

# **Public Written Comments Submitted to PCAST**

**from October 13, 2011 to December 20, 2011**

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MONSANTO



Isaiah J. Flato  
Executive Vice President  
Chief Technology Officer

MONSANTO COMPANY

<http://www.monsanto.com>

October 13, 2011

Mr. Mark Gorenberg  
Managing Director  
Hummer Winblad Venture Partners

Dear Mr. Gorenberg,

Please allow me to extend my thanks to you for hosting the recent workshop on “Agricultural Preparedness.” The discussions touched upon several topics which represent key focus areas for the future of agriculture and food production as well as Monsanto’s global businesses and our vision for sustainable agriculture. Given our company’s strong commitment to agricultural innovation, I would like to reiterate specific near-term opportunities and challenges for ensuring long-term global food security.

It is difficult to overstate agriculture’s importance to our country’s economic security and global leadership position in providing food security. In 2009, food and agricultural products and the industries they directly support contributed approximately \$650 billion to the gross domestic product, similar to the \$611 billion contributed by federal government. Additionally, roughly 20 percent of U.S. agricultural production is exported to other countries. This resulted in more than \$115 billion to the U.S. economy last year, an amount that has doubled since 2000. Today the U.S. accounts for more than half of global corn exports, more than 40 percent of global soybean and cotton exports, and more than a quarter of global wheat exports.

America is a global leader in meeting the world’s demand for food thanks to significant productivity gains achieved since the middle of the 20<sup>th</sup> century. Yields of staple crops like corn, soybeans and cotton have more than doubled despite a decrease in both available cropland area and the number of individuals directly working in agricultural production. Numerous studies attribute this success to the discovery, development and rapid adoption of new technologies and agronomic practices – a direct result of our country’s investment in basic and applied research, much of which has been made by the federal government.

However, even greater challenges lie ahead. By 2030, global grain demand is expected to roughly double as a larger, wealthier population shifts their dietary choices. Uncertainties in water availability and

climate effects on global agricultural productivity put even more pressure on resource-rich countries to drive yields higher.

Fortunately, we see the beginning of a paradigm shift in agricultural technologies, both on the farm and in our research labs and fields. On-farm decisions regarding input selection and use are increasingly data-intensive, helping ensure optimal productivity and resource-use efficiency. Equipment automation, satellite capabilities and expanded wireless networks are driving the computerization of the farm. Agricultural research and development is seeing a parallel shift towards high-density, molecular data that must be integrated and applied on a systems-wide scale.

Delivering solutions to responsibly intensify agricultural production will require continued advances in both basic and applied research areas, as well as in translational research that bridges the gap between fundamental and functional learnings. Investment in the research supporting sustainable agricultural productivity gains is critical. Given the scale of the challenges, innovations to drive this growth must come from all sectors - public, private, and their collaborations - and come as quickly as possible.

Developing the technical workforce capable of supporting the next generation of agricultural technologies is also vital. Recent estimates predict more than 270,000 jobs will be created in agriculture, food, and natural resource industries by 2015. Unfortunately, only about half of these jobs are expected to be filled by highly-qualified graduates, as the number of students majoring in agricultural and food sciences continues to decline.

I would ask you to consider that the next generation of food and agricultural scientists and engineers will face the brunt of the challenges of feeding a growing population. As today's leaders, we must ensure they will be prepared and have the resources to explore new ideas and deliver innovations. The public and private sectors must work in partnership to provide the resources, education and training across both basic and applied science fields that impact our country's ability to provide long-term global food security. Investment in these young women and men and their future discoveries is fundamental for assuring a promising future for agriculture.

Sincerely,

A handwritten signature in blue ink, appearing to read 'R. Fraley', is positioned below the 'Sincerely,' text.

Robert T. Fraley  
Executive Vice President and Chief Technology Officer

**From:** RF - [REDACTED]  
**Sent:** Monday, October 24, 2011 11:07 AM  
**To:** [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** One week away from Humankind's seventh billion

Dear **Drs. Fedoroff, Holdren,**  
and Distinguished **PCAST** Scholars

As all of you already know, humankind is now just one-week away from the arrival of our SEVENTH billion

Given the facts that: (1) the most recent U.N. world population projections show that we could be on a trajectory toward

**15.8 billion**

by century's end

along with:

(2) The fact that (speaking biologically and biospherically) earth's planetary carrying capacity for a modern, industrialized humanity with a U.S. / Western European standard of living for all is on the order of TWO billion or less

these numbers constitute the **demographic equivalent of a population asteroid on a potential collision** trajectory with humanity, civilization, and the only planetary life-support machinery so far known to exist anywhere else in the universe

If a planetary asteroid were on such a collision trajectory, the world's top science and astrophysics advisors would certainly hold private and emergency presidential briefings

and at the same time NASA and other international space agencies would immediately launch emergency programs to "nudge" the asteroid out of its collision trajectory

But such emergency nudging would have to

**BEGIN IMMEDIATELY**

while the object is still far enough away for the nudging to have an effect

*for with every passing hour, day, and week of delay, the object's collision trajectory becomes increasingly locked more and more inescapably into place*

To educate policymakers on the essentials of the potential humanitarian, civilizational, and biospheric collision that may be unfolding right now

we suggest communication of the content of the slide presentations [accessible here](#), along with the accompanying PDFs

- RF

Randolph Femmer, Senior Director  
The Wecskaop Project  
[What Every Citizen Should Know About Our Planet](#)  
golddoubleons at hotmail.com

We also specifically suggest the following links

WHY 15.8 BILLION SHOULD BE VIEWED AS AN EMERGENCY

[http://www.scribd.com/fullscreen/55268052?access\\_key=key-tov3iziacuwi8o8itf0](http://www.scribd.com/fullscreen/55268052?access_key=key-tov3iziacuwi8o8itf0)

CONSERVATION - WHY 10% GOALS MAY PERMIT COLLAPSE

[http://www.scribd.com/full/18030175?access\\_key=key-cprix4htb45xmqlh5k](http://www.scribd.com/full/18030175?access_key=key-cprix4htb45xmqlh5k)

DEMOGRAPHIC TRANSITION THEORY - NEW QUESTIONS

[http://www.scribd.com/full/19805610?access\\_key=key-26edj738ikczlrzhj5w](http://www.scribd.com/full/19805610?access_key=key-26edj738ikczlrzhj5w)

POPULATION, CARRYING CAPACITY, AND LIMITING FACTORS

[http://www.scribd.com/full/18200189?access\\_key=key-226a157t58s60vfziy2m](http://www.scribd.com/full/18200189?access_key=key-226a157t58s60vfziy2m)

HOW BIG IS A BILLION?

<http://www.calameo.com/read/000676519a0f5f8d39904>

ECOLOGICAL SERVICES and ECOLOGICAL RELEASE

<http://en.calameo.com/read/000676519c061743fccf1>

LAG-TIMES, DELAYED FEEDBACKS, OVERSHOOT, AND COLLAPSE

<http://en.calameo.com/read/00067651904a0cbc37940>

SUMMARY OF HUMAN POPULATION HISTORY

<http://en.calameo.com/read/000676519b01872a28c3b>

and we also note that planetary carrying capacity, limits, thresholds, tipping points, and unintended consequences (which are essentially neglected or utterly ignored in vast sectors of social science academia)

**ARE NOT LIMITED TO WORRIES ABOUT FOOD**, or water,  
or resources, or oil, or similar "**running-out-of**" suppositions

but are also governed by production of wastes, and by sheer levels of **physical eradication of**, damage to, and degradation of earth's biospheric life-support machinery

No rational astronauts, for example, would permit deliberate damage to or physical eradication of critical navigation, propulsion, and life-support machinery of the vehicle that maintains their lives in space, and the rest of us would never permit 70-80 and 90% levels of damage to, removal of, and eradication of similar systems in our automobiles, or the human body.

*Why then should we suppose that the earth's  
biospheric life-support machinery is invulnerable?*

*What Every Citizen Should  
Know About Our Planet*

Wecskaop

Presentation Three:  
**Ecological Services and Biospheric Machinery**

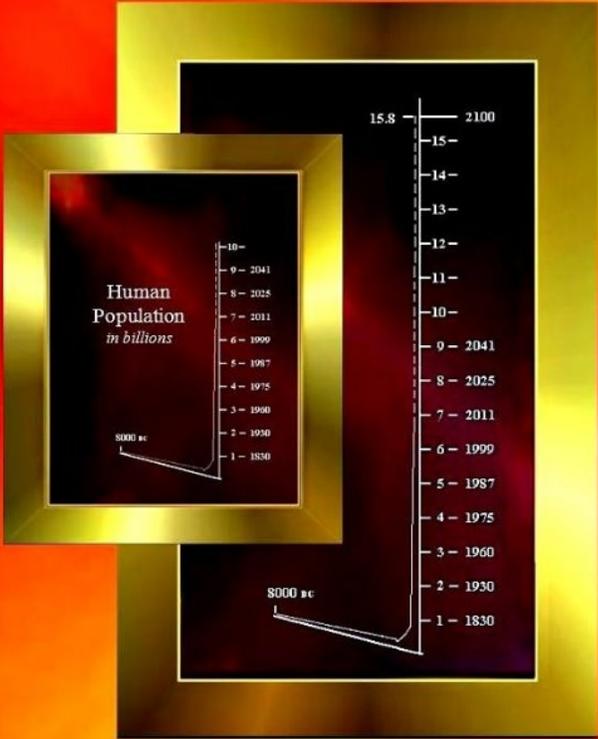
The U.N.'s  
newest  
"medium-fertility"  
population  
projections  
show us to be  
on-track  
toward TEN  
billion  
by 2100

8000 BC



The U.N.'s newest  
"high-fertility"  
population projections  
would carry us to  
**15.8 BILLION**  
by 2100





*Presentation 1*

# World Population and Demographics

An Introductory Overview



**Carrying Capacity  
and Limiting Factors**

*Earth's Razor-Thin Surface Films*

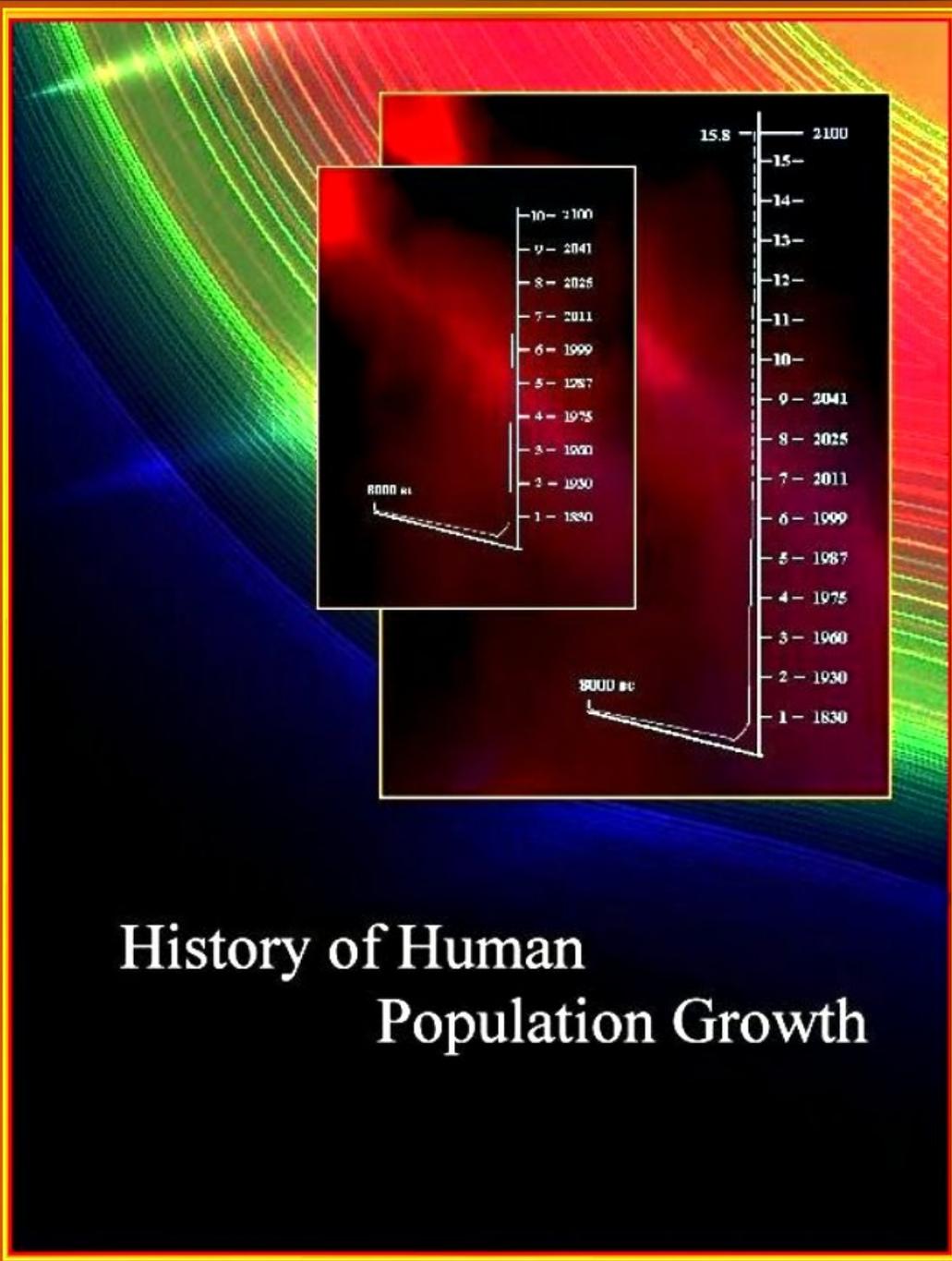


*It's atmosphere, oceans, and seas*



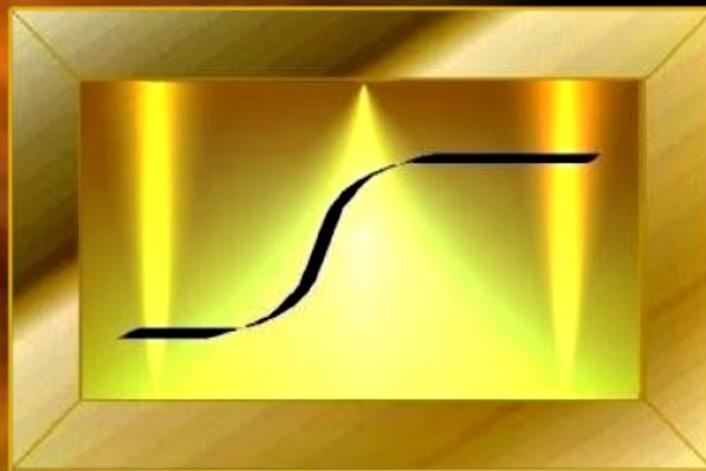
# Conservation

Why 10% goals are not enough



# History of Human Population Growth

# Demographic Transition Theory



New Questions

# How big is a Billion?

**Key math  
concepts**

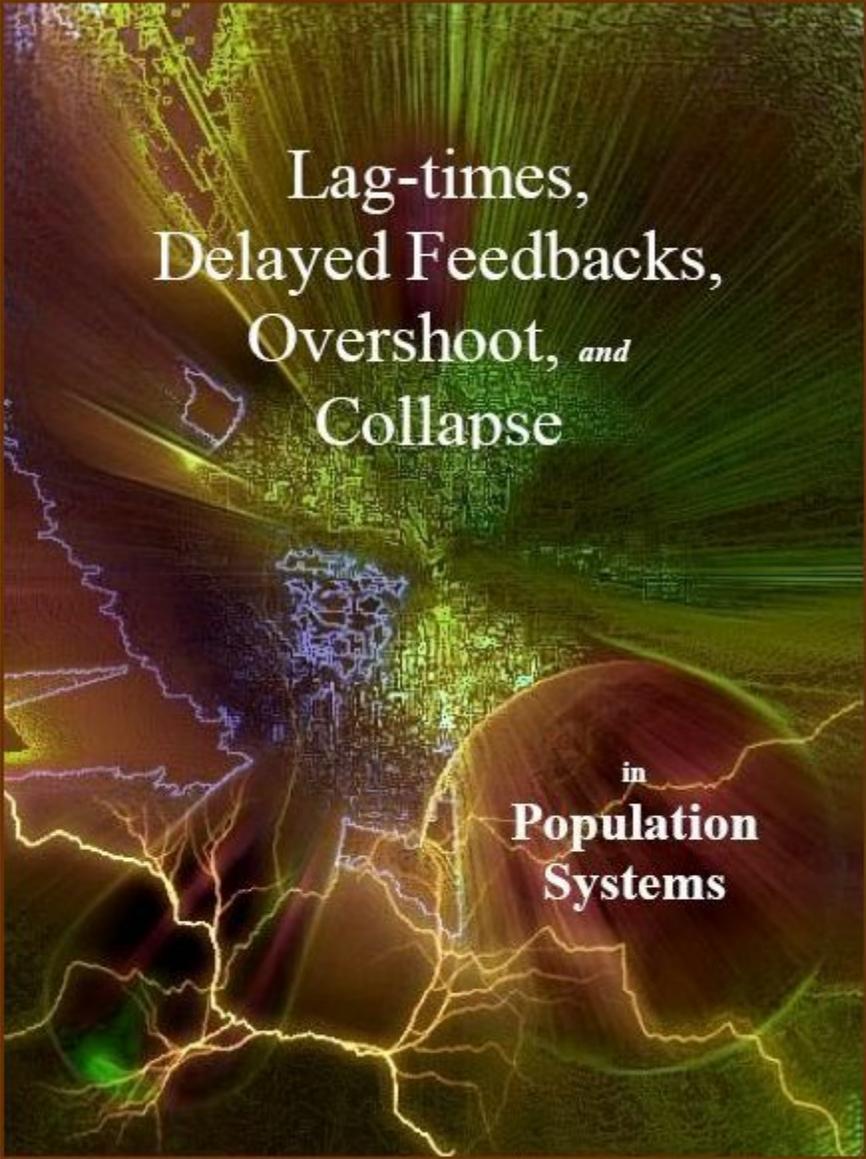




Population calamities in  
seemingly “empty” environments?

# Ecological Services and Ecological Release

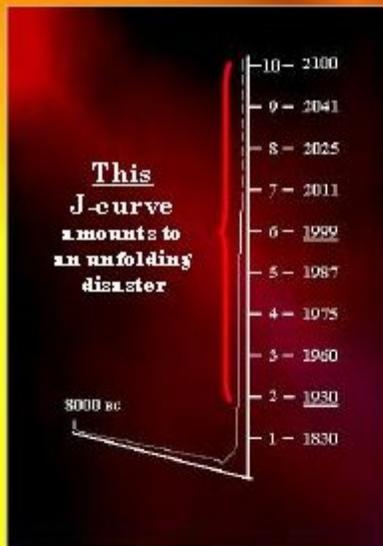


The background of the slide is an abstract, artistic composition. It features a central, glowing globe in shades of green and yellow, surrounded by a complex network of bright, jagged lines resembling lightning or neural pathways. The overall color palette is dominated by deep greens, purples, and yellows, creating a sense of dynamic energy and complexity. The text is overlaid on this background in a white, serif font.

Lag-times,  
Delayed Feedbacks,  
Overshoot, *and*  
Collapse

in  
**Population  
Systems**

## Why the U.N.'s newest world population projections



should be viewed as an emergency



## What Every Citizen Should Know About Our Planet

100 key understandings for  
the half-century that lies ahead

[Inbox](#)[Compose](#)[Addresses](#)[Folders](#)[Options](#)Current Folder: **INBOX**

## Welcome: Pcast@ostp.gov

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### [OpenPCAST Ideas] - Today In IdeaScale

**From:** "OpenPCAST Ideas" <openostp@gsa.gov>**Date:** Sun, November 13, 2011 1:11 pm**To:** pcast@ostp.gov**Priority:** Normal**Options:** [View Full Header](#) | [View Printable Version](#) | [Download this as a file](#) | [View Unsafe Images](#)  
| [Add to Address Book](#) | [View as plain text](#)

**This image has been removed for security reasons.**

## OpenPCAST Ideas (<http://pcast.ideascale.com>)

An Open Source Quantal Universal Exchange Language

**2**[Vote On Idea](#)

An open source Quantal Universal Exchange Language providing an XML-like metadata language as proposed by PCAST in December 2010. This language is a combination of the triplets proposed by the WC3 as implemented in RDF and a probabilistic semantics, as well as a quantum mechanics notation and a secure aggregation model. See more information about QuantalUEL at <http://quantalsemantics.com>.

[Comments \(0\)](#) | [Health IT](#), [uel](#), [universal exchange language](#), [xml](#), [rdf](#), [wc3](#), [metadata](#), [open source](#)

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#### Attachments:

1 k

[ text/plain ]

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**From:** DOUGLAS BOBB [REDACTED]

**Sent:** Monday, November 14, 2011 11:57 PM

**Attn:** Members of Federal Government Community,

Why is it that I, a black American US military veteran, with 100% compensation, born in South America, have mysteriously acquired or have been given so much power to make the US dollar extremely weak, and with a such a minimum of effort? This is so true especially in the case of the Euro, concerning my "ability" to make the US dollar extremely weak, very rapidly against the Euro. My merely visiting EU websites causes the dollar to weaken precipitously. It was also the case with the European currencies before the Euro, and since 1983 when I was aware of this "ability". This infinitely singular power is not something that I crave as I feel more like the de facto unpaid Central Banker of the world rather than someone who can profit from this in the futures and options market.

I don't have to read online of the European Union goal of revival of the Holy Roman Empire on European websites or visit the website of the **The Order of The Teutonic Knights of Saint Mary's Hospital in Jerusalem** to effect a sudden decline of the dollar, but merely, visiting .eu websites causes a downward spiral of both the Federal Reserve dollar index and the ICE dollar index. A phone call to Europe or receiving SMS messages on my cell phone from Europe has a similar effect. Using a European bank's Maestro card also has such a drastic effect. Yes, I am aware that one may consider me extremely fortunate and that I should be able to profit enormously in the foreign exchange market. But I don't want a very weak US dollar as it would cause a very drastic drop in the US standard of living. This is no exaggeration. There is nothing in the world I like better than an extremely strong dollar. Because of the US Treasury recommended Direct Deposit system, it is difficult for me to keep the dollar strong, as where I cash the check is one of the secrets of a strong dollar. Foreign banks in the USA, with their corporate headquarters in a major currency zone such as London, Tokyo, Frankfurt, Zurich, Paris, Milan, Toronto, or Sydney, who also are members of the FDIC, and therefore can receive such VA direct deposits, can therein be used to make the US dollar strong. However such banks are few. Having Direct Deposit of VA compensation to black owned and operated banks in USA also result in an extremely strong dollar.

On the day when the US dollar index was strongest on February 25, 1985, if I remember correctly, the address on my VA check was:

**Douglas J Bobb**  
**Gold Department**

**Voschod Handelsbank  
Schutzengasse 1,  
8001 Zurich, Switzerland**

mailed to that address of that Russian Bank Voschod Handelsbank, by the Federal Benefits Unit of the US Embassy, Bern, Switzerland, originating from The US Treasury, Austin, Texas. Checks with this address were cashed at Union Bank of Switzerland, St. Margrethen and also at Deutsch Bank, Luebeck. [This was directly responsible for the strong dollar.](#)

Being the first Veteran to receive 100% compensation VA checks at a particular US embassy also causes a strong dollar: eg:

**Douglas. J. Bobb  
Embassy of the United States,  
Tunis, Tunisia,**

That was September 1983. This was when I was first aware that the US dollar became very strong because of something quite normal that I did.

On November 1, 2002, I had been using Western Union Bank for Direct Deposit of VA compensation. On that day I was in Bucharest, Romania. At that time 33,000 Romanian lei was equal to 1 US Dollar. I tried to make a small cash withdrawal at an ATM machine of about 1,000,000 Romanian lei or about 30 US Dollars. I received no cash but instead, \$1,000,000.00 USD was mysteriously deposited into my Western Union Bank account. After several attempts at different ATM machines, I received no cash, and made a call to Western Union Telebank. The recording said I had \$8,151,634.30 US in my account. On that day, at that time, for the first time 1 US dollar was equal 1 Euro. The mailing address at that time which I submitted to the VA read:

**Douglas J Bobb,  
The Instant Millionaire  
etc-- address in Australia.**

Was it a coincidence that this resulted? On my subsequent calls to the Bank which was based in St. Louis, I could not explain these deposits, which seemed to be a breakdown of the global system caused by my Instant Millionaire being included in mailing address. The Bank Manager David Krause garnished the funds. The Bank then was separated from the parent company First Data Corporation, and eventually Western Union Bank moved overseas to Austria, which has by far, the strictest banking secrecy in the world and is the only country where a bank account can be opened with not a single piece of ID.

My friend in Latvia once told me that the financial markets need me, but why me? I dislike the daily deceptions of the financial news industry as it pertains to causes and effects of the quote movements by all major TV financial news networks.

My first contact with a major currency currently traded against the US dollar was in 1969 when I was stationed in Japan, at which time it was 360 JPY to the 1 US dollar. After that, not until 1972,

did I touch a foreign currency, which, at that time, was the British pound on my first visit to London in 1972.

Occasionally feeling sophisticated as I watch foreign currency exchange rates predictably respond to my geographic global location, I have subsequently decided to minimize this effect by residing in countries with currencies that are either pegged to the US dollar or use the US dollar as the locally most widely used ATM dispensed currency.

I am of the opinion that the Swedish Nobel Prize in Economics should be abolished as it more precisely reflects 100% conjecture rather than 100% economic science for not yet detecting such an invariable singularity.

I am also of the crystal clear personal opinion that Austria, birthplace of Adolf Hitler is still an enemy of the United States of America, but in the most deceptive way. There are a multitude circumstances from which I draw this logical conclusion.

Additionally, from a personal level, I can see through my daughter who was born in Greece, but is both an Austrian and an American citizen, and lives in Austria, how she was used by Austria to seize power. Even her Austrian passport does not even mention anything of her actual birthplace in Athens or Greece. Thus, we have one root of the Greek financial crisis.

I am sending you this email because on August 16, 1964, when I first arrived in the United States from what was then British Guiana, in South America, the ratio of workers pay to CEO's pay was about 6 to 1. Today it is about 355 to one. GREED KILLS. Unfortunately the merger link between the NYSE and EURONEXT and the NASDAQ and OMX with European Exchanges will prove to be a burden to the US financial economy especially the Dow and Nasdaq, as Europe's problems automatically becomes America's problems.

Ask how many European countries really qualify for the EURO according to the Maastricht Treaty? Unlike the US dollar which is very old and very global (even European AIRBUS prices its planes in US dollars instead of Euro's, the EURO was born on January 1, 1999. Americans don't really like to be used on assumption of naivety once they are aware of it. Both European born former Secretaries of State Kissinger and Albright, said repeatedly over and over again on TV that America is a European country. So if the Eurozone has .5% GDP, does it mean that America can't simultaneously have 5% GDP taking advantage of its natural Pacific geographic links to Asia?

America needs to decouple from what is seen as an inextricable intertwining of its NATO based "unfair percentage of military budget" links with Europe and also to decouple the US stock exchange linkage with European failures. Greed and Eurocentrics have led to very unwise acquisitions by US exchanges of European exchanges.

Douglas John Bobb

**From:** Lloyd Etheredge [REDACTED]  
**Sent:** Friday, November 18, 2011 12:20 AM  
**To:** [REDACTED]

**Subject:** PCAST & "Smoking Gun" Testimony by NSF Deputy Director Marrett;

Dear Drs. Holdren, Lander, Press, Savitz and Colleagues:

Concerning issues that I have raised for your review, I enclose testimony on July 26, 2011 by Dr. Cora Marrett, NSF Deputy Director. As you will note, the testimony is a "smoking gun" that confirms and places candidly into the public record, NSF's abandonment of the peer-review system to determine scientific merit and NSF awards.

One implication of the testimony is that the support for NSF, by the 140+ signers (scientific societies and universities) of the Inter-Society Letter earlier this year, was based on an inaccurate and outdated belief that NSF makes awards by scientific merit as determined by a peer review system.

- As Dr., Marrett confirms, NSF stopped using the peer-review system in the Reagan Administration. Under pressure, they decided to keep their new top-down powers and they (officially but quietly) demoted the nation's leading edge (and more politically independent) research scientists at our nation's universities. They did not consult with the nation's scientists about this change. They also quietly changed the description of the NSF system to "merit review."

Thus at NSF, in reality, the ultimate "portfolio" of funded initiatives and grant applications is determined by the NSF bureaucracy. It is not controlled by external peer-review judgments of scientific merit by our nation's leading edge research scientists.

**In Dr. Merritt's words: "[I]n contrast to a number of other funding bodies [e.g., NIH - LE], the external reviewers do not make binding recommendations that the program officer is obliged to follow "(p.3).**

- Dr. Marrett defends the "high standard for excellence" of the program officers who work for her in the NSF bureaucracy and who "are subject matter experts in the scientific areas that they manage." The higher level purview that she and her subordinates enjoy also gives them wiser judgment, in her view, and a better "portfolio" in what has slowly evolved as (de facto) an NSF empire..An empire that, in my view, has predictably reduced the rate of innovation across all of the fields within its purview..

One benefit of Dr. Marrett's candid testimony is that it expresses her hubris, on behalf of herself and her subordinates. This helps to frame the issues.

The NSF "take charge" shift has had chilling implications for Economics and underscores my request for leadership at your scientific level. With the undermining of peer review, NSF's national strategic planning in Economics is being done by Program Officers and nobody else at higher levels has the competence to craft strategic initiatives. Neither Suresh nor Marrett are economists and the Assistant Director (SBE) is an historian who has other priorities and is distancing himself.

Yours truly,  
Lloyd Etheredge

Dr. Lloyd S. Etheredge - Director, Government Learning Project  
Policy Sciences Center Inc.

[REDACTED]



Testimony of

Dr. Cora Marrett, Deputy Director  
National Science Foundation

Before the

U.S. House of Representatives  
Committee on Science, Space, Technology  
Subcommittee on Research and Science Education

The Merit Review Process:  
Ensuring Limited Federal Resources are Invested in the Best Science

July 26, 2011

Chairman Brooks, Ranking Member Lipinski, and distinguished Members of the Subcommittee, thank you for inviting me to participate in this hearing on “The Merit Review Process.”

I am delighted to discuss the National Science Foundation’s (NSF) Merit Review Process with you. As you well know, NSF is the primary Federal agency supporting research at the frontiers of knowledge, across all fields of science and engineering (S&E) and all levels of S&E education. Its mission, vision and goals are designed to maintain and strengthen the vitality of the U.S. science and engineering enterprise. As part of the overall national R&D enterprise, the basic research and education activities supported by NSF are vital to the economic advancement of the U.S. and provide the know-how that allows the U.S. to respond rapidly and effectively to a range of unexpected challenges. The NSF merit review process lies at the heart of the agency’s strategy for accomplishing its overall mission. As such, NSF is continuously striving to maintain and improve the quality and transparency of the process.

Before I begin my discussion of the unique elements of the NSF merit review system, let me first describe the essential features of merit review writ large. In general, merit review refers to an independent assessment of a plan's worthiness. The Code of Federal Regulations (Section 600.13 of title 10) defines Merit Review as a "thorough, consistent and objective examination of applications based on pre-established criteria by persons who are independent of those individuals submitting the applications and who are knowledgeable in the field of endeavor for which support is requested."

I would also like to note here that although the terms "merit review" and "peer review" are often used interchangeably, they are not equivalent terms. NSF made this distinction clear back in 1986, based on a report from an external Advisory Committee on Merit Review, established by then-director Erich Bloch at the request of the National Science Board. As is described by Marc Rothenberg, the NSF historian, in his 2010 article "Making Judgments about Grant Proposals: A Brief History of the Merit Review Criteria at the National Science Foundation:"

"According to the committee, the term 'peer review' was properly a restrictive term referring to the evaluation of the technical aspect of the proposal. However, for more and more federally funded research, 'technical excellence' was, in the words of the committee, 'a necessary but not fully sufficient criterion for research funding.' Acknowledging that the NSF (as well as other federal agencies) was using a wide range of nontechnical criteria as part of the decision-making process, the committee suggested that the term 'merit review' more accurately described the NSF selection process."

The committee's recommendation was accepted by Director Bloch, and since then NSF has used the term "merit review" to describe our process.

Since its founding, NSF has relied on the merit review process to allocate the vast majority of its funding. As in other agencies, this has involved the use of proposals from prospective researchers that are judged on their merits by knowledgeable persons. But there are several elements that give merit review at the NSF its distinct features. For one, right from the beginning, NSF utilized the project grant mechanism (as opposed to a contract mechanism) for providing funds. This was a rather radical concept back in 1951, when most government operations used contracts. Since that time, the use of the grant mechanism has been adopted by many federal extramural research funding organizations.

NSF's process for deciding which proposals to fund differs from the approach of a number of other funding agencies and organizations (such as philanthropic foundations) nationally and internationally. Perhaps the most distinctive differences are our reliance on expertise from

both outside and within the Foundation, and the discretionary authority vested in the NSF program officer to make funding recommendations. Unlike many philanthropic foundations (and even some federal research funding programs), NSF policy requires that the program officers seek external expert advice before making most of their funding recommendations. However, in contrast to a number of other funding bodies, the external reviewers do not make binding recommendations that the program officer is obliged to follow, although program officers always pay close attention to all external reviews. Because of the responsibility we give our program officers, NSF sets a high standard for excellence in that position. Our program officers are subject matter experts in the scientific areas that they manage, and bring strong credentials with them, including advanced educational training (e.g., a Ph.D. or equivalent credentials) in science or engineering, and deep experience in research, education, and/or administration.

NSF has chosen to give the program officer the responsibility for making funding recommendations to enable a more strategic and long-term approach for building the award portfolio. As important as the input of the external scientific experts is, they have only a snapshot view of the current set of proposals they are evaluating. The NSF program officer is responsible for putting that snapshot view into the larger context of the entire award portfolio they are managing, which can lead to a more diverse and robust portfolio overall. Together with the division directors, who have the authority to review and act on the program officers' recommendations, program officer teams are poised to identify promising research that responds to national priorities identified by Congress and the Administration. In addition, program officers can incorporate agency or programmatic priorities, which are articulated in the annual agency budget, special solicitations, and standing program descriptions, all of which are available to the community via the NSF web site.

The NSF merit review process is described in full detail on the NSF web site (<http://www.nsf.gov/bfa/dias/policy/meritreview/>). There is also a summary of the major steps in the merit review process in the annual Report to the National Science Board on the Merit Review Process (the most recent report covering activities in FY 2010 can be found at <http://www.nsf.gov/nsb/publications/2011/nsb1141.pdf>). It is worth noting here that the key features of the NSF process have remained remarkably stable over time. Any changes that have been incorporated have sought primarily to clarify the process and make it more transparent. For example, initially only excerpts of the external reviews were shared with the proposal authors. Over time, NSF provided the verbatim reviews (but not the identities of the reviewers) to the applicant. Similarly, over time there have been modifications to the number and clarity of the review criteria. In the America COMPETES Reauthorization Act, the broader impacts criterion is specifically mentioned, and the National Science Board is in the process of analyzing the many comments received on this topic.

A flowchart that graphically depicts the major steps in the merit review process and a timeline is attached to this testimony as Appendix I. These steps include:

- Assignment to the appropriate program for review. Principal investigators initiate this process by selecting the program or programs to which they wish to submit their proposal. Once submitted, the cognizant program officers for those programs confirm that the assignment is appropriate. On occasion, a proposal may be reassigned to another program where there is a better fit. During this initial assignment process, it is not uncommon for proposals to be assigned to multiple programs for review, if the subject is interdisciplinary in nature, or if the question is of interest and relevance to more than one program.
- Administrative review of all proposals for compliance with NSF regulations. These regulations, which are intended to ensure fairness in the review process, are described in the Grant Proposal Guide, which is widely available to the NSF community on the NSF web site ([http://www.nsf.gov/pubs/policydocs/pappguide/nsf11001/nsf11\\_1.pdf](http://www.nsf.gov/pubs/policydocs/pappguide/nsf11001/nsf11_1.pdf)). Proposals that do not comply with these regulations may be returned without review.
- Merit review of all proposals that pass the administrative review. As noted above, a critical feature of NSF's process is the use of both external review by experts in the field and internal review by NSF's corps of program officers. The program officers are responsible for administering the merit review process from beginning to end, starting with identifying and recruiting appropriate peer reviewers from the external community to serve either as individual reviewers for a particular proposal (referred to as "ad hoc" reviewers) or as members of a panel of reviewers who evaluate a larger set of proposals. To ensure that they receive substantive reviews from a variety of perspectives, the program officers reach out to a broad range of experts for input—in fiscal year 2010, over 46,000 external peer reviewers from academia, government, and occasionally industry provided authoritative advice to the Foundation. Selection of expert peer reviewers may be based on the program officer's knowledge, references listed in the proposal, individuals cited in recent publications or relevant journals, presentations at professional meetings, reviewer recommendations, bibliographic and citation databases, or suggestions from the proposal author (subject to the program officer's discretion). In making these selections, program officers pay very careful attention to avoiding conflicts of interest, both real and perceived.

NSF takes seriously its responsibility to ensure that the merit review process is fair and equitable. One of the ways in which we address this responsibility is through the briefings that are given to each review panel before it begins its work. In these

briefings, panelists are instructed on NSF's review criteria (Intellectual Merit and Broader Impacts), and on maintaining confidentiality and avoiding conflicts of interest. In addition, review panel briefings typically include alerting the reviewers to the phenomenon of implicit bias, which may adversely impact new investigators, smaller institutions, and underrepresented groups. By guarding against the effects of implicit bias in the review process, NSF is working to ensure that there are equitable opportunities for all investigators.

I should note here that while the vast majority of the proposals received at NSF (~96%) are subject to both external and internal merit review, for some proposals the external review requirement is waived. This waiver provides necessary flexibility for handling proposals for which most of the external community would be conflicted (such as proposals for small conferences, workshops, or symposia), those for which there is a severe urgency (submitted through the Grants for Rapid Response Research, or RAPID, mechanism used, for example, on rapid-response research to the Deepwater Horizon oil spill), and those that request support for high-risk, potentially transformative exploratory work (submitted through the Early Grants for Exploratory Research, or EAGER, mechanism). These proposals are usually only reviewed internally by program officers with appropriate expertise.

- *Development of funding recommendations.* A central tenet of the NSF merit review process is that the reviewer input is advisory in nature. Funding recommendations are developed by the program officer, who is responsible for synthesizing the advice of the reviewers along with several other factors, with the goal of allocating funding to a diverse portfolio of projects that addresses a variety of considerations and objectives. In addition to their scientific expertise noted above, NSF program officers bring their own unique perspective born from their experience of working with hundreds, thousands, or – in some cases – tens of thousands of proposals. In developing recommendations within the larger context of their overall portfolio, program officers consider carefully the individual merits of each proposal with respect to both its intellectual merit and the potential broader impacts of the project, and how each proposal might help advance a variety of portfolio goals such as:
  - Achieving special program objectives and initiatives;
  - Fostering novel approaches to significant research and education questions;
  - Building capacity in a new and promising research area;
  - Supporting high-risk proposals with potential for transformative advances;
  - Supporting NSF's core strategies of integration of research and education and integrating diversity into NSF's programs;
  - Potential impact on human resources and infrastructure;

- Other available funding sources; and
- Geographic distribution.

NSF has set a goal for completing this process within six months, from the time the proposal is submitted to the point at which the proposal is either declined or recommended for funding and forwarded to the Division of Grants and Agreements for the final stages of review and processing. The proposal assignment and administrative review stage is typically complete within a few weeks. The bulk of the time is spent in the merit review stage, which can take three to four months to complete. Despite the volume of proposals that NSF receives annually (in FY 2010, over 55,000 proposals were submitted, an increase of 23% over the previous year), NSF routinely processes the majority of these proposals (>75%) in fewer than six months.

To ensure the integrity of the process, all program officer recommendations are reviewed by the division director (or other appropriate NSF official), who examines whether the process used to arrive at the decision has been executed in accordance with NSF's policies and that the decision has been based on a thorough analysis of the merits of the proposal. Large awards may receive additional review, either by the Director's Review Board (DRB) or additionally by the National Science Board (NSB). The DRB examines award recommendations with an average annual award amount of 2.5 percent or more of the awarding division's prior year current plan. The NSB reviews recommended awards with an annual award amount of one percent or more of the awarding Directorate's or Office's prior year current plan, or less than one percent or more of the prior year total NSF budget at the enacted level. Once the funding recommendation is approved (at whatever level is appropriate), the Division of Grants and Agreements ensures that the award recommendation meets all of NSF's requirements before officially issuing the award.

In addition to having multiple layers of review of individual award recommendations, NSF requires that all programs undergo an external review by Committees of Visitors (COVs) every three years. COV reviews provide NSF with external expert assessments of the quality and integrity of program operations and program-level technical and managerial matters pertaining to the merit review and final proposal decisions. Finally, retrospective analysis of the process is periodically performed on a Foundation-wide basis, including the statistical reports submitted to the NSB every year and the Impact of Proposal and Award Management Mechanisms (IPAMM) report of 2007 (<http://www.nsf.gov/pubs/2007/nsf0745/nsf0745.pdf>).

At the request of Congress, in 2005 the NSB undertook an examination of NSF's Merit Review Process (<http://www.nsf.gov/nsb/documents/2005/nsb05119.pdf>). The report concludes that:

“The Board fully supports the current NSF system of merit review, which utilizes the peer review process as the principal driver in funding decisions. The Board also strongly

endorses the role of NSF program officers' discretionary authority, in concurrence with division directors, for ensuring the implementation and goals of both Merit Review Criteria, along with achieving a balanced portfolio of research and education awards, both within directorates and across the suite of NSF programs. Unlike a system based solely on peer reviews' scores, NSF's merit review process incorporates peer review in a system that also considers those attributes of a proposal (risk, multidisciplinary nature, novelty) that are not readily accommodated by a numerical score, but essential to identifying the most innovative proposals."

The National Academy of Sciences, in the 1994 report "Major Award Decisionmaking at the National Science Foundation," stated that, "The United States has built the most successful research system in the world. The use of peer review to identify the best ideas for support has been a major ingredient in this success. Peer review-based procedures such as those in use at NSF, the National Institutes of Health, and other federal research agencies remain the best procedures known for ensuring the technical excellence of research projects that receive public support." In November 2009, the Executive Director of the Transportation Research Board at the National Research Council, provided testimony before Congress on how to facilitate the implementation of research at the Department of Transportation. In that testimony, the Director endorsed strongly the fact that NSF's merit review process is well suited to the mission of the agency. His observation: "The more applied mitigation and adaptation research topics should be steered by the concerns and needs of policy makers and practitioners, while the fundamental research topics should be organized along the NSF model in which scholars and experts are guiding the decisions about which projects are likely to be most promising."

NSF's merit review process has served the agency, the scientific community, and indeed the country well for many years. Many Nobel Laureates, National Medal of Science and Technology winners, and MacArthur Foundation Fellows (popularly known as recipients of Genius Grants) have been supported by NSF at various stages in their careers. Through separate programs and in the course of funding specific scientific progress, over the past 25 years NSF has also supported the training of hundreds of thousands of graduate and post-graduate scholars in STEM fields. Discoveries stemming from NSF-funded projects have led to advances across all areas of science, engineering and education, with far-reaching impacts in the fields of nanotechnology, information technology, environmental science, genomics, STEM education, and many others.

The high quality of NSF's merit review process is recognized globally, as evidenced by the fact that it has been used as a model by countries around the world that are newly establishing their own funding agencies. The merit review system for L'Agence Nationale de la Recherche (ANR), the French counterpart to NSF, is explicitly modeled after NSF, as is that of the Foundation for

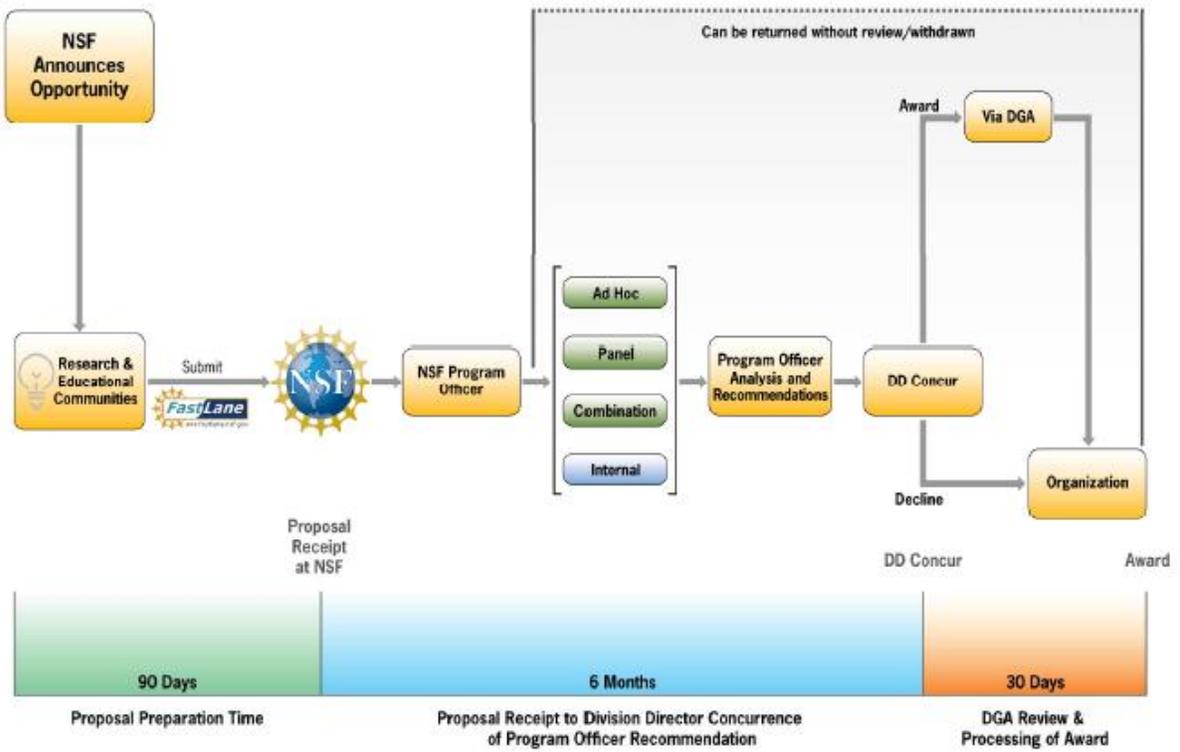
Polish Science. NSF helped the European Research Council establish its merit review system some five years ago, and was instrumental in helping Ireland establish Science Foundation Ireland. Back in 1986, a Chinese official came to NSF for 6 months to learn about our merit review and decision making processes, and subsequently incorporated what he had learned in establishing the National Natural Science Foundation of China (NSF-C). These are just a few examples of international agencies where NSF has had an explicit role in helping develop their merit review systems, but there are literally dozens of others that have borrowed our approach over the years.

As the nature of research and the scientific enterprise continues to change – becoming more interdisciplinary, technological, international and collaborative – NSF continues to explore ideas and strategies that could strengthen the merit review process by enlarging the range of tools that can be used in proposal evaluation. These ideas have come from a variety of sources – internally, from the research community, from the practices of other funding agencies, and from the scientific literature on merit review. One idea that we are actively exploring is a greater use of technology-mediated virtual panels when and where it makes sense, with the hope that decreasing the travel burden will expand the potential pool of reviewers. Among the benefits that NSF would derive from an expanded pool of reviewers are the inclusion of more and varied perspectives, increased opportunities for participation by underrepresented groups, decreased review burden per individual reviewer, and decreased travel costs for the agency. We have established an internal working group to identify other viable candidates for pilot activities, and to develop plans for running and evaluating those pilot activities. We will be discussing these with an advisory committee over the next few months to get their help in refining the processes.

For over 60 years NSF has been forward looking in terms of how the agency manages its research and education portfolio. Merit review fosters the "process of discovery," the means by which researchers can identify emerging scientific challenges and innovative approaches for addressing them. NSF is dedicated to ensuring that the merit review process remains robust, rigorous, and beyond reproach, in support of our mission and enabling us to pursue our goal of funding the world's best research in science, engineering and education.

I appreciate the opportunity to appear before the Subcommittee to speak to you on this important topic. I would be pleased to answer any questions that you may have.

# Appendix I: NSF Proposal and Award Process and Timeline



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Attention PCAST:

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

You may have seen an earlier version of what follows..... *but now that the date has been set we resend , re-issue the following.*

The following information should/could to of interest to you,  
I've been seeing, hearing , reading lots lots LOTS of the poor performance  
of our students, schools especially as it pertains to **S.T.E.M.** education  
(**S**cience-**T**echnology-**E**ngineering-**M**ath)

Some are even say there is NO **"E"** is STEM as students learn little about **E**ngineering in school

ref: <http://www.todaysengineer.org/2009/Oct/STEM-education.asp>

Sincerely,  
Robert B. Johnson, SE, PE



volunteer to [www.futurecitychicago.org](http://www.futurecitychicago.org)

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 news of this program might be of interest to you, your staff.

PLEASE CHECK THE UPDATED and expanded [www.futurecitychicago.org](http://www.futurecitychicago.org) website for additional news.

However take note the website (URL) will be changed ! (2013)

<http://www.futurecity.org/illinois-chicago>

and check this out !!!!!

<http://www.chicagolandeweek.org/explore.asp>

November 2011

CONTACT: Don Wittmer  
Jennifer Buglione

## Regional Finals in "*Future City Competition*<sup>TM</sup>" Set Students create a vision of the future

Chicago, November; In conjunction with NATIONAL ENGINEERS WEEK<sup>TM</sup> (NEW), Chicago engineering societies will be hosting a student design competition in area schools. The contest, known as the "Future City Competition<sup>TM</sup>" ([www.futurecitychicago.org](http://www.futurecitychicago.org)), will require middle grade students with the assistance of an engineer mentor, to design a future city with *SimCity 4 Deluxe* software and then build three-dimensional table top model to scale.

This program has been developed by engineers to provide much needed technological education to the students. According to Bob Johnson, spokesman for the Chicago program, the competition is in its nineteenth year and is the only one of the 39 regional programs that has competed continuously in all years. **"Currently schools are assembling teams to begin the construction of their model. Besides building a model students will be required to write an essay."** This year's essay topic

is – ***Fuel Your Future: Imagine new ways to meet our energy needs and maintain a healthy planet.*** Students will also write a City Narrative outlining the key features of their city.

Regional chairman Don Wittmer notes, "It is exciting to see the interaction between the students and witness the enthusiasm that these students have in learning about engineering and the real life problems that are encounter everyday. Our hope is that this competition helps students consider the possibility of studying engineering when they attend college."

Derek Johnson, co-coordinator adds, "It is a great experience for all involved -- the students have fun while learning about engineering and gaining valuable teamwork and presentation skills. Engineers, mentors, judges and volunteers always leave impressed by the students' ability and enthusiasm."

Locally, the regional judging for the competition will take place **Saturday, January 21, 2012**, at the **University of Illinois at Chicago, 750 South Halsted**. Judging of the projects will begin 8:30 a.m. and end at 2:30 p.m. The winners will be announced at an Awards Ceremony beginning about 3:00 p.m.. The student models will be on display until the conclusion of the awards ceremony. The public is invited and encouraged to see the vision of the future as seen by Chicagoland's 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grade students. There is no cost to attend.

Students from Chicago area schools will be competing for the top prize. The winning school will receive prizes and trophies for the team members. All participants will receive gifts courtesy of the Chicagoland Engineers Week Committee and local engineering/architecture firms. In addition, team members from the winning school will advance to the final judging in Washington, DC. during **NATIONAL ENGINEERS WEEK™**, February 19-25, 2012. The winner of the national competition will receive a week's trip to Space Camp. Top teams from the Regional Competition will be honored at the Annual Chicagoland Engineers Benefit, February 24, 2012.

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Since 1951, NATIONAL ENGINEERS WEEK™, has been the nationwide celebration of the engineering profession, to acknowledge the essential role which engineering has played in advancing civilization and adding quality to our lives. In Chicago, activities scheduled include engineering lectures, student outreach efforts, bridge building competitions and exhibitions of engineering achievements. More than 33,000 students from 1000 schools in 39 regions participated in the 2011 competition. It is sponsored by the National Engineers Week Committee, a consortium of engineering associations and major U.S. industries. Co-chairs for 2012 are Battelle and **ASME**.

For more information (***including sponsorship opportunities***)

**[www.futurecitychicago.org](http://www.futurecitychicago.org)**

VISIT THE NATIONAL ENGINEERS WEEK™ WEBSITE AT <http://www.eweek.org>

**CHICAGO ENGINEERS WEEK INFORMATION AT**

**<http://www.chicagolandeweek.org>**

**Check out the awards Banquet!**

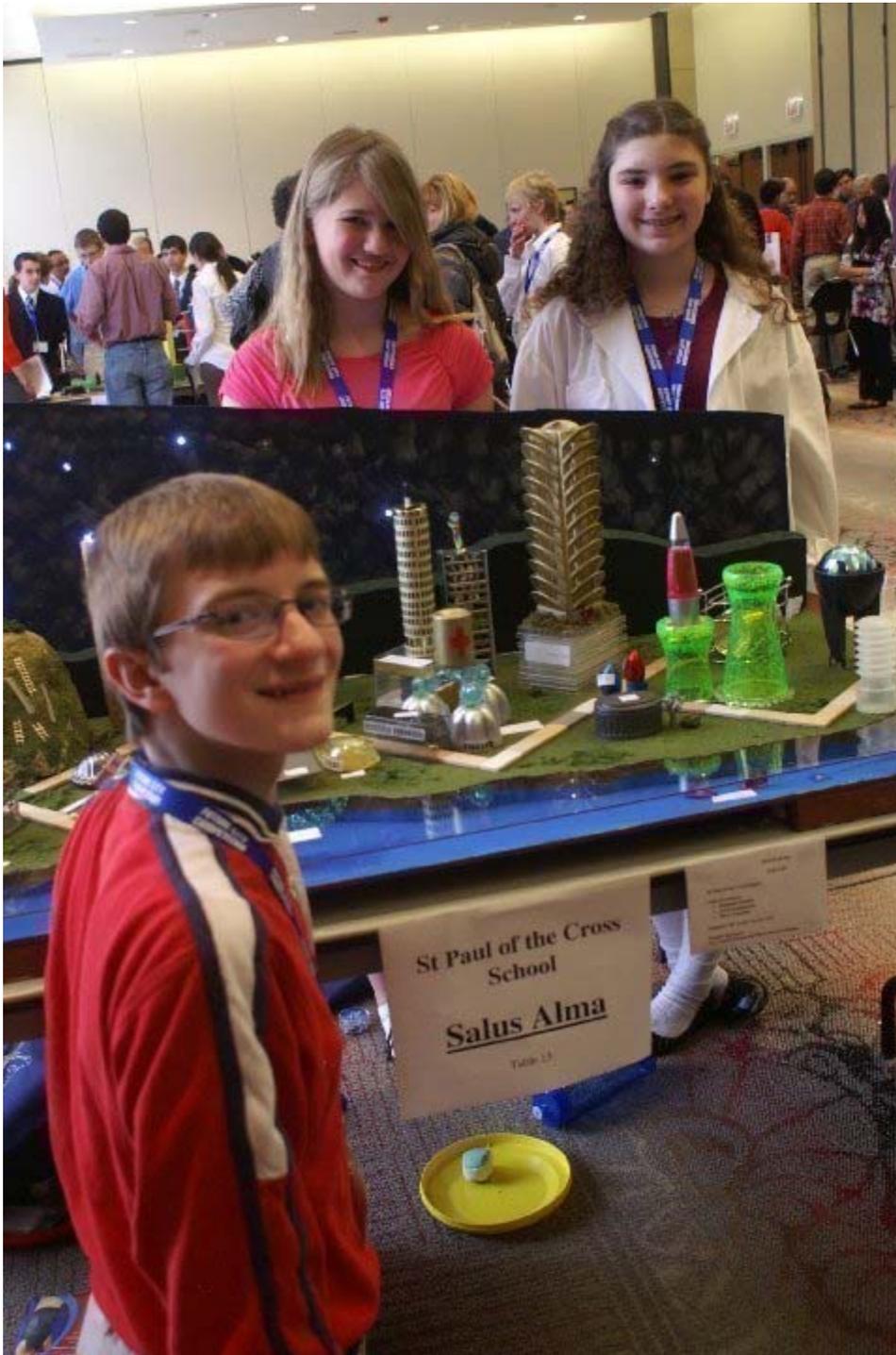
and these activitivities:

**<http://www.chicagolandeweek.org/activities.asp>**

Last year's winning team St. Clair Junior High ( *coming all the way from Missouri!* )



2nd Place team from St. Paul of the Cross/ Park Ridge



Judging process ... In the morning Students get questioned as to the merits of their city



Students are encourage to use recycled materials in their model FUTURE CITY





Interesting ??? when the Stereotype is girls avoid engineering careers ????



In the afternoon (*the 2nd round of judging*) the Five Finalist teams get **"grilled"** by a panel of architects / engineers on stage before the parents, guests!



## Hope to see you at the Regional Finals

Save the Date: Saturday- January 21, 2012

**Come witness a vision of the future !**

More pictures:

<http://www.flickr.com/photos/10752828@N05/sets/72157626018755926/>

## COMMENTARY

If this is the first you are learning about some of the activities of the Chicago area engineering profession, I am not surprised. Engineers are generally not one to boast of their volunteer efforts. I have generally found engineers are extremely poor communicators. They fail to transmit their activities outside their respective engineering discipline. Then again when they have found it difficult, if not impossible, to get media coverage of our positive activities. In Chicago, shootings, stabbings, fights, cheating, failing test scores, high dropout rates, financed teacher junkets, misappropriation of funds, teenage pregnancy, drugs, and children bringing guns to school for protection are all negative stories about schools we see on television or read about in the newspapers. I am concerned that such stories bring high ratings on television and sell newspapers, while the positive efforts of the engineering community striving to improve technology literacy do not

make for great "sound bites" or headlines.

Though students are educated in the sciences, few if any schools provide any training in the practical uses for science(engineering). The engineering outreach program mentioned above attempts to correct this deficiency in America's educational system,..... **and there are others!**

I strongly believe the future of America rests NOT with those athletic superstars or entertainment celebrities garnering headlines and idolized by today's youth but with those scientists, technologists and engineers charting the new information age. **The future of America is not found on the basketball courts, football grid irons or baseball diamonds but in preparation of the next generation of scientists and engineers.**

I look forward to further communication and interest in our efforts.

Bob Johnson

<http://blip.tv/avila-media-nfp/robert-b-johnson-educating-children-about-engineering-5271390>

Video ( October 2010 Des Plaines Tech Expo )  
<http://www.vimeo.com/15937683>

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Dear Presidents Council of Advisors  
on Science and Technology Organizers,

Hello. A note to say that having a podcast available of the PCAST proceeding would make the discussion more available to the public.

Thank you.

Sincerely,

John McLaughlin

--

John McLaughlin, PhD  
Department of Plant Biology and Pathology (SEBS)  
Rutgers University

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