.g., Adrenergic receptors, GABA_A 5-HT_{1A}, 5-HT_{2A}, ASGP receptor H1, D1, D2 (D2S and D2L), D3, D4, human N-formyl peptide and C5a chemoattractant receptors are endocytosed by Clathrin.

A Natural, Intelligent Nano-Platform

- Natural Clathrin protein, 40 to 100+ nanometers
- Ubiquitous, found in humans, animals, plants, fungi
- Performs endocytosis (transports extracellular materials into cell)
- Clathrin transports multiple heterogeneous cargo elements
- Forms protective cage around vesicle housing cargo elements

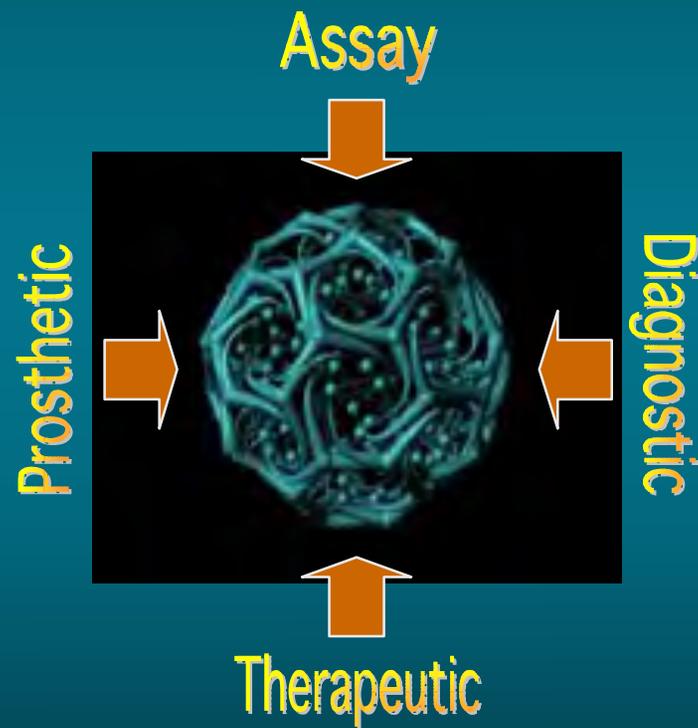


Clathrin Basic Building Block: **The Triskelion**



The heavy chain terminal domain provides multiple interaction sites for a variety of adaptor proteins that can bind multiple ligands.

ExQor Bioengineered Clathrin Preliminary Data



ExQor Clathrin

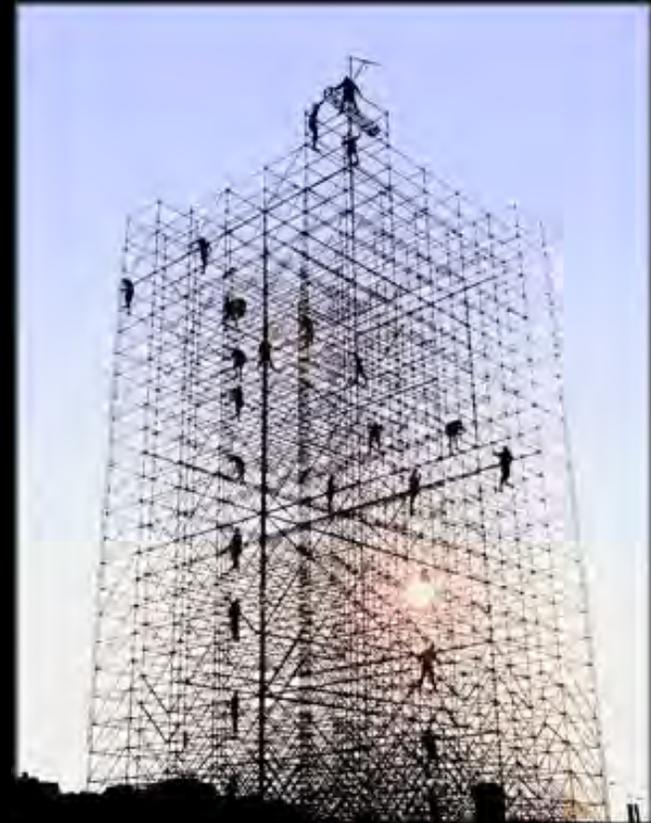
A Versatile Bio-Scaffold

Our patented bio-nanoparticle is a *mechanical* bio-scaffold.

Its versatility, features and capabilities make it unique among competing nanoparticle technologies.

Clathrin protein forms the mechanical scaffold part of a Clathrin coated vesicle.

Clathrin and cell membrane are linked by many different clathrin adaptors, which bind to Clathrin and membrane phospholipids.

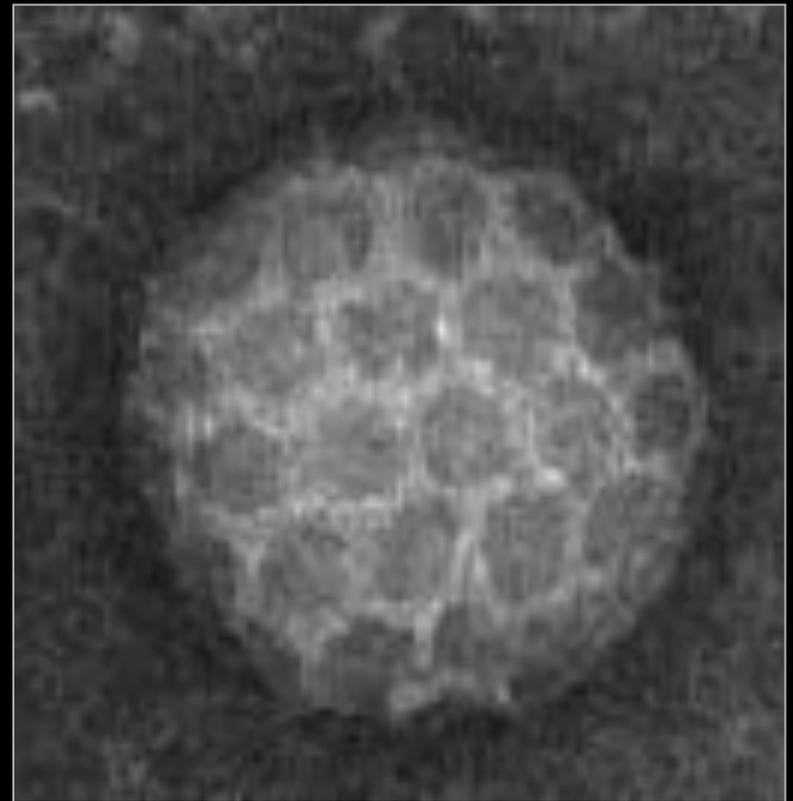


We self-assemble elements into unique multimolecular complexes, forming specialized scaffold motifs, thereby fulfilling significant unmet medical needs.

The scaffolds also transport multiple cargo types, including transporting *large molecule* elements past the blood brain barrier.

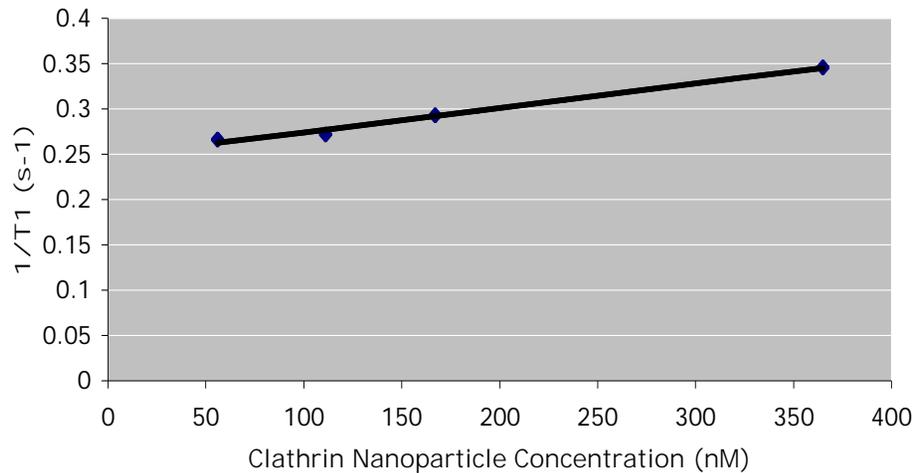
ExQor Clathrin For Drug Transport

- The Clathrin self-assembly process is carried out by preparing clathrin-coated vesicles (CCVs) using any of several methods.
- Clathrin coated vesicle is auto-filled with cargo.
- Alternatively, no vesicle is used, only Clathrin cage used for cargo transport
- Below pH 6.5, purified Clathrin triskelions self-assemble in vitro into a polyhedral lattice (cages) without vesicles. We can use clathrin cages or clathrin coated vesicles (liposomes).
- The mean curvature of baskets is adjustable by the pH level and by other environmental conditions.



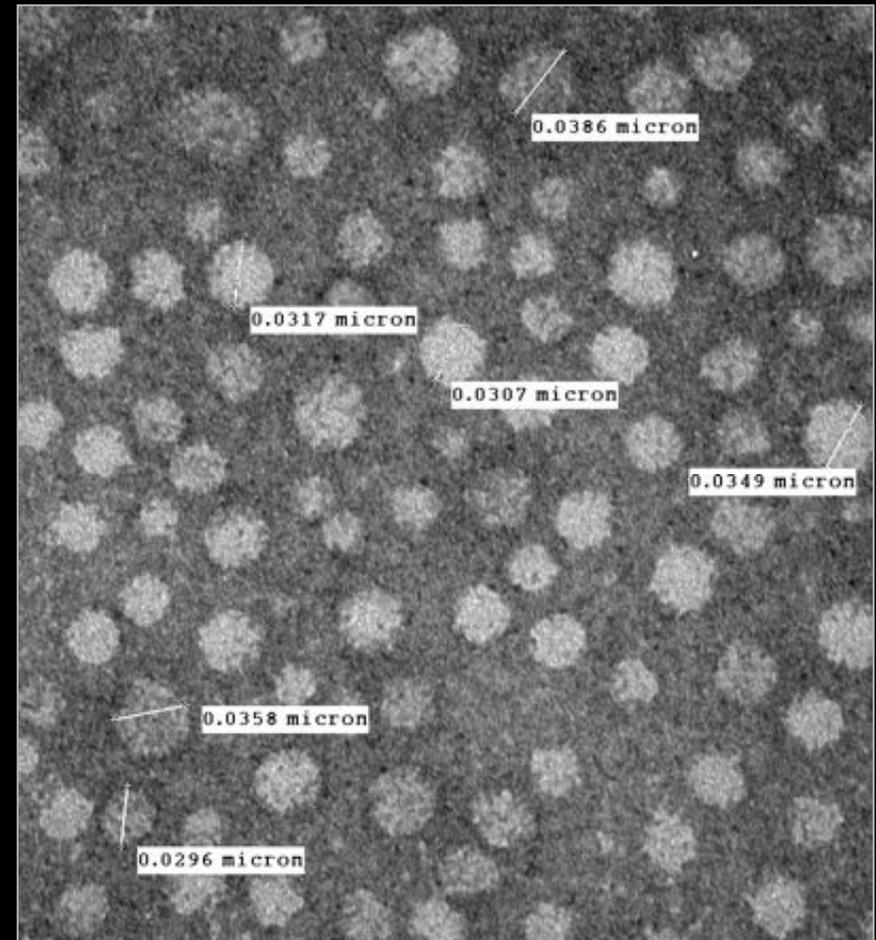
MRI Contrast Agents Clathrin-Gd- Cages

T1 Cages Relaxivity



T1 Relaxivity at 0.47T. Solid line ($R^2 = 0.99$) represents Clathrin Cages with Gd-DTPA contrast agent.

Nanoparticles had ionic relaxivity of $97 \text{ mM}^{-1}\text{s}^{-1}$ that is 24 times better than ionic relaxivity of Magnevist ($4\text{mM}^{-1}\text{s}^{-1}$).

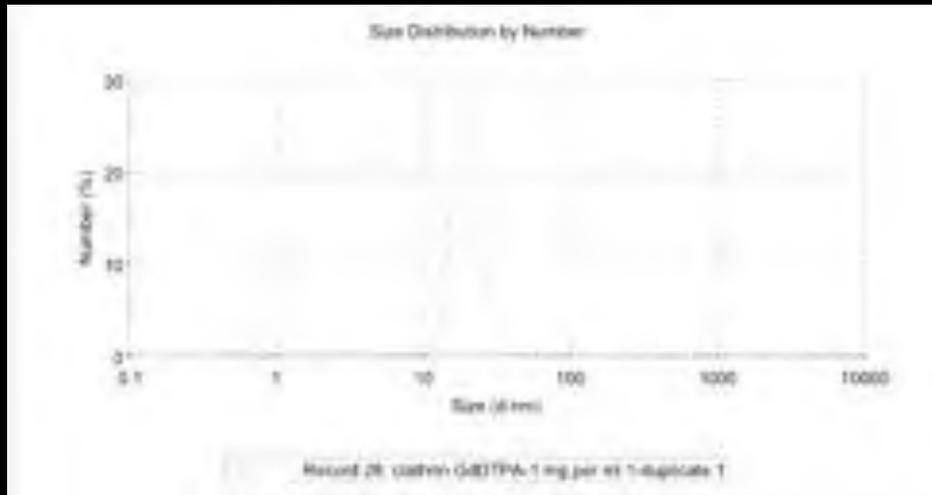


Gd DTPA-Cages

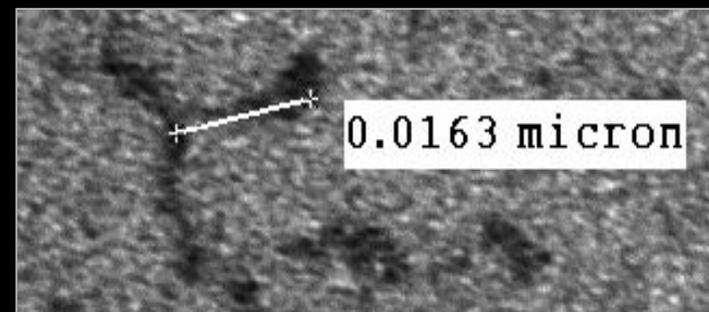
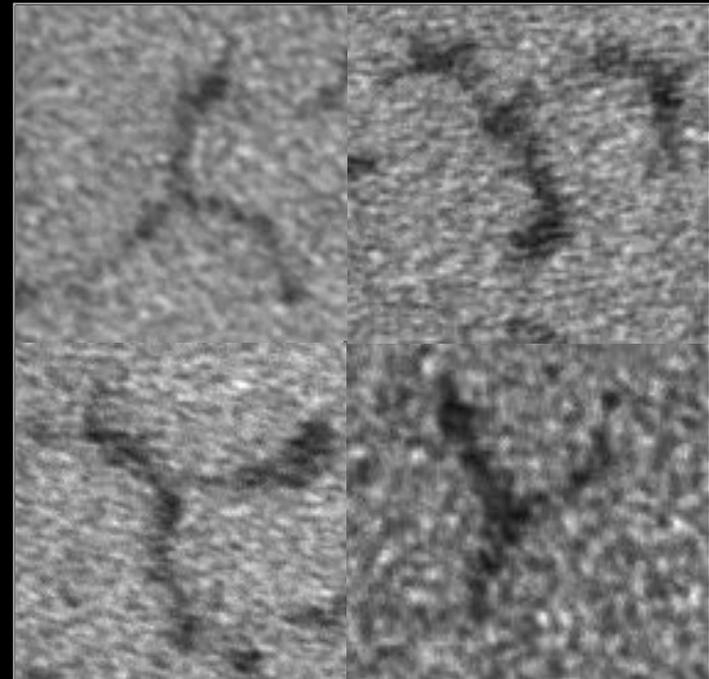
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MRI Contrast Agents Clathrin-Gd Triskelia

Dynamic Light Scattering Data



The mean hydrodynamic radius of Clathrin triskelia with attached Gd-DTPA is 20nm. DLS studies of Clathrin triskelia alone showed a Stokes radius of 17-18 nm (Ferguson et al. 2006, Yoshimura et al 1991).

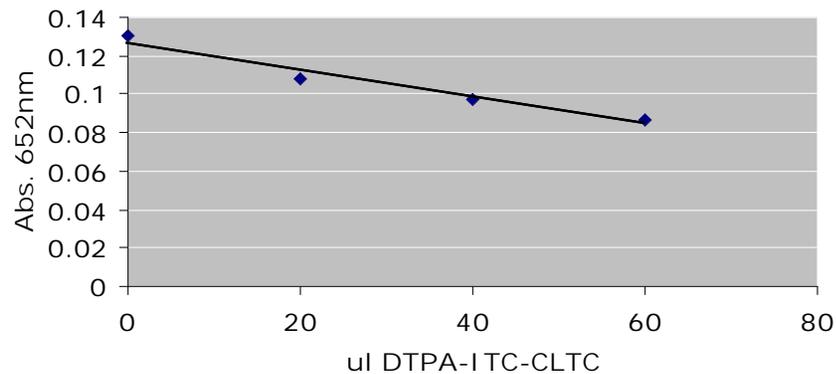


Gd DTPA-Triskelia

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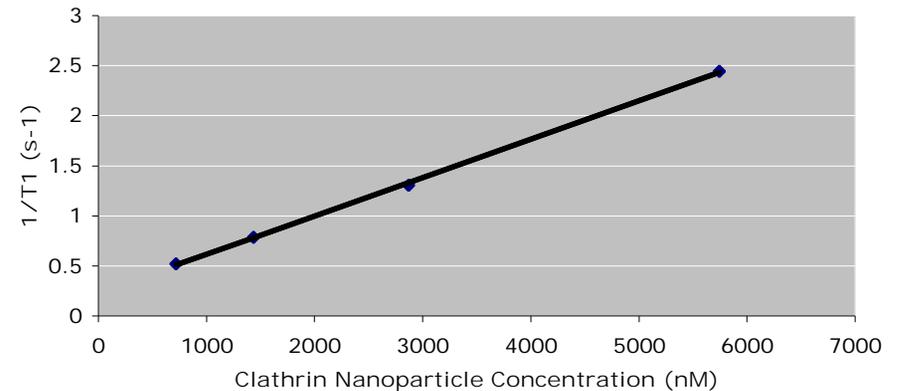
Clathrin Gd DTPA-Triskelia

ArsenazoIII/YIII Assay



Linear relationship between absorbance $A_{652\text{ nm}}$ and the volume of added solution during a sample titration of a yttrium complex of arsenazo III with DTPA-ITC-clathrin triskelia conjugate. The mean Ligand (DTPA-ITC)/Protein (Clathrin Heavy Chain) molar ratio was 27.

T1 Triskelia Relaxivity



T1 Relaxivity at 0.47T. Solid line ($R^2 = 0.9996$) represents Clathrin Triskelia with Gd-DTPA contrast agent. Nanoparticles had ionic relaxivity of $16\text{ mM}^{-1}\text{s}^{-1}$ that is 4 times better than ionic relaxivity of Magnevist ($4\text{ mM}^{-1}\text{s}^{-1}$).

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In-Vivo Research

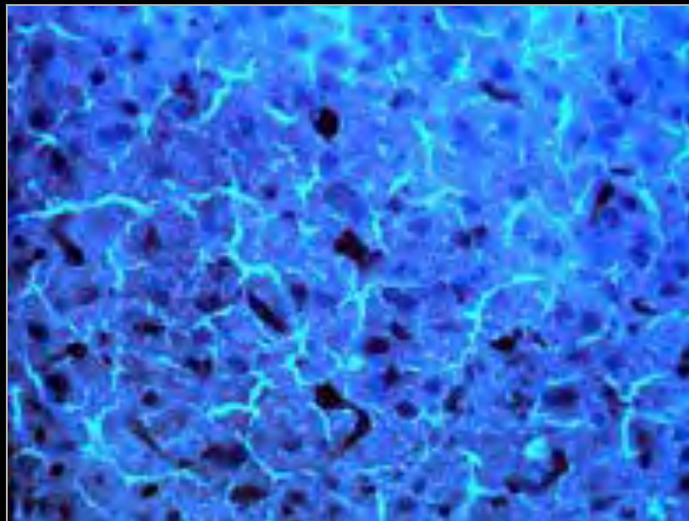
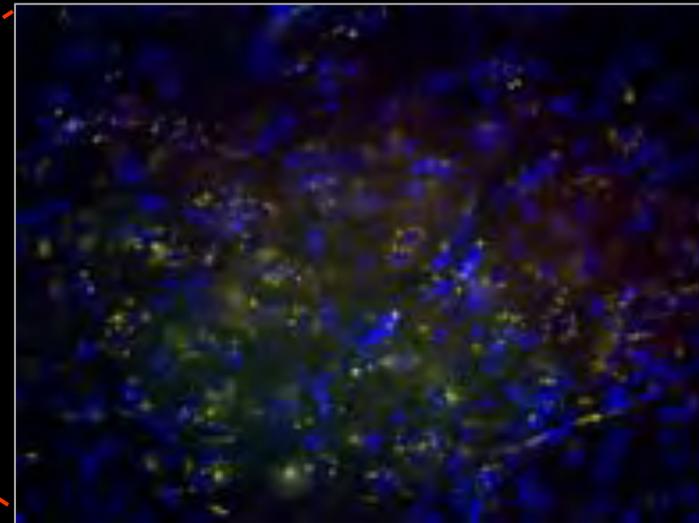
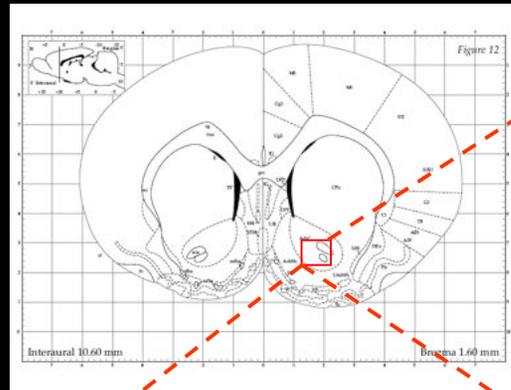
A 2009 in vivo ExQor study provides first evidence that ExQor's patented Clathrin nanoparticles with D3 antibodies can be successfully delivered non-invasively intranasally into the rat brain.

Further, these nanoprobes can target D3 brain regions and remain stable in the rat brain.

In addition, IP administration has shown that our bio-nanoparticles natively pass the blood brain barrier, and further, preferentially avoid other parts of the body like the liver.

Significant milestone, opens the door to various forms of large molecule CNS treatments.

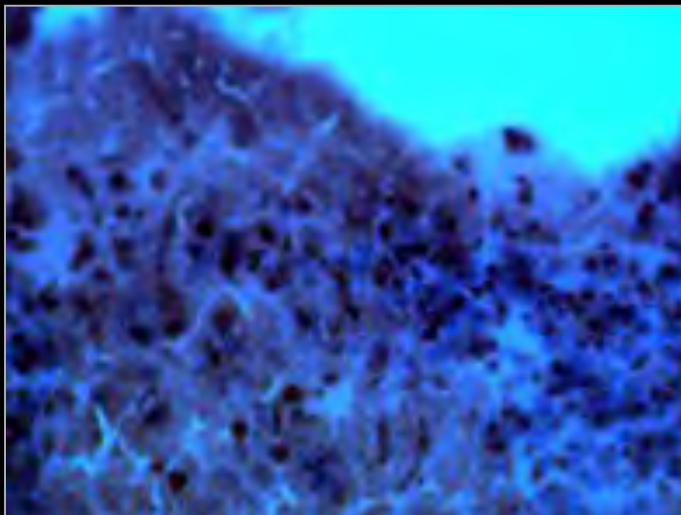
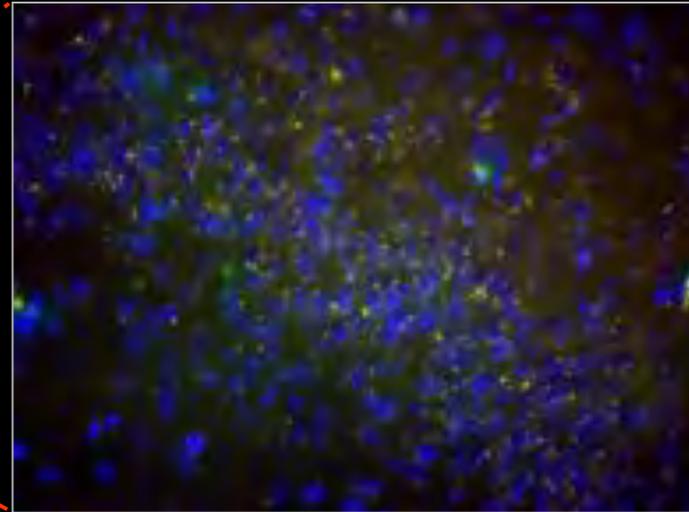
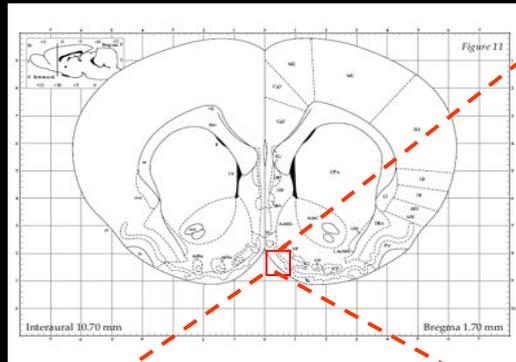
Clathrin D3Ab-nanoprobes



Three hours after intranasal administration D3Ab labeled clathrin nanoprobes were identified by fluorescent and light microscopic examination in the Nucleus Accumbens (rat brain).

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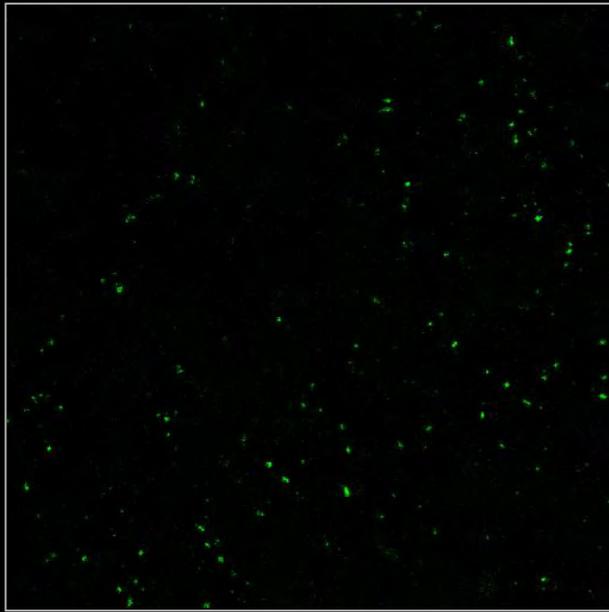
Clathrin D3Ab-nanoprobes



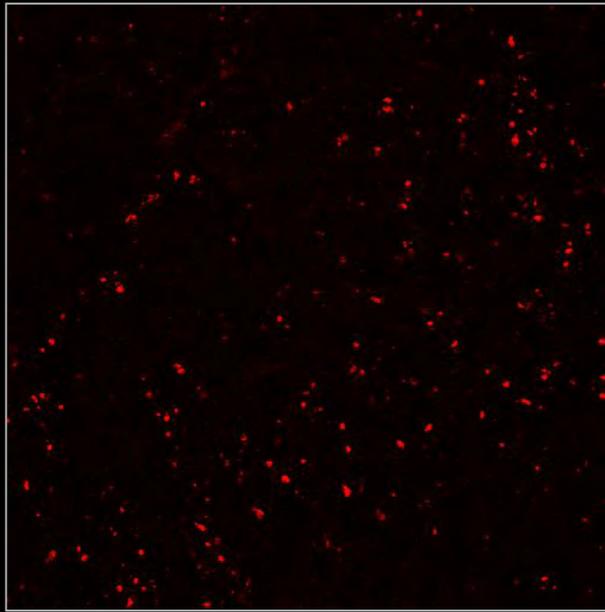
Three hours after intranasal administration D3Ab labeled clathrin nanoprobes were also identified by fluorescent and light microscopic examination in the Island of Calleja (rat brain).

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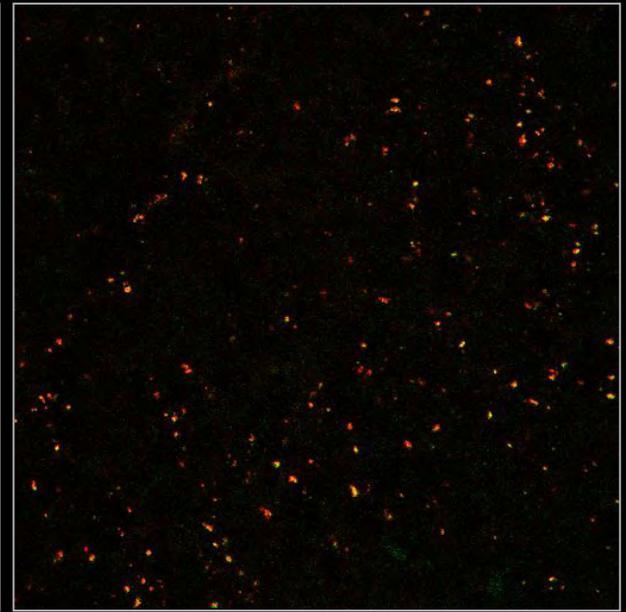
Co-localization of Alexa-488 anti-D3Ab with Rhodamine Clathrin (rat brain)



**Alexa 488-anti-D3Ab
3 hr time point, IC (40x)**



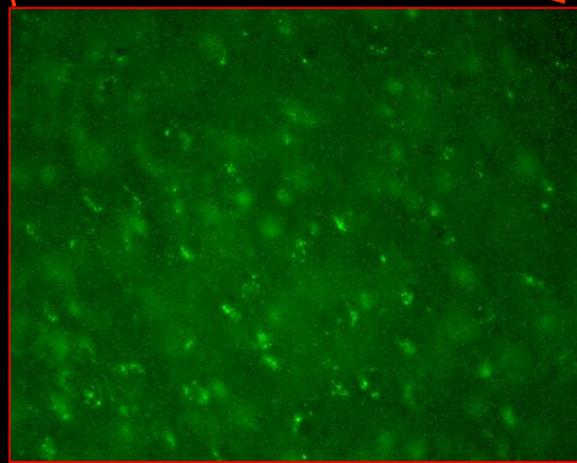
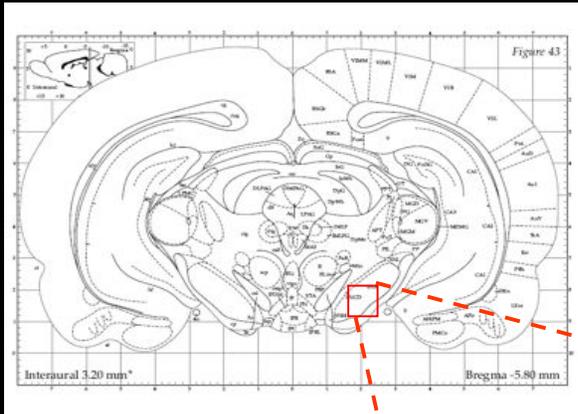
**Rhodamine clathrin
3 hr time point, IC (40x)**



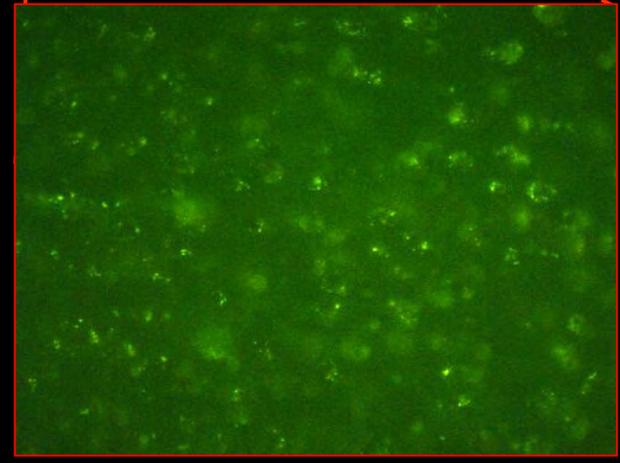
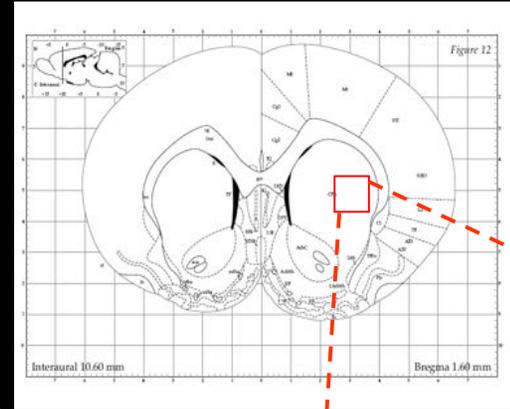
Merged image

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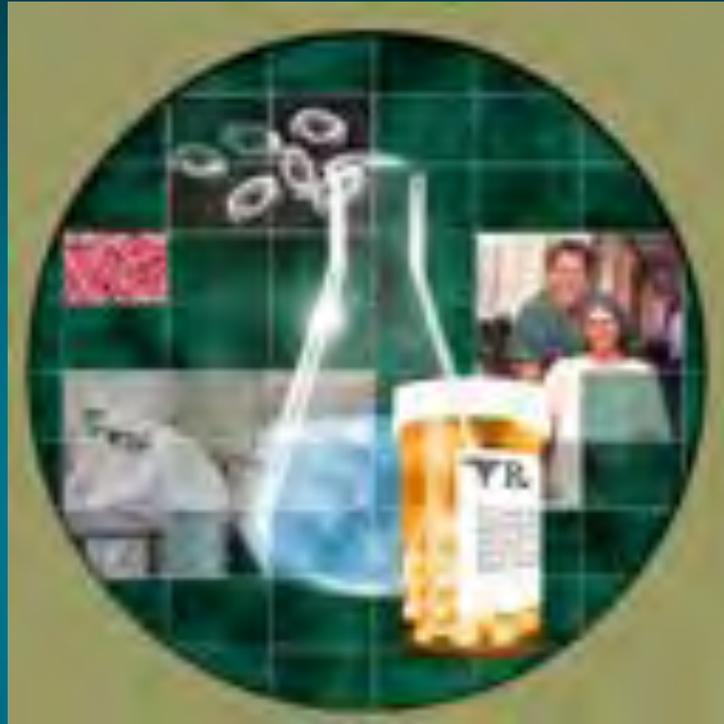
BBB Crossing and Protein Brain Distribution (rat brain)



Localization of Fluorescein-Clathrin in substantia nigra after intraperitoneal administration. 2 hr time point (40x).



Localization of Fluorescein-Clathrin in corpus striatum after intraperitoneal administration. 2 hr time point (40x).



ExQor The Business

ExQor

- Our unique drug delivery nano-platform utilizes bio-engineered proteins protected under US and International issued and pending patents.
- This new platform can function anywhere in the body, including passing the blood brain barrier while transporting both small and large molecules.
- Our unique delivery capability will be of licensing interest to pharma and biotech companies operating in the CNS market space, as it enables new, highly efficacious drugs, and facilitates patents for both new and well-known agents.
- In addition, ExQor will use its patented bio-nanotechnology to internally develop simpler, safer, and more efficacious ways of treating primary and metastasized brain cancers in a variety of inpatient and outpatient settings, fulfilling a significant unmet medical need.

U.S. & International Patents

Issued

Clathrin & Coatomer Cages

Clathrin Coated Vesicles

Multiple Types Self-Assembled Structures

E.g., functionalized bio-scaffolds, bio-devices

Unpublished & Confidential

Clathrin Triskelia

Individual Clathrin & Coatomer Amino Acids

Including their extensive modification

Utilizing, Modifying Associated Proteins

E.g., dynamin, tubulin, AP's, etc.

Regulating Endocytosis & Cell Processes

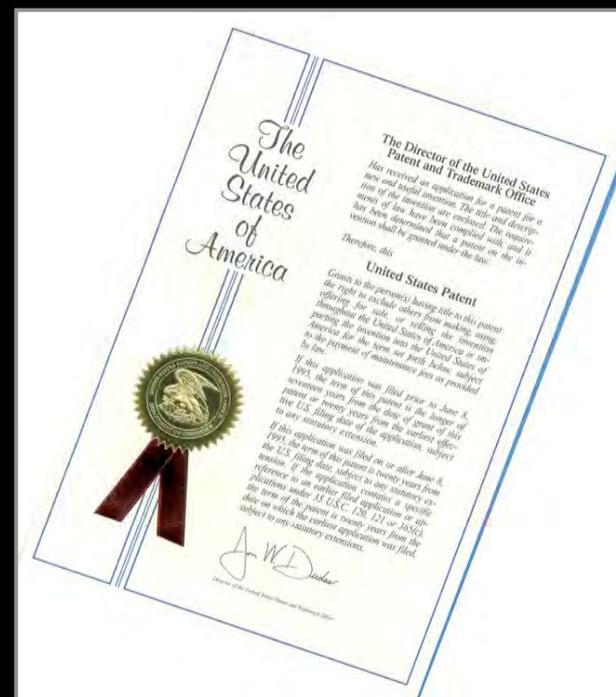
E.g., controlling receptor signaling, regulation

Remedying Cell Disorders, New Cell Growth

E.g., cancer treatments, neurogenesis agents

ExQor IP

**Broad Reaching
Patent Protection
US & Global**



Harvard University/McLean Hospital has non-exclusive license to use ExQor IP.

ExQor has option to license new McLean IP based on ExQor patents.

ExQor

2 Product Tracks Using Same Nano-Platform

1. Cancer Drugs

An initial US FDA Notice of Claimed Investigational Exemption (IND) Application Process by ExQor, with a request for a fast track for proven effective anti-cancer chemo agents (e.g., paclitaxel and cisplatin) encapsulated in our nanoparticles.

Non-invasively pass blood brain barrier to treat CNS metastases, as well treat their primary tumors.

Marketed directly by ExQor to health care providers through local and national specialty distributors, and also to oncology purchasing organizations.



2. CNS Drug Transporters

Blood brain barrier passing CNS drug transporter platform licensed to, and or ExQor partnered with global pharmaceutical and biotech companies.

ExQor

Internally Developed Products *Cancer Drugs*



The chemotherapy market (Est.. \$49 billion, 2012) is currently the fastest growing in the pharmaceutical industry.

- ❖ Relatively small number of Neuro-Oncologists means that treatment of CNS tumors is both expensive and limited in scope.
- ❖ There is thus an unmet medical need for a new CNS chemotherapy approach that enables general oncologists to treat CNS primary tumors and their brain metastases, in both in patient and out patient settings, allowing much larger numbers of patients to receive critical therapy worldwide.

ExQor Bio-nano-platform For Treating Cancer

Projected Results



Before

After

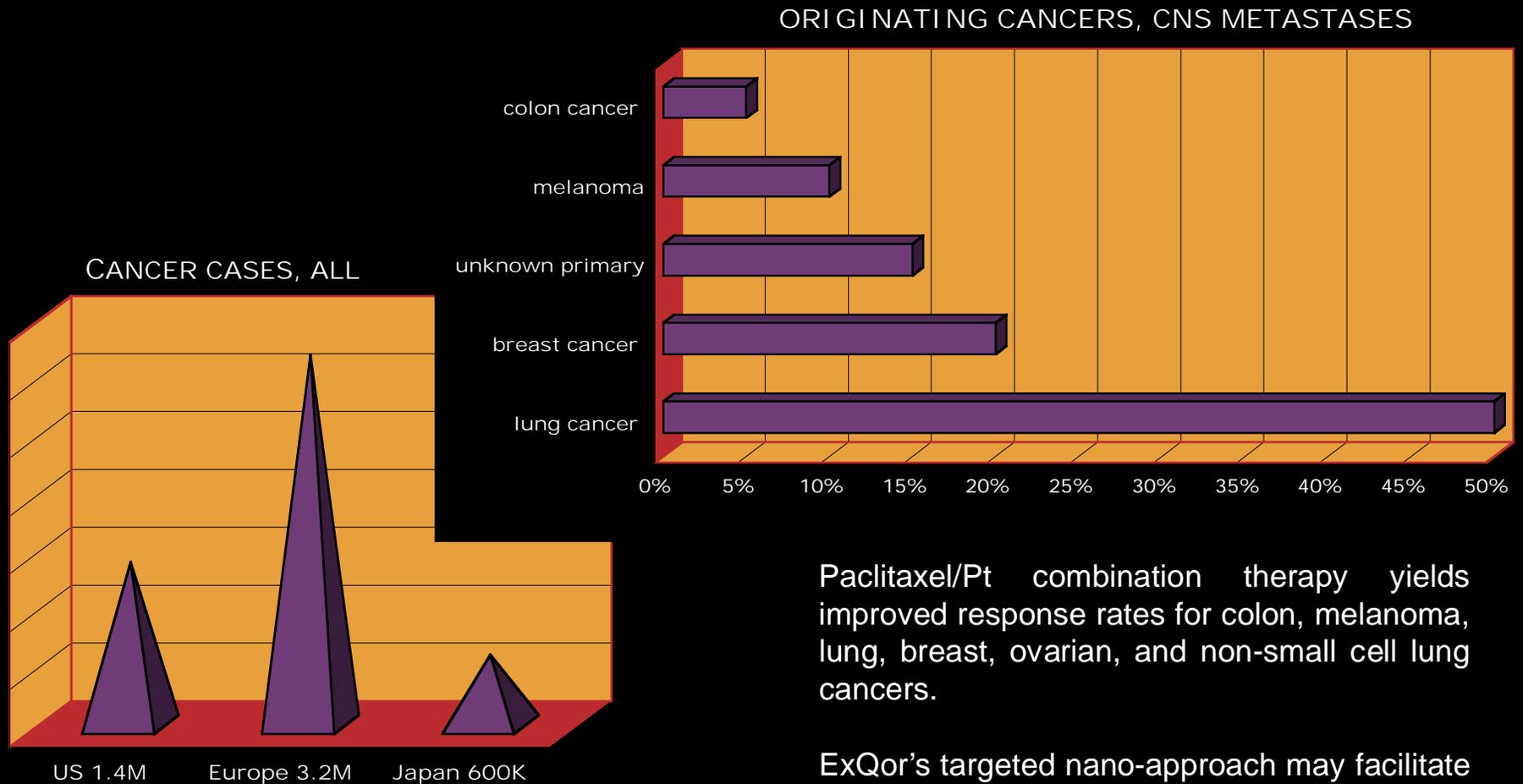
- ❖ Positioned as front line treatment or in conjunction with other treatments like radiation.
- ❖ Chemo agents may be combined with diagnostic elements, providing complete thera-diagnostic system that non-invasively passes the BBB and treats CNS metastases.

ExQor will develop first-ever, solvent-free, paclitaxel and PT that non-invasively treats and targets CNS & brain metastases, and also the primary cancers (Stage IIIA/B or stage IV).

Unlike conventional chemotherapy, minimal side effects are projected due to targeted, small doses, and not using toxic cremaphor (castor oil).

Nano-particle encapsulation increases bioavailability of poorly soluble drugs like paclitaxel and protects them from destruction in biological surroundings, and beneficially modifies their pharmacokinetics and biodistribution.

The Unmet Medical Need



❖ **Single shot therapy for primary and CNS metastases.**

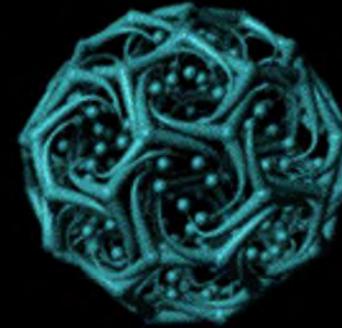
Paclitaxel/Pt combination therapy yields improved response rates for colon, melanoma, lung, breast, ovarian, and non-small cell lung cancers.

ExQor's targeted nano-approach may facilitate improved treatment results for these primary tumors, as well.

ExQor Licensing

- ExQor is licensing its patented bio-nano-technology, primarily to CNS Pharma's.
- Non-invasive transport of small and/or large molecules past the blood brain barrier.
- Targeted, high precision dosing of CNS drugs, antibiotics, and antineoplastic agents.
- Therapies involving cellular & molecular processes

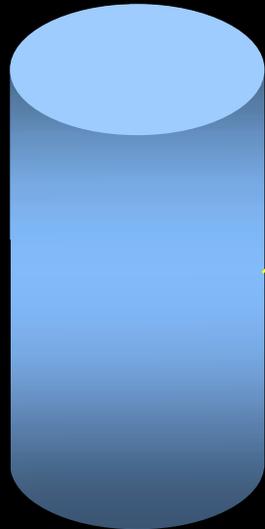
Specific CNS Receptor Licenses



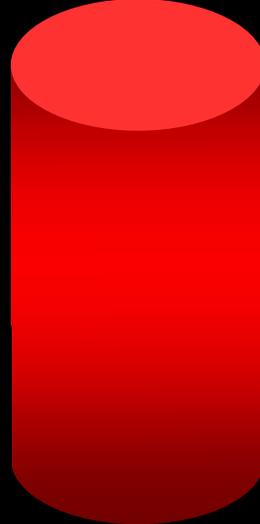
Because ExQor's Clathrin transporter passes the BBB and targets individual receptors (a first) we are granting exclusive licenses for one or more specific CNS receptors. Exclusive licensing for specific CNS metabolic functions also available.

What ExQor Is Licensing

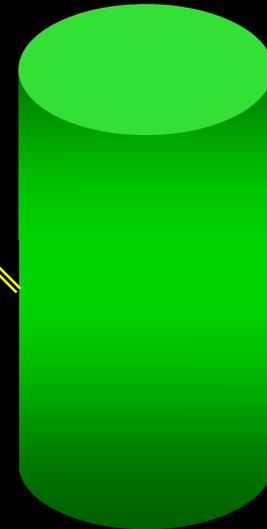
Three Primary Licensing Modules



**Bioengineered
Clathrin**



**Blood Brain Barrier
Delivery Systems**



Bio-Functionalization

**MODULES ENABLE HIGHLY FLEXIBLE LICENSING.
MODULES CAN BE INTEGRATED WITH 3RD PARTY PRODUCTS.
EACH MODULE CAN BE SEPARATE LICENSING OPPORTUNITY**

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ExQor

State Of The CNS Market

- ❑ Leading nine companies' CNS portfolios recorded 7.0% growth rate in 2005-6, representing sales of \$57.9m. However, sales increasingly volatile due to recent patent expiries.
- ❑ \$84 Billion CNS market likely to decline in value as several drug classes encounter generic competition
- ❑ Over 800 clinical candidates in development for wide range of CNS indications, about 10% in Phase III. But few products are distinctly novel or offer any differentiated mechanism of action.
- ❑ Five of the most promising compounds are replacements for blockbusters forecast to lose patent protection by 2012, including J&J's Invega (paliperidone), Wyeth's DVS-233, and Merck's potential anti-depressant Vilazodone.

Source: Business Insights

ExQor

Licensing Benefits

ExQor Offers CNS companies:

- ❑ Non-invasive blood brain barrier passage of large molecule drugs.
- ❑ Transport of unique combination therapies.
- ❑ Off patent or soon to be off patent drugs may be eligible for new patents due to BBB-passage, targeted action, transport methods.
- ❑ Potentially unique treatments for Alzheimer's (already, 225 compounds estimated in various stages of development), and other neurodegenerative diseases.
- ❑ New CNS approaches for cellular/molecular level therapies.

ExQor Founders

Unique Merger of Biomaterial Science & Biomedical Science

Franco Vitaliano

President and CEO and ExQor co-founder, formerly President & CEO of VXM Technologies, a Boston-based firm.

VXM Technologies specialized in advanced biomaterials and architectures for extremely high performance computer systems, including advanced computer models of neuro-biosystems.

VXM's clients included General Motors, Ford, Chrysler, GTE, U.S. Air Force, U.S. Navy, General Dynamics, Sandia National Labs, Argonne National Labs, NSA, Advanced Micro Devices, among other blue chip clients.

He was formerly associated with the Nanomedicine Lab for Neuroscience at Caritas St. Elizabeth's Medical Center in Boston MA.

Gordana Vitaliano, M.D.

Executive Vice President & co-founder of ExQor. She is a psychiatrist and researcher at McLean Hospital. Currently, she is the Medical Director of DBRP, psychiatrist at McLean Brain Imaging Center, and Instructor in Psychiatry at Harvard Medical School. She is the recipient of the NARSAD award in 2007 and NIH grants.

She was formerly the Director of the Nanomedicine Lab for Neuroscience at Caritas St. Elizabeth's Medical Center in Boston MA.

She is an NIH grant recipient and sits on NIH review panels for cognitive science.

She came from Serbia to the U.S. in 1991 when she won a highly prestigious NIH Fogarty Fellowship. She is now a U.S. citizen

Contact

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Boston MA 02114-2818
USA

Tel 617 742 4422
francov@exqor.com
www.exqor.com

From: Dr. Anita Goel , M.D., Ph.D. [<mailto:AGoel@nanobiosym.com>]

Sent: Tuesday, July 20, 2010 9:32 PM

To: Jochum, Gera M.; president@rpi.edu

Cc: Stine, Deborah D.; Maxon, Mary E.; Chopra, Aneesh

Subject: RE: PITAC/PCAST Meeting Information for June 22

Dear Shirley,

It was a great pleasure chatting with you at the PCAST meeting a few weeks ago. Enclosed as we had discussed is a (somewhat belated) summary of some of the take home points I had hoped to get across for consideration to the Committee. Please feel free to let me know if I can be of any further help in this noble cause.

Best Wishes,

Dr. Anita Goel, MD, PhD

Chairman & CEO

Nanobiosym

www.nanobiosym.com

email: agoel@nanobiosym.com

Mobile: 617-669-6359

<http://www.people.fas.harvard.edu/~goel/>

email: goel@physics.harvard.edu

Transcript of Dr Goel's remarks at the PCAST/PITAC Meeting June 22, 2010



Thank you. My name is Anita Goel. By training I'm an MD-PhD physicist and physician from Harvard and MIT and I am the Founder, Chairman and CEO of a company called Nanobiosym.

Theme #1: So Nanobiosym is a research institute and a high tech incubator that focuses on creating innovation at the holistic convergence point where physics, biomedicine and nanotechnology come together. Out of this convergence we are creating new sciences, new technologies , new commercial applications, new spinoff companies that can take those innovations and commercialize them in both the developed and in the developing world. For example, we have created, as a beneficiary of the DARPA, DOE and other such wonderful government initiatives, we have created a technology called Gene Radar® which enables you to take a drop of blood or saliva or algae water and stick it into a portable chip in a portable device like a wireless cell phone and rapidly diagnose what kind of infectious disease a person has or what kind of genetic signature or algal strain is there. The key to this innovation is being able to harness capabilities from physics and nanotechnology to be able to detect genetic fingerprints , with orders of magnitude improvement in precision and accuracy, that would simply not be possible using the traditional tools of molecular biology.

We established a spinoff company called Nanobiosym Diagnostics which is commercializing and adapting our Gene-Radar® technology platform into various verticals.

Theme #2: Innovation not only happens at the convergence of fields but the applications of that innovation can be taken to cut across many fields. So, for example, our Gene-RADAR® platform can be used for water testing, biodefense (where we have gotten initial validation working with the US Department of Defense), food/beverage testing, but also for biofuels by using it to screen different strains of algae or bacteria to find the best genetic traits correlated with high yield clean fuel production, as well as healthcare which is one of the primary applications.

Theme #3: One of my favorite themes here is not to ignore the developing world or to be threatened by it but to embrace the developing world as a partner in our global innovation agenda. We're also focused on bringing our nanotechnology capabilities into both the developed the developing world in a

way that harnesses some of the initiatives in the developing world to help leap frog the critical lack of infrastructure that they have there. Through the Nanobiosym Global Initiative, we are forming innovative public/private partnerships with players in the developing world, whether they be governments, NGOs, academicians and industries to help create an innovative ecosystem which helps to accelerate bringing some of these technologies into market in the developing world and then creating that two-way street between the developing world and the developed world where the two can inform each other and accelerate the coming to market of that innovation.

Innovation on 3 Levels: We at Nanobiosym are pursuing innovation on three levels, hopefully paralleling President Obama's strategy for America innovation on the same three levels: i) Fundamental innovation at this convergence of disciplines, 2) incubating and commercializing it across a variety of industries 3) bringing emerging technologies to both the developed and the developing world to address the greatest challenges facing our planet in healthcare, energy, the environment, etc.

1) One has been echoed by many of the speakers before me: **Much of the innovation in the past century that put America on the global map happened in reductionistic silos.** Today there is an historic opportunity to create breakthrough innovation at the convergence of these disciplines. It really means a transition in our thinking, a paradigm shift from a purely reductionistic paradigm to a more holistic paradigm where some of the greatest innovations happen fundamentally at this convergence.

2) **Impacting A Wide Spectrum of Industries:** Transcending the conventional boundaries not only between different disciplines scientifically but between academia and industry and between academia, industry and the broader geopolitical boundaries that traditionally separate different kinds of innovation.

3) Forming innovative partnerships as a collaborative network. **I strongly believe that information technology can help to create some of that substrate by which we can create a global information superhighway whereby innovations happening here can affect Africa, can affect India, China and vice versa.** I like how Aneesh beautifully laid out the role that information technology can play to enable and implement these systems. Today everyone in the world is globally innovative and Google can show us the speed at which information can transfer around the world.

We can accelerate innovation in America and restore the USA to a kind of new kind of global technology and economic leadership by not only creating these holistic innovations but collectively

harnessing innovation across the world to accelerate how we deploy, commercialize, and scale up that innovation to take it into different parts of the world.

Specific Proposal: I have a specific proposal from my own personal experience, Eric, on what specifically the Obama administration can do to invest in physical and even virtual infrastructure to accelerate the commercialization of some of these breakthrough technologies. I'll try to give you the punch-line upfront and then go back and try to justify it.

Special Economic Zones (SEZ's) or Technology Parks: I believe that we should invest in creating highly focused Special Economic Zones (SEZ's) or Technology Parks. I envision these as Special Innovation Zones that not only focus on cross-disciplinary innovation but taking it from concept to prototype to testing to accelerating it through the regulatory pathways to commercial validation in several verticals. In fact, governments in East Asia are doing this actively.

Innovative Next-Gen NanoManufacturing: To scale up, including building an innovative manufacturing base here in the US which means, for example, in the area of nanotechnology, there are ways that we are looking at, in our company to actually innovate the process of manufacturing itself by doing things that are popularly called "nanomanufacturing" which will help reduce the cost itself of our products. ***So, we can actually, instead of worrying about our manufacturing jobs being taken overseas, we can create the next generation of manufacturing here that then pilots all over the world.***

Scale-up and take our products into global markets: Then the last thing is that we should focus in these innovations or special economic and special innovation zones on how we can scale up and take our products into global markets.

Innovation from a Holistic Paradigm: We should start thinking holistically, not just the VC model which is one technology, one product, one market focus but cross-disciplinary technologies at the convergence--multiple markets hit by disruptive platforms and then multiple geographies hit by game-changing platforms that are then deployed on a global scale.

Infrastructure Investments: Then, part of this infrastructure should be a physical infrastructure as well, as superimposed on it a virtual infrastructure enabled by IT and that should involve best of breed players from different sectors, for example, if it is a healthcare platform such as ours-- the healthcare industry-- for clinical testing a bunch of different customers who can be adopters of that technology.

Nanobiosym- Innovation at the Nexus of Nanotechnology, Biotechnology & Physics: Just to give you a specific example in the area of nanotechnology, it is somewhere where the IT industry was about 10 years ago and the biotech industry was about a couple of decades ago in that it is projected to become a multi-trillion dollar industry globally.

Today, most of the nanotechnology exists in R&D labs across America, at least in the US but that commercial exploitation of that technology has not yet happened here. In fact, other countries like India and China and Russia are investing heavily into the commercialization and the scale-up of technology that we have been, through the NNI, is at the forefront of innovating. So a question for this

esteemed group: In order for us to really be at the center point of that innovation, can we create the infrastructure, both physical and virtual, here so that we can be at the pinnacle of that global revolution rather than as a follower.

Dr. Anita Goel, MD, PhD

Chairman & Scientific Director, **Nanobiosym**

Chairman & CEO, **Nanobiosym Diagnostics**



Dr. Anita Goel, MD, PhD, founded Nanobiosym® as an R&D innovation engine and hi-tech incubator at the convergence of physics, nanotechnology and biomedicine. Over the past 15 years, her pioneering contributions to this interface have been recognized globally by prestigious honors and awards. Her work at Nanobiosym has received multiple awards from US Governmental agencies such as Defense Advanced Research Projects Agency (DARPA), Department of Defense (DOD), Department of Energy (DOE), Air Force Office of Scientific Research (AFOSR) and US Defense Threat Reduction Agency (DTRA). She established Nanobiosym® Diagnostics to commercialize the Gene-RADAR® nanotechnology platform to empower people worldwide with rapid, accurate and portable diagnostic devices. She launched the Nanobiosym® Global Initiative to build innovative public-private partnerships with academic, commercial, and global thought leaders, NGO's, industries, governments and global organizations who can help bring disruptive technologies like Gene-RADAR® to sustainably address some of the greatest unmet needs in both the developing and developed worlds. For more information see www.nanobiosym.com.

Awards & Education

A Harvard-MIT trained physicist and physician, Dr. Goel was named as one of the world's "Top 35 Science and Technology Innovators under the age of 35" by *MIT Technology Review*. Among other awards and prizes, she received the "Global Indus Technovator Award" from MIT, an honor recognizing the contributions of top leaders working at the forefront of science, technology, and entrepreneurship. She holds a PhD in Physics from Harvard University, an MD from the Harvard-MIT Joint Division of Health Sciences & Technology (HST), and a BS in Physics with Honors and Distinction from Stanford University.

Research & Publications

Dr. Goel has a deep passion for fundamental science, especially elucidating the physics of living systems at the nanoscale. Her work in applied science harnesses these fundamental insights to develop next-generation nanotechnology platforms like Gene-RADAR® for portable disease detection and nanosystems for novel energy harvesting and biocomputing applications. Some of her recent publications include "Molecular Evolution: a role for quantum mechanics in the dynamics of molecular machines that read and write DNA," in the book *Quantum Aspects of Life* (<http://en.wikipedia.org/wiki/QuantumAspectsofLife>) and "Harnessing Biological Motors to Engineer Systems for Nanoscale Transport and Assembly" in *Nature Nanotechnology* (<http://www.nature.com/nnano/journal/v3/n8/abs/nnano.2008.190.html>).

Global Initiatives

Dr. Goel has been an invited keynote speaker at many major international conferences, symposia, and university colloquia and often gives Guest Faculty Lectures at Harvard and MIT. She was recently invited to chair a Roundtable on “Using Science and Technology as a Tool for International Diplomacy” at the 2009 *Science and Technology in Society* Forum in Kyoto, Japan. Senator John Kerry invited her to give expert testimony before the US Senate Subcommittee on Science, Technology and Innovation to support the reauthorization of the \$1.5 billion U.S. National Nanotechnology Initiative. While at Stanford, she envisioned building new hi-tech bridges between developed and developing world economies and founded and chaired an international conference and think tank (*SETU – Sanskrit for ‘bridge’*), comprised of world leaders from academic, business, socio-political, and humanitarian arenas.

Other Affiliations

Dr. Goel is a Member of the Board of Overseers of the Boston Museum of Science and a Charter Member of TiE (The Indus Entrepreneurs, a global organization of successful entrepreneurs engaged in the cycle of wealth creation and giving back to society). Dr. Goel is also a Fellow of the World Technology Network, a Fellow-at-Large of the Santa Fe Institute, an Associate of the Harvard Physics Department and an Adjunct Professor of the BEYOND Institute for Fundamental Concepts in Science and Arizona State University. She also serves on the National Board of the Museum of Science and Industry, on the Nanotechnology Advisory Board of Lockheed Martin Corporation, and on the International Advisory Board of the Victoria Institute of Science and Technology.

Dr. Goel’s Harvard profile at: www.people.fas.harvard.edu/~goel/

Comments directed to PCAST from the general OSTP Contact Us page

<http://www.whitehouse.gov/administration/eop/ostp/contactus>

From: Lonnie Gardner
Sent: 02/11/2010 - 2:37am
Organization:

NASA's Future
by Lonnie R. Gardner

There is a lot of talk outside NASA about letting private industry send humans to space and other statements along these lines but I do not think turning over human space flight to private industry is wise because the private aerospace companies have not proven they can put humans into space successfully and they have not shown they can do it cheaper than NASA.

Sending humans to space is very difficult and it still needs the money and intellectual talent that only the government can generate. Of course, the US government and NASA are inefficient but they have a success record (in human spaceflight) that will not be exceeded for many years by the US private aerospace companies.

If human space is turned over to private aerospace companies in the US I believe the loss of human life will be high and surely much higher than the brave souls we have lost to date. NASA has made human spaceflight look easy but nothing could be further from the truth.

NASA has put more than 500 people into space and returned them to earth alive and well. Of course, we should not forget those who died in the Apollo 1, Challenger, & Columbia accidents but when you consider the kinds of physics needed to put humans in space and bring them home, NASA has done a good job.

At the end of this year, NASA will no longer have the ability to put humans in space and Congress and the President do not see this reasoning as irrational or as a threat to America's leadership in human spaceflight science and technology. The greatest nation on earth will have to pay its way into space using Russia rockets, starting in 2011. This kind of logic is unreasonable and dangerous to America's national pride and is appalling for our national security.

The problem with Congress is simple: They do not want to spend any money on human spaceflight and they are not willing to accept that death is part of the human spaceflight business, so they continue to cut NASA's budget and marginalize any program that would keep US astronauts in space on a continuous basis.

It will cost billions of dollars to keep America the leader in human spaceflight and it will cost human lives too. Human spaceflight cannot be done cheaply by some private aerospace company and Congress and the President should not be looking for ways to reach space by contracting NASA's talent out to the lowest aerospace bidder. American aerospace companies are the best in the world but they do not have a history of successfully putting humans into space and for my money, I would bet that NASA can do a better job than they can. Even if you put humans in space with private aerospace companies it is still going to cost billions of dollars. Spaceflight cannot be done cheaply by NASA or any other public or private company in the US, and Congress needs to understand this fact, clearly. The Apollo program was an enormous success because America spent the money it needed to get to

moon and they did not cut any corners, trying to save money. Sadly, the Space Shuttle was under funded (from the beginning) which indirectly lead to the Challenger & Columbia accidents.

Congress does not understand that the Space Shuttle and other human spaceflight projects have made it possible for thousands of Americans to buy homes, pay their monthly bills, and send their kids to good colleges. The space program is not a waste of money& it is a program that shows the world that the people who live in last great democracy (on earth) can do things that are challenging and perilous (in space) better than any other county on this planet.

The President talks a lot about job creation but the unemployment numbers across America say that he and Congress have done little to help the common man or women (in America) find a job. I respectfully remind the President and Congress of this fact: Letting NASA return to the moon or creating a lunar base on the moon would create thousands of jobs and keep America's colleges and universities at the forefront of technology for many decades to come. Terminating the Constellation program and begging the Russians to let us use their rockets (after the Space Shuttle is retired this year) is not going to create one job in America and it not going to help our universities and aerospace companies keep their lead in aeronautical science.

I would have say that Congress and the President need to rethink their decision to disinvest in NASA's future because this action shows a lack of insight (on their part) and it clearly demonstrates that Congress and President see themselves as elected accountants, trying to save money, rather than political leaders who want America to remain the preeminent nation in human spaceflight. If America continues to move away from human spaceflight as Congress and the president are doing now& America will loose its technological edge and be exposed to the technological will of other nations and some of those nations are committed to removing America from the face of the earth.

How Congress and the President have decided NASA's future says only one thing: The America people should think hard about who they elect to Congress or the White House because sometimes the intelligent people we put into political power seem to unconsciously or consciously treat the average American as if he or she is child who cannot make rational decisions and this child-parent relationship that Congress and the President have with the American people needs to be discontinued before we lose more than just NASA.

From: Alexander Braithwaite
Sent: 02/12/2010 - 5:54am
Organization:

Good morning - I wanted to send a note specifically to your office to follow-up on a letter I directly mailed to President Obama earlier this week. I have deciphered the string. You should be aware the data is very powerful, and it appears to be the beginning of a new era. I wrote to offer my support and cooperation. The president ought to be notified that if he does not take the lead on this project, the power of his office will gradually and then suddenly diminish. This nation needs a head-start to overcome the dismal long-term scenario it faces. Inside and out, our community demands a makeover.

The letter specified a suspense of 3/1/2010. I am without work and I have basic necessities. If I receive no reply by then, I intend to independently develop software to get a better look. I am inexperienced in this field, but I now have the capacity to do whatever I choose. If this is the route taken, China wins in all likelihood and I will not have time for children.

There is bad news for scientists. This is not only about science. It covers everything. That is also good news.

From: william fisher
Sent: 02/19/2010 - 3:57pm
Organization: institute of food technologists

On your Science landing page you mention, "Finally, it means ensuring that all Americans have the science, technology, engineering and mathematics (STEM) education they will need to participate in modern society and to be a part of a reinvigorated American economy.

Among the benefits to be gained by this renewed support for American science and science education:

Improved American Agricultural Productivity: Modern agronomic techniques offer solutions to the serious challenges facing farmers in the United States and around the world, including climate change, declining fresh water reserves and the need to reduce the substantial energy inputs and CO2 emissions attributable to agriculture.""

From: Sonja Moody

Sent: 02/22/2010 - 11:19am

Organization: School District of Philadelphia

Dear Mr. President, First Lady and Officers of Science and Technonlgy,

How wonderful. Science and Technology. Children the focus for Nutrition and Exercise. Health Care also a focus. Health Insurance Companies having to let go of their choke hold.

I will send my other Lesson Plans as soon as I can. Renovating takes time. I went through some blips in relationship with Marvin. I don't know what that's about. My Career is and always has been my focus since I learnt what the word Career means.

I'm trying to make my Classroom as beautiful as I can.

Sonja

From: Noemi Gulyas
Sent: 02/23/2010 - 1:39pm
Organization:

Dear Mr./Ms.,

I am writing to You regarding information on PCAST subcommittees. Where can I find in-depth information about the PCAST subcommittees?

Regards,

Noemi Gulyas

From: James H. Cook
Sent: 02/27/2010 - 5:49pm
Organization: Retired

Why do you have absolutely no support for Cold Fusion research? It is not a hoax. For proof of this, see CBS 60 Minutes segment on Cold Fusion aired April 18, 2009 entitled "More than Junk Science". See also Defense Intelligence Agency Defense Analysis Report DIA-08-0911-003 dated 13 November 2009 Subject "Low Energy Nuclear Reactions".

I have also posed this question to The President and The Secretary for Energy.

James H. Cook

From: William Lacy
Sent: 02/27/2010 - 7:20pm
Organization: BROGGCAST.com

From: William Lacy BROGGCAST.com

(broggcastfriends@gmail.com)

To: Aneesh Chopra

BROGGCAST.com, has a Super-Majority of web-browser video playback support, over YouTube with only two web browsers (at only 9%) of the new HTML5-TV ready web browsers.

President Obama can have a stronger high-tech media presence using the new OGG-video format used by BROGGCAST.com

Here is the link, which shows that BROGGCAST.com, is in the Super-Majority, of web browser video playback.

<http://www.oggtv.com/communicate.html>

President Obama can have a channel on the original high-tech HTML5 video site, (which was a year ahead of YouTube with HTML5), and connect with a new level of tech users.

BROGGCAST.com is a hometown Chicago Dot-Com also, which will be a positive for the area, after the Olympic bid loss.

Supporting the "ORIGINAL" HTML5-TV video site, will be positive as a show of support, while not buying into Google, and Apple's powerful PR news campaigns on the web, and psychology tactics with search and fake "popularity" tactics on the public, which keep all of the web results in their favor.

I want the President to acknowledge a positive and constructive Dot-Com, which does not bend the rules to "look" popular to the web, and keep everything in their favor.

Basically an official Obama Channel on BROGGCAST.com, will show, -the Whitehouse is serious with working with new technology companies, instead of just the ones in control of the internet.

<http://www.oggtv.com/communicate.html>

thanks

William Lacy

From: Shree Pragada
Sent: 03/04/2010 - 4:49pm
Organization: ExeCue, Inc.

Dear Aneesh,

As an introduction my name is Shree Pragada. I am the Founder & CEO of ExeCue, Inc. We are a venture funded startup focusing on searching structured data. Like millions, we are avid followers of your progress with DATA.GOV and wanted to connect with you about our product www.Semantifi.com. While DATA.GOV makes data accessible, it is NOT TRULY TRANSPARENT UNTIL THEY ARE SEARCHABLE and that is our goal.

ExeCue envisions the future search is data and a large part of web data is expected to be Government Data. Recognizing this vision, Microsoft has launched Open Government Data Initiative to host the massive amounts of data on their Azure Cloud Platform. ExeCue has taken one step further to make these datasets SEARCHABLE.

ExeCue has developed a search platform to search both databases & documents so users can ask simple questions and get relevant knowledge driven results. When searching databases, ExeCue shows automatic charts & tables in real-time even from multi-terabyte databases.

Using this technology, ExeCue launched SEMANTIFI.COM as an open & free search portal where the community can build & share Search Apps. Search Apps are essentially search engines customized for specific Web Pages or Web Data.

The collection of Search Apps can provide meaningful results from millions of datasets which are currently simply hidden for leading purpose search engines.

Semantifi.com has initial Apps to search datasets covering SEC Filings, Analyst Ratings, US Economic Metrics, Government Spending, Earmarks, and CrunchBase's Venture Funding activity. To see the value for internet users, compare search queries like Amazon, Best Buy Sales and Income at

<http://Finance.Yahoo.com>, Cleantech companies from Boston at <http://www.Crunchbase.com>, "Earmarks by Senator" at <http://taxpayer.net> with <http://www.Semantifi.com>.

I would very much appreciate the opportunity to discuss in further detail if you could suggest your availability for an introductory call/meeting.

Regards,

Shree Pragada

CEO, ExeCue, Inc. (C)914.433.1776

product: <http://www.semantifi.com>

blog: <http://blog.semantifi.com>

From: Ross French

Sent: 03/05/2010 - 8:18pm

Organization: University of California, Riverside Office of Strategic Communications

Hello-

I am looking to document a statement that I read in an engineering web site that cited a study done by PCAST in June 2004 that showed that 55% of Fortune 100 CEOs have a background in engineering. I could not find any citation of this on your site, but was wondering if you had any record of it?

Thank you in advance for any assistance you can provide.

From: Markus Thomi
Sent: 03/12/2010 - 4:29pm
Organization: Harvard University

I am a graduate student at Harvard's Kennedy School of Government and currently conducting research for my thesis: a comparative analysis of European and American space policies and their respective impact on the commercial launch sector. To this end, I am writing to inquire whether someone at the OST would be willing to speak with me to share the President's perspective on the U.S. launch sector, the impact of various government policies, especially ITAR and the new space policy, on the U.S. s competitiveness, and the prospects of policy changes in the U.S. that might strengthen the commercial launch sector.

Attached, by way of background, please find a brief abstract of the project.

<http://edit.whitehouse.gov/sites/default/files/webform/Launch%20Industry%20Abstract.doc>

From: Robert E. Cobb
Sent: 03/12/2010 - 6:01pm
Organization: Forelaws on Board

Subject: Global Water Equilibrium and Human Unity in the Age of Cosmic Genealogy

In 1859 Louis Pasteur disproved spontaneous generation of life, thus beginning the age of cosmic genealogy meaningfully characterized and defined by evolutionary panaltruism and human unity. ("Life comes from space because life comes from life." - Brig Klyce, Astrobiology Research Trust). Universal forelaws of empathy and compassion (empirical attributes of cosmic genealogy seated within the genome of humankind and all intelligent life) form the foundation of evolutionary panaltruism and human unity - moving humanity in modern times to global achievement of the basic necessity of a compassionate/cooperative world order: freshwater.

Though today actively in denial of their own humaneness, international terrorists remain genetically predisposed - and reeducable - to compassionate humanness common to all humankind. Human unity is imperative in creating a compassionate/cooperative global society, in dealing with climate change (global water equilibrium), in development of life-centered cosmologies, and in fulfillment of the promise and gift of intelligent life.

Achievable global water equilibrium on Earth is the state of balance between seawater converted to freshwater amply available worldwide on one side and, on the other, constancy in planetary sea levels, Mandated and coordinated by the United Nations, dramatically accelerated, expanded and sustained seawater desalination ensures (1) relief for member-states vulnerable to sea-level rise, (2) potable water amply available worldwide, (3) stabilization of ocean shorelines, (4) enlarged land mass/biomass, and (5) freshwater deposits where once resided coal and petroleum.

". . . we have found a way to make a membrane (for use in seawater desalination) that can produce higher amounts of water compared to the commercial membranes being used today, while using the same process." - Mohammed Rasool Qtaishat, Water for All.

"Among U.S. states, Maryland, Virginia, and DC are exceptionally vulnerable to climate change. The states have more than 6,000 miles of Chesapeake and Atlantic shoreline, almost every inch of which would be degraded or inundated completely by the projected sea-level rise of up to three feet." - Chesapeake Climate Action Network.

Concerns about global warming, energy consumption and increased demand for potable water sources are causing a dramatic expansion of the desalination industry." - Lisa Henthorne, President, International Desalination Association.

"The melting of these glaciers (Himalayan "Earth's Third Pole") is the most massive threat to food security that we have ever projected." - Lester Brown, president, Earth Policy Institute.

By exemplifying "concern for others and for those who will succeed us" (The Center for Naturalism) - such as the achievement of global water equilibrium - humankind takes an important step toward its rightful place within the cosmic community of intelligent life. Intelligent life reciprocally propagated from infinity to infinity by intelligent life, from habited sites to habitable sites - fundamental in fulfilling the promise and gift of intelligent life while defining the cosmic community of intelligent life - bears witness to evolutionary panaltruism and the intrinsic unity of all intelligent life, in the age of cosmic genealogy on Earth.

www.forelawsonboard.net/GlobalWaterEquilibrium.html

In forelawsship on board,

Robert E. Cobb

Forelaws on Board

www.forelawsonboard.net

From: Dr Raj Bawa
Sent: 03/13/2010 - 5:54pm
Organization: Bawa Biotech and Rensselaer Poly Inst

PDFs of nanotech related recent paper attached.

From: Ryszard Rokicki
Sent: 03/17/2010 - 7:23pm
Organization: ELECTROBRIGHT

To those responsible for implementing President Barack Obama policies.

Dear Sir or Madam,

A Strategy for American Innovation: Driving Towards Sustainable Growth and Quality Jobs

"History should be our guide. The United States led the world's economies in the 20th century because we led the world in innovation. Today, the competition is keener; the challenge is tougher; and that is why innovation is more important than ever. It is the key to good, new jobs for the 21st century. That's how we will ensure a high quality of life for this generation and future generations. With these investments, we're planting the seeds of progress for our country, and good-paying, private-sector jobs for the American people."

-PRESIDENT BARACK OBAMA, AUGUST 5, 2009

The above strategy laid out by President Obama will only work if people responsible for its implementation approach the task seriously and open-mindedly.

In this letter, I would like to show, based on my own experience, how this great Strategy for American Innovation has been swept under the carpet for inexplicable reasons, holding back our technological progress and costing our country thousands of well-paying jobs.

In 2007, I contacted several members of SRF (Superconductive Radiofrequency) communities at several national laboratories and proposed to them a new electropolishing process (at the time US Patent Pending) for finishing niobium cavities (used in particle accelerators), namely magneto-electropolishing (currently US Patent #7632390). After I got a response from Dr. Charles A. Cooper of Fermilab, I prepared several samples using my new process and sent them to him for evaluation. He outlined the preliminary results during an internal Fermilab presentation on October 8, 2007. According to Cooper, the results were very promising and in some instances totally novel (removal of residual hydrogen from the sample during process never achieved anywhere before, dissolution rate 15 times faster than that of the currently used method, roughness of 0.1µm representative of high-quality electropolishing, etc). At the end of his presentation, he pledged further collaboration with me. Unfortunately, further research was abruptly cut off by Fermilab's budget cuts at the end of 2007.

In spite of this, I have pursued my research to improve the niobium electrolytic finishing, because I know that there is still much work to be done: for example, the elimination of sulfur contamination which is

one of the main unresolved problems connected to the currently used process. To deal with this problem, I have developed a new electrolyte. I also obtained US Patent Pending status for my new electrolyte.

At the beginning of 2009, I contacted Dr. Cooper again, and told him about my new patent pending formula. By that time, Fermilab's budget problems had vanished, most probably due to implementation of the Recovery Act. Cooper and I decided to proceed first with niobium samples, and assuming the preliminary results showed promising results, we would electropolish real niobium cavities at the Fermilab facility. The one obstacle we faced was obtaining special internal permission to use my new electrolyte at Fermilab. After not hearing from Fermilab for months, in May 2009, I sent an email to Fermilab's director Dr. Pier Oddone describing the whole situation in detail. Several days later, in June, I received NDA (Nondisclosure Agreement) to sign. I signed and emailed it back. In August, I sent another email to Dr. Cooper asking if he got permission to use my electrolyte at Fermilab. He said that he obtained the permission, but we had to wait with our experiments for about 8 weeks due to maintenance on the Fermilab Tevatron.

When I learned from Fermilab News that maintenance work on Tevatron had been finished, I phoned Dr. Cooper and asked if he was ready to start our planned experiments. To my astonishment, he told me that although he would like to perform these tests, he was too busy and would not have time to do them in the near future. He mentioned that he might be able to do some tests at very slow pace, which made me doubt the seriousness of his attitude. I told him that to try performing tests at slow pace made no sense, considering that laboratories all over the world were working nonstop to improve the electropolishing process for niobium cavities.

In early October, I sent an email to Fermilab's director Dr. Oddone, describing my conversation with Dr. Cooper and trying to convince Dr. Oddone that my new electrolyte should be tried. I also said I had not requested any compensation when I prepared samples back in 2007, and I did not ask for it now. Dr. Oddone has never replied to my email.

But I am a persistent person. At the end of January of this year, I found out about a conference Proceedings of SRF 2009, which took place in Berlin, Germany. After reading presentations from the meeting (including Fermilab's), I realized that SRF Community still struggled with many unresolved problems. I emailed several scientists who had participated in the Proceedings and offered to help them solve the problem by applying my new electrolyte formula. I got back a number of responses but none from Fermilab. A leading Italian scientist in the field, Professor Enzo Palmieri, had measured roughness (the most important parameter of finished niobium cavities) of the sample which I electropolished in my new electrolyte. Here is what he wrote to me in his email (which I quote with his permission):

Dear Ryszard,

the sample arrived last monday and yeasterday we measured the roughness.

Attached you will find the results.

For my experience the result we found is comparable to the best obtained results. On my opinion you should pursue. and you should "put advertisements" as more as you can.

Metasulphonic is a very good idea. If you want I can assign to you a talk in the "4th workshop on thin films and new ideas" that I am organizing in Padua October 4-6, 2010.

<http://master.lnl.infn.it/thinfilms/>

If you are interested, please let me know.

E.P.

prof. V. Palmieri

Master in "Surface Treatments for Industrial Applications"

Direttore

Superconductivity Lab - Laboratori Nazionali di Legnaro

Istituto Nazionale Fisica Nucleare - Viale dell'Universita', 2

35020 Legnaro PADOVA - ITALY

Tel.: ++39-049-8068.321 Fax.: ++39-049-8068.817

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Università degli Studi di Padova - Facolta' di Scienze -

Corso di Laurea in Scienza dei Materiali

As a naturalized US citizen who would like to give back something to this great country, I am very sad that I have to contact scientists abroad to prove my ideas and inventions, especially since my results have already been partially tested and proven during my earlier collaboration with Fermilab. The abrupt way Fermilab terminated our collaboration and the ensuing silence are a great puzzle to me. In my opinion, my case is the best example of what can happen to the Strategy for American Innovation advocated by President Obama if people responsible for its implementation do not take it seriously.

Should my patent pending electrolyte prove superior to the one used currently in all the laboratories around the world, as my own experiments indicate, the United States would regain the world lead in the field. This lead would give us the upper hand in future negotiations concerning localization of the planed

ILC (International Linear Collider), which in turn would create hundreds, or even thousands, of high paying jobs for American people.

I urge the decision makers to look closely at my case, and induce one of our national laboratories to test my process. The likely benefits far outweigh the required investment.

Sincerely

Ryszard Rokicki

ELECTROBRIGHT

142 W. Main St.

Macungie, PA 18062

Phone (610) 967-5800

Email info@electrobright.com

www.electrobright.com

Cc:

Secretary of Energy, Dr Steven Chu

United States Senator from Alaska, Mrs. Lisa Murkowski

United States Senator from Washington, Mrs. Maria Cantwell

United States Senator from Pennsylvania Mr. Robert P. Casey, Jr.

Professor Frank Tipler Tulane University

Professor Enzo Palmieri, Direttore Superconductivity Lab - Laboratori Nazionali di Legnaro, Italy

Mr. Bill O Reilly, Fox News

From: Eric Lucas
Sent: 03/26/2010 - 6:31pm
Organization: human

Regarding the upcoming debate on cap and trade...

I think I have a better idea than getting in a knock down drag out with big business. Today I've been writing detailed letters to my representatives explaining to them the Holocene extinction event. I doubt I need to explain this to John Holdren, but in the event that whoever is reading this hasn't heard of what I'm talking about...

"Overall, the Holocene extinction is most significantly characterised by the presence of human-made driving factors."

http://en.wikipedia.org/wiki/Holocene_extinction

We know what will happen if we try to have a public debate about climate change. The same sides will make the same arguments they've been making for 30 years, only this time they'll have "climate-gate" to throw in the mix. With complicating factors such as the economy and distrust of government the playing field becomes tilted against you.

I say we change the scope of the debate. I believe the public will be more concerned about the daily loss of thousands of species than they are about a few degrees temperature change spread out over a century. It shifts the terms of the debate from the damage we might do to the damage we've already done. The latter being much easier to demonstrate.

Honestly, I am ultimately trying to get this message to the President because I believe he is the perfect person to present the big picture to the world and provide leadership towards sustainability.

Please do all that you can to move this idea up the chain. The last thing I want to see is climate change deniers getting equal coverage on my evening news.

Thank you!

- Eric Lucas

From: Daniel N Donahoe
Sent: 03/28/2010 - 11:51am
Organization: IEEE CPMT

I would like to contact Mr. Aneesh Chopra about an initiative related to technology and employment. The BLS predicts zero growth in most engineering fields for the next ten years while we claim unfilled jobs. We suffer a policy disconnect. Of course, we need innovation, but I fear that most people misinterpret the history and sources of innovation. My plan is to hold symposia. I am working within the IEEE CPMT Society. I write to you as one of the people I would like to engage.

Daniel N. Donahoe, MBA, PhD, PE

North Salt Lake, UT

801-294-5536

From: Gal Gressel
Sent: 03/29/2010 - 3:56pm
Organization: UCLA Law

I am reviewing an article that will be published in our Journal of Law and Technology. One of the sources the author cites refers to a presentation given for your organization. I am unable to locate it however. Do you have a copy of it and/or can you help me locate it? It is cited as "Dr. Norris Alderson, FDA, Perspective on Regulating Nanomaterials, Presentation at the President's Council of Advisors on Science and Technology (Mar. 30, 2004)."

Thank you,

Gal Gressel

From: Keith Watts
Sent: 04/07/2010 - 1:07pm
Organization: Boeing

With all of the changes going on in the space industry and given the President's Kenyan roots I wanted to submit an idea that I have been working on for launching payloads to space more efficiently. It also portends a significant technological advancement for Africa. I have attached a white paper that describes the concept. Thank you for your consideration.

<http://edit.whitehouse.gov/sites/default/files/webform/MLSwhitepaper.doc>



Mountain Launch System

A white paper on gravity assisted launch

By Keith Watts

October 8, 2009

ABSTRACT:

The purpose of this paper is to explain an idea for significantly lowering the cost per pound of launching payloads into space. Current launch systems rely solely on expensive and complex rocket propulsion to lift payloads into space. This idea uses inexpensive and plentiful natural resources such as dirt and gravity to improve the performance of existing launch systems. It uses existing technology and materials. This idea would also be of great benefit to the countries of Ecuador, South America and Kenya, Africa given their unique geological features.

BACKGROUND/PROBLEMS:

Rocket launches are expensive. It is an exponential problem with not only fuel required to lift the payload but fuel to lift the fuel. Lifting one pound into orbit requires 34 to 60 lbs of fuel. Most of this fuel is used in the beginning of the flight, lifting a stationary rocket and payload from sea level and accelerating through the thick lower atmosphere. This idea came from thinking about using what we have in abundance like dirt and gravity and low cost materials such as steel and concrete and applying these resources to the problem of rocket launch.

In addition, most of the world launch sites are located in coastal areas near sea level. Rockets must push through the thickest part of the atmosphere and travel the furthest distance to space. They are also vulnerable to forces of nature, and possible attack.

SOLUTION/THE IDEA:

The basis of the idea is quite simple, that is to use a counterweighted platform similar to early elevators (see figure 1). Rather than use a single counterweight the idea uses multiple counterweights perhaps 10-12 arranged like numbers on a clock face around the central launch shaft (see figure 2). The limit of a manmade structure would be approximately 1000 ft, similar to a 100 story building and probably not worth the effort. What is needed is a really large natural structure, a large pile of dirt, fortunately such large piles of dirt exist, they are called mountains. Hence the name of this idea is the Mountain Launch System or MLS.

In terms of gravity, we usually think of free falling, but instead think of free ascending. When a skydiver freefalls, he quickly reaches a terminal velocity (120 mph) where the forces of aerodynamic drag and the gravitational pull balance each other and he no longer accelerates. Because the MLS is located inside of a mountain nearly all of the surface area is sealed. Thus if you put a hatch on the bottom of the launch tube and a thin membrane (think cellophane) over the top, then the air can be evacuated from the system. With the air removed there is no

aerodynamic drag and hence no terminal velocity. Acceleration will continue proportional to the length of the tube. See figure 3.

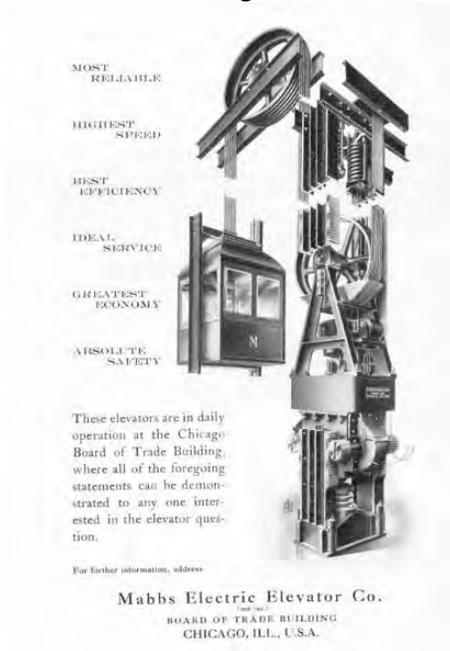


FIGURE 1
Early counterweight elevator

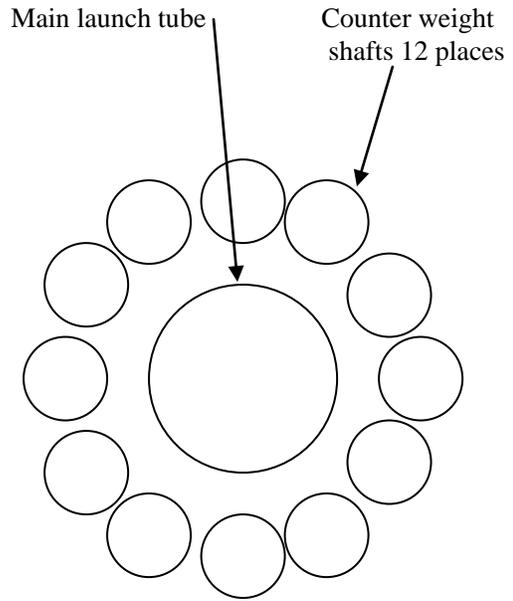


FIGURE 2
Cross section of MLS

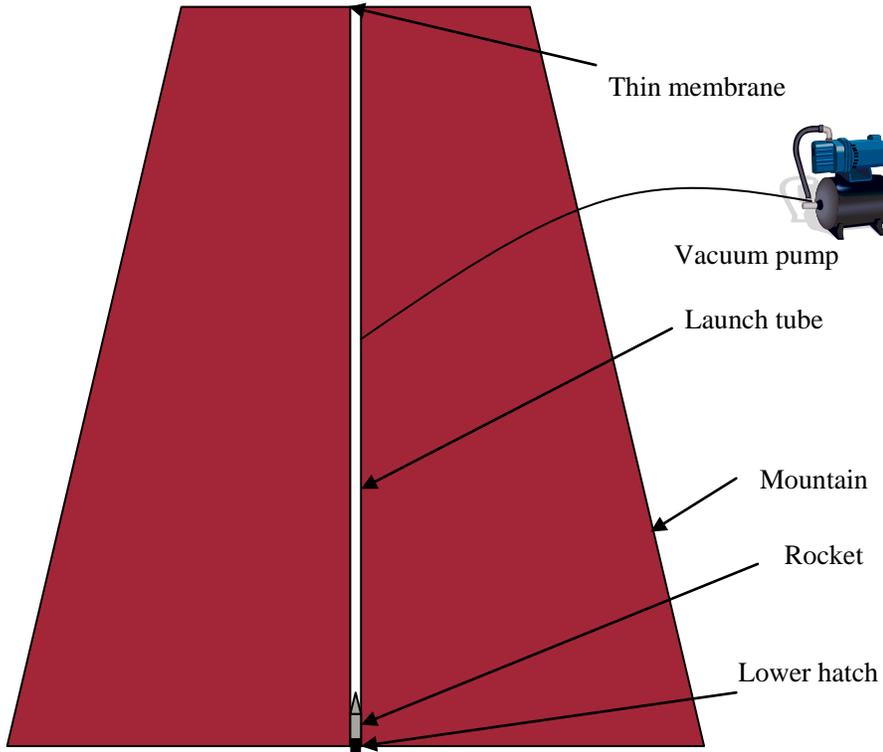


FIGURE 3
Evacuation of air from system

HOW BIG IS IT?

Current Atlas and Delta rockets weigh approximately 500,000 lbs, using a 4:1 ratio this would require 2,000,000 lbs of counter weight. The main launch tube would be 6 meters in diameter and the 12 counterweight tubes could be 1 meter in diameter. Each tube would then contain a 150,000 lb counterweight. Wire ropes of 1 inch in diameter have a 100,000 lb rated load and weigh 10,000 lbs, so a minimum of 2 would be required. The resulting acceleration on the rocket is axial and less than 1 G so the rocket structure should be adequate. This would allow the use of existing launch vehicles. The counter weights would be winched up individually before being attached to the launch platform. No exotic technology is required just steel and concrete.

THE NUMBERS:

Using the 4:1 counterweight ration mentioned above the resulting vertical acceleration would be $\frac{3}{4}$ G going up. For a 10,000 ft launch tube, in 29 seconds the rocket would exit the top of the tube traveling at 475 mph! For a 20,000 ft launch tube it would take 41 seconds and the speed would be 670 mph! This means the rocket would be above 10,000 ft and traveling at nearly 500 mph without having consumed any onboard propellant!

MOUNTAINS ON THE EQUATOR?

The advantages of launching near the equator are well known and it so happens there are two large mountains (greater than 15,000 ft) located on the equator (marked by red X) where the Mountain Launch System would be of the largest benefit. There are also smaller (approx 5,000 ft) mountains in Malaysia, see figure 4.

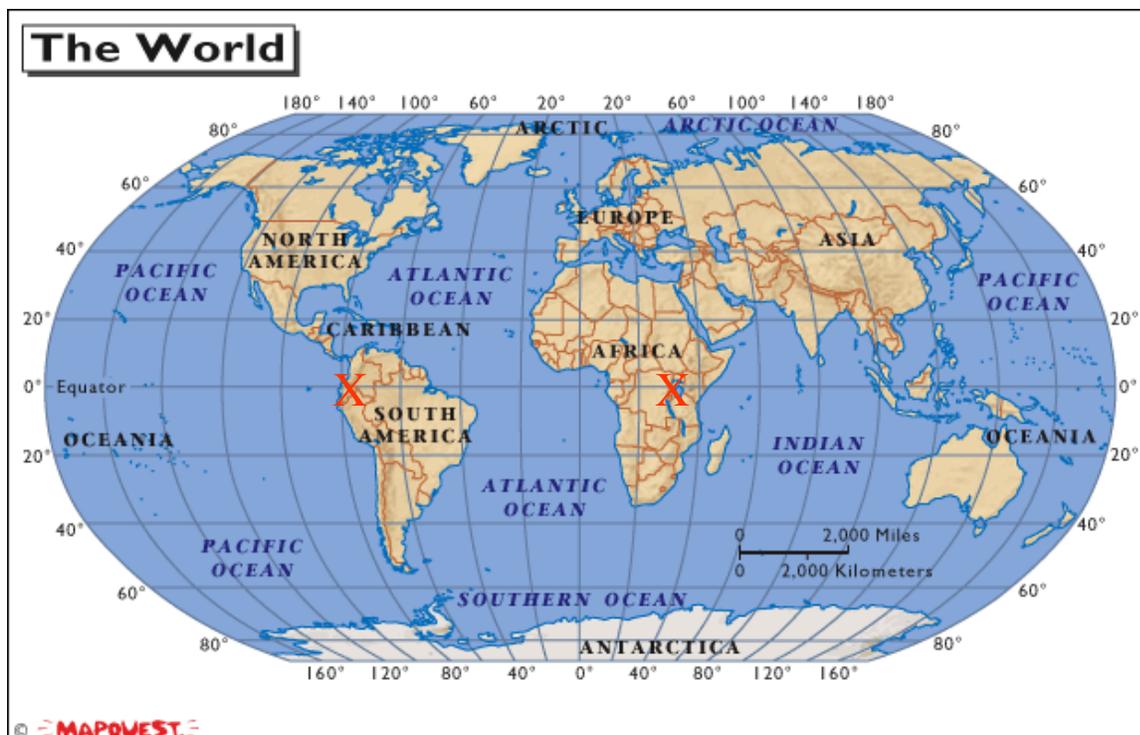


FIGURE 4
Mountains on the equator

Mt Chimborazo, Ecuador

This is located on the west coast of South American near Quito which is the capital of Ecuador. It is 20,560 ft in elevation and has the distinction on being the outer most point on the planet. Mt Everest is higher, but due to the equatorial bulge of the Earth, Mt Chimborazo is the point furthest from the center of the Earth. It is a stratovolcano, which last erupted in 640AD +/- 500 years. The coordinates are 1°28'9"S, 78°49'3"W. Over flight of South America is a concern with this location as well as recent seismic activity in the area. See figure 5.



FIGURE 5
Mt Chimborazo, Ecuador

Mt Kenya, Kenya

This location is near the West coast of Africa not far from the old San Marcos launch platforms. It is an extinct stratovolcano which last erupted 2.6 to 3.1 million years ago. The nearest city is Nairobi. It rises to an elevation of 17,058 ft and has coordinates of 0°9'0"S, 37°18'0"E. The over flight concern is minimal as it is not far from the coast and the area is not heavily populated. This location is well suited to serve a large percentage of the world's population, located close to Europe and Asia. A world space port in Kenya would provide the country and continent with a great deal of pride and prestige in the 21st century. See figure 6.



FIGURE 6
Mt Kenya, Kenya

USE WITH RAMJET:

For even greater efficiency to orbit, the speeds achieved by the MLS would be sufficient to ignite a ramjet which would consume atmospheric oxygen up to an altitude of 100,000 ft. A conventional rocket with on board propellant would be used for the remainder of the mission, perhaps an existing 3rd stage rocket.

MORE POWER!:

Greater launch speeds are achievable by adding power to the counterweight pulleys. The acceleration would need to be gradual depending on the structural capability of the rocket. Magnetic drive could also be employed to increase the speed of ascent.

SHIELDED LOCATION:

Current launch facilities suffer delays due to weather; recent examples include hail damage to the Shuttle and hurricane damage to buildings. They are also vulnerable to a military or terrorist attack. The MLS located inside of a mountain is naturally shielded and easier to defend. It would be a method to provide assured access to space.

DESIGN DETAILS:

The membrane on top of the launch tube could be pierced by the rocket fairing or burned through with a heater before the rocket arrived.

Regenerative braking could be used to slow the counterweights after the rocket launched to recapture a large amount of energy.

OTHER USES:

MLS could be adapted for use in micro gravity research by providing a controlled free fall environment. With the increasing interest in space tourism a low cost vehicle with solid boosters could carry paying passengers to the edge of space.

HOW TO BUILD IT:

I would expect the approach to be from the bottom up. Tunnel in horizontally and create a large central chamber. Tunneling up could be done in sections with a construction platform being raised by counterweights.

WILL IT WORK?:

I cannot say with certainty that this idea will work. There will be financial, political and technological obstacles to overcome. I think the Sea Launch system is similar example of an unconventional approach that has proved successful. Certainly there is the potential for improving the performance of existing rockets which has been difficult recently.

NEXT STEPS:

- Preliminary design concepts
- Consultation with geologists on feasibility
- Consultation with civil engineers on feasibility
- Possibly a technology demonstrator in the Owens valley. Use of a Cliffside or an abandoned oil well for a proof of concept.
- Use with small missiles, ramjets or rockets and work up to larger sizes

CONCLUSION:

I wish to thank the reader for taking the time to learn about the Mountain Launch System. The MLS can take existing rockets and accelerate them to high speed and give them a boost to orbit. This will result in improved payload performance and a lower cost per pound to orbit. The MLS uses conventional materials such as steel and concrete and no new technology is required. We are seeing the start of the space tourism industry with a lot of new rocket development. This idea does not compete with these systems but rather provides a means for further increasing their performance.

THE AUTHOR:

Keith Watts has worked in the Aerospace industry for the past 30 years. The first 8 years was in aircraft structural design and the last 22 years has been in satellite structural design and system engineering. He is currently is an Associate Tech Fellow with Boeing in El Segundo CA

Contact information:

Email: keith.p.watts@boeing.com

Phone 310-364-5666

PATENT No: 7530532, issued May 12, 2009

From: Dr. Vishal Shah
Sent: 04/08/2010 - 11:57am
Organization: Dowling College

Dear Dr. Holdren,

It was of great interest to read the recommendation made by the PCAST to The President and Congress related to nanotechnology.

As a scientist working in the area of Environmental Sciences and Biotechnology, I would like to contribute my expertise and knowledge through PCAST. I am willing to participate in open forums, development of future reports or other similar activities. My curriculum vitae is attached with this message and should any clarifications be required, I would be more than happy to provide them.

Sincerely

Dr. Vishal Shah

Vishal Shah

Assistant Professor

Department of Biology

Dowling College,

Idle Hour Blvd,

Oakdale. NY 11769.

Ph : 631-244-3339

Fax: 631-244-1033

http://edit.whitehouse.gov/sites/default/files/webform/Vishal_Re%27sume_2010.doc

From: desmond Murray
Sent: 04/10/2010 - 9:30am
Organization: Building Excellence in Science & Technology

Early Research Participation

Please take a look and view this video

and tell me what you think.

<http://www.youtube.com/watch?v=G3gQU6pUQSI>

This is an education innovation we propose for national adoption.

<http://edit.whitehouse.gov/sites/default/files/webform/ERP%20Press%20Release%20-%20short.pdf>

From: Anthony V. Manzo, Ph.D.
Sent: 04/12/2010 - 4:17pm
Organization: Emeritus, U. of Missouri-KC

Recommendations...

1. Revise this otherwise excellent statement - Educational software that is as compelling as the best video game and as effective as a personal tutor. - to include online Edutainment sites as well as educational software. The term Edutainment illustrates that these "games" etc. ideally would be played at home and in recess periods hence adding intentional but incidental time on task learning w/o lengthening the school day (No offense Mr. Duncan, but lengthening the school day and year are pretty naive ideas).

2. Advance Pedagogic Science & Teacher Education at the applied level. Currently there can be no such thing as true Teacher Education since there is no core curriculum that cannot and does not overly diverge, no matter its name, from one professor to another. Below is my feeble attempt to address this issue. Please look in. The USA's lead in this continued Formation more so than Reformation of Education could have global implications, and untold savings through increased efficiency and effectiveness in every classroom, K-16 (Yes, it should include at least 4 units of How to Teach/Lecture for professors, especially at the Community College level).

Thank you.

Anthony V. Manzo, Ph.D.,

Professor Emeritus

Excerpt

http://teacherprofessoraccountability.ning.com/main/invitation/new?xg_source=msg_wel_network &
<http://bestmethodsofinstruction.com/>

Teacher Education is a Myth That Could be made Real,

The Race to the Top Leaves Only Teachers Behind

There are some great teachers, and even some great Teacher Preparation programs, but these are random occurrences where consistency is essential. The reason is simple: Professional Education is missing fundamental standards found in all other professions. There is no standard curriculum, no sincere effort to identify Best Instructional Practices, and truckloads of weak consultants and players with diluted degrees serving up their own brands of Faculty Development. To be called a profession it is imperative that a profession, one way or another, needs to convene a rolling forum to collect and prioritize the core content of principles and practices that every member ought to know. Ironically, Teachers worldwide are being held to standards for annual yearly progress of their students. Meanwhile, Professors, Learned Societies & commercial schools, and some painfully self-serving non-profit foundations and Universities never even address the need for solid pedagogic content. Worse, those that do publish material under titles referencing Best Practices are quite simply hype, if not fraudulent. The current crop of in-charge Leaders dangerously resembles the Investment Bankers who remain in charge of the economic systems that they nearly bankrupted. Perhaps the only way to expose and reform this systemic disaster would be a class action by teachers &/or parents & students against all of us who have been complicit in these myriad layers of self-interest actions embarrassingly bordering on malpractice.

Since the likelihood of legal action is remote it would be wonderfully unprecedented if a leveraged agency, such as the US Department of Education were to hold a convention of the nation's leading educators to consider and ideally endorse a covenant of principles and more importantly prescriptive practices ideally on a website that transparently allows these to be challenged, tweaked and further specified for different age-grade-situational conditions. Additionally, such a rolling convention also could address differentiated staffing based on what schools are expected to do, and with a differentiated set of Best Practices for each function, such as doctors and nurses, attorneys and paralegals, etc. Schools are expected to carry-on three essential although overlapping functions: 1. Teach new concepts, content and a positive disposition toward self-directed learning; 2. Provide assessment and supervised practice in these objectives; and, 3. Operate a massive custodial role that keeps students in school for at least seven-nine hours a day for about 200 days a year for about 13 years, and now through at least 2 more years of college. Our labor market and economic system depend on schools to meet these criteria at the very least. The problem is not the expectations, but that staffing, and organization do not reflect these three societal essentials. And, sadly there is no free market in which to buy the best ideas and practices. But, this is another complex issue requiring several additional paragraphs that would not begin nor end with issues over vouchers and charter schools.

Meanwhile, please consider joining the websites below offering a potentially startup means of getting the current system moving in the right direction for all who would teach. As an aside, taxpayers would be grateful since increasing classroom effectiveness and adding differentiated staffing could bring about efficiencies that could save billions of dollars with even the smallest degree of adoption. Join the narrative.

1. http://teacherprofessoraccountability.ning.com/main/invitation/new?xg_source=msg_wel_network

2. <http://bestmethodsofinstruction.com/>

3. <http://bipartisanthinktank.com/>

Anthony V. Manzo, Ph.D. Emeritus Professor,

Education, Dir. Center for Studies in Higher Order Literacy,

Governor, Interdisciplinary Doctoral Studies, U. of

Missouri-KC, (ret, CSU-Fullerton)

avmanzo@aol.com

Recommended book on the Topic of Robust Teaching Practices: Manzo, U, Manzo, A. & Thomas, M (2009) Content Area Literacy: A Framework for Reading-Based Instruction (5th edition) Wiley

<http://edit.whitehouse.gov/sites/default/files/webform/Recommendations%20AAAS.doc>

From: Prof.Delbert Tesar
Sent: 04/15/2010 - 10:34am
Organization: UT Austin & ASB

Following a suggestion by Dr. S. Kota, I share a short document regarding the Future of U.S. Advanced Manufacturing.

D. Tesar

<http://edit.whitehouse.gov/sites/default/files/webform/Response%20to%20PCAST%20Policy%20Forum.pdf>

Response to PCAST Policy Forum
Future of U.S. Advanced Manufacturing
D. Tesar, UTexas, April 10, 2004

Support for New Manufacturing Technologies

1. Public-Private Consortia

Yes, these are extremely valuable when the technical risk is high and it requires 4 to 5 years to create a working prototype to truly advance the tech base for manufacturing. This work should lead to a leapfrog result to revolutionize the associated product sector.

2. Expand Lab Mission to Manufacturing

No, they already have well defined missions. They already have strong and continuing support. What is needed are university based major laboratories (say, at \$20mil/year) distributed throughout the U.S. with strong ties to selected industrial sectors. These FFRDC university labs could pursue high risk, long-term manufacturing research (product development, manufacturing processes and production systems) and generate a whole new wave of young people (B.Sc., M.Sc., Ph.D. and technicians) to fill the ranks of future manufacturing companies.

3. Yes, innovation for manufacturing is as critical (more so) than innovation in any other field in that it produces products that can be sold across our borders as well as meet our own human needs. The real culprit is the disincentive of the DoD offset program which has diminished our U.S. machine industries dramatically while strengthening our competition. We need a reversal of this offset and an incentive program to make up for this long-term loss which has been in place for 50 years. Analysis of the effects of the offset program should be the basis for a new incentive program.

Support for New Manufacturing Firms

4. Yes, if the goals and requirements are set by industry where they put in a matching amount of capital so they share the risk. The difficulty here is to make sure that this is governed by outstanding leaders in the field (as a governing board) so that real products emerge as a result and not popular /personal goals of a select few people in a position of power (think of the problems in this case for Russia- very good science and very poor products).

5. Yes, small firms led by dynamic leaders can fill niche markets and take risks not pursued by large companies. These firms should be given some risk capital to start under a rigorous evaluation. Given success, they would then repay these loans (with nominal interest) without the huge penalty now exacted by venture capital firms.

6. Yes, if the work meets real product requirements. Much of the university science however, does not meet real requirements and it is difficult for industry to benefit from these results. Normally, universities want a hand-out from industry with little mutual responsibility. Yes, translational research meeting real requirements set by high level leaders in manufacturing development would be of real value. Unfortunately, most university efforts do not concentrate on

real requirements. Real manufacturing requirements are certainly the best drivers of the best science and they are frequently the most demanding and interesting.

Support for Existing Manufacturing Firms

7. Yes, especially for fields which are just emerging. Note that the computer industry is not just emerging; the U.S. government has done a great deal to make this happen. However, electro-mechanical systems cuts across all industries (ships, aircraft, manufacturing, autos, instruments, orthotics, construction machinery, etc.) and it has been left dormant for the last 5 decades. In this case, a new tech base can emerge that is horizontal and would have a broad impact on 30 to 50% of our product industries. In this case what is the equivalent of the computer chip for electro-mechanical systems (EMS)? It is the intelligent actuator which drives all EMS under human command to expand human choices and to meet human needs. This is horizontal and it must be pursued to leapfrog our competitors. Similar examples can be found in other sectors.

8. Yes, if this is done in a concentrated manner and not as an after thought. Basically, we need to know if we are ahead, level, or behind our competition so we can properly invest in the weaker sectors and catch up. The investment would be by all parties (private, industrial, government) who then know where they stand. Government should invest in the weak sectors to jump-start companies who want to take the associated risk

9. Yes, definitely we need a strong workforce at all levels. This however, should be driven by the young where they compete with each other for support and not given a handout without their real participation or commitment. Here, I would liken it to a forgiveness approach (say, loans forgiven over 10 years) if they actually enter into the manufacturing workforce.

A National Manufacturing Strategy

10. Absolutely yes with no reservations. Our S & T policy is very much dominated by science practitioners and not by product oriented technologists (at all levels of training). There is some merit to have a separate major technology agency which sets its own policy. This should not be given to the DOC which has really dropped the ball on this for several decades. It would be useful to make this new agency something like DARPA. It could be called MARPA and would have 3 primary missions

- i. Crossing the Valley of Death
Ensure that we incentivize industry with risk capital to commercialize DoD tech base development and to remove the effects of the DoD offset program
- ii. Establish 10 major university research centers distributed throughout the U.S. to work on real requirements for manufacturing funded at not less than \$ 20 mil/year. Once this has proven effective, establish 2 new centers each year for another 10 years.
- iii. Establish really hard problems in manufacturing to leapfrog our competitors much like DARPA now does for DoD problems. These really hard problems should be pursued by consortia that could then emerge as a new company or a part of a well established company who would compensate the government for part of the up front investment.

From: Mary Toler
Sent: 04/23/2010 - 1:49pm
Organization: Battelle

Does the new Exec Order for PCAST mean a new council will be nominated or establishes current PCAST membership?

From: Lawrence J. Reeves
Sent: 04/25/2010 - 1:49am
Organization: AFCEA International

We are performing a legacy research project on the late Dr. John M. Wozencraft who was associated with the PSAC 1964-65. It would be helpful to know who the members were of the PSAC. This is a joint effort involving MIT, AFCEA, and the Naval Postgraduate School.

Lawrence J. Reeves, President, Monterey Bay Chapter, AFCEA, 831-425-2811

From: Hugh Ching
Sent: 04/28/2010 - 8:06pm
Organization: Post-Science Institute

Post-Science Institute (official web site <http://www.postscience.com> and student web site with explanation and fun <http://www.post-science.com>) is promoting three practical Knowledge Revolutions based on its solution of value, software, and touch:

1. Valuation Revolution
2. Complete Automation Revolution
3. Robotics Revolution

To learn more about 1, there is an intensive discussion at LinkedIn:

http://www.linkedin.com/groupAnswers?viewQuestionAndAnswers=&gid=1939488&discussionID=16631681&sik=1272496456811&trk=ug_qa_q&goback=%2Egdr_1260564882976_1%2Eana_1939488_1272496456811_3_2

and commercial valuation programs at:

<http://www.infinitespreadsheet.com>

and patent at:

<http://www.post-science.com/ispatent.pdf>

The Solution of value is the solution of financial crisis:

<http://www.postscience.com/crises.htm>

About 2:

<http://www.universalcomputersourcecode.com>

About 3:

<http://www.jumpulsetennis.com>

and

<http://www.tennis.com/messageboards/forums/forum-view.asp?fid=3>

The problem of touch is the bottleneck of robotics research. Japanese Sixth Generation Computer Science Robotics failed because they cannot robot to touch. A robot finger bounces off a surface like a ball bounces off a racket.

Thank you for time and consideration.

Hugh Ching SB, SM, ScD MIT

<http://www.post-science.com/ching.htm>

From: William Erdmann
Sent: 05/01/2010 - 9:59pm
Organization:

We just want to cap the well as quickly as possible, right?

The seabed is composed of silica. Targeting the wellhead with a tactical nuclear-tipped torpedo should form a trinitite cap, effectively sealing the well.

Yes it's outside the box, but if activating the BOP fails, you are talking Ixtoc 1 X2. The worst oil spill in history.

Just putting another option on the table.

From: Sharon R. Delshad
Sent: 05/04/2010 - 5:45pm
Organization: Pfizer Inc.

Hello,

How can a doctor from Pfizer get involved in the PCAST Science Division?

Thanks,

Sharon

From: Brian Zoric
Sent: 05/05/2010 - 6:01pm
Organization:

I would like to work for the U.S. Government in the field of information technology. Attached is my resume.

<http://edit.whitehouse.gov/sites/default/files/webform/Brian%20Zoric%20Resume%20usgov.doc>

From: Fred Wentzel

Sent: 05/07/2010 - 3:59pm

Organization: National Council for Advanced Manufacturing

Attached below is my 2 minute statement on "recommendations for advanced manufacturing policy" that I would like to read and/or present at the May 21, 2010 PCAST meeting in Washington, DC.

<http://edit.whitehouse.gov/sites/default/files/webform/PCAST%20statement%20%285-6-10%29.doc>

NACFAM'S VISION FOR STRENGTHENING U.S. MANUFACTURING

We must never forget that manufacturing historically has been the principal *wealth creating engine* of the U.S. economy. For manufacturing to continue to be a *wealth creating engine*, U.S. manufacturers must look beyond our borders and become more internationally competitive.

NACFAM believes that **strengthening the U.S. manufacturing sector** here and now is the only way that U.S. manufacturers can successfully compete in the ever-changing global marketplace.

NACFAM recommends for strengthening U.S. manufacturing begin with a call to “develop a comprehensive, coherent, overarching national manufacturing policy” that looks at least five years into the future.

A national manufacturing policy must be rigorous, objective, and cost-conscious ... and be built on input from all relevant stakeholders at the national, state and local levels.

It must recognize that small and medium-sized enterprises (SMEs) are the greatest providers of quality jobs and the backbone of U.S. manufacturing success. Only by addressing the needs and concerns of SMEs can this nation remain a major manufacturing player in the 21st century economy.

The federal government's role in strengthening the U.S. manufacturing sector and the SMEs that are the foundation of this sector is built on six policy options:

- Improved access to government-guaranteed credit and loans for SMEs.
- Expanded federal applied research and development funding for innovative SME manufacturing systems and processes.
- Increased focus on SME sustainability, resource efficiency, renewable energy and lifecycle incentives.
- A stronger Pre K – 20 learning system to enable students and workers to have the knowledge and skills needed by SMEs.
- An integrated supply chain network that encourages SMEs to think globally and supports SME growth and innovation.
- Reduced cost barriers to enable SMEs to expand production in America to serve both national and international markets.

U.S. manufacturing competitiveness is defined by firms finding more productive and profitable ways to do business – including the use of new manufacturing technology. For U.S. manufacturing to be *competitive* in the global economy, U.S. companies – especially SMEs – need to consistently strive to be world class manufacturers. As such, government needs to better understand how to provide a world class support infrastructure to better enhance U.S. manufacturing competitiveness.

From: Rita Neznak
Sent: 05/21/2010 - 5:29pm
Organization: American Forest Foundation

Please see the attached letter. Thank you for the opportunity to provide comments.

<http://edit.whitehouse.gov/sites/default/files/webform/AFF%20Letter%20to%20Pres%20Advisory%20Council%20on%20EE.pdf>



American Forest Foundation

1111 Nineteenth Street, NW

Suite 780

Washington, D.C. 20036

May 21, 2010

Mr. John Holdren, co-chair

Mr. Eric Lander, co-chair

Mr. Harold Varmus, co-chair

President's Council of Advisors on Science and Technology

Office of Science and Technology Policy

Executive Office of the President

725 17th Street Room 5228

Washington, DC 20502

Dear Co-chairs Holdren, Lander, and Varmus:

On behalf of the American Forest Foundation, a non-profit conservation organization that strives to protect America's family forests and to prepare future generations of conservation leaders, I'm writing to urge you, as you look for ways to address and advise the President on the issues of science, technology, engineering, and mathematics (STEM) education, you consider the important role that environmental education plays in preparing our youth to tackle complex science and technology issues.

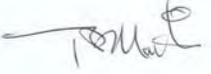
Comprehensive environmental education improves student achievement across core subject areas, including math and science, and increases engagement in learning. We have seen this firsthand through Project Learning Tree®, a program of the American Forest Foundation, which trains over 30,000 educators each year to include environmental education in their classroom. Project Learning Tree® is a unique program that provides teachers with the knowledge and skills to help their students learn how to think—not what to think—about the environment. We are equipping the next generation of conservation leaders with the critical thinking skills to identify and tackle complex problems.

Enhancing students' environmental literacy is a proven way to expand the academic pipeline for STEM subjects and is increasingly seen as an innovative way to give students the sense of wonder and excitement so essential to encouraging scientific inquiry. Environmental education has been shown to improve student achievement across core subject areas and increase engagement in learning. What's more, getting kids outside and active promotes a healthy lifestyle that is essential to fighting obesity and reducing symptoms associated with attention deficit disorder, depression, and stress.

Again, we strongly urge you to consider and support a strong role for environmental education in any efforts to address STEM education. We would be pleased to discuss this with you further at your earliest convenience.

Thank you for your consideration.

Sincerely,

A handwritten signature in black ink on a light blue background. The signature is cursive and appears to read "Tom Martin".

Tom Martin
President & CEO

From: Alex Reisner
Sent: 05/29/2010 - 3:54am
Organization:

When will the achieve of the May meeting become available?

From: brent root
Sent: 06/04/2010 - 3:26pm
Organization:

I left a message for Dr.Holdren about the cleanup in the gulf. I saw a program with two oil experts; Matt Simmons and Nick Pozzi, on the Dylan Ratigan show 5-27-2010. They don't have all the answers for stopping the leak in the gulf, but the do have a great solution for cleaning the oil that has already leaked. I keep wondering; if the best minds in the country are working on this, why has your office not been talking to these men?

From: John R. Scarborough III
Sent: 06/12/2010 - 1:46pm
Organization: United States Citizenry

Please weigh-in regarding the oil gusher in the Gulf. You can inform the President's decisions and the fate of the gulf States!

Why is there no call by the Federal Government to cap the gulf oil gusher? Why isn't BP being forced to answer questions as to why they are not capping the gusher instead of just recovering some oil? This is just a glorified plumbing problem! Yes, it's 5000ft deep, but if we can cap 100's of wells in Kuwait, we can cap 1 in USA. At 50,000 bbls (210,000 gals) per day, the best way to help with clean-up is stopping the flow! BP isn't the only Oil Expert! Exxon? Marathon? Retirees?

Please use your influence to advise the President, and provide real engineering solutions to this problem! Let's stop the oil gusher!

From: John Martin
Sent: 06/14/2010 - 5:02pm
Organization:

"IT'S TIME TO ACT"

I wanted to pass along some information to your group about a major project that has been building a lot of momentum, not only here in the states, but throughout the world as well. You may have already heard of it!

The HyRail, The Hydrogen Superhighway, created by The Interstate Traveler Co., out of Detroit, Michigan. The HYRAIL, is a solar/hydrogen powered, totally self sustained, elevated, people, utility, and freight delivery, high speed mag-lev project. Using existing right of ways, be it DOT, Rail, High Power Tension Lines, etc... having the ability to deliver people and freight at speeds of 250+mph using its own generated power, in addition, with a conduit cluster system built within it's rail system, it's also capable of delivering utilities along the rail system as well, supporting existing and creating utility grids throughout a region. Having the ability to deliver large amounts of electricity, through a super conducting cable, giving it the ability to draw power from one region and transport it across a wide area with very little if any energy loss, supporting other regions, eliminating brownouts and blackouts from coast to coast. With additional conduits, having the ability to deliver clean water, vapors, liquid fuels, etc... also generating huge amounts of Hydrogen, creating the first safe, secured, viable hydrogen delivery system to fueling stations along the rail system and throughout the region. And all of this at NO COST TO TAXPAYERS TO BUILD!

The HyRail was been created as one of many answers to the worlds need to step into a clean energy future, the need is out there, we all know we have go into this direction or face a dismal future, a future controlled by unsecured oil producing countries, coal companies, high fuel prices, blackouts, declining oil supplies, fuel spills, carbon buildup, climate change, etc...

This is truly an amazing project, it's generating a lot of interest, but at the same time it is going through the typical red tape and political delays of the many governments involved, be it state, national, or internationally. It needs support, it needs to be built, this will be a game changer, a major step into a clean energy future, it can be done with the right support. Once built to its full capacity throughout our nation, as it is designed, it will make a difference. Imagine what life changing effects this could make throughout the world, especially impoverished regions, third world nations, improving access to

transportation, suppling and upgrading infrastructure and communication needs. Bringing knowledge, access, clean and sanitary living conditions to a much needed region.

As with many start ups it needs support, it needs pushed through the right channels, a prototype is needed and yet to be built, the technology is off the shelf, the science is done, its ready to be built.

It has already been approved through the Michigan House and Senate, as the their Mass Transportation of choice. Michigan has recently finished the final of four public hearings, with a final recomendation by Rep. Bill Rogers to pass it on through the remaining channels and on to the Governor. (Information on this and its many other achievements is in the web site).

It has been received with great and overwhelming enthusiasm, throughout our nation and many countries throughout the world as well. As with many new endeavors, there is some critisisum, some has seen this as Disney World or Star Wars, but by far, the vast majority sees its potential and wants to see it up and going, at the same time, everybody wants to see an up and operating prototype, which is understandable. This is a small start up company with a huge heart a great idea and over fourteen years of history. Once a Public/Private Partnership is established with a local goverment, be it State or Federal, and/or a utility company, rail group, etc... and an agreement is in place for an existing right of way to build on, funding is available to build. Until then... the political game continues!

Decide for yourself, I've attached a link to the future of mass transportation. I hope you and your group can see its potential and I hope you will take it upon yourself to pass this information on to the proper contacts. Playing the phone game, being passed from one person to another, more times than not, it can and does get lost in the shuffle and at times end on deaf ears. All it takes is for someone who can make a difference to take the time, make the effort, then great things do seem to happen.

Thank you for your time and consideration. If you have any questions please feel free to contact me.

A Link To The Future: The HyRail, The Hydrogen Superhighway.

<http://www.interstatetraveler.us>

John L. Martin

410-598-3029

From: yuriy
Sent: 06/15/2010 - 10:31am
Organization:

Dear Sir or Madam,

There is huge network of highways in our country.

It could become a permanent source of clean energy utilizing technology in link below:

<http://www.newscientist.com/article/mg20026856.100-crystals-turn-roads-into-power-stations.html>

Sincerely,

Yuriy.

From: Dave Clark
Sent: 06/23/2010 - 2:45pm
Organization: Aerospace

David Clark

Aerospace Propulsion and Mechanical Systems Engineer

davidfosclark@gmail.com

772-559-0450

Office of Science and Technology Policy

Executive Office of the President

725 17th Street Room 5228

Washington, DC 20502

Phone: (202) 456-7116

Fax: (202) 456-6021

To the Office of Science and Technology Policy,

The answer is build heavy lift now, use the Russians for a minimal length of time, invest in commercial space, but don't bet the farm on them. Explore now, not in 30 years which the administration plan ensures. America had the resources and if turned around can keep them. But don't bet on us out of work engineers/technicians etc. becoming teachers or running to work for SpaceX, that is not going to happen.

Although I have the experience and education to site the cost of space missions, the particulars or spacecraft subsystem design, rocket propulsion technology, and the ability to assess risk for sending humans into space I will not. I will just say there can be a compromise, work the compromise, keep this nation great, after all what kid is going to be excited about sitting in a lab researching and dreaming about space travel? Maybe two. But most of us want results we want to build something that no one else can and do things that others cannot do. Most of us were motivated by seeing rockets go up not

just fabricating dreams of doing something some day. Action, is what is needed, we would have never gone to the moon if JFK said in the next decade we will think about going to the moon, and one day our research may lead us there . That would have been comical though!

All Americans and especially those in the space industry have an obligation to future generations to ensure that America remains great and retains aerospace supremacy. That should be obvious to all. However, dismantling our space program and attempting to hand the keys over to the commercial and international community is reckless, for advancements in space technology helps keep this nation safe and secure; the commercial space industry is not worried about our security they are worried about dollars. Further, our world is not perfect, but for some reason this administration thinks it is, and if this administration turns over 60 years worth of space technology to the private sector you can bet it will be turned on us. That is why cancelling the US space program is not the correct thing to do it is not the smart thing to do. Oh, and I know that the perception that this administration conveys to the American public is, "this administration is not cancelling the US space program", in reality the administration is doing just that. Some of us work on the inside of this industry and have for years we see what is happening, right now. Consequently, the president in one sentence says he's creating jobs, but in reality we are losing our jobs. Not long after saying that, just yesterday (June 21, 2010) thousands of space workers lost their jobs, jobs that will never be replaced under this administration, we all know that, we know the plan, and it is the wrong one.

Do you want a rocket exploration program? If yes then you have to build rockets, not dream about them.

Regards,

David F. Clark

http://edit.whitehouse.gov/sites/default/files/webform/rocket_man.pdf

David Clark
Aerospace Propulsion and Mechanical Systems Engineer
davidfosclark@gmail.com
772-559-0450

Office of Science and Technology Policy
Executive Office of the President
725 17th Street Room 5228
Washington, DC 20502
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Do you want a rocket exploration program? If yes then you have to build rockets, not dream about them.

Regards,

David F. Clark

From: richard schumacher
Sent: 06/23/2010 - 3:45pm
Organization:

The President's proposals for reforming space policy are exactly what is needed. NASA must focus its resources on basic research and exploration; space transportation and exploitation should be left to the private sector.

From: Matthew Adam Adler, PhD
Sent: 06/23/2010 - 4:36pm
Organization:

For the July 16 session, when will those who have registered be notified whether they are selected. (Pick me, I'm the best.)

From: Linda Billings
Sent: 06/24/2010 - 11:36am
Organization: George Washington University

I am submitting comments on the national space policy review.

http://edit.whitehouse.gov/sites/default/files/webform/PCAST%20comment.LB_.6.24.10.pdf

June 24, 2010

To: The President's Council of Advisors on Science and Technology
From: Linda Billings, Ph.D., Research Professor, School of Media and Public Affairs, George Washington University, Washington, DC; ph. 703-635-9799; libillin@gwu.edu
Re: Comments on space policy

On March 29, at a conference organized by the United Nations Institute for Disarmament Research, Ambassador Laura E. Kennedy, U.S. Representative to the Conference on Disarmament, provided an update on President Obama's national space policy review. Two key elements of the review, Kennedy reported, are "an evaluation of the range of approaches for enhancing the protection of critical government and commercial space assets against 'all hazards' [and] assessment of options for greater international cooperation in space." Regarding international cooperation, the policy review is evaluating options for "potential reforms to U.S. export controls governing space-related goods and services...; the development of common international arrangements to prevent the transfer of dual-use space capabilities to unauthorized destinations; [and] enhanced cooperation with established and emerging spacefaring nations on the peaceful exploration and use of outer space for civil and commercial applications."

Kennedy said the U.S. delegation to the U.N. General Assembly has recently affirmed "enduring U.S. support for a number of long-standing principles, including those in the 1967 Outer Space Treaty," that provide "for the free access to, and use of, outer space by all nations for peaceful purposes." These principles, she said, "serve as the foundation for international cooperation between, and among, all nations. Such cooperation is essential...as space evolves into an increasingly congested and interdependent domain." A first step to reducing possible misinterpretation of, and increasing transparency into, other nations' actions," she said,

“is through bilateral and multilateral transparency and confidence-building measures” [TCBMs]. Bilateral TCBMs such as those under discussion with Russia could “also be used with other spacefaring nations on either a bilateral or multilateral basis.”

I support the Administration’s directions in space policy, and I strongly endorse the direction of expanding international cooperation in civilian space exploration. I can only hope that, in the not too distant future, political posturing in the U.S. Congress and aerospace industry about the evils of competition in space from the likes of China, India, and Russia will be a topic for historians rather than for public discourse.

NASA and cooperation

The 1958 NASA Act’s “Declaration of Policy and Purpose” (Section 102), states that “it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind” and “space activities of the United States shall be conducted so as to contribute materially to...[c]ooperation...with other nations and groups of nations in work done pursuant to this Act and in the peaceful application of the results thereof.” Section 404 of the Act directs NASA to “make every effort to enlist the support and cooperation of appropriate scientists and engineers of other countries and international organizations.”

I note with interest that NASA has renewed or initiated a number of international cooperative agreements since the beginning of 2009, when President Obama took office. The next big step for the White House and NASA to take is to start building a global partnership for the long-term robotic and human exploration of space. A new report from the Committee on Space Research (COSPAR) Panel on Exploration (PEX), “Toward a Global Space Exploration Program: A Stepping Stone Approach,” outlines an approach to robotic and human exploration of the solar system aimed to enable maximum opportunities for science and for participation by developing as well as developed nations (the full report is available at:

http://cosparhq.cnes.fr/PEX_Report2010_June22a.pdf).

The Outer Space Treaty

I am pleased that the Administration views the 1967 United Nations Outer Space Treaty as a useful framework for space policy decision making.

I recommend to you the expert views of my dear friend Eilene Galloway (who died in May 2009 at age 102), who played a role in drafting the 1958 NASA Act and the 1967 U.N. Outer Space Treaty. Eilene opposed the weaponization of space and consistently argued that the Outer Space Treaty has enabled the world community to maintain peace in space and should be preserved and upheld. She constantly affirmed the core principle of the Treaty, as stated in Article II: "Celestial bodies are not subject to national appropriations by claims of sovereignty, by means of use or occupation, or by any other means." What will be needed to enable commercial uses of space that are compliant with the Treaty is a suitable regulatory regime for such activities.

On November 17, 1958, Senate Majority Leader Lyndon B. Johnson addressed the U.N. General Assembly about prospects for space exploration, saying:

"We of the United States have recognized and do recognize, as must all men, that the penetration into outer space is the concern of all mankind. All nations and all men, without regard to their roles on earth, are affected by what is accomplished over their heads in outer space.

If nations proceed unilaterally, then their penetration into space becomes only extensions of their national policies on earth. What their policies on earth inspire – whether trust or fear – so their accomplishments in outer space will inspire also.... Today outer space is free. It is unscarred by conflict. No nation holds a concession there. It must remain this way."

While I find the current discourse on space policy overly burdened with old-school, Cold-War rhetoric, I find LBJ's words highly relevant to the current political environment.

A note on transparency: I have only one concern about the Administration's national space policy review. The President's January 2009 directive on transparency, openness, and participation in government apparently does not apply to this review. Virtually no information about it is available on the White House web site, including the NSC home page.

From: red
Sent: 06/28/2010 - 6:45am
Organization:

I'd like to offer a few comments on NASA's new exploration policy. These comments may sound like criticism, so I should make it clear up front that I strongly agree with the key drivers of this policy, such as repairing the budgets of areas like Earth observations and Aeronautics, funding commercial crew/cargo and generally strong commercial participation, a Flexible Path that reaches some easier deep space destinations before adding the expense of surface landers, a strong robotic precursor line, extending and seriously using the ISS, declining to dedicate extremely large amounts of money and time to rockets like Ares I and Ares V, and investing significantly in space technology development and demonstrations. Keeping in mind that I support NASA's new approach, and think it's the best approach in NASA's history, here are some thoughts on how it might be improved.

- There is a considerable amount of confusion about the role of astronaut visits to the Moon's surface in the current plan. On the one hand, many recent NASA documents and comments by the Administrator and Deputy Administrator indicate NASA intends to send astronauts to the Moon's surface at some point, and the FY2011-2015 work it plans to do helps to get there. On the other hand, the roadmap of destinations that the President described on April 15 does not mention the Moon; he just noted that the Moon's surface should not be the first destination. NASA's plans for the Moon should be clarified, at least to the point of showing where it fits, if anywhere, in NASA's roadmap of destinations. If reaching the lunar surface depends on earlier successes such as technology demonstrations, robotic precursor results, new commercial capabilities, or other future events, this should be explained.

- A number of critics of the FY2011 plan center their objections on the postponement of heavy lift decisions until 2015, even though the Program of Record could not start serious heavy lift development until after then. I'm not convinced that heavy lift is needed in the first place, but the FY2011 plan may need more supporters if it is to be implemented, and not only that, but survive long enough so commercial and technology efforts succeed. Thus compromises may be needed. One compromise could be to start heavy lift development earlier. If this is done, it would be crucial to ensure that the heavy lift development and operations are affordable. It may also be important to take a path that allows for affordable growth. One possible approach to accomplish this sort of compromise might be to implement a "Phase I EELV" heavy lift rocket in the 40-50MT to LEO range. Another could be to fund a COTS-like competition so vendors like SpaceX, ULA, and others could compete for a modest but scalable heavy lifter.

- The recent NASA exploration workshop showed several larger robotic precursor missions. The first 4 were to a NEO, Mars, the Moon, and Mars again (a notional NEO mission was also mentioned). It seems that the Martian surface is over-emphasized in that sequence, given that Mars surface missions are multiple decades away at best, that 2 of the flagship technology demonstration missions (SEP and aerobraking) might carry instruments to Mars, and that there will likely be a number of opportunities for hosting robotic precursor instruments on U.S. and international Mars science missions. Constellation's big iron rockets floundered, but there's a great deal of momentum and success in today's lunar robotic community, so it may make sense to switch one of those Mars missions to the Moon. This may also help with the spirit of compromise I mentioned before. Some of the opposition to NASA's new plan, including prominent opposition by Apollo astronauts and others, is centered around the idea that there is a lot left to do at the Moon, and that lunar resources may prove to be economically useful. A strong lunar robotic precursor program would help to reduce opposition from that quarter. Alternately, it may make sense to dedicate one of the Mars missions to NEOs, Mars moons, or perhaps even Lagrange point satellite servicing demonstrations, since these destinations appear earlier than the Martian surface in the Flexible Path roadmap.

- The recent NASA exploration workshop showed that the robotic precursor allocation is for 5 large missions, 3 small scout missions, and various other work. I would suggest that there should be more scouts and fewer large missions, sort of like a food pyramid for robotic precursors. Perhaps 4 large missions and 5 scouts would be a better balance.

- The Augustine Committee stated that the ultimate goal of NASA's astronaut exploration should be Mars. I disagree. I'm not against Mars; I have a 1500 page book on the planet, and several others. However, a focus on Mars tends to lead NASA to overreach, designing the biggest heavy lifters and other expensive systems to be used decades in the future. The real goal of NASA's exploration should be Earth. What that means is the exploration program should provide benefits to the people of Earth. The science benefit of exploring Mars and other deep space destinations is part of that. However, it's probably more important to deliver economic and security benefits. One example of this could be developing and making affordable useful capabilities like satellite servicing during Lagrange point missions so these capabilities can be used for comsats, military satellites, and environment monitoring satellites. Another example is making a serious attempt to assess and develop space resources such as lunar or asteroid volatiles that can be used economically.

- NASA's current exploration plans include an astronaut exploration test flight around 2020 in lunar orbit or some other beyond-LEO cislunar space destination, followed by an asteroid mission around 2025. I'd suggest that our ambitions should be set a lot higher than a test flight for the earlier, safer, easier-to-reach, and potentially more valuable cislunar space destinations, even if it delays reaching more distant destinations. There are many economic, science, and security benefits that can be had from these

nearby in-space destinations, such as commercial growth, infrastructure development, satellite servicing, lunar observations and sample return, assembly of missions to deep space, and more.

- At \$4.5B or more, the Orion-based Crew Rescue Vehicle that was introduced into the FY2011 budget plans may be too expensive to add without seriously weakening the rest of those plans. It may make sense to support the CRV capability through a commercial COTS-like competition instead. This may have synergies with the commercial crew effort, since the CRV represents more business for commercial service providers, and since commercial space stations these services may also address will need some sort of CRV capability.

Meanwhile, if an Orion-based mission, or work for the Orion contractors even if not technically derived from Orion, is needed for political reasons, that work could be for beyond-LEO crew transportation. This is not on the short-term critical path as the CRV is, so its budget can be controlled or even cancelled if it threatens the higher-priority items in the NASA FY2011 budget. Capabilities and thus costs could be limited by making the first version a demonstration-only vehicle, by assigning some of its subsystems to future flagship technology demonstrations, or by limiting the vehicle to cislunar space only (so a separate vehicle would be built later using results of flagship technology demonstrations). The vehicle's schedule could also be used as a per-year cost control. Initial work might be limited to early designs. The vehicle could be in-space only, an Earth casule lander, or an in-space vehicle with emergency Earth landing ability. It could be launched crewed, or uncrewed like the Orion-based CRV. Even though this vehicle could be limited in these various ways, it could address the demands of the Orion contractor political support, and could also address the concerns of those FY2011 opponents who insist that development of a beyond-LEO spacecraft start soon.

From: Jeffrey Woytach
Sent: 06/29/2010 - 7:46pm
Organization:

Please see my attached document with commentary regarding the future of NASA. Thank you for the opportunity to share my thoughts with you.

<http://edit.whitehouse.gov/sites/default/files/webform/Is%20space%20exploration%20important.rtf>

Jeffrey Woytach
5591 Wallace Boulevard
North Ridgeville, OH 44039
June 30, 2010

The President's Council of Advisors on Science and Technology (PCAST)
Office of Science and Technology Policy
Executive Office of the President
725 17th Street Room 5228
Washington, DC 20502

To the members of PCAST;

Is space exploration important?

Time and time again, public opinion polls tell us that the people of the United States believe space exploration is important. So, we know that the American public supports it.

But why doesn't the United States government believe space exploration is important? Not important POLITICALLY, but important in and of its own right.

Let's look at the historical record.

Space exploration began as a cold war political tool. Once the Soviet Union launched Sputnik we had to play catch up to quell the fear that the Soviet Union had the capability to launch rockets with nuclear weapons against the US, and we had no such capability. The reason we had to do this, was because our government did not have the foresight that the Soviets had in recognizing the importance of rockets.

The Soviets embraced the work of their rocket pioneer, Konstantin Tsiolkovsky. He published over 500 works on space travel, from liquid-fueled rockets, to gyroscopes for attitude control, to air locks for exiting the spaceship into the vacuum of space, and other amazingly accurate predictions of space travel. Many of these works were published before the first airplane flight in 1901.

On the other hand, the US denigrated the work of its rocket pioneer, Robert Goddard. In 1914, Goddard received two U.S. patents for liquid and solid propellant rockets. He developed the mathematical theories of rocket propulsion. Goddard also outlined the possibility of a rocket reaching the moon. The press picked up Goddard's scientific proposal about a rocket flight to the moon and erected a journalistic controversy concerning the feasibility of such a thing. Much ridicule came Goddard's way. Goddard's patents and papers on liquid fueled rocket systems were largely ignored by the United

States government. His theories and designs were too far advanced for the times.

Indeed, the United States owes its early space achievements to Wernher von Braun and the German rocket team from Peenemunde. As a young engineer in Germany, von Braun found a kindred spirit in Goddard, and he became enamored with the possibilities of space exploration by reading the science fiction of Jules Verne and H.G. Wells. From his teenage years, von Braun had held a keen interest in space flight, becoming involved in the German rocket society as early as 1929. During World War Two, von Braun was the leader of the German rocket team which developed the V-2 ballistic missile for Germany. It is known that he was arrested by the Nazi's and nearly imprisoned because he focused more on the space flight potential of the V-2 than its war potential.

The V-2 rocket developed by von Braun and his team was the immediate ancestor of the rockets used in space exploration programs in the United States. Before the Allied capture of the V-2 rocket complex, von Braun engineered the surrender of 500 of his top rocket scientists, along with plans and test vehicles, to the Americans. For fifteen years after World War II, von Braun would work with the United States army in the development of ballistic missiles, launching them at White Sands Proving Ground, New Mexico. In 1950 von Braun's team moved to the Redstone Arsenal near Huntsville, Alabama, where they built the Army's Jupiter ballistic missile. The first successful spacecraft launched by the United States, Explorer-I, was lofted into space aboard von Braun's Jupiter rocket, a direct descendant of the V-2 missile.

The Russians and the Germans cultivated the seeds planted by the early pioneers and reaped a harvest. We had to take what they had harvested to begin our own programs.

President Kennedy's challenge in May 1961 to land a man on the moon and return him safely to the earth by the end of the decade was an audacious challenge given that the sum total of US human spaceflight experience at the time was Alan Shepard's fifteen minute suborbital flight. We know from White House tape recordings that President Kennedy had no real predilection for space exploration. He needed a political program to soothe over the fiasco of the Bay of Pigs invasion and to, once again, get us ahead of the Soviet Union. Going to the Moon was a political tool.

But, President Kennedy's speeches in the 1960's on reaching for the moon resounded differently in the minds, and spoke to the aspirations of hundreds of young people at the time. They were engineers and scientists who saw the opportunity to create a new human endeavor; one that had been relegated to the science fiction pages of Verne, Wells, Burroughs and Clarke. And thanks to James Webb, NASA's first administrator, space exploration as more than just a "beat the Soviets" program took hold in the fledgling NASA. Webb argued with the President that science and education were important, too, above and beyond human space flight. NASA gave birth to true space exploration, and, in doing so, gave birth to a dichotomy that exists to this day, more than fifty years after NASA's creation: NASA with its cadre of the foresighted who see the

intrinsic worth and necessity of space exploration versus those who see space exploration as a political tool.

Today, we are bringing the Space Shuttle Program to a close. Why? It has nothing to do with safety as many would like to us to believe. We are ending the Space Shuttle Program because there is only a fixed political pie for NASA, and the Space Shuttle program represents too big a slice of that pie for NASA to fund both Space Shuttle and Exploration. President Nixon made the decision to do the Space Shuttle because going to Mars was going to cost too much. He decided we'd build a space shuttle, use it to build a space station, then we could go to Mars. Unfortunately, the space shuttle program suffered through the same type of funding shortfalls that eventually doomed Constellation. The Space Shuttle flew for almost twenty years before space station assembly even began. Now that we have a space station and an in-space infrastructure that can fully employ the capabilities of the space shuttle, we're shutting the program down. Why? Politics. The budget's not big enough for NASA to do everything.

And, therein lies the rub.

The history of NASA is the history of an agency populated by scientists and engineers with a vision, hampered by the fact that NASA is merely a political afterthought, and, ever since the end of Apollo, is ill funded to accomplish what it sets out to do.

The Space Shuttle represents the United States' only way to send humans into space. Closing it down while trying to maintain and expand capabilities on the International Space Station makes no sense. The Space Shuttle Orbiters (Discovery, Atlantis and Endeavour) were designed to fly 100 missions each before requiring a major structural overhaul. They've barely reached one-third of that capacity.

Let's address shuttle safety head on. Debris impacting the thermal tiles on the Orbiters was a concern from day one of the shuttle program. But NASA became complacent over the many successful years of the Orbiters safely enduring impacts. Until the Columbia tragedy, that is. Foam shedding on the external tanks has now been almost completely eliminated thanks to the dedicated efforts of NASA and contractor employees. If the Orbiter's reinforced carbon-carbon nose and leading edge wing panels are still a safety concern because of impacts, then replace them with a metallic thermal protection system like that developed and tested for the X-33 program. Sure, this will add mass to the Orbiters and reduce their cargo carrying capability, but so what? The era of station assembly is over. We can afford to lose some up-mass capability in the name of added safety. The Space Shuttle is still a safe, reliable and viable space transportation system.

Yes, flying the shuttle is costly. Doing anything correctly is costly. But how much of the cost of flying the space shuttle goes right back into the economy via the salaries of its work force? How many high-tech industries are maintained? How much science and

engineering talent is maintained? What price do you place on the inspiration that a space shuttle launch has on a young boy or girl who dreams of space exploration?

The Orbiters could be flown without crew; a completely automated flight profile for cargo carrying missions to the space station. How much can we carry if we fill the Orbiter payload bay and the pressurized compartment with cargo? Without a crew, the cost savings on a per mission basis would be sizeable. And you now have a reusable cargo vehicle.

It seems like a no-brainer to me. We would not have to rely solely on Russian Progress vehicles to supply the space station, or on Russian Soyuz spacecraft to transport crew to and from the space station. Fly one or two Space Shuttle's each year, uncrewed, to carry cargo to and from the Station, and no Progress vehicles are required. One shuttle launch per year to do a crew rotation, and one Soyuz launch per year to perform crew rotation and refresh a crew emergency return vehicle at station minimizes the use and cost of the Shuttle to fly human cargo.

Logic, not politics.

And the Space Shuttle's external tank and solid rocket boosters can be used as the basis for a first generation "heavy lift vehicle".

Continue to fly the Space Shuttle in the manners outlined above until commercial cargo and crew carrying capability is alive and well and ready to take up the load. Doesn't that make sense? NASA should be helping these commercial crew and cargo entities in their endeavors; working hand in hand to lend them the value of NASA's expertise. They are an asset to, and a natural growth of space exploration, not a competition for NASA.

Starting one NASA program and ending it only to be able to fund another does not define a sustainable program of exploration. A truly sustainable vision for space exploration is one that combines the strengths of NASA, the other space agencies in the world, the commercial space industry and academia in a true partnership that goes beyond contractual or political agreements.

For NASA to truly meet its goals and live up to its potential, for it to act as an inspiration for science and engineering, its funding must be increased. As a minimum, it's funding to should be 1% of the federal budget. Aren't the tangible and intangible returns on investment in NASA worth 1% of the federal budget?

Where should the additional money come from? Look for overlaps between NASA, the Department of Energy and the Department of Defense where cost sharing can be done. They are certainly there. We must, however, be willing to look for them and be willing to streamline the work of these government agencies. Maybe NASA needs to be restructured? It's worth looking at. It's a 50+ year old organization. Maybe it needs a

re-birth? Let's look at it. Put all the cards on the table and really do what is needed to make space exploration important.

Look at the return on investment provided by NASA. Technology spin-offs galore; industries and products that can trace their existence back to NASA work. Astronomy texts have been rewritten thanks to the Great Observatories of Compton, Hubble, Chandra and Spitzer. New knowledge of the Moon has been gained from LRO, LCROSS and the international missions of SMART-1, Chang'e and SELENE. The wonders of Mars have been revealed by the cadre of U.S. and European spacecraft that have given us a permanent virtual presence at the Red Planet for the last decade. Numerous careers in math, engineering and science have been maintained by NASA work. The knowledge already gained on ISS, and the knowledge that is yet to be gained, prepares us to build the spacecraft that will carry humans farther out into the solar system.

What price do you place on an organization that provides inspiration to a country to reach new heights, and explore new frontiers?

From: Fred H. Francis
Sent: 07/01/2010 - 3:29am
Organization: None (private citizen)

With respect to the President's stated intention to kill the Constellation Program and the recent release of the National Space Policy, and in light of the analysis provided in the Augustine Report on human spaceflight, what can be said of the President's proposed changes and of their wider implications? What of their underlying assumptions and the validity of those assumptions? In reviewing my attempt to address some aspects of these and other related questions, I ask the Council's indulgence with respect to the largely qualitative nature of this document; as time and resources prevent a more thorough-going report, let alone one as comprehensive as that of the Augustine commission.

With that in mind, members of the Council may feel free to call upon me at their convenience, should the need arise.

Sincerely,

Fred H. Francis

<http://edit.whitehouse.gov/sites/default/files/webform/To%20PCAST%20for%20July%2016th.doc>

From: Fred H. Francis
Sent: 07/01/2010 - 4:32am
Organization:

For easier reading, please substitute the attached version of my "Concerns About the Basis of Proposed Changes in U.S. Space Research" for the one sent previously.

As to the email, your system would not allow me to reuse my original normal email address, so I was forced to use my old school backup.

Many Thanks, Fred H. Francis

<http://edit.whitehouse.gov/sites/default/files/webform/To%20PCAST%20for%20July%2016th%20ver%2002.doc>

Concerns About the Basis of Proposed Changes in U.S. Space Research.
by Fred H. Francis

With respect to the President's stated intention to kill the Constellation Program and the recent release of the National Space Policy, and in light of the analysis provided in the Augustine Report on human spaceflight, what can be said of the President's proposed changes and of their wider implications? What of their underlying assumptions and the validity of those assumptions?

Assumptions; Financial Resources:

Taking the last question first, time presses, so I shall only attempt to address the most fundamental assumptions implicit in all discussions published so far. First must surely be what I call the "Curious Politics of Scarcity". That is to say that all of the discussion published so far seems to assume that there is no more money to be had, in real dollars, for NASA; at least not in terms of meeting the nominal funding needs of NASA for Constellation. This assumption is as strange to the taxpayer as it is significant. It is significant in that, as the Augustine Commission correctly found, such an assumption forces radical programmatic change to be considered; and strange in that, interpreting the data presented in Fig. 4.3.2-1 on page 59 of the Augustine Report, the disparity between projected Constellation program needs and prospective budget projections appears to be no more than \$4 billion.

To use the vernacular, \$4 billion is "chicken feed"; not even enough to feed the active military three square meals per day; using 2008 numbers for active U.S. military, only, we get 1,385,122 service members X 3 meals/day @ \$5/meal x 365 days/year is \$7.6billion. If we short-change those same troops and spend only \$3/meal, the total cost is \$4.5 billion. These calculations are conservative in that they do not take into account the maintenance of the estimated 1,458,500 members of the various reserve units, many of which are on active duty at any given time. It is important to remember that the taxpayer foots the bills for service members' expenses through their paychecks, whether or not those individuals eat government-prepared meals.

The source for the troops strength is data quoted here:

http://www.globalfirepower.com/country-military-strength-detail.asp?country_id=United-States-of-America, citing the Library of Congress. Wikipedia's article:

http://en.wikipedia.org/wiki/United_States_armed_forces cites

<http://siadapp.dmdc.osd.mil/personnel/MILITARY/ms0.pdf> and quotes a slightly higher active service number of 1,473,900, which would cost \$4.8 billion at \$3/meal.

Clearly, and quite curiously, this is not a significant amount of money, so the reflective reader must wonder at its cause; I have not yet been able to find it. One can only imagine the chaos which would ensue, in all governmental departments, if \$4 billion were the budgetary threshold triggering an this kind of blue-ribbon hand-wringing for our other expenditures. To quote the vernacular again: "that dog don't hunt."

Concerns About the Basis of Proposed Changes in U.S. Space Research.
by Fred H. Francis

Assumptions; “Stunts”:

The Roman poet Juvenal (circa 100 AD) ridiculed public apathy towards the duties of citizenship with the Latin phrase “panis et circenses” or “bread and circuses”; to describe the only remaining cares of a Roman populace which had given up its birthright of political involvement. This “stunt”-like mentality is the greatest weakness inherent in the “Flexible Path” (Option 5) the President has chosen from the Augustine report, as it was even in the heyday of Apollo. The result then was the cancellation of Apollo and the dismantling of the greatest technological infrastructure in the history of Man. Americans, led by a poorly-informed media and several key members of Congress collectively said: ‘we’ve beaten the Russians to the Moon, why do we continue to go there? Indeed, this sentiment has been echoed almost exactly by the President Obama, himself.

The fundamental flaw in the President’s reasoning (and he’s not alone in this) lies in seeing the establishment of a permanent base on the moon in this light, rather than as a logical adjunct to our existing National Laboratories, one of which is now in Earth Orbit. The Moon is not a goal in and of itself. Rather it is like the shuttle and the ISS: a staging area for scientific inquiry and technology development of all kinds. Science and technology innovation are of necessity slow, deliberative processes punctuated by moments of great insight. Their development is at all helped by implicit program requirements to entertain the public with “bread and circuses”.

Unfortunately, because human nature has not changed in thousands of years, the danger to the “Flexible Path” is thus the same as it was to Apollo: public appetite for spectacle is short-lived and fickle in its tastes. Recognition of this fact is essential, both for correctly ordering national research priorities and for the survival of whatever is ultimately selected; one has only to reflect on changes in popular music to observe this. Failure to do so simply leaves a rump program, stripped of long-term goals, highly episodic in nature, which can be delayed or abandoned even more easily than Constellation with, or without, planned cuts to NASA itself. This vulnerability is only increased by kicking even modest milestones like cis-lunar flight “down the road” to the 2025 time-frame.

Given that the Augustine Report places their Option 4: “Moon First” on a par with Option 5, the “Flexible Path”, and the need recognized by the President for investing in science, technology and education, there is clearly sufficient support for him to reconsider his position in light of expert testimony.

Concerns About the Basis of Proposed Changes in U.S. Space Research.
by Fred H. Francis

Economics; Technology Transfer:

Though the National Space Policy presents a number of worthwhile benefits derived directly from space systems, I could find no mention of the role of technology transfer as a result of investment in space research. This omission obscures a key part of the value of NASA spending to the American economy: that of distributing intellectual property. The beauty of NASA spending has always been that the research it funds is largely unclassified. This is significant in that it allows American companies of all kinds to use tax-payer-funded advances in technology to support their businesses and, ultimately, expand the economy by creating new products and services. Moreover, although NASA-funded research is sometimes patented, its public financing also precludes it being appropriated as “company private” information exclusive to any one corporation or individual. The results have been critical advances in avionics, food production, telecommunications, cordless power tools, microelectronics, pharmaceutical and medical research, mathematical modeling, biology, climatology, etc. More robust spending for all NASA research is thus very much to this nation’s advantage.

Economics; Job Creation and Social Improvement:

Though NASA is not and never should be operated as a jobs program per se, one additional benefit to both NASA and military spending are the set of regulations known as ITAR which have the effect of protecting the kind of “good jobs” the President has expressed interested in fostering. It is no exaggeration to state that for each engineering job on a given project, there are 10-12 good lower-level manufacturing jobs without which that project could never be built. This stands in stark contrast to typical photos showing a handful of engineers present during final assembly of satellites and space probes. The actual manufacturing process involves hundreds of technical workers; often from minority communities, performing countless steps to build, test, and package precision components for integration into the systems of the overall project.

These jobs provide challenging, demanding work in precisely the kind of environments which value education and personal initiative and involvement in order to produce some of our nation’s finest work, work which supports families, and work of which those families can be proud. At precisely such times as these, when our nation faces economic insecurity unmatched since the Great Depression, and when, by contrast, we’re willing to spend hundreds of billions investing in the long-term security of hostile foreign nations, it is also time for us to spend at least a few billions in long-term investment in our people here, at home. This the President has begun to do, but more aggressive spending on unclassified public research will further his stated goals of creating good jobs in the private sector while stimulating the economy and providing the intellectual tools of innovation to a much broader base than can be done through direct payments to contactors. It’s a double benefit from the same tax dollar.

Costs of Cuts; Safety and Reliability:

Quite apart from the glaring national security problem of allowing a single company to become a sole-source provider of U.S. manned flight into LEO (Low Earth Orbit) are questions of safety and hardware reliability. While one might hope that a “commercial” service provider would be contracted to provide immediate, on-demand access to space should need arise, what record there is of much more mundane privatization efforts shows this, for example: the wide-spread use of contractors for U.S. Mail delivery, for example; shows the folly in this. Postage rates continue to climb, delivery times for first-class service have stretched to what was considered 2nd or 3rd class service only 20 years ago, mis-delivery is up, and contract personnel have abandoned, failed to deliver, or failed to pick-up mail in cities all over the nation.

An obvious counter-argument would be that the safety and reliability requirements of something as important as human spaceflight would forestall such peccadilloes along with the safety and reliability issues, yet the abolishment of the Civil Aeronautics Board resulted in the formation of an NTSB without any enforcement powers and a long list of well-considered safety recommendations on a years-long backlog with the FAA. Even the existing NASA management scheme has found things like the hold-down components on the Shuttle stack not being installed as required, to say nothing of the long-term non-technical idiocy which precipitated the deaths of the Columbia and Challenger crews. To suggest that privatization of human spaceflight will result in anything but increased risks to flight crews flies in the face of experience.

We cannot wish-away aspects of human nature any more than the Russians could under their ideal of communism. Leaving honest errors aside, even educated people will do stupid things when there is incentive to do so and long history has shown that the interests of corporations and even of organizations established to serve the citizens of a democracy are not always identical to those of the people they’re supposed to serve. We simply must not give-in to the political fad-of-the-moment; oversight cannot be relaxed without increasing both the frequency of mission failures, and the root causes which lead to failures. Maintaining such vigilance in the once-removed environment of a “commercial” space-flight provider will certainly be more problematic, as well as costly, than the system now in place.

As to the sole-source issue, this too cannot be left to the chance vagaries of human nature. While any need which might immediately arise could be met by a “crash-priority” mission of the shuttle, what is there to prevent any contractor from “going-under” in a free market? would any contract signed with such a vendor preclude the vendor from selling-off assets in time of extremity? What prevents its board from deciding on some appropriately-euphemized “change” to its “business model” which would preclude further interest in manned space flight? Does the Administration really suggest that an entire body of law governing corporate rights and conduct could/would be set aside so as to assure Americans of safe, reliable access to space? What of stockholder rights? What of foreign (individual or governmental) rights as stockholders?

Concerns About the Basis of Proposed Changes in U.S. Space Research.
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With respect to planned cuts to NASA staffing and facilities, any cuts reduce the “depth” of the team, forcing increased reliance upon contractors with even less institutional memory than NASA. Doing so will puts crews at risk and reduces policy options for Technical, administrative, and national political leaders alike. The organization itself must thus be treated as a national asset, much like the staff of the Library of Congress, or that of the national labs; we ARE the “leading space-faring nation” BECAUSE of the technical staff we’ve been able to cultivate and preserve. If we cut that staff and/or eliminate facilities, we simply insert another unnecessary impediment into simply getting the job done. To use a homey analogy, it’s one thing to have free use of a neighbor’s swimming pool, and quite another to own one.

Both science and engineering are creative disciplines, but physical implementation of designs and methods MUST be a thoughtful and methodical in order to contain development costs and prevent costly failures. Poor planning, management, testing or oversight will lead to further loss of life, a cost paid throughout all history. It is incumbent upon all citizens to assure that our endeavors prevent this, or at least mitigate it’s probable causes; adding yet another interface to already complex undertaking simply looks foolish on general principles.

Costs of Cuts; Contract Management:

Implicit in several statements of the President; in the Augustine Report on page 16 under “Organizational and Programmatic Issues”; and in several of the Guidelines presented in the National Space Policy is the idea that cuts must be made to both NASA staffing levels, and to the agencies physical assets. This is simply folly. Past experience has shown the folly of “fast, better, cheaper”, both in human lives and in equipment. Cutting NASA’s workforce and facilities will cause the same harm over a larger scale. It will also harm the national budget more than hurt it for, unless reliability requirements are dropped (read safety, for manned spaceflight) cutting NASA facilities and personnel will increase both direct and indirect program costs, not merely over the long term, but immediately, in on-going programs.

As an example, JPL was gutted of most manufacturing personnel in the 1980’s and 1990’s. Since that time, much money is wasted “reinventing the wheel” on every project because most of the personnel there are contract workers who are hired and fired with the passage of every project, resulting in a catastrophic loss of institutional knowledge. Each time a system or an instrument is re-engineered costs a project time and money; without institutional knowledge, there is little choice BUT to do so; even Constellation has had to reverse-engineer Apollo hardware and testing criteria in order to develop Orion and the second stage for Aries I.

Concerns About the Basis of Proposed Changes in U.S. Space Research.
by Fred H. Francis

A personal anecdote is illustrative: I worked at an Aerospace company on a piece of hardware for an as-yet-to-be-launched unmanned mission. Our task was to work with JPL scientists to create an instrument using their specifications, drawings and design criteria. Their problem as they said to us in the first meeting, was that they were not manufacturing engineers and so knew only how to design bench-test circuits, not how to manufacture finished, flight-ready devices. Our problem was that their lack of expertise didn't relieve them of the responsibility for oversight, and left them with well-considered specifications which were, nevertheless, not based upon physical reality.

As a result, successful completion required countless change orders covering materials selection, components, component placement, assembly order, test conditions, testing methods, you name it. JPL got their instrument, and my company "took a bath" to the tune of almost 200% of our planned costs. We sustained these costs, as we have before, in the national interest and out of individual and collective patriotism, but such losses cannot be sustained during tough economic times like the present and my (now former) company has had to lay-off personnel and decline to bid of several subsequent NASA projects for this reason.

This is neither an isolated example or an extreme one, as interviews with aerospace professionals will bear-out, should the Council care to make the relevant inquiries. Such cases have become all-too-common since JPL's current business model was set in place during the Reagan-era privatization mania, when the push was on to out-source as much of JPL's manufacturing capability as possible to industry.

Unfortunately for the nation, human nature is consistent and the history of many similar efforts is clear: this is precisely the kind of thing we will see NASA-wide, should cuts now under consideration be implemented. Once gone it is extremely unlikely that they will be recovered, and the costs of building large-scale infrastructure, given the low quality of most political debate, make them unlikely to ever be replaced. Once lost, the nation loses just as surely as a university science department would suffer if it lost its laboratories. An example which comes to mind was the closing of the 80 by 120 Foot Wind Tunnel at NASA Ames Research Center. After years of attempting to find commercial partners to support the operation of this national asset, NASA was forced to close it in 2003. Apparently it has been reactivated under Air Force aegis as part of the Arnold Engineering Development Center (AEDC), at testament both to the continuing need for a facility built in the 1940's, and to the foolishness of trying to politically manage technology.

Costs of Cuts; "Commercialization":

There has never been a successful private effort to put humans in space for the simple reason that there is no viable business model for doing so without funding from taxpayers. Should any individual company wish to create the capacity for manned spaceflight services, there are no significant legal impediments. One must ask why then, with their long history of rocket development, did neither GE (the Redstone); Convair (the Atlas); Lockheed (the Titan I/II); Chrysler (Saturn 1B/C); McDonnell-Douglas (Mercury & Gemini capsules, Saturn SII stage); Martin-Marietta (SIC stage of the Saturn V) or North American (Saturn V); ever put forth such an effort, even in the heady days of the 1960's?

They surely considered it: McDonnell, for one, had an extensive exhibit in Disneyland's now-defunct "Tomorrowland" featuring massive craft with rings of aerospike engine-shielded spacecraft carrying hundreds of passengers into orbit and on sub-orbital ballistic courses that could've reached Australia in under 90 minutes from engine start. The reason, of course, is that such things are (still(!)) not commercially-viable. Indeed, the only credible private launch firm at present, following the demise of Rocketplane, Kistler Aerospace, and Rocketplane Kistler, is , SpaceX, which has had a manned version of it's Dragon capsule on the boards for some time, but has no market to develop it apart from a request from NASA.

With the foregoing in mind, it is simply fatuous to pretend that the contracting-out of human spaceflight is anything more than corporate welfare. Adventures to MIR and the ISS are instructive in this context as even their exorbitant costs don't come anywhere close to paying for the development costs of the rockets they're flying on, let alone that of the infrastructure of which they're taking advantage. It makes sense to continually fund bid competitions for ever-better boosters, but no financial sense to "commercialize" human spaceflight.

Ignoring safety and reliability issues, the problem with the President's proposed "commercialization of manned spaceflight, as it is proposed, is exactly analogous to the advent of "managed health care"; the more hands in the revenue stream, between the source and the ultimate consumer of goods and services the less money there is to be applied to a given situation. As the dynamics are the same so would be the results; costs would rise, reducing the funds available to NASA for other work and forcing the agency to examine whether or not it could afford a given operation (pun intended) or be forced to defer it or cancel it outright. In the meantime, the drain on funds would affect other program efforts, prompting ignorant political calls demanding NASA account for its 'wasteful spending', etc., etc. Allowing this would be a ridiculous waste of (allegedly) scarce financial resources in both the short and long terms.

Conclusions:

If we accept the “Curious Politics of Scarcity”, I urge the Council to recommend the President modify his initial “take” on the Augustine Report and follow its Option 4: “Moon First”, while aggressively funding Areas V for Heavy Lift capability to take advantage of the economies of scale inherent in the design. Doing so would eliminate the stunt-like mentality of “firsts” from manned spaceflight programs and allow technologists, and the public at large, to focus on meaningful scientific and technology development. Secondly, it should be NASA’s mandate to fully fund and develop an Orion-compatible liquid-fuelled booster and require such boosters for all future U.S. manned launches. In this context it would be appropriate to create an open -bid competition, in which SpaceX would be invited to compete, for the creation of such a booster. It would NOT be appropriate to sacrifice Orion, or its long-term capability, by redesigning it for compatibility with any particular booster, including the Falcon 9.

If we don’t accept the “Curious Politics of Scarcity”, the answer is mostly simple: repudiate cuts to Constellation while adding the funds necessary to hew to the Program’s ESAS design baseline. Mandate and fully fund compatible liquid-fuelled booster development for all U.S. manned launches, and add money wherever else in NASA it’s technically valuable to do so; return to exploration at an aggressive pace. In this context it would STILL be appropriate to create an open -bid competition, in which SpaceX would be invited to compete, for the creation of such a booster. It would NOT be appropriate to sacrifice Orion, or its long-term capability, by redesigning it for compatibility with any particular booster, including the Falcon 9.

Though NASA is certainly not the “Alpha and Omega” of technological advancement, its large, well-managed technology programs provide economies of scale in the efficient disbursal of government funds and that those which are unclassified provide the most means for creating and disseminating technological and scientific advances into the general economy. This is also true of unclassified work at the National Labs, though to a lesser and less-consistent extent.

Conversely, if we are willing to invest in our intellectual and technological infrastructure, we can be secure in the knowledge that every dollar spent on space research returns several times that to the economy while supporting good jobs among aerospace manufacturers which will help stabilize the economy and lend direct as well as indirect support to small business. This, in turn, will provide more money to local, state and federal taxes which will allow the nation to return to more rational education spending, thus enabling the nation to better address the ongoing national demographic shift and the loss of our skilled/highly-skilled labor force through death and retirement.

Concerns About the Basis of Proposed Changes in U.S. Space Research.
by Fred H. Francis

Finally, I agree with Astronaut John Glenn's assessment that our national priorities require that we continue to fly the space shuttle to close the gap in our access in space; the one caveat I would make is to keep the program only until a flight-ready heavy-lift booster is in place. Moreover, in addition to funding conventional booster development, developmental funding needs to be made available for transformational technology such as the Variable Specific Impulse Magnetoplasma Rocket (VASIMR) technology pioneered by engineer and former astronaut Franklin Chang-Diaz. This technology has the potential to cut missions to mars from 2 years to 39 days, successful development would be great boon to both manned and unmanned programs. Developing it teach us about electronic controls and materials science issues applicable elsewhere.

Chang-Diaz' pioneering engine technology also points-up yet another reason for establishing a permanent base on the moon; the close proximity of the moon, with it's well-understood climate and abundant raw materials (any random handful of moon material is comprised of oxygen and useable metals) provides both a need for support technologies, and a safe place to test manufacturing and maintenance techniques in the natural environment. Add to that the newly discovered water deposits on the moon and one can see that our nearest neighbor in space is the perfect place to develop all the technologies involved in going nearly every other place in the solar system.

From: Thomas Lee Elifritz
Sent: 07/01/2010 - 5:19am
Organization: The Tsiolkovsky Group

Written statement and recommendations for the President's Council of Advisors on Science and Technology meeting of July, 16, 2010, concerning United States National Science Policy, National Space Policy and NASA executive and congressional direction, authorization, appropriations and funding.

http://edit.whitehouse.gov/sites/default/files/webform/Advisory_Council.pdf

United States National Space Policy

Safety, Security and Diplomacy Through Science and Technology

Written Statement for the President and his
Council of Advisors on Science and Technology

Thomas Lee Elifritz
Director of Research

The Tsiolkovsky Group
Madison, Wisconsin USA

Comments Due June 30, 2010
PCAST Meeting July 16, 2010

Life on this Planet

Life on the planet Earth is currently under siege. Human population is now approaching seven billion lives. Atmospheric carbon dioxide concentration is approaching 400 ppm. The atmospheric combustion of carbon is the fuel that is driving our economic growth. We are sustaining a global human community far beyond the natural carrying capacity of the planet. We are extracting and creating a body of natural wealth and transforming it into intangible and obsolete assets. As a direct result of these uniquely human activities, numerous species are rapidly being driven into outright extinction habitat migration and evolutionary adaptation. To state this isn't happening - is to deny science and the reality. Human intellectual aspirations have now exceeded the resources that Earth can sustain.

The Human Condition

It is the nature of the human condition that even confronted with seemingly intractable problems, one still has faith in the knowledge that we since have also evolved into this situation slowly over a period of time, then laws of physics must be such that solutions to our ever present problems actually do exist, and are therefore discoverable. We admit to ourselves that although we do not have all the answers at this time, we will make it an urgent goal to find them, for we have already hypothesized that they, in fact, must exist.

So it is with our current problems of population, our economic growth, energy and the environment, the security of our nation, and health, welfare and education of our citizens. We have reached a crisis of conscience with the modern world - that we cannot continue down the path that we have been taking. We must change direction in order to survive. We don't know exactly where we will end up going, but methods of science have clearly given us tools to identify the hazards that lay before us, and we choose to navigate them. We understand the hazards that we must navigate are those of the planet Earth. Some of those hazards are of our own making, and others have helped make us what we are today.

The Astrophysical Universe

Through the auspices of NOAA and NASA, we have discovered previously unknown truths about our universe and the world in which we live. With that new found knowledge we have begun to understand many of the well known hazards that accompany it, and we have also uncovered a few previously unknown hazards that inhabit it, and surround us.

We are able to come to grips with these dangers, because we have confidence, *dare I say faith*, in our abilities to sift and winnow through the noise, and discover and acknowledge those truths, which reveal themselves by our actions. We now have the abilities to look outward into the universe and examine other worlds for clues to the origin and behavior of our own world, and by doing so, we have gained a greater appreciation and insight into dangers that we face here, and the methods by which we may confront those worst fears.

We have learned to conquer those fears, by confronting our problems, and solving them. By recording our successes and failures we have codified these problem solving methods into a body of work we call science, so that they may be transmitted across borders and down through the generations, greatly increasing the success rate of subsequent solutions. The processes by which we accomplish these tasks mimic the same processes by which life evolves. Now that we have a rough understanding of our human origins, we also have the utmost confidence that evolution will proceed, hindered only by lack of knowledge of ourselves, and the planet on which we reside, in the external universe that has created us. We make the conscious decision to take control of that evolution, so that we may survive.

The Quantum Dynamical World

Through the auspices of the DOE and the NSF we have funded research in quantum and condensed matter physics that has revolutionized our lives; in the way we live; in the way we communicate; how we convert energy, move about, maintain and entertain ourselves. The flow of progress starts from theory, and moves through engineering trade studies, laboratory experiments, device development and fabrication, construction and operation of facilities, and the commercialization of services and technologies that will manufacture the products that we need to organize lives, perform our duties, and maintain our health.

Innovation, Exploration and Discovery

The entrepreneurial spirit that we know can create entirely new industries, enter and compete in evolving marketplaces, invent novel applications and supply new services, depends upon our abilities to think honestly, openly and critically about the real evidence. These abilities are available to anyone and everyone, but from the evidence we know that these critical thinking skills may be developed by enhancing our educational experiences via virtual and real demonstration using 21st century information processing technologies.

Education - Mathematics, Physics, Chemistry and Biology

The vast repository of knowledge that we have at our fingertips is clear, well organized and concise. Commercial search engines and non profit encyclopedias provide nearly instantaneous access to all of human knowledge, and education in the fundamental hard sciences has been reduced to the creative design of educational software architectures, along with guided or mentored instruction, at all age levels of our educational experience. Education itself, both in learning and teaching, has become a lifelong personal endeavor.

Experience - Science, Technology, Engineering and Mathematics

Complementary to the need for teaching, instruction, training, and self education through software solutions, is some actual experience in the real world of hardware and wetware; the biological and geological imperatives of living organisms and their environments, along with the technological tools and techniques, and the operational procedures for the instruments and equipment that allow us to carry out the tasks necessary to our society.

Entrepreneurship - Nanotechnology, Biotechnology and Information Technology

"What are the critical infrastructures that only government can help provide that are needed to enable creation of new biotechnology, nanotechnology, and information technology products and innovations that will lead to new jobs and greater GDP?"

The short answer¹ is - advanced light and particle sources, and spectroscopy laboratories. Some believe we are on the verge of much deeper understanding of quantum phenomena, which will open the gates to a floodwater of innovation in materials and exotic physics. The continued funding of materials science and condensed matter physics at specific interest points will allow the nation to direct intellectual resources to its urgent problems.

Agriculture, Construction, Manufacturing and Transportation

The infrastructure of our world is what sustains the bulk of our population, whether they are interested in science or not. The transition from advanced spectroscopy laboratories, to the astronomical instruments and deep space missions of our space programs, through all of the intermediate transitions of education, experience and entrepreneurship within all economic sectors, is the ultimate goal of our national science policy. Without the bulk of the entire efforts of our civilization to support us, there would be no scientific endeavors.

Administration, Communications, Operations and Services

The administration, operations, servicing and supplying of that infrastructure may seem mundane and ordinary, but these are the activities that every one of us participate in every day of our lives. We go about our day to day tasks, seamlessly and efficiently enough to take for granted the extraordinary powers of rationality and reason. We have evolved to a point in space and time, where scientific advances and astronomical discoveries can be communicated in real time to a eager public - now directly participating in that progress.

Recommendations

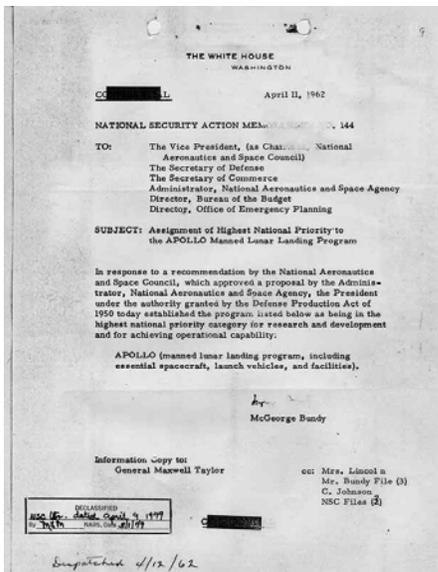
I recommend that you get out there and make speeches with as much thoughtfulness and sophistication as you have put into national space policy, because although the problems we face in the modern world are indeed difficult, they are not insurmountable, even if we don't have all the answers - yet. Our greatest human attribute is the acknowledgement and awareness of the problems of our society and life, which promotes the willingness among the public to make the changes that are necessary to allow us to achieve our goals.

Conclusions

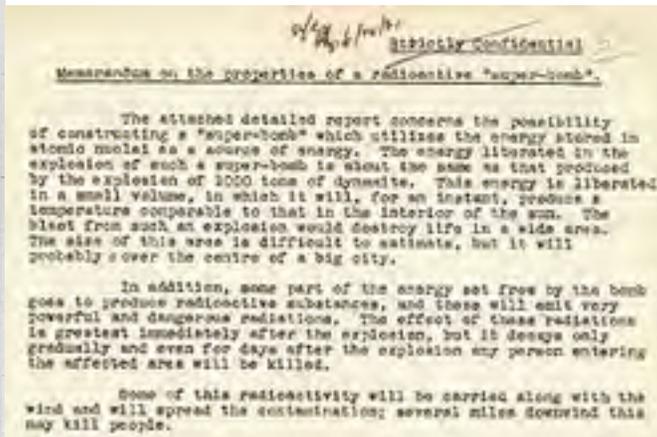
It is not possible to fund a modern, high national priority, manned lunar landing program such as Apollo. Manhattan style projects of any nature, are not executable in our present budget circumstances. We need to put the legacy of Constellation to rest. It may indeed be possible to make a small concession to a space shuttle and space station constituency, by including the existing SSMEs, as primary engines, and a vital component to a national heavy lift launch vehicle architecture, but that engineering exercise only has value if it yields fundamental advances in reusability that will dramatically lower space flight costs. Executive decisions of a president can make or break the solutions to national problems. The recently announced National Space Policy and NASA funding directives adhere to the highest scientific and engineering, diplomatic and national security standards, while still permitting future latitude in executive direction. That future may very soon arrive.

References

1. *Light First*, Research Proposal for the Wisconsin Institute of Discovery
URL: http://webpages.charter.net/tsiolkovsky/Light_First.pdf



National Security Action
Memorandum – NSAM 144.



Frisch – Peierls Memorandum

From: Christopher Pestak
Sent: 07/06/2010 - 11:37am
Organization: Battelle Memorial Institute

The attached file contains the oral statement that I will read at the July 16th PCAST meeting if selected.

Thank you.

<http://edit.whitehouse.gov/sites/default/files/webform/Statement%20to%20PCAST%20on%20Participatory%20Space%20Exploration%20-%20CPestak%20-%202016%20July%202010.pdf>

Statement to PCAST on Participatory Space Exploration (2 minute time limit)

By Christopher J. Pestak, Battelle Memorial Institute, pestakc@battelle.org

July 16, 2010

As the Nation lays out a new course for exploring space, I urge you to strongly consider the highly impactful role that a robotic lunar program of Participatory Space Exploration can have on STEM education in our country. Participatory Space Exploration holds great potential for engaging many thousands of junior high, high school, and college students in hands-on space exploration projects that immerse the students in activities that both educate and inspire them.

Seeing the tremendous potential for STEM education initiatives within NASA's Participatory Space Exploration framework, Battelle coordinated with NASA to plan and host the inaugural Participatory Space Exploration & Education Workshop on April 13- 15, 2010. The activities of the workshop were centered on the following focus question:

What is the design of an exploration program that meets exploration goals while also substantially supporting the achievement of national education goals?

The workshop brought together leaders from NASA, industry, academia, informal science centers, the K-12 education community, and more than a dozen high school students currently involved in STEM education curriculum. The students provided an important and valuable perspective on what type of involvement students want to have in NASA's space exploration and Earth science initiatives. The workshop recommendations were developed in an open forum where students and educators were on equal footing with NASA and industry personnel.

The number one recommendation that came out of the workshop was to create a program of lunar robotic missions that allow students to participate in the development robotic systems to meet real lunar exploration needs where the students can:

- Actively participate in the planning, design, and development of the robots, and
- Perform lunar telerobotic operations themselves

This recommendation is very achievable. Don't miss the opportunity that Participatory Space Exploration presents to greatly enhance our STEM education curriculum and, at the same time, nurture the next generation of explorers and entrepreneurs. I have included a copy of the summary report from the workshop along with my statement.

Thank you.

From: Corey Brown
Sent: 07/11/2010 - 3:36pm
Organization:

I encourage PCAST to reconsider the decision to cancel NASA's Constellation program. What the space agency needs more than anything is continuity--the ability to pursue a clearly defined goal without interruption by the political winds of change. In order for NASA to carry out its mission of inspiration, for children as well as all Americans, it must produce accomplishments as striking and impressive as the first footprints on the moon. An endless series of redirections and program cancellations will do nothing to inspire young people to pursue careers in science and math, and will have a profoundly negative impact on the morale of the existing work force. Constellation is an aggressive, focused program that can achieve great things if it is allowed to continue. Please renew NASA's commitment to Constellation and allow it to finish what it has begun.

Sincerely,

Corey Brown

From: O Glenn Smith
Sent: 07/14/2010 - 2:25pm
Organization: retired

If manned spaceflight is reduced, there is a danger to NASA science, since Joe Citizen is not greatly interested in space science unless an astronaut is involved. Same is true of nearly all Congressmen.

From: Burgess
Sent: 07/14/2010 - 2:52pm
Organization:

There are many ways for a President to make His or Her mark on the world for good or ill. start a war, end a war, manage a major crisis, or perform a great work. I think a way to turn not only the economy around but transform it into a whole new direction. Place a colony on the Moon in less than 4 years using NASA as the governing body to set standards on the base building requirements. Allow any private enterprise to build on the moon to service it. Create lease contracts to sell mining rights to the moon to begin harvesting its resources to expand the Colony further. Use the Metric system only for all design requirements. move the International Space Station to a higher orbit and use it as a stop over before venturing on to the moon as well as continuing its scientific pursuits. If international partners are interested in getting in on the Moon base create lease deals and contracts for space. Treat this as investment in the colony as the revenue it will eventually generate can be shared amongst the building partners. By creating a viable and self sustaining colony on the moon you would have set the foundation for billions to be spent on Universities and manufacturing jobs across the US. The price to go into space will begin to fall as more and more people see the vast monetary opportunities space offers. This will be expensive but if we are willing to spend almost a trillion dollars to bailout failing companies why not do something truly inspiring with close to the same amount of money.

From: Joseph Shoer
Sent: 07/16/2010 - 9:24am
Organization: Cornell University

As a young professional about to finish a Ph.D. in spacecraft engineering, I am extremely disappointed in the so-called "compromise" NASA reauthorization that came out of the Senate Committee on Commerce, Science and Transportation Committee yesterday and I hope the President will push to fix its dramatic shortcomings.

I was very excited by the President's proposed NASA budget, with its focus on developing the truly space-age technologies that will be required for NASA to push humans out into the Solar System and explore all the treasures the planets, moons, and asteroids have to offer. After the Constellation Program's focus on "existing technology" from the 30-year-old Space Shuttle, this technology research has been much delayed and is desperately needed. However, the Senate's NASA Authorization Act strips the technology development out of the President's proposed budget, in favor of a heavy lift rocket based on "existing technology," flaunting of the Augustine Commission's findings in a clearly transparent attempt to direct NASA funds to ATK Corporation - which has already proved its ability to deliver rockets to NASA on a behind-schedule, over-budget basis with the Ares program.

I am passionate about space exploration. I was excited by the President's proposals, which I saw extending humanity outward by letting NASA focus on space vehicles and technologies instead of launch vehicles it could readily buy from the existing commercial market. I hope the President will push to make NASA more than a short-term jobs program for the companies with Constellation projects, and make it into the agency that will push the boundaries of human technology and capability.

From: bill
Sent: 07/19/2010 - 7:01pm
Organization:

You have listed the report on nanotechnology for some time now.

When can I look for a listing of the next one?

Bill

From: Melissa Taylor
Sent: 07/22/2010 - 11:10am
Organization:

Could you please email to me the powerpoint from the Pcast on July 16?

Thank you very much.

From: Kevin O'Neill
Sent: 07/28/2010 - 12:35pm
Organization: PinPoint Environmental Inc.

NOAA and the Inter-Agency Joint Analysis Group (JAG) appear to be overlooking, possibly, a BP & USCG RDC pre-screened airborne technology that can speedily assess and monitor submerged oil beyond assets presently in use in the Gulf of Mexico. Dr. Eric Bone at STATE has followed this matter, to a degree, and H.E. Michael C. Polt, U.S. Ambassador to the Republic of Estonia, was fully briefed in Tallinn during his 7/13 visit with our Chief Scientist, Dr. Sergey Babichenko, at the offices of Laser Diagnostic Instruments SA. Will you please endeavor to help bring PinPoint Environmental scientists into the conversation ASAP with Dr. Lubchenko's office so we can argue our case and get assigned to begin vital baseline surveys ASAP? While we also direct skimmers in real-time, night or day, to recoverable underwater tar balls? Many thanks. Attached are reference materials. Yours sincerely, Kevin O'Neill

--

Kevin O'Neill

VP Business Development & Government Affairs

PinPoint Environmental Inc.

<http://www.pinpointenvironmental.com>

koneill@pinpointenvironmental.com

914.244.0100

<http://edit.whitehouse.gov/sites/default/files/webform/PinPoint%20Environmental%20FLS%C2%AE%20LIDAR%20RDC-BAA-DHR%20Tracking%20Number%202000785.pdf>

From: Kevin Heyer
Sent: 08/04/2010 - 2:23pm
Organization: AT&T

The agenda for the July 16, 2010 PCAST meeting with the President refers to a "Science, Technology, Engineering, and Mathematics Education Study". Might this be forwarded to me for review, or is it available on line somewhere?

Thanks

Kevin Heyer

From: patriot
Sent: 08/12/2010 - 12:31pm
Organization:

new breakthrough technologies in space and energy, use them. bulgarian page: <http://newtechbg.hit.bg>

From: bulgarsky discovery
Sent: 08/12/2010 - 12:33pm
Organization:

new breakthrough technologies in space and energy, use them. bulgarian page: <http://newtechbg.hit.bg>

From: deb
Sent: 08/21/2010 - 5:02pm
Organization:

Kindly enlighten me. I am not such a brain at this stuff, but seeing Eric Schmidt sitting on your board, and hearing about this incredibly enormous bid to own the internet, between Google and Verizon, I am scratching my head and wondering about such things as conflict of interest. I don't know much, but this feels REALLY bad, to me, a peon--just a citizen. It seems that you look at us that way, anyway.

Something very bad is going on, here.

From: John McCormick
Sent: 08/23/2010 - 11:54am
Organization: Energy Policy Center

I registered to attend and make a 3 minute presentation at the September 2 PCAST meeting.

Following is an abstract of my presentation:

Melt back of Arctic sea ice is not about breaking the 2007 record for ice extent. Rather, it is about the impacts that open dark ocean is having on weather and climate of the Northern Hemisphere.

Recent research points to how changes in Arctic sea ice have the potential to influence: temperature and precipitation in the US Midwest; the formation of extra-tropical teleconnection patterns; timing and intensity of Asian monsoon; and, intensity of cold wave transport from the Arctic region to lower latitudes.

Given the importance of North America's agricultural base to world grain supply and reserves, it is of vital importance that USGCRP, in collaboration with NSF, WMO and possibly European counterparts, undertake a comprehensive research effort to determine impacts on sea ice melt back on North America, in particular, and the Northern Hemisphere in general.

This task (or initial establishment of this research program) should be included in the President's FY 2012 budget request.

I would appreciate your acknowledging receipt of this comment.

Thank you for your time and attention.

John McCormick

571-331-1066

From: Dennis R Karote
Sent: 08/24/2010 - 12:42pm
Organization: NanoScale Corporation

Hello,

My name is Dennis Karote, I work for NanoScale Corporation in Manhattan, KS. I was reading the "Report To The President And Congress On The Third Assessment of The Naational Nanotechnology Initaitave. I am involved in Book Writing and wanted to incorporate Figure 3-6,3-1 and 3-4 from the published report. I wanted to know the procedure and contact information of the writer so i could incorporate it into the book.

Thank You

DenniS K

Oral Public Comment Submitted to PCAST

from November 4, 2010

To: President's Council of Advisors on Science and Technology (PCAST)
From: Julian M. Goldman, MD
Date: November 4, 2010
Re: Comments on Medical Device Interoperability

In contrast to most Information and Communication Technologies, most medical devices do not have standardized, interoperable electronic data interfaces. The absence of interoperability presents significant barriers to the achievement of our national vision of using EHRs to transform healthcare.

Here are three brief examples:

1. Incorrect clock time: Cell phones and email programs obtain the correct time from the network using Network Time Protocol (NTP), but the clocks in most medical devices do not synchronize with the network. Consequently as the medical-device clock drifts, clinical data is exported to the EHR with an erroneous time stamp. These erroneous time-stamps may confound the interpretation of clinical events, undermine the integrity of the EHR, and complicate the implementation of clinical decision support tools. (Interestingly, when the clock is rolled back each autumn ("fall back") some systems lose one hour of patient data.)
2. Interface performance: Even when using manufacturer-provided electronic data interfaces, data acquisition may neither be simple nor benign. For example, recently in our research lab, we discovered that under certain conditions a widely used Intensive Care Unit lung ventilator shuts down and reboots when prompted to communicate data to the EHR.
3. Barriers to improving safety: We cannot interconnect medical devices from different manufacturers to improve the safety of medication delivery. For example, consider a patient receiving an intravenous infusion of arthritis medication that may drop the blood pressure precipitously. If the monitored blood pressure drops, an alarm may sound at the nursing station, which will hopefully summon a nurse to stop or slow the medication infusion and examine and treat the patient. If the nurse is delayed or doesn't hear the alarm, the patient may be injured. Why can't we interconnect the blood pressure monitor and infusion pump to automatically stop the medication infusion and summon help when the blood pressure falls? Unfortunately, the absence of effective medical device interoperability standards and technologies precludes this and many other approaches to improving patient safety.

I encourage the Council to address the healthcare technology challenges represented by these examples.

Respectfully,

Julian M. Goldman, M.D.
Massachusetts General Hospital
Partners HealthCare System
The Center for Integration of Medicine and Innovative Technology
Research program: <http://www.mdnpn.org>



Remarks as prepared for delivery by Matt Madia, Federal Regulatory Policy Analyst, OMB Watch, before the President's Council of Advisors on Science and Technology, November 4, 2010.

Thank you for the opportunity to speak today. My name is Matt Madia, and I am a regulatory policy analyst with OMB Watch, a nonprofit organization dedicated to transparency, government accountability, and citizen participation.

OMB Watch has supported many of the Obama administration's efforts to improve accountability, transparency, and the role of science and technology in government decisionmaking, and we have applauded the administration's success in hewing to many of its own, self-imposed.

However, today I would like to talk about a glaring exception – President Obama's March 2009 memo on scientific integrity which asks the Office of Science and Technology Policy for recommendations that will serve as the basis for new government-wide scientific integrity policies. The memo set a deadline of 120 days for the recommendations, but OSTP has now missed that deadline by well over a year.

Ensuring the integrity of science is one of the best ways to ensure that regulation serves the public's interests. From our perspective, scientific advice and evidence often serve as the foundation for regulatory decisionmaking. Often this evidence matters most to issues of public protection like environmental preservation, worker safety and health, and consumer safeguards.

It is clear that new guidelines are still necessary. Just last month, a report by the president's commission on the BP oil spill accuses the White House Office of Management and Budget of delaying the release of National Oceanic and Atmospheric Administration oil spill estimate models.

That controversy erupted at least in part because it remains unclear what the White House's standards for scientific integrity are, and because the White House has not done enough to advance disclosure as a safeguard against scientific abuse – for example, by disclosing OMB comments on agency materials.

And so today I ask that the council take up the cause of the delayed recommendations and urge President Obama to finalize new government-wide guidance for scientific integrity as quickly as possible. I thank you for your time.

Celebrating 25 Years of Promoting Government Accountability and Citizen Participation – 1983 - 2008

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PCAST Meeting Public Discussion notes

November 4, 2010

Terrie Rust

Middle School Technology Education Teacher

Albert Einstein Distinguished Educator Fellow for 2010-2011, serving at NSF

trust@nsf.gov

Good morning. My name is Terrie Rust. I have taught Technology Education at the middle school level in Arizona for 18 years. I was selected as an Einstein Fellow for this school year.

The PCAST report does a commendable job of identifying the needs within the K-12 community for STEM education improvement. A student population transformed by an engaging STEM curriculum will be ready to meet the rigorous demands of the 21st century. Something in the PCAST report was missing, however. Throughout the entire PCAST report, the T and E are noticeably absent. STEM is identified in many instances as science and math, specifically (PCAST pp. 61, 62, 65, 103). The T in this acronym was defined in the PCAST report by a non-T descriptor: computer science (PCAST p. 9). The T makes no reference to the subject which truly belongs here, technology education. The National Academy of Engineering and the National Research Council published Technically Speaking: Why all Americans need to know more about technology. In the report, technology was defined as “the process by which humans modify nature to meet their needs and wants” (TS p. 2). The PCAST report stated that “the Obama administration has demonstrated its commitment to instilling a culture of innovation...” (PCAST p.73). True innovation occurs when all four of the STEM components fuse. In more recent years, the term *technology* has taken on a public persona reflecting computers and other digital media. Computer science, also known as educational technology, incorporates use of technological tools that have become an essential part of all of the STEM fields. I would encourage the PCAST committee to reexamine the T as used in the language of the PCAST report. Accept the definition of technology as Technically Speaking has described it. Then, STEM will adequately reflect the importance of how the four singular components work in tandem. Continuing to separate the components of the STEM initiative, and omitting the vital elements of technology and engineering, will only confuse and polarize those who hold an equal stake in the success of this important piece of reform.

Thank you.

Reference: <http://www.iteea.org> for additional information on Technology and Engineering education



AAUW

Statement for President's Council of Advisors on Science and Technology
November 4, 2010

Chairman Holdren, Chairman Lander, Members of the Council and Public,

On behalf of the nearly 100,000 bipartisan members and donors of the American Association of University Women (AAUW), I am pleased to be here today.

AAUW supports promoting and strengthening STEM education, especially for girls and other underrepresented populations. These efforts will help increase America's competitiveness by reducing barriers that deter women and girls from pursuing academic and career goals in these fields.

The statistics for women in STEM are quite dismal. Women earn more than half of all college degrees,¹ but comprise only 25 percent of the labor force in STEM fields.²

There are a number of reasons why there are not more women in these fields. AAUW's recent report, *Why So Few? Women in STEM*, finds that many environmental and social barriers – including stereotypes, gender bias and a hostile academic climate– continue to block women's participation in STEM. However, there are a number of legislative and regulatory actions that can improve women and girls' progress in STEM.

AAUW urges Congress to reauthorize the Elementary and Secondary Education Act and the America COMPETES Act, which provide tremendous opportunities to improve STEM education in our nation's schools.

Additionally, AAUW recommends requiring federal agencies to proactively conduct STEM Title IX compliance reviews. These reviews could uncover sexual harassment, hostile environments or practical obstacles that discourage women from pursuing STEM. A thorough, government-wide review of Title IX compliance would make STEM fields much more welcoming to women and girls.

AAUW believes that the federal government has a critical role to play in improving America's competitiveness in STEM education and industry. We applaud the administration for making this issue a priority, and thank you for this opportunity.

¹ U.S. Department of Education, National Center for Education Statistics. (2009). *The Condition of Education 2009*. (NCES 2009-081). Retrieved June 29, 2009 from <http://nces.ed.gov/pubs2009/2009081.pdf>.

² National Center for Women & Information Technology. (2009). *By the Numbers*. Retrieved June 29, 2009 from <http://www.ncwit.org/pdf/BytheNumbers09.pdf>.

A strong central plan implemented by the agencies will go a long way to improve federal science.

Such a plan must include:

- Media and publications policies that allow scientists to share their research results with the public and other scientists.
- Adequate disclosure of meetings among government officials and outside groups while science-based decisions are being made.
- Stronger conflicts of interest rules for scientists and science advisors, including revolving door restrictions.
- Protections for scientists and other federal employees who blow the whistle on political interference in science.

We urge OSTP to fulfill the president's pledge to “restore science to its rightful place” and release its plan before the end of the year as promised by PCAST.

STATEMENT TO PCAST FROM MIKE TOWN ADVANCED PLACEMENT ENVIRONMENTAL
SCIENCE TEACHER/EINSTEIN FELLOW, NOVEMBER 4, 2010

My name is Mike Town and I teach AP Environmental Science, the fastest growing AP STEM course in the United States. Currently, I am an Einstein Fellow with NSF. I wanted to thank the Council for defining Environmental Science, Computer Science and Engineering as STEM subjects. This is needed because a subject like Advanced Placement Environmental Science has great potential to meet some of the more challenging PCAST recommendations such as increasing AP enrollment. This would also align with the Presidents vision for preparing students for careers in the new green economy. However, environmental education is scarcely mentioned in the PCAST report. My concern is that as reforms go forward environmental science education will get lost as it lacks a significant funding source and is unknown as a high school subject to most of America. Therefore, I would like to suggest that the council be more supportive in future presentations and recommendations in order to educate stake holders that High School STEM Education is greater than just Biology, Chemistry and Physics.

Jochum, Gera M.

From: Stine, Deborah D.
Sent: Wednesday, November 03, 2010 2:39 PM
To: Jochum, Gera M.; Brandon Ledford (ledfordbrandon@gmail.com); Evers, Danielle
Subject: FW: Written Comment for PCAST's 11.4.10 Public Comment Section

From: Kelly, Heather [<mailto:hkelly@apa.org>]
Sent: Wednesday, November 03, 2010 2:38 PM
To: pcast@ostp.gov
Cc: Stine, Deborah D.; Maxon, Mary E.
Subject: Written Comment for PCAST's 11.4.10 Public Comment Section

Thank you for the opportunity to provide a written comment that will be read aloud at tomorrow's PCAST meeting during the public comment session (we are unable to be physically present). The following is from the American Psychological Association's Executive Director for Science, Dr. Steve Breckler:

The American Psychological Association (APA) is a scientific and professional organization of 150,000 psychologists, and we share PCAST's goal of supporting and strengthening the quality of K-12 STEM education. Students in the United States demonstrate a declining interest in science-based professions, and international comparisons show that the science proficiency of U.S. students is not keeping pace with students in other industrialized and rapidly-industrializing countries. APA also agrees that a strong STEM workforce is vital to achieving national goals and solving societal challenges. We share the fundamental assumption that science is needed to make progress in such areas as energy, health, environmental protection, and national security. We all know that a lot is at stake.

APA therefore was deeply concerned to see that the recent PCAST report defined STEM education to exclude the social and behavioral sciences at the K-12 level. Psychological science is absolutely essential to solving societal challenges and to preparing a scientific workforce capable of addressing these challenges. The last great frontier of science is unraveling and understanding the complexities of human cognition, emotion, and behavior. In a forward-looking world of science, psychology is front and center, and the concepts and phenomena of psychology should be woven throughout the K-12 science curriculum. Students must learn that social and behavioral phenomena are proper subjects of scientific inquiry, even in the context of physics, math, and biology courses. APA urges PCAST to revisit its recommendations to reflect the critical role of the social and behavioral sciences in 21st-century K-12 STEM education.

Thanks very much,

Heather O'Beirne Kelly, PhD
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Exposing Corruption *Exploring Solutions*

Project On Government Oversight

**Public Comments of
Angela Canterbury, Director of Public Policy
Project On Government Oversight
Submitted to the
President's Council of Advisors on Science and Technology (PCAST)
November 4, 2010**

Members of PCAST, it is my pleasure to offer comments today on the long overdue need for a plan to restore scientific integrity to federal policy making. Founded in 1981, the Project On Government Oversight or POGO is an independent nonprofit that investigates and exposes corruption and other misconduct in order to achieve a more effective, accountable, open, and ethical federal government.

POGO has a keen interest in ensuring both public confidence in government science and our public's health and safety. Federal science must reflect the authentic work of scientists free from conflicts of interest and political tampering. This is why we are deeply concerned about the lack of guidance to improve scientific integrity and protect scientists.

Federal government scientists play a vital role in providing policymakers data and scientific analyses to ensure they can make the best, most informed decisions about our environment, health and national security. Whether it is toy safety, drug efficacy or air quality, we count on federal agencies to use independent and unbiased science to protect us from harm. We are all at risk when federal scientists have their work altered or suppressed because it doesn't support predetermined policy decisions.

We welcomed President Obama's Scientific Integrity Memorandum issued on March 9, 2009. However, the Office of Science and Technology Policy (OSTP) has yet to produce the scientific integrity plan due on July 9, 2009—nearly 16 months ago.

Federal agencies must have guidance to create policy and practices that allow independent science to fully inform policy decisions. We've seen individual agencies take significant steps, such as the EPA providing more information about toxic chemical releases. But there also have been extremely troubling examples of malfeasance with federal science, such as the recent evidence that NOAA may have put a rosy spin on the scientific estimate of how much oil is left in the Gulf following the BP disaster. Another worrying example is the FDA scientific advisory committee members who have financial conflicts of interest who voted to keep the risky diabetes drug Avandia on the market.