Public Written Comments Submitted to PCAST

from May 19, 2010 to July 7, 2010

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5-19-2010

Hello
I ask you to help in the dissemination of my new theory that will change our concept of all in terms of physics, the interpretation of most dilemmas of modern physics and to correct our thinking in physics.
And I will send you a file that contains a summary of the theory.
Thank you very much
Researcher / Ayman Kamel

Theory of dimensions

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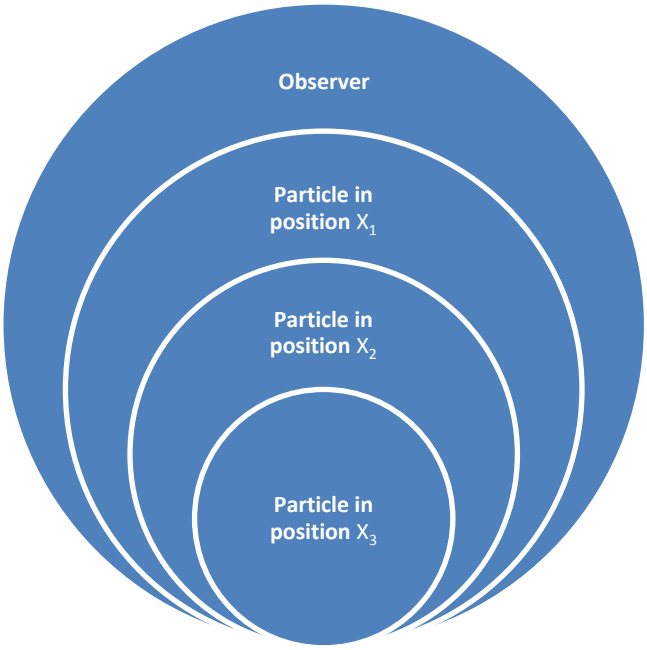
In brief

The Principles:



1) **All objects away from each other dimensions of spatial and temporal differ among themselves on the body observer (the law of static objects).**

Where is a Virtual dimension & is the real dimension & is Virtual length and is the actual length.

2) **Deflection of moving objects to each other, but with a different degree of curvature by their speed in the spatial dimension in it (the law of moving objects).**

Where is Time recorded by the observer moving & is Time recorded by the static observer & is Constant curve equals 0.3131655288 & is Speed of an object moving and is The speed of light.

3) **Measured the speed of light in the universe is not the truth, and light beams carrying qualities and particulate together according to the light of the nature of the mutation to the particulate nature of the wave while maintaining the capacity, particulate matter, as well as the rest of the objects.**

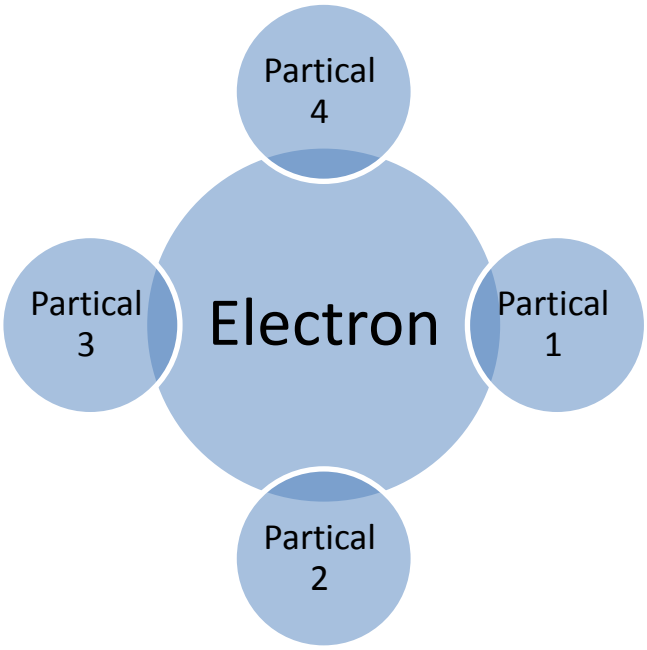
&

Where is real speed of the object & is the real distance traveled by a body moving & is Non-real distance traveled by a body moving.

4) **Of the most important applications of the theory is a magnetic According to this theory and to identify areas of strength and weaknesses and strong interpretation of gravity.**

Where is The force of gravity & is force of a body moving in a curved path & is force of a body moving in a straight path.

*** A new vision for energy:**



From this equation we can accurately obtain the force of gravity resulting from the movement of objects a certain speed and this destroys the theoretical wavelengths of the material from the premise that the entire universe is a nanoparticle, a building block for building materials in the universe and, consequently, out of energy is not radiation, as some see or an image beam of radioactive article, but the truth is a particulate material moving at speeds of near the speed of light and micro does not feel his presence the material in the form of particulate matter, but feel it in the form of radiation of wavelength, as previously explained that the image wave located by particulate matter are only bending particle during movement as a result of attractive particle moving himself and bent on itself, the picture of natural energy is Removing particulate matter of the electrons with the correlation and coherence in the form of unstable these particles with the electron transmitted from orbit with a power level lower to the higher it gets worse particles associated with the electron to be separated from electrons and graduated in Picture an image accepted radioactive wavelength and frequency of any particular wavelength of curvature of particle through a unit of time that call frequency, and this picture is illustrative of the general form of the particulate matter.

5-30-2010

http://tetradyn.com/bottomseal

You'll find in the "supportive-mostly-tech-docmts" subdirectory enough stuff to convince you that this is solid real science, SAFE, and I can explain in "plain-english" (really!) why this MUST get put into motion Now.

We could have had this @#$@#$ Gulf Oil gusher-leak sealed up, permanently, cleanly, solidly, weeks and weeks ago.

Now it appears that BP wants to screw around until August, and longer, just to get a partial fix. Is this poor engineering only so they can try to save their bloody equipment and future use of the well or because they cannot conceive of a simpler, faster fix that is "in their face" so to speak if only eyes and ears can be opened?

How about the people, the People - and that starts with the folks living on the shores and nearby areas around the Gulf, but it really means ALL of us. And the national economy, and national security?

BOTTOM SEAL will work. And we have worked out certain "containment" issues in a simplistic and demonstrable manner.

Here is an answer, and there is a growing and committed team of Americans, also some Russians and a few others who can do it Right. We've all worked on nuclear physics, applied and military real-world stuff, even 20-40 years back, and some of us, on opposing sides of the fence. Now we can solve this damnable problem that is going to ruin much more than some parts of the Gulf of Mexico! [see the "PS" below]

We need the "Commander in Chief" to give the go-ahead, and in between DOE and DOD and a few of us experts (of which I am not the best "guru" by my own admission!) , the Gulf Oil Disaster Gusher can and will be stopped.

Very sincerely,
Martin

(working over Memorial Day weekend on all this, and also in memory of all those (let's not forget them) who made the ultimate sacrifices for our country and for our world - let's not their sacrifices become done-in-vain because we are letting the whole eco-system be destroyed, needlessly).

PS
What has happened and is going on down there is paving the way for parts of "The Hellstrom Chronicle" becoming a reality within 2-3 insect breeding seasons. That's an old movie from @ 1970. It is not science fiction but it was science-possible, and now it is looking more real, and more of a threat, by the way, than even some towel-headed

terrorists and we all know they are a very real threat, but this can be more damaging to the USA and the rest of the world.

PPS
This is not something that will be a risk to the environment! It is not "Bikini Atoll" stuff, which was orders of magnitude greater in energy release and radioactivity, and also at a miniscule depth close to the surface. No splash, no spray, no mushroom cloud. I know you all are smart - just give a tiny bit of belief that some physicists know their stuff and that this is better than what BP has been (not) doing for the past 6 weeks.

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Sincerely,

Dr. Martin Joseph Dudziak, PhD
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"Pluralitas non est ponenda sin necessitate" (William of Occam)
"Having one thing, to know ten thousand things" (Musashi Miyamoto)
"Mais quand une regle est fort composee, ce qui luy est conforme, passe pour irregulier" (Gottfried Leibniz)
"Frankness is the child of honesty and courage. Say just what you mean to do on every occasion, and take it for granted that you mean to do right" (Gen. Robert E. Lee)
"To exist is to change, to change is to mature, to mature is to go on creating oneself endlessly" (Henri-Louis Bergson)
"There is no security upon this earth; there is only opportunity" (Gen. Douglas MacArthur)

The second-most famous formula in science is the equation, "E=mc2". The first and most important, which gives rise to this and all others, is "God = Love" (anonymous)

"BOTTOM SEAL"

The Alternative to "Top Kill" and all the other "preserve the well for BP at all costs" methods

Please consider with an open mind and realize that there are 64 years of tests and simulations, but also real-world tests, and a growing number of international experts in physics, geology, oceanography, biology, medicine, and environmental health and safety that back this up as the best solution for the Deepwater Horizon Disaster.

Please note that it could have been implemented in a matter of days or a couple of weeks and it still will require only a small bit of time if the federal and state and corporate "powers that be" and the People can bring together the small team of experts to work out the final details.

Please note that the "containment" issues re: blast waves, any seismic effects, any dispersions beyond the immediate small radius around the Deepwater well head have been worked out with simple physics, classical wave mechanics.

http://tetradyn.com/bottomseal

Please call or write any time of day or night ---

Contact person for a growing group of scientists and engineers:

Dr. Martin J. Dudziak, PhD

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martinjd@tetradyn.com martin.dudziak@gmail.com

(If there are extra pages in this coming to you as a fax, then those are what we have been trying to use to get even a single response from the President who says, "Talk to me" if you are not being heard!)

6-3-2010

I was reading the AIP account of your May meeting. I hope that when you consider problems like biodiversity, energy shortage, environmental damage, and many others you will keep in mind the effects of population growth. The huge growth in population in the U.S. and the world exacerbates all of the biggest problems that we face. It is a serious problem that is never mentioned anymore in the media. Perhaps they are afraid to touch this issue because of fear of stirring up religious or ethnic concerns, or because it is complicated. But if you are to be true to the science of the situations you examine, population growth should be a consideration. I hope to see it mentioned in your reports and recommendations.

Respectfully,

Christine Celata
retired staff scientist, Lawrence Berkeley National Laboratory
presently physicist at Cornell University and visitor in Physics, Mathematics, and Astronomy at Cal Tech

6-7-2010

The Ultimate Green Energy Source

A Solution Based on a New Property of the Electron

Dear Dr. Stine,

I am sharing just the essence of a potential new electron behavior which could reshape our entire energy future. I no longer have the time or means to pursue this (I am just another victim of the financial fiasco created by Wall Street). The Gulf of Mexico catastrophe should be a wake up call about the ridiculous lengths we will go to find oil (a primitive substance that needs to be replaced as an energy source) – this need is my primary motivation for sharing my idea now in its unfinished and speculative state.

We have been very successful at using and manipulating the electron – it is the technological foundation of our civilization. The electron may have one more trick for us exploit. A re-interpretation of the discovery of the positive electron (positron) could indicate that the charge state of the electron can be manipulated as well – something that could have an extraordinary impact on our energy future (as well as world politics and physics). The dream of science fiction writers has been to exploit the annihilation reaction,* in this case between negative and positive electrons. Unusual discoveries made since the 1980's may give us both the proof and insight into how to change the charge state of the electron and, in the process, hopefully yield an inexhaustible and inexpensive energy source.

I have attached a short presentation in Acrobat pdf format. I hope that it will generate enough interest to explore this exciting new possibility about the electron and how it can possibly revolutionize our future energy resources.

With my very best regards,

Mark Rosen

Mark David A. Rosen, Ph.D.
mdarosen@post.harvard.edu
www.GAP-s.net

*The Ultimate Green Energy Source – 100% mass conversion, no radioactivity and no CO_2 emission

NOTE: I am aware that what I am proposing may seem to violate charge conservation and other closely held beliefs. I believe that there are answers to all possible objections.

The Electron and Electric Charge

A New Perspective

Mark David A. Rosen, Ph.D.

mdarosen@post.harvard.edu

Short History of the Electron

- **1897** Discovered by Thompson
- **1909** Charge determined by Millikan
  - The smallest unit of charge until the construct of the quark in the 1960's
- **1932** Positively charged electron discovered by Anderson (dubbed the "positron")
  - The origin of the idea of antiparticles (mainly because of the Dirac equation with its negative energy solutions)

The Ultimate Green Energy Source

The Solution

Particle –Antiparticle Annihilation

100% Mass to Energy Conversion

(specifically looking at electron – positive electron (positron) interaction)

No radioactivity (or transmutation) and no CO_2 emitted

The Problem

A viable (inexpensive) source of positive electrons

(as well as the efficient use of the gamma rays emitted in the process)

Known Sources for Positrons

- **High Energy Particle Collisions**
  - Cosmic Rays – led to the discovery of the positive electron (Anderson, 1932)
  - Accelerators
- **β^+ decay of radioactive isotopes** (^{22}Na)

- **High Power Laser Interactions with Materials**
  - Gold target – recent work produced record quantities

None of these are a viable inexpensive solution

Re-evaluating the Electron & Charge

Edwin Land (Polaroid) once expressed the following:

"Discoveries are made by some individual who has freed himself from a way of thinking that is held by friends and associates who may be more intelligent, better educated, better disciplined, but who have not mastered the art of the fresh, clean look at the old, old knowledge."

The nature of the electron and electric charge may need a "fresh, clean look."

The Discovery of the Positive Electron A Different Interpretation

What if the Dirac Equation with its negative energy interpretation did not exist?

What would the discovery of the positive electron imply?

- Either we would assume
  - it to be a separate distinct entity
  - or **that the sign of the charge (charge state) of an electron is not a fixed property but can be changed under conditions to be determined.**
- Recent unusual discoveries may support the latter view

The influence of the Dirac equation may have misled physics since the early 1930's

Recent “Strange” Discoveries

- Fractional Quantum Hall Effect (FQHE)
  - Fractionally charged quasiparticles or composite fermions) proposed
- High Temperature Superconductivity
  - Layered structures – electron motion limited to 2-dimensional planes
- Electrochemically generated excess heat
  - Unfortunately initially dubbed “cold fusion”

Fractional Quantum Hall Effect (FQHE)

- Experimental Conditions
  - Electrons confined to 2-dimensions
  - Temperature near absolute zero
  - Strong magnetic field perpendicular to electron plane

- Theory
  - Fractionally charged quasiparticles (composite fermions)
  - SIMPLER Approach – possibly a fraction of the electrons have become positively charged
    - this would imply the gamma ray signature of annihilation should be present (a good, but not necessarily easy, test)

High Temperature Superconductivity

- Generally tend to be layered structures
- Still no theory after 23 years
- Perhaps a new property for the electron could help
  - If the electron's charge state can be altered, this could help to explain how it could traverse the electric fields present in the layered structures without loss (charge coupling and oscillation)

Electrochemically Generated Excess Heat

- There have been enough successful experiments to establish the phenomenon
- The cause remains uncertain
  - The claim of “cold fusion” or low energy nuclear reactions (LENR) remains controversial and has marginalized this real effect
  - Could annihilation (due to some of the electrons becoming positively charged) be an alternate explanation?

Electron-Positron annihilation might not be less controversial, but a much more plausible explanation

Annihilation Gamma Ray Signature

- It has been established that gamma ray emission accompanies excess heat production
- The presence of .511 MeV or 1.02 MeV gamma rays would support an annihilation mechanism
- Unfortunately, no measurements of spectra below 1.2 MeV seem to exist

Electrochemical Excess Energy

Long incubation period usually needed before the beginning of excess energy

- Recent microscopic examination of the electrode surface has possibly shown why
- Morphology changes indicate areas that could constrain electron motion allowing the surrounding cations' electric field to possibly flip the electron's charge state to positive

SEM Photo of Cathode

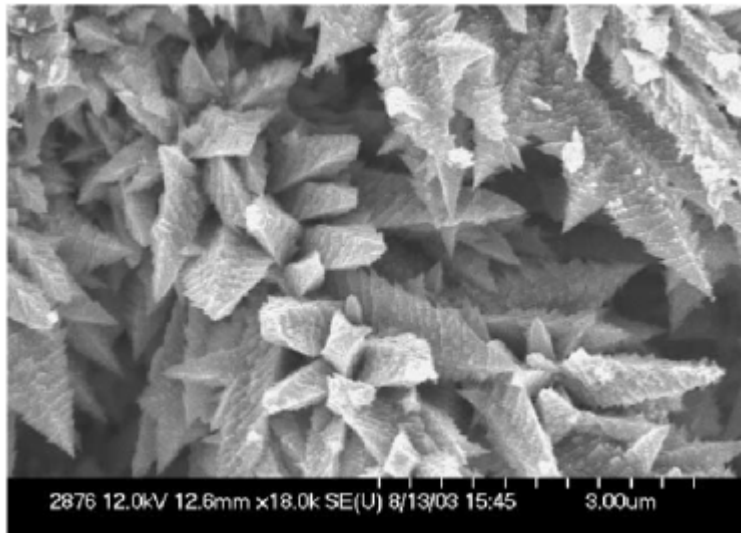
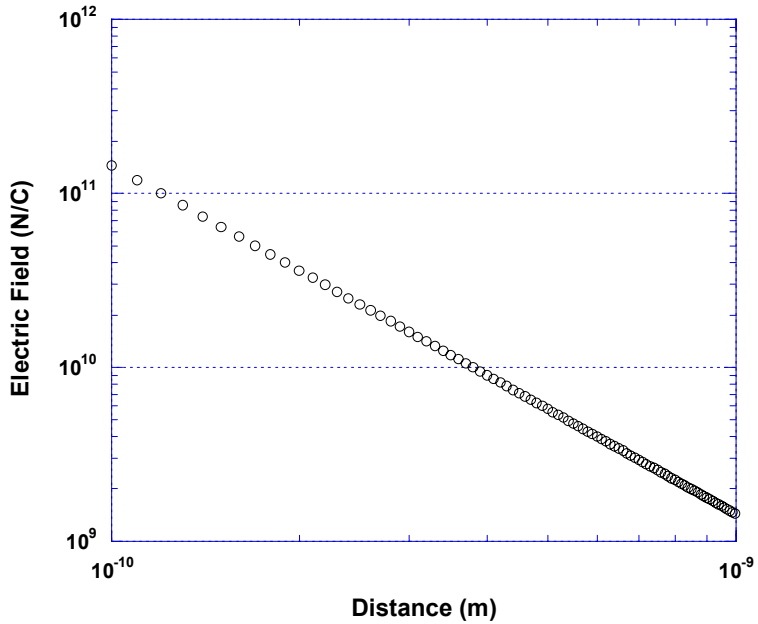


Fig. 6. Dendritic growth due to the action of the cell current on microglobules immobilized in tight pores

S. Szpak et al. / Journal of Electroanalytical Chemistry 580 (2005), p 288

Estimate of Electric Field due to Cation and Electron



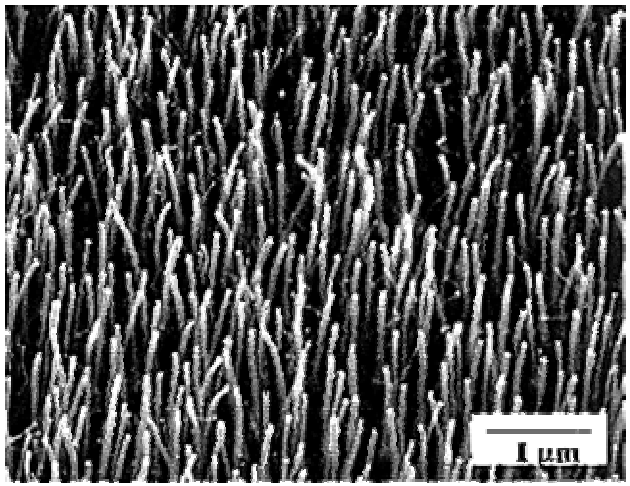
Simple approximation of the electric field (E) indicating that E> 10^9 N/C (multiple angstrom separation distance) is probably necessary for altering the electron's charge state

Creating Microstructured Cathodes
Possible Materials Ideas

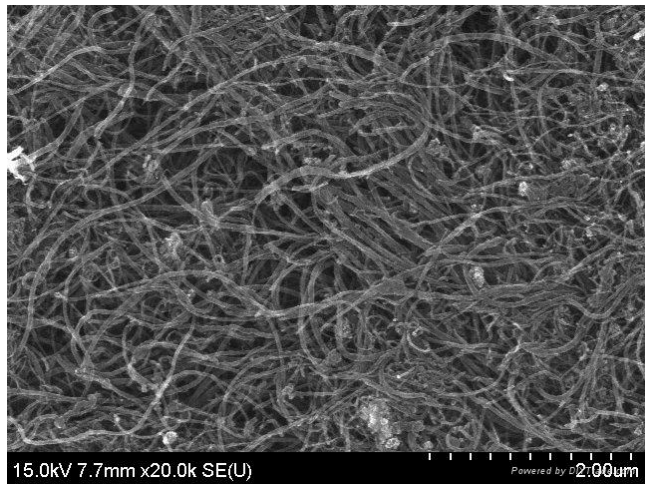
- Carbon Nanotubes (use ideas being developed for battery technology)
- Graphene Sheets (new formation technology being developed)
- Black Silicon (Mazur Group, Harvard)

Possible Cathode Surface Materials

Carbon Nanotubes



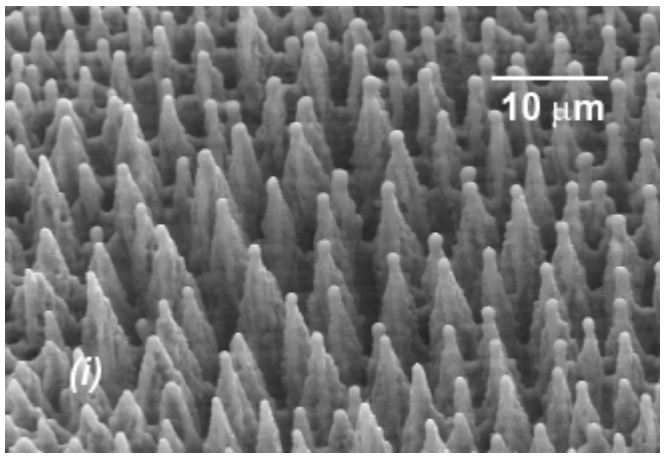
Parallel Carbon Nanotubes

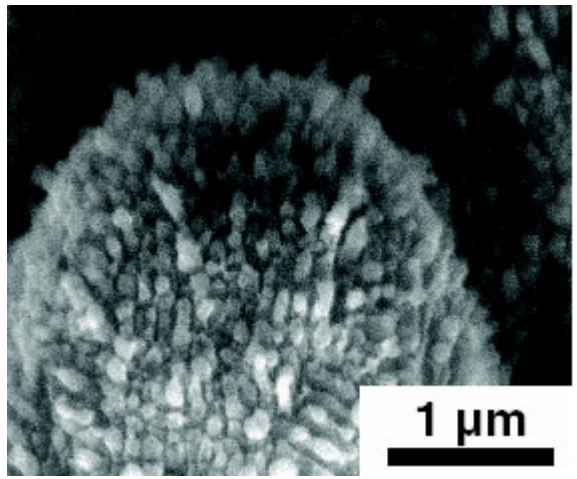


Entangled Carbon Nanotubes

Possible Cathode Surface Materials

Black Silicon





Mazur Group, Harvard University

Proposed Conditions
To Alter the Charge State of the Electron

- Constrain the electron's motion in the cathode (allows sufficient time for applied force to cause charge state change)
  - Possible geometries: 2-dimensional graphene sheets, carbon nanotubes, processes like black silicon (Mazur Group, Harvard) and other similar surface morphologies

- Create an electric field of sufficient strength to flip the charge state by proximity to cation in electrolyte (liquid, gel, or solid)
  - Simple estimate of 10^9 to 10^{10} Newtons/Coulomb

Summary

- **Discovery of the positive electron** (1932)
  - Alternate implication is that the charge state of the electron may be able to be changed (a new electron behavior to exploit)
- **Charge State Change -- Under What Conditions?**
  - Best estimate is given by electrochemically generated excess heat
    - Cathode with surface morphology to constrain the electron's motion
    - Can vary the applied voltage to the electrochemical cell to control the annihilation reaction based on temperature and the intensity of gamma rays produced
- **The annihilation reaction would be the UTIMATE GREEN ENERGY SOURCE**
  - Considering the incredible energy implications, it should be worth the small cost to investigate the validity of this proposed new property of the electron

APPENDIX

Neutral Electron?

- Many particles discovered have been seen to exist in three charge states
  - negative, neutral & positive
- **Is there a neutral electron?**
  - Could this be the neutrino?
    - Pauli wrote in his famous 1930 letter “The mass of the neutron [neutrino] must be of the same order of magnitude as the electron …”
    - Present estimates put the mass much less than that of the electron – This raises the intriguing question

Is there energy (mass) associated with charge?

6-12-2010

THE REASON FOR THIS LETTER IS I'VE DONE LOTS OF JOBS WITH METALS AND HAVE DONE ENGIENEERING,FABRICATION,MACHINE SHOP , WEILDING EXPERTICES AND WOULD LIKE TO PROSENT MY IDEA FOR A IT IS FOOLFROOF.

1. IDEA
TO MAKE A HINGED CIRCLE WHICH WOULD OPEN INTO 2 FREE PARTS WHICH WOULD BE HINGED WHEN CLOSED. A SPLIT HINGED CIRCLE WITH 20 FOOT 24 IN X 6 FT PLANKS EXTENDING FROM THE BOTH RINGS TO EXISTING PIPE. SELF TAPING BOLTS THEN WOULD BE PLACED IN 6 EQUAL PLACES ON THE EXISTING PIPE ITSELF . 4 PLANKS AROUND THE CIRCLE WHICH WOULD BE THE MAIN SUPPORT FOR HOLDING THE RING IN PLACE WITH A MANUAL CRANK SHUT DOOR" THE CRANK DOOR WOULD BE IN SQUARE SHAPE THAT WOULD SLIDE ACROSS "LEFT,RIGHT""RIGHT,LEFT INDIFERENT TO COVER FRESH CUT THROUGH EXISTING PIPE

THE RING ON END WOULD HAVE A 48 IN. GAP ,WHICH THE TIGHT FIT DOOR WOULD BE ON 2 TRACKS ON THE TOP AND BOTTOM OF CIRCLE… THE DOOR SPEED WOULD HAVE-TO BE SLOW YET STEADY NOT TO OVERWHELM THE MACHINES YET CUT WITH THE PRESSURE … CUTTING DEVICES WOULD BE MADE OF CARBIDE ,WOULD BE 4 IN . OUT FROM END OF SQUARE DOOR TO PROTECT CUTTING DEVICE. FROM BREAKING AWAY .THIS DEVICE COULD BE EASILY MADE ON LAND THEN PLACED ONTO OCEAN FLOOR USING ROBOTIC DEVICES ..BOTTOM HALF-CIRCLE UNDER PIPE THEN CLOSE DEVICE FROM TOP TO FORM CIRCLE AROUND PIPE AND BEGINE CUTTING WILE CLOSING PIPELINE CAUSING A CAPING EFFECT… THE CLOSING SPEED WOULD BE DETERMINED BY THE SPEED OF THE FLOWING CRUDE OIL...SLOW YET STEADY...

FINALLY AN IDEA WITH MUCH HOPE PLEASE READ AND TAKE INTO CONSIDERATION SERIOUSLY . THANK YOU AND THIS WILL BE YOUR FINALL ANSWER TO A SEEMINGLY UNRESOLIVIBLE DEASTER

I RYAN MISKOLCZI , PROPOSE THIS IDEA TO HELP ALL THES WITH EXHAUSTED IDEA AND FOR A TERIBLE DEASTER ANSWERING THE QUESTION THAT NEED NOT GREAT THOUGHT JUST ACTION . 732-678-4141
201-838-1473

AM MORE THAN HELP ANYWAY THAT I CAN FOR MANKIND
WITH MUCH THOUGHT
RYAN MISKOLCZI

THE REAL AMERICAN

6-12-2010

To Whom it May Concern;

The President needs your informed advice as to how to cap the gusher in the Gulf. Surely you can help find the engineering resources to propose a highly probable capping solution. 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! Remember Exxon? Marathon? What about their retirees?

We need the help of the best and the brightest NOW! We cannot afford to wait for the wells in August. Please advise the President on this matter immediately.

Sincerely,
John Scarborough, P.E.
2128 Longwood Dr
Auburn, AL 36830
(334) 502-6639

6-14-2010

My Fellow Americans,

Everything is verifiable! **Energy (torque and electricity) from Magnets!** Who else needs to see a demonstration? Everything we know and do is related to the magnetic field one way or another and another part has been discovered!

These reactions cannot be caused using only what is taught to exists. I am using part of a magnetic field, which is not a pole, and manipulating it to generate torque, while current is being generated from the poles and the current is used. I can cause these reactions with magnets only after knowing Wardforce exists and can be manipulated. As today, without this part of a magnetic field being used, torque and current is generated from different devices. With Wardforce being manipulated, usable torque and current can be generated from a single device.

I have discovered a part of the magnetic field, "Wardforce", which is not a North or South Pole. Using magnetic fields, I am causing reactions which have been taught for over 200 years as impossible. Some of the over 10,000 (hits 2009) people, who are from the US and other countries, have been emailing me, asking questions and I know they understand how I am manipulating Wardforce. Some, from other countries, have indicated that they are teaching their children (future work force) about Wardforce. Defining Wardforce, gives a better understanding of cause and effect. NOW, is the time for science communities and educational facilities, here in the USA, to be involved with developing a curriculum for our future work force.

"This is the information age!" Let's share this information! I have demonstrated to High Schools, Colleges, Universities, Companies and individuals in the area where I live. A&M, LIT, attendees of the Houston Inventers Tradeshow, (references) etc..., just to name a few qualified GROUPS who have attended one of these demonstrations of 3 or more devices. Who else needs to witness a demonstration? How many people need to see a demonstration before others get involved? I personally think other people should know about this, rather than only the ones who live near me. After all, the people who see my demonstration will be ahead of everyone else in the world and if I can inspire one, it will be worth my time. In the "information age" why are our children not being taught about this new technology? Energy from magnets! Physical proof of my claims have and can be demonstrated. Knowing this, who needs to see a demonstration, so a curriculum can be developed for our children?

With this method regarding US patent 7531930 being used, I can demonstrate that torque and current can be generated from magnetic fields. It is not as simple as it sounds and yes, that is right, energy from Magnets. As requested by the President of the United States, we can be weaned from burning oil and generate jobs. Use this technique in our autos, homes, businesses, public buildings, street lights, computers, etc…, building more textiles and all this adds up to commerce=jobs=TAXES, your salary.

Magnetism, which has never been seen, is and has been used for many purposes other than energy. Some of these are: Various medical treatments, medical equipment, many types of communication, radar, etc. Knowing Wardforce exists will affect the advancement of many technologies which can and will be a tremendous benefit to mankind. How many things exists which we cannot see? Wind, Wardforce, current, North and South poles, just to name a few, are forces not seen, only the reactions caused by them can be seen. To whom do I demonstrate that "Wardforce" exists? The main point is, I offer PHYSICAL PROOF and all I get are people who have seen nothing physical, telling me that I am

wrong. I have demonstrated to many, yet no one who has seen this demonstration has said my claims are not true. Come see for yourself as others have. How can anyone tell me that I am wrong without seeing what I have to offer? Who can say that they know everything about electrons, protons, magnetic field, etc…, things which no one has ever seen and defined only by the reactions caused? By developing a curriculum, others can be educated which will be potential future employee's, educators, research personnel, etc. If we don't teach others what we have learned, what good does it do for the future of our children… or mankind? Let's make this knowledge open to the public, building a brighter future for our children and their children. Let's start educating our future workforce regarding this new field related to magnetism.

The long story short, I need funding for developing a curriculum and hiring employees, building facilities, etc. Using this technology will create millions (1,000,000's) of new jobs, generate commerce worldwide, cut emissions from burning and aid in the advancement of mankind. Let's make this knowledge public …. learning from the past. A better understanding of how things REALLY work will ultimately help us make better choices. If what we now know, was known then, would we have made the same choices?

Please reply with your intentions, pass this information to others and thank you for your support towards educating your children, as I know you will, working with us, the people of the United States of America. What about our military, should they know about this?

Steven Ward
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936-628-6192

P.S. On my blog www.energy-ingenuitycom.blogspot.com you can see the videos I have posted. I demonstrate devices which prove the existence of "Wardforce" and that it can be manipulated to produce torque while the poles generate current. It is not as simple as it sounds, or looks.

6-17-2010

I note that PCAST/PITAC is looking for ideas on convergence of bio/nano/info. The "Translational Nanomedicine" workshop report (attached) is certainly pertinent to that topic. If PITAC isn't already aware if it, you might wish call it to their attention.

murday@usc.edu

Translational Nanomedicine: Status Assessment and Opportunities

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Abstract

Nano-enabled technologies hold great promise for medicine and health. The rapid progress by the physical sciences/engineering communities in synthesizing nanostructures and characterizing their properties needs to be rapidly exploited in medicine and health toward reducing mortality rate, morbidity an illness imposes on a patient, disease prevalence, and general societal burden. An NSF funded workshop "Re-Engineering Basic and Clinical Research to Catalyze Translational Nanoscience" was held 16-19 March 2008 at the University of Southern California. Based on that workshop and literature review, this paper briefly explores scientific, economic and societal drivers for nanomedicine initiatives; examines the science, engineering, and medical research needs; succinctly reviews the U.S. Federal investment directly germane to medicine and health, with brief mention of the European Union (EU) effort; and presents recommendations to accelerate the translation of nano-enabled technologies from laboratory discovery into clinical practice.

I. Introduction

Nanostructures and their properties are critical to understand and develop innovations in biological systems, therapeutic agents, and medicine and health. However it has only been in the last five years that "nanomedicine" as a field has been created and has rapidly accelerated. This paper explores the reasons behind that fact, examines the science and engineering issues that remain to be addressed if one is to more rapidly translate nanoscience discovery into nano-enabled medical technology, and suggests Federal agency actions that could accelerate that eventuality.

The U.S. National Nanotechnology Initiative was instituted in 2001 to accelerate and exploit progress in the science and engineering of nanostructures. As evident in Figure 1, exponential growth in literature addressing the nanoscale began about 1990. Interest in the nanoscale has been driven by the commercial availability of nanoscale manipulation and characterization tools, the expectation of new physical, chemical, and biological properties of nanostructures, the expectation that nanostructures will provide new building blocks for innovative new materials with novel properties, the miniaturization into the nanoscale by the semiconductor industry, and the recognition that the molecular machinery in a biological cell functions at the nanoscale. Historically, aspects of chemistry and biology - such as colloids, protein engineering and molecular virology - have involved nanostructures, but on a largely empirical basis. Finally, there is an expectation that a better understanding of the 1-100nm materials size scale (the nanoscale) will lead to a seamless integration of theory and models across the size scales that encompass atomic-molecular-nanostructure-microstructure behavior and thereby enable the *a priori* prediction and design of a material's properties.

The nanoscale literature in the 1990s is dominated by investigations of "hard" materials – ceramics, metals, semiconductors - only in small part due to the keen interest in nanoelectronics devices. Many of the new nanoscale analytical tools depend on proximity between a tip and the sample under investigation. This requirement was not overly onerous for relatively stiff materials, the primary focus of nanotechnology in the 90s. In contrast, soft materials, those of predominant interest in the biology and medical communities, are more readily deformed by a proximal probe and are thereby more difficult to analyze quantitatively. It wasn't until roughly 2000 that improvements in commercially available instrumentation made the analysis of soft material more viable. Not coincidently, the literature reporting nanostructures in biology, medicine and health began to increase more rapidly at that point (see Figure 1).

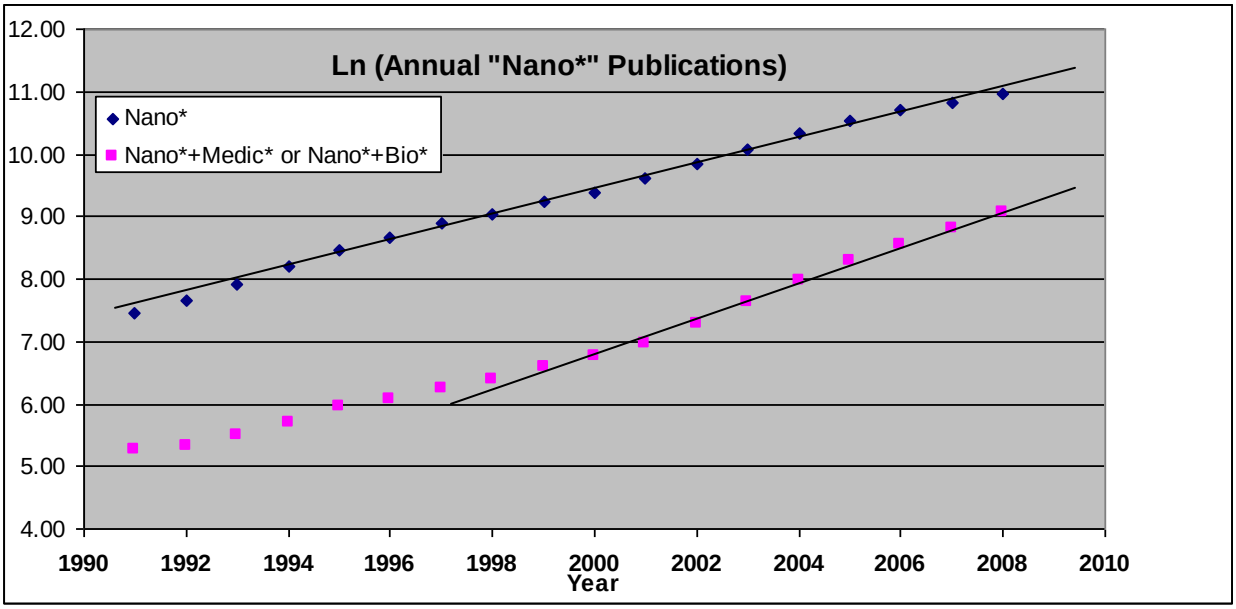

Figure 1: Publication counts derived from the Thompson ISI Web of Science database on 3/15/2009 using the indicated keywords. The vertical axis is the natural logarithm of the number of publications. There is a clear change in slope for the publications associated with biology and medicine around the year 2000.

The increase in research activity has to be complemented by programs in the various funding entities. For example, in the U.S. there are eleven agencies with nanoscale research and development (R&D) programs reported by the U.S. National Nanotechnology Initiative (NNI, see Table 1) [1, 2]. The reported funding for nanoscale science and technology has grown by nearly a factor of 4 since the initiation of the NNI in 2001.

Table 1
U.S. Federal Agency R&D Funding in the NNI

	FY2001 requested*	FY2001 actual*	FY2005 requested*	FY2005 actual*	FY2009 requested*
NSF	217	150	305	335	431
DOD	110	125	180	352	397
DOE	94	88	211	208	311
HHS (NIH, NIOSH)	36	40	89	168	232

DOC (NIST)	18	33	53	79	110
NASA	20	22	35	45	6
EPA		5	5	7	5
USDA (CSREES, FS)			5	2	8
DOJ			2	2	2
DHS (TSA)			1	1	1
DOT (FHWA)					1
Total		~460		~1200	~1500

* The Presidential Budget submission presents requested funding; actual funding is reported by the agencies after the end of the fiscal year. The differences reflect Congressional appropriation decisions, including Congressional adds, and agency funding decisions taken during the fiscal year.

At the beginning of the NNI, the National Institutes of Health (NIH) investment at the nanoscale was modest. The NIH hosted two workshops - Nanoscience and Nanotechnology: Shaping Biomedical Research, June 2000 [3], and Nanobiotechnology, October 2003 [4] - to better understand the potential impact of nanostructures on medicine/health and the knowledge deficiencies inhibiting progress. These workshops, along with promising results from research [5], led to major increases in the NIH investment in nanoscale research. The nanoscale investment by NIH has more than doubled since 2005 (sextupled since 2001 – see Table 1).

As part of the NIH investment to exploit the nanoscale, Nanomedicine was incorporated into the NIH Roadmap for Medical Research in 2004 [6]. Understanding nanoscale properties permits engineers to build new materials structures and use these materials in new ways. The same holds true for the biological structures inside living cells of the body. To meet the challenges, and complement its Institute-based programs, the NIH established a national network of eight Nanomedicine Development Centers. These collaborative centers are staffed by multidisciplinary research teams including biologists, physicians, mathematicians, engineers and computer scientists. In the initial phase of the program (FY2005-FY2010), research has been primarily directed toward gathering extensive information about the chemical and physical properties of nanoscale biological structures.

The European Science Foundation launched a Scientific Forward Look on Nanomedicine in 2004, which involved a series of five workshops and a Consensus Conference (Nov 2004). This was followed in Nov 2006 by a report with a strategic research agenda for nanomedicine [7]. A proceedings from the 2006 NATO Advanced Research Workshop on Nanomaterials for Application in Medicine and Health has been published [8]. Founded in 2007, the European Society for Nanomedicine [9] (ESNAM) shares office space with the European Foundation for Clinical Nanomedicine (CLINAM foundation) [10]. The first European Conference for Clinical Nanomedicine was organized by CLINAM in May 2008 and had sessions on unsolved problems waiting for nanomedical solutions, nanotechnologies at hand for solving medical problems, clinical trials in nanomedicine, and building bridges between clinicians and nanoscientists.

The growing attention to nanostructures in medicine/health is also reflected in other professional science and engineering communities. A Handbook of Nanomedicine is being implemented [11]. The American Academy of Nanomedicine was founded in 2005. The non-profit American Society for Nanomedicine (http://www.amsocnanomed.org/) was launched in 2008, and – in collaboration with ESNAM - has recently founded the International Society of Nanomedicine at

the second CLINAM meeting in April 2009. In 2005 Elsevier launched a journal - Nanomedicine: Nanotechnology, Biology and Medicine (ISSN1549-9634). Additional journals, the International Journal of Nanomedicine (ISSN 1176-9114) and Nanomedicine (ISSN 1743-5889) were both launched in 2006. The Institute of Nanotechnology, founded in the UK in 1994, began its nanomednet [12] in 2007. While not strictly "nano," another relevant journal initiated is the Royal Society of Chemistry's Lab on a Chip [13] which was initiated in 2001. The American Physical Society PACs classification scheme has been modified to include "nanotechnology design" (87.85.Qr) and "nanotechnology application" (87.85.Rs) under Biomedical Engineering (87.85). Recurrent professional forums addressing aspects of nanomedicine are: The International Nanomedicine and Drug Delivery Symposium (NanoDDS – begun in 2003) [14], the Annual Meeting of the American Academy of Nanomedicine (2005-2008) [15], the Society for Biomaterials meeting [16], the AVS International Symposium and Exhibition [17], the European Science Foundation conference Nanomedicine 2008 [18], and the International Conference on Biomedical Applications of Nanotechnology [19].

The paucity of knowledge for nanostructure impact on environment, safety, and health (ESH), coupled with the growing prevalence and diversity of, and especially the novel engineered properties in, nano-enabled technologies continues to raise ESH concerns [20]. Knowledge of nanostructure ESH risks and their amelioration will be symbiotic with health and medicine applications since understanding how to avoid health problems can potentially be used to guide therapy and *vice versa*. Workshop and task force reports on ESH issues include: Nanotechnology: A Report of the US Food and Drug Administration [21], and Environmental, Health, and Safety Research Needs for Engineered Nanoscale Materials [22], a UK report on Nanomaterials risk [23], an International Council on Nanotechnology (ICON) report [24], and a European Commission paper [25].

Conventional wisdom, buttressed by observation, posits a 20 year gestation period between science discovery and its exploitation in the market. Figure 2 illustrates this point for several major 20^{th} century technologies, and suggests imminent emergence of nano-enabled technologies. In practice, nanostructures have been utilized in selected technologies for some time, including carbon black in tires, colorants in stained glass windows, colloidal silver as a disinfectant, colloids and colorants in cosmetics, and many catalysts. Small particles have also been in use for biomedical research and *in-vitro* diagnostic protocols during the last fifty years [26, 27]. Most of these applications are based on technology derived empirically from macroscopic observations.

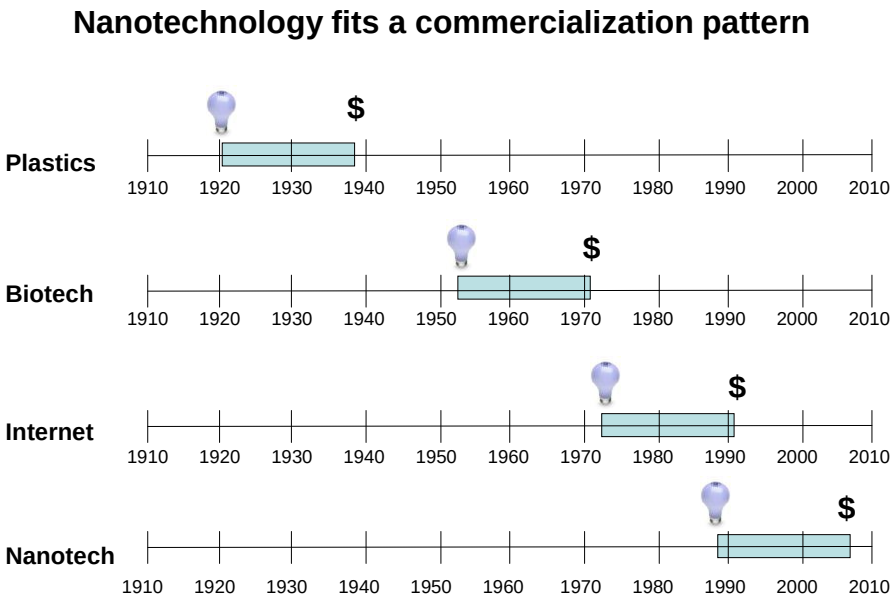

Figure 2: Time required for maturation of science discoveries into commercial products. Courtesy Lux Research Inc. • One Liberty Square, Suite 210, Boston MA 02109

There is a database with a listing of products in the market that are (or claim to be) nano-enabled [28]; there are also specific listings of nano-enabled products in medicine and health [29, 30]. As the capability to make, measure, and manipulate individual nanostructures continues to progress, one can expect more extensive entry of nano-enabled and nano-enhanced products and technologies into the marketplace in the coming years.

While twenty years might be the generic interval for transition of science discovery to innovative technology to translation of these technologies into medical applications, a thoughtfully crafted investment strategy might shorten this time frame. To improve human health, scientific discoveries must be translated into practical applications. Such discoveries typically begin at "the bench" with basic research — in which scientists study disease at a molecular or cellular level — then progress to the clinical level, or the patient's "bedside". Scientists/engineers are increasingly aware that this bench-to-bedside approach to translational research is really a two-way street [31]. Basic scientists provide clinicians with new tools for use with patients and for assessment of their impact; clinical researchers make novel observations about the nature and progression of disease that often stimulate basic investigations. Translational research has proven to be a powerful process that drives the clinical research engine [32]. However, a stronger research infrastructure could strengthen and accelerate this critical part of the clinical research enterprise. Through discussions with deans of academic health centers, recommendations from the Institute of Medicine, and meetings with the research community, the NIH recognized that a broad re-engineering effort is needed to create greater opportunity to catalyze the development of a new discipline of clinical and translational science. An outcome was the launch of the Clinical and Translational Science Awards (CTSA) Consortium in October 2006.

Accelerating discovery into technological device is certainly a goal for the DOD hierarchy of research and development funds (evolving from basic (6.1), applied (6.2), advanced technology development (6.3), advanced component development and prototypes (6.4), to system development and demonstration (6.5)) and the NASA research and development funds evolving from technology readiness levels 1 through 6. One might consider the NIH equivalent as R01 programs to explore new concepts (basic), the R21 programs to demonstrate feasibility (applied research), the R33 programs to further develop the idea toward a technological/methodological goal, and the Clinical and Translational Science Awards (CTSA) providing translation into the clinic (which might be considered the equivalent of initial field testing by DOD or NASA).

Many agencies, NIH included, also utilize SBIR/STTR and public-private partnerships as a bridge into commercialization. In contrast to many DOD/NASA technologies, because there are large public markets for medical/health technologies, commercialization does not have to rely as predominantly on additional Federal funding.

The April 2008 report on the NNI by the Presidents Council of Advisors on Science and Technology (PCAST) emphasizes the central role the NNI must play in overcoming the barriers to nanotechnology development and commercialization [33]. The 2009 U.S. NNI reauthorization draft bill (H.R.554, 111th Congress) also places greater emphasis on applications. As a key supporter of nano-bio basic research, NSF sponsored a workshop on Re-Engineering Basic and Clinical Research to Catalyze Translational Nanoscience on 16-19 March 2008, hosted by the University of Southern California, with a goal to provide insights toward a Federal government nanomedicine investment strategy. The workshop participants, listed in Table 2, were carefully chosen to reflect both individuals working in nanoscience and nanoengineering and those working in clinical settings. The NIH - Institute of Biomedical Imaging and Bioengineering (NIBIB) sponsored a conference (20-21 March 2008) to present the preliminary findings.

Table 2: Workshop Participants

Name	Institution
Mark Braganza, MD	Texas Pacific Group Growth
Tom Buchanan, MD	University of Southern California
Wah Chiu, PhD	Baylor College of Medicine
Vicki Colvin, PhD	Rice University
Richard Cote, MD	University of Southern California
William Galey, PhD	Howard Hughes Medical Institute
Martha Gray, PhD	Harvard University
James Heath, PhD	California Institute of Technology
James Hone, PhD	Columbia University
Mark Humayun, MD, PhD	University of Southern California
Anupam Madhukar, PhD	University of Southern California
Ellis Meng, PhD	University of Southern California
Michael Roukes, PhD	California Institute of Technology
Jeffrey Schloss, PhD	NHGRI, NIH
Richard Siegel, PhD	Rensselaer Polytechnic Institute
Judith Stein, PhD	General Electric Corporation
Edwin Stone, MD, PhD	University of Iowa

Samuel Stupp, PhD	Northwestern University
Sally Tinkle, PhD	NIEHS, NIH
Fraser Wright, PhD	Children's Hospital of Philadelphia and Univ Penn.
Steven Moldin, PhD	University of Southern California
James Murday, PhD	University of Southern California

Based on information derived from the workshop and other resources, the succeeding sections of this report will examine opportunities to accelerate the development and optimization of nanostructures for impact on medicine and health. The next section briefly explores economic and societal drivers for nanomedicine initiatives. The third section will examine the science, engineering, and medical research needs. The fourth section succinctly examines the U.S. Federal investment directly germane to medicine and health, with brief mention of the European Union (EU) effort. The final section presents recommendations to accelerate the translation from laboratory discovery into clinical practice.

II. Healthcare Needs with Promising Nano-enabled Technology Impact

An investment strategy to accelerate nanoscience into nano-enabled technology for medicine and health should reflect both health need (technology pull) as well as science push. Within this context, science and engineering of nanoscale structures is expected to make major contributions across the entire medicine and health spectrum ranging from mortality rate, morbidity an illness imposes on a patient, disease prevalence, and general societal burden [29, 34-36]. The following examples illustrate potential economic and therapeutic impacts, even if nano-enabled technologies only contribute partial solutions:

- The direct medical cost for cancer in the U.S. for 2007 was about $90B [37]. The National Cancer Institute has recognized the importance of nanostructures in the diagnosis and treatment of cancer in its Alliance for Nanotechnology in Cancer (http://nano.cancer.gov/). Nanotechnology approaches [38] are progressing rapidly in: early diagnosis [39-41], nano-enabled contrast agents for in-vivo imaging [42-47], nano-reformulations of chemotherapy agents for lesser quantities of drug, targeted delivery for smaller side-effects [48-52], and new treatments such as nanoparticle-mediated tumor ablation [5, 53].

- The direct medical cost for diabetes in the U.S. for 2007 was about $116B [54]. Nanotechnology approaches to monitors of glucose levels [55, 56] and production of insulin [57] are being explored.

- The annual medical care cost for spinal cord injury in the U.S. is about $1.5B; the full costs are estimated as about $10B/yr [58, 59]. There are promising nano-enabled approaches to the regeneration of spinal neurons, a capability once thought impossible [60, 61].

- In the US, in order to remain physically active, approximately 200,000 people receive hip implants and 300,000 people receive knee implants [62]. The average life-time of

current orthopedic implants is only 10 – 15 years; revision surgeries and their recoveries are not as successful as the first operation. The cost of an implant varies but is roughly $20,000. Nano-enabled innovations in bone cement and composite structures are opening new possibilities for improvements in implants [62-66].

The 2006 "Nanomedicine: Nanotechnology for Health" publication of the European Technology Platform – Strategic Research Agenda for Nanomedicine presents additional examples of expected nanomedicine impact [67].

The workshop participants were polled for their opinion of pressing clinical needs amenable to nano-enabled technology and identified the following as illustrating the wealth of opportunities:

- Intelligent nanobiomaterials for cell therapy to improve heart function
- Safe and affordable therapeutic strategies to regenerate neural tissues
- Kidney – hollow fiber membranes
- Detoxification implants- correction of metabolic disorders
- Cochlear and retinal implants
- New power source technology for implants
- Repair articular cartilage and regain homeostasis with the joint
- Skin regeneration
- Anti-microbials
- Drug delivery with
    - Targeted pharmacotherapy – tissue/organ
    - Therapeutic DNA transfer vectors
    - Nanoparticle (NP) to carry a therapeutic payload across the blood brain barrier
    - Transfection devices for therapeutic uses.
    - Controlled release (especially long term, continuous and programmed)
    - Transient application – sonoporation and electroporation

III. Nanoscale Science and Engineering Research Needed to Enable More Effective Technology

The considerable investment in nanoscience across the world has been leading to many new discoveries. In the second five years of the U.S. National Nanotechnology Initiative there is growing effort to identify potential applications for those discoveries and to accelerate their transition into innovative technology solutions to societal problems. Medicine and health provide fertile ground for this goal. For convenience, this section is organized about the headings of Diagnostics; Drugs, Delivery and Therapy; Implants and Tissue Regeneration; Biological Systems Engineering; and Medical Instrumentation and Devices. The amount of published work is growing rapidly; this paper's intent is not to be exhaustive, but rather illustrative of these topics.

IIIa. *In vivo* and *In vitro* Diagnostics

IIIa1. *In-vivo* Imaging – Contrast Agents

A number of non-invasive medical imaging approaches - such as computed tomography (CT), magnetic resonance (MR), positron emission tomography (PET), single photon emission CT(SPECT), ultrasound (US) and optical imaging (OI) - are currently being used. The emergence of nanosized contrast agents for these tools has been the subject of several recent reviews [45-47, 68, 69] and is anticipated to lead to advancements in imaging for understanding biological processes at the molecular level. Examples of these nanoparticles are biocompatible polymer-based nanogels/nanospheres/nanoemulsions, carbon nanotubes, dendrimers, gold nanoparticles, liposomes, micro-bubbles, semiconductor quantum dots, silica nanoparticles with enclosed fluorescers, and superparamagnetic iron oxide particles. Generic goals for these contrast agents include:

- Signal-to-noise (S/N) enhancement to allow high sensitivity and resolution levels.
- Selective binding to target cells to provide a localized, specific enhancement.
- Long circulating half-life (hours) to expand the imaging time window.
- Acceptable toxicity profile.
- Ease of production and clinical use in order to be economically and commercially sustainable.

Nanostructured imaging contrast agents are overcoming many limitations of conventional contrast agents such as poor photostability, low quantum yield, and insufficient *in vitro* and *in vivo* stability. They are small enough to be taken up by single cells - via processes such as phagocytosis, pinocytosis or vector-mediated transport - as labels for *in vivo* imaging [42, 43]. Since the nanostructures are sufficiently small, one can envision linking them to provide multiple functions, opening possibilities for multimodal imaging, high payload of imaging reporter, activatable "on-off" systems, and chemical information. For instance, human oral cancer cells have been found to assemble and align gold nanorods conjugated to anti-epidermal growth receptor antibodies [70]. Molecules near the nanorods on the cancer cells gave a Raman spectrum (SERS) that was enhanced, sharp and polarized; those spectral features could be used for diagnostic signatures.

Research issues and opportunities include:

- Controlling nanomaterials themselves: a) purity, b) particle size and shape, and c) size distribution (mono-dispersity) of the particles. Their characterization requires specialized laser scattering techniques and microscopies to measure particle size and overall morphology, core composition/structure techniques, and surface analysis for composition/structure of any shells. The high-end instruments necessary for this characterization may not be readily available for the normal research laboratory and may require the use of user facilities or private analytical groups.
- Exploiting new contrast mechanisms - such as nanoparticle enabled surface-enhanced Raman [68, 70-73] - for the extraction of molecular spectral information.
- Ascertain the effects of composition, size, coating, surface charge density and the attached ligands on nanostructure pharmacokinetics and biodistribution.
- Explore mechanisms to ensure that particles are not rapidly accumulated in the spleen and liver.
- Delivery of nanoparticles to the cytoplasm of live cells.

- Incorporate multiple targeting ligands for enhanced selectivity. More than one epitope may be over expressed on a cell surface at a given time, so heteromultivalent probes for diagnosis and therapeutics will likely be important to selectivity.
- Utilizing nanoparticles as building blocks to obtain multimodal functionality – such as recognition, enhanced contrast, functional imaging, and therapeutic action.

IIIa2. *In-vivo* Diagnostics (non-imaging)

As microelectromechanical systems (MEMS) become more sophisticated and miniaturization continues into the nanoscale (MEMS evolving into nanoelectromechanical systems, NEMS), it will become possible to incorporate ever more sophisticated analytical capability onto and into the human body [74, 75]. There are already a growing number of miniaturized devices for transdermal sensing. Examples include the SCRAM system which is a high-tech bracelet that samples a person's sweat to monitor alcohol ingestion [76]; Echo's Symphony™ tCGM System which is a non-invasive (needle-free), wireless, transdermal continuous glucose monitoring (tCGM) system [77]; and Flexible Medical Systems, which is testing a MEMS chip with readable via RFID technology that could be applied to the skin via a band-aid to sense body fluid constituents [78]. As miniaturization continues, enabling greater sophistication per unit volume, the variety of measured analytes (and other properties such as temperature, tissue turgidity, etc.) will certainly increase. It is also within the realm of possibility that "spectrometers-on-a-chip" will be developed for insertion beneath the skin.

Research issues and opportunities include:

- Continued miniaturization for more sophisticated sensing of medically relevant parameters, including nanostructures for sensitive and selective transduction of biological events into electrical signals.
- Development of more effective wireless communications and power delivery suitable for the human body and human body exposures.
- Additional items as listed in Section IIIc, Implants.

IIIa3. *In-vitro* Miniaturized Diagnostics

Current approaches to medical diagnostics are usually high-cost, bench-top laboratory analyzers, or disposable kits that only test for a single analyte. The challenges are considerable when determining whether sophisticated chemical/physical laboratory instrumentation can be reduced in size, while retaining adequate capabilities. For instance there are 10^4-10^5 different proteins in blood with concentration ranges from 10^{-3} to 10^{-17}M. Miniaturized chip-based, array detection methods, known as microarrays, have been prevalent in almost all areas of health-related research for some time; continued miniaturization into nanoarrays will generate many orders of magnitude increase in multiplexed detection [79, 80]. Further, as noted in the section on contrast agents, nanoparticles are already incorporated into some diagnostics to provide greater selectivity, sensitivity, and practicality as compared with conventional systems.

Beyond the arrays, an alluring potential for micro/nano devices is to harness the concept of laboratory-on-a-chip for medical diagnostics [81-92]; analytical microchips are considered to be a fast growing technology [93]. The lab-on-a-chip concept (incorporating microfluidics) has several features that have attracted users in biology, chemistry, engineering and medicine. It

requires only small volumes of samples and reagents, produces little waste, offers short reaction and analysis times, is relatively cheap, and has reduced dimensions compared with other analytical devices. Potential applications include: point of care measurements of saliva for periodontitis [41], heart disease [94], hemacrit determination [95], insulin detection [96], and improving healthcare accessibility [97]. In addition to improving established diagnostics, new approaches - such as mechanical analysis to distinguish cancerous cells from normal ones even when they show similar shapes [98] - will be discovered and implemented. The lab-on-a-chip concept is particularly attractive as an approach to providing inexpensive, effective medical care especially in underserved populations [40, 99, 100].

Research issues and opportunities include:

- Arrays that can carry out larger numbers of experiments in parallel to assess reproducibility.
- Separation techniques to sort body fluid constituents.
- Optical and electromagnetic technologies incorporated in chip-based devices for manipulating samples and their analysis.
- The need for improved knowledge of pertinent biomarkers so that chip technologies can be more effective.
- More robust alternatives to antibody/antigen for selectivity determination.
- The need for validated and easy to operate microfluidic platforms which give the users the freedom to easily combine the basic modules for different fluidic operations in order to build application-specific microfluidic systems [101].

IIIb. Drugs, Delivery, and Therapy

IIIb1. New Approaches to Drug Development

There is need to analyze potential drug candidates in a more rapid and accurate manner, a need that provides an opportunity to develop new tools for that purpose. Ideally, to provide specific information, quantification of single cell pharmacokinetics/dynamics is desired, but requires the detection of minute quantities of proteins and other molecules [102]. One must identify and evaluate types of drug targets (including proteins, polysaccharides, lipids and nucleic acids) that can interact with small-molecule therapeutic agents. Polysaccharides, lipids and nucleic acids have been investigated less frequently than proteins, because of a lack of understanding of the involvement of these molecules in disease and a lack of small molecule therapeutic agents.

Traditional high throughput systems (HTS) perform by using multiple-well plates. Microfluidic technologies, and their nano-enabled enhancements, have great potential in high-throughput studies involving target selection, lead compound generation, identification, and dosage design.

In general, in-vivo imaging has been focused at the diagnostics level and has not been an inherent component of drug discovery. In the past decade a paradigm shift has occurred; imaging is now adding a new dimension to our understanding of basic biological and pharmacological mechanisms [103]. Many aspects of drug development can be facilitated using molecular imaging as an integrative tool to discover new "druggable" targets, identify novel drug candidates and validate their potency, sensitivity, specificity, PK, PD and toxicity, metabolism

and adverse drug-drug interactions in living systems. Clinical, epidemiological and bioinformatical data suggest that population-wide genetic polymorphism may dictate the responsiveness to molecular therapy. Novel drugs are envisioned to be specifically tailored to selected patients.

While the greatest use of nanotechnology to date has largely been in passive carriers for drug delivery (see next section), nanoparticles themselves hold potential as therapeutic agents [104, 105]. To date, about ten years after the regulatory approval of liposomally encapsulated doxorubicin to treat various forms of cancer, "higher functionality" nanoparticles such as gene transfer vectors are in the investigational new drug stage of clinical research [106]. On the horizon is the use of nanoparticles themselves as drugs – as truly active "nanomedicines".

Research issues and opportunities include:

- Continued miniaturization of microtiter plates to expand the number of materials being evaluated.
- Dispensing nanoliter volumes of liquid into the wells.
- Microfluidic devices for drug screening that are sufficiently simple and highly versatile to enable their use in both academic and industrial pharmaceutical labs.
- Drug screening chips that incorporate living cells.
- Tailored nanoparticles as drugs.

IIIb2. Innovative Drug Delivery

Nanotechnology advances are the cornerstone of a paradigm shift in targeting and safely delivering agents - thereby improving controlled drug release, improving patient safety and compliance, and reducing side effects [107-112]. Through the use of colloid chemistry – e.g., liposome and micelle encapsulation – nanoparticles have been used for drug delivery for decades. Examples of nanoscale delivery vehicles now under investigation include polymeric particles [113, 114], dendrimers [48, 115], nanoshells [116, 117], liposomes [51, 118], and magnetic nanoparticles [26, 119]. There are a number of new delivery platforms in clinical trial including: a dendrimer-derived microbiocide (i.e. VivaGel, Starpharma) for HIV or genital herpes in its final stage of Food and Drug Agency (FDA) approval [48], and a dendrimer-based targeted delivery of chemotherapeutic drugs and an apoptotic sensor in cancer cells [120]. Nanoparticles also show considerable promise for drug delivery to the retina and for powering prosthetic "artificial retinas" [121]. Various gene delivery systems based on nanoparticles have been developed and different polymers have been tested as gene delivery agents [122]. Going beyond simply carrying a drug, the development of "smart" nanoparticles is an exciting and promising area of investigation, [39, 49, 52, 123-125].

Delivering intravenous agents to their intended targets is no easy task. For intravenous infusion it is estimated that only approximately one of every 100,000 molecules of agent reaches its desired destination. The generic requirements of delivery systems are [49]:

- Biodegradability and biocompatibility.
- Stability under the *in vivo* conditions.
- In the bloodstream, it must be withdrawn from the circulation where the pathology is located, to reach elevated drug concentrations in the target cells.

- Allow sustained release of the drug, to achieve therapeutic levels at the site of pathology over long periods of time.
- Prevent the drug from manifesting its pharmacological and toxicological actions until present at the site, hence decreasing the incidence of side effects.
- Prevent premature degradation of the encapsulated drug and also immunological reactions.
- Minimize resistance due to low drug permeation levels in bacteria and phagocyte cells.

Nanoscale building blocks provide opportunity for multifunctional packaging small enough to navigate body vessels and membranes. A multifunction approach is needed to circumvent the body's natural defenses or biobarriers, which act as obstacles to foreign objects injected in the blood stream. One must avoid them being removed from circulation by monocytes and macrophages or accumulated in the organs of the reticulo-endothelial system (RES), especially the liver and spleen. For instance, for many cancers endothelial gaps in tumor vasculature are measured in hundred of nanometers rather than in tens of nanometers. In this case, nanocarriers in the appropriate size range could more selectively extravasate into a tumor and provide a passive means for selective delivery [126]. Other factors influencing the magnitude and pattern of tumoral distribution are [127]: *in-vivo* stability, particle size, surface charge, and intracellular uptake.

In most cases active selectivity will be desirable. Targeted drug delivery carriers are being functionalized with antibodies or antibody fragments to provide active localization. It is well accepted that the binding affinity, stability, and size of the ligand play a critical role for successful targeting. The conjugation of multiple antibodies to each nanocarrier enhances their avidity, and nanocarriers can be surface functionalized with multiple distinct antibodies to overcome tumor heterogeneity. Peptides and antibody fragments have been developed to overcome some of the shortcomings of antibodies, and several examples of these ligands are now under clinical development. Functional, single-domain heavy chain antibodies, referred to as nanobodies, have been raised against cancer targets which either antagonize receptor function or deliver an enzyme for prodrug activation [128]. Affibodies against a variety of cancer-related targets have been developed and are now commercially available, including: EGFR, HER2, and transferrin [27].

Cancer stem cells are characterized to be a quiescent and small cell subpopulation with different surface markers than bulk differentiated tumor cells, and to present well-developed drug resistance. While there is considerable emphasis on specific cell markers in the current cancer targeting paradigm, one must also recognize cases where cell-nonspecific approaches may be necessary for more effective and consistent therapeutic output [129].

For more sophisticated applications, where greater dosage and/or actively controlled time-release is needed, MEMS/NEMS-based devices are envisioned that can incorporate both local sensing and mechanisms to dispense drugs – see section IIIc3.

Research issues and opportunities include:

- Improvements to drug storage in the nanocarrier, including increased loading capacity.

- The mechanism(s) that drives the nanocarrier toward the target.
- Approaches to surmount bio-barriers, including mechanistic understanding [130].
- Knowledge of and control over the excretion modes.
- External/internal trigger events – ultrasound, NIR, RF, pH, …– for drug release and/or intracellular penetration.
- Bioresponsive and self-regulated delivery systems.
- Improved knowledge of pertinent biomarkers.
- Novel approaches to accelerate the discovery process for multifunction nanocarriers, such as synthesis and automated screening.
- Reduce batch-to-batch variability by prefunctionalized biomaterials for the self-assembly of nanoparticles (NPs) [113].
- Defining the optimal interplay of biophysicochemical parameters that simultaneously confer molecular targeting, immune evasion, and drug release.

IIIb3. Innovative Therapy

The possibilities for innovative therapies are limitless. As one example, hyperthermia has been explored as a treatment for cancer for a couple of decades, but with limited success. Nanostructure-enabled innovation has rejuvenated hyperthermia with the nanoparticles extracting energy from near-infrared (NIR) [131, 132] or radio frequency (RF) [53, 133] electromagnetic fields. Lack of knowledge on the fundamental mechanisms involved has slowed the implementation of clinical protocols. For instance, recent efforts [26] for elucidating the mechanisms have demonstrated that cell membrane and cytoskeleton are important loci of cell damage by both ionizing radiation and hyperthermia. Technical difficulties in developing magnetic field applicators at the frequencies and field values with concurrent compliance of the safety regulations demanded for clinical use will need to be addressed.

As a second example, photodynamic therapy is also an innovative, evolving approach for treating neovascular diseases of the eye where nanostructures can play an important role [134]; two-photon infrared, nanoplatform phototoxicity has been demonstrated for rat glioma cells [135]. A third example is magnetic nanoparticles to remove toxins from the blood; however a magnetic separator suitable for real-time clearing of magnetic nanospheres needs to be improved [136]. As a final example, self-assembling nanofibers have been shown to promote neural healing after spinal cord injury [61].

Research issues and opportunities include:

1. Develop and sustain a sufficiently robust chemistry, physics, and engineering research discovery base that is effectively coupled with the biology and medicine research community so that new opportunities are recognized and quickly exploited.
2. The paucity of information on the physical/biochemical mechanisms involved in thermosensitization, including models that can describe on a microscopic basis the interplay between physical and biochemical cell mechanisms involved.
3. For magnetic nanoparticles there are different effects to be considered for power losses in physiological conditions: a) magnetic losses through domain wall displacements (in multi-domain particles), Neel relaxation (in single domain

particles); and energy loss from mechanical rotation of the particles acting against viscous forces on the liquid medium [26].

IIIc. Implants and Tissue Regeneration

IIIc1. Tissue Engineering

Tissue engineering, or regenerative medicine, is an interdisciplinary field that merges principles and innovations from the physical and chemical sciences, engineering, and the life sciences. The focus is on the improvement, repair, or replacement of tissue and organ function [137-140]. The ultimate goal is to enable the body to heal itself by introducing an engineered scaffold – i.e., substitute extracellular matrix (ECM) - that the body recognizes as "self." Signals are transmitted between the cell and the ECM enabling communication for cell adhesion, migration, growth, differentiation, programmed cell death, modulation of cytokine and growth factor activity, and activations of intracellular signaling. Any scaffold material must be able to interact with cells in three dimensions and facilitate communication. Scaffold pore size, pore orientation, fiber structure, and fiber diameter are known to regulate proliferation, cellular organization, and subsequent tissue morphogenesis.

Current research in tissue engineering is approaching a major breakthrough in the treatment of injury and disease due to the ability to routinely create extracellular-matrix analogous nanofibers [137]. For example, reports of nanostructure approaches to tissue engineering have dramatically increased in the literature in the last four years (from 32 in 2004 to 219 in 2008, as identified by a literature search of ISI Web of Science using the simple keywords nanofib* and tissue). An extracellular matrix mimic must:

- Be biocompatible and function without interrupting other physiological processes.
- Not promote or initiate any adverse tissue reaction.
- Be produced by simple techniques yet versatile enough to produce a wide array of configurations to accommodate the size, shape, strength, and other intricacies of the target tissue/organ.
- Be removed via degradation of adsorption or incorporated via innate remodeling mechanisms, leaving behind only native tissues.

There are several approaches being explored for the manufacture of nanofibers for ECM such as: electrospinning [112, 141-144], phase separation [145], self-assembly [146-148], and template [149]. Each approach is different and results in a unique set of characteristics as a scaffolding system. Electrospinning is a process that can be used to fabricate scaffolds economically at large scales and can incorporate solid nanomaterials within electrospun fibers in a well-dispersed and spatially controlled manner [150]. Electrospun collagen nanofibers, for example, have been shown to produce skin substitutes with similar cellular organization, proliferation, and maturation to the current, clinically utilized model, and were shown to reduce wound contractions which may lead to reduced morbidity in patient outcomes [141]. Phase separation has generated fiber diameters in the same range as the ECM and allows for the design of macroporous structures [145]. Self-assembling peptides (SAPs) have emerged as an attractive class of 3D scaffolding materials, mainly due to the nano-scale fibrous and porous topographies

that mimic the natural ECM features. Cell behavior can be controlled by cell-materials interactions if biofunctional sites are synthesized into the scaffolds [148, 151-154].

Research issues and opportunities include:

- Design nanoscale materials with functional domains that promote self-assembly into higher order scaffolds that have mechanical strength, resilience and compliance of natural ECM, while maintaining porosity and high surface area, and cues to bind circulating stem cells and then induce proliferation [154].
- Modify nanofiber properties for drug/cell recognition through the incorporation of nanoparticles and/or functionalization.
- Understand the role of nanoscale surface topography and chemistry in cell mediation through biomolecular interactions.
- Characterize the complex three-dimensional organization of the structural and functional molecules constituting the ECM .
- Incorporation of drug and gene delivery systems into biomaterial scaffolds.
- Develop and understand methods of stem cell delivery in biomaterial scaffolds overcoming the problems of cell survival.
- Biodegradable biomaterials where the by-products are bioactive agents.
- The role and efficacy of nanostructures in central nervous system regeneration.

IIIc2. Orthopedic Implants

Self-assembly and biomineralization are used in biological systems for the fabrication of many composite materials. Bone tissue is a particularly complex biological system because it contains multiple levels of hierarchical organization. Bone has been hard to replicate, so alternative materials such as Ti alloys or composites with micro-fillers have been substituted.

The lifetime of orthopedic implants is limited primarily by implant loosening, a result of interfacial breakdown and stress [62]. Implant materials - titanium, stainless steel and cobalt alloys - are much stiffer than bone; a cement must buffer their respective mechanical properties. Polymethyl methacrylate (PMMA) is commonly used in orthopedic implant cements; without it, metal directly contacting bone leads to strong inflammatory response, and creates highly localized stresses and micro-motion of the implants. Disadvantages of PMMA include limited radiopacity, exothermic setting, and poor ossification with juxtaposed bone. The application of nanoparticles in PMMA cements, an approach that can address all of these issues, is still in its infancy. Current approaches to implant materials include creating porous surfaces [63, 155] in attempts to improve fixation, but this does not necessarily solve stiffness mismatch. Additionally, osteoblast activity can be significantly enhanced using controlled nanotopographies [156]; for instance, nanotubular titania surfaces have been shown to provide a favorable template for bone cell growth and differentiation [157, 158]. There is a published broad review on the topic of nanomaterial interactions with proteins and cells [159].

In a somewhat simpler application, new dental restorative materials already in the marketplace are exploiting composites incorporating nanoparticles of silica (for improved mechanical properties and luster) and zirconia (for improved radiopacity) in a polymer matrix [160].

Research issues and opportunities include:

- Dispersion of nanoparticles evenly in the bone cement matrix.
- Inadequate knowledge of how to engineered surfaces with nanoscale features to affect vascular and bone cell adhesion, thereby providing a bioactive surface for bone integration.

IIIc3. Implanted drug dispenser / factory

The next generation of drug delivery systems, in addition to having spatial and temporal control, is expected to be "smart" and to enable therapy that is responsive to the patient's specific needs. These advanced systems would protect drugs from environmental or biological degradation in the body, use closed-loop control to assist the patient with homeostasis, and provide autonomous drug administration. MEMS/NEMS methods can provide a sophisticated approach. With controlled delivery, appropriate and effective amounts of drug might be precisely calculated by the controller and released or manufactured at an appropriate time. Present MEMS based microfluidic drug delivery devices [161, 162] include: microneedle-based transdermal devices, osmosis-based devices, micropump-based devices, and microreservoir-based devices. Micropumps for transdermal insulin delivery, injection of glucose for diabetes, and administration of neurotransmitters to neurons have been reported [163].

The fabrication of nano- and micro-scale 3D programmable volume enclosures (voxels) to encapsulate nano-scale quantities of various materials is expected to greatly expand current capabilities. If cells/tissue are incorporated into the voxel as the drug manufacturing mechanism, the enclosure walls must have pores small enough to prevent immunoresponse, but large enough to permit the suffusion of metabolites [57]. Nanoscale approaches to power for such devices include: stored energy (battery) [164], wireless transfer [165, 166], and local generation [167-170].

Research issues and opportunities include:

- Biocompatibility of the implanted devices.
- Implantable power sources – battery, wireless, scavenging.
- Devices with low power, low heat dissipation and high sensitivity.
- Technologies for the development of new generations of synthetic polymers that can change their molecular conformation in response to changes in external stimuli (mechanical, temperature, pH, etc.).
- The use of low-cost technologies such as injection molding or low-cost substrates such as PDMS (polydimethylsiloxane) or polyimide for the fabrication of microfluidic devices.
- Sensor technology for the assessment of the interface activity and the progress of implant integration and functional state.
- Development of effective, long-lived, implanted systems incorporating transplanted living cells for the production of needed chemicals.
- Biomimetic membranes with built-in functionality, which can mimic real cell membranes for (stem) cell attachment and/or stimulation (proliferation, differentiation).

IIIc4. Implants interacting with the Central Nervous System (CNS)

The nervous system has a poor healing capacity. Additionally, an aging population leads to more persons acquiring disabilities - such as hearing loss, stroke, and Parkinson's disease. The demand for solutions is growing [171]. The meeting report [172] "Smart Prosthetics: Exploring Assistive Devices for the Body and Mind" focused on several themes relevant to future prosthetics where it is expected that the nanoscale will be important. The potential of nanotechnology applications in neuroscience is becoming accepted and is the subject of several reviews [69, 110, 173-175].

Dating from 1972, about 100,000 patients worldwide have received cochlear implants. The current state of this technology is bulky, difficult for the surgeon to implant and doesn't allow a broad range of perceived frequencies [176]. The human auditory nerve contains ~30,000 axons, which cochlear implants stimulate currently with 3-22 electrodes. MEMS, micromechanical devices are being developed to ameliorate these problems. Since the human ear itself already uses nanostructures [177], continued miniaturization beyond the microscale is certain to provide additional improvements.

In contrast to the auditory nerve, the optic nerve has about a million fibers. Visual prosthesis must also deal with two dimensional spatial data and the highly complex signal processing that occurs in the retina before transmission to the brain. A fully implantable retinal prosthesis would ideally capture all of the functions performed by the mammalian retina in one autonomous device. It is postulated that the needed computations can be performed at an energy efficient and physical scale comparable to biology by incorporating principles derived from neural circuits into nanoelectronic circuits [178-180].

For the control of artificial limbs the next generation of prosthetics will use regions of undamaged nervous tissue to provide command/sensory signals [181]. However, problems range from improper neuronal adhesion to inadequate signal stability. Implanted electrodes do not remain statically placed due to different flexibilities in implants materials versus tissue, or the growth of fibrous tissue around the implant. So new materials solutions are needed [182, 183]. Single wall carbon nanotubes (SWCNT) have received promising attention because of their unique physical and chemical features [184, 185]. Nanostructured porous silica is found to be more biocompatible than a smooth surface, producing less glial activation and allowing more neurons to remain close to the device [186]. Light-activated semiconducting nanoparticles have been shown to wirelessly stimulate neurons in the rat brain [187].

Research issues and opportunities include:

- Fundamental studies to find highly stable substrate and electrode materials, reliable and robust assembly, and encapsulation materials to deliver vision implants with lifetimes, biocompatibility and functionalities that are comparable to cardiac pacemakers and cochlear implants [188].
- Improving how the implanted device responds to stimuli in its local mechanical environment.
- Improving the transfer of information between the brain and/or nervous system and the device.

IIId. Biological Systems Engineering

A goal of systems biology is to fundamentally transform the practice of medicine [189-193]. Systems biology is the study of an organism, viewed as an integrated and interacting network of genes, proteins and biochemical reactions. The study of systems biology has been aided by cyber-enabled information storage/processing, advances in nanotechnology, advances in modeling and simulation, and the infusion of science and scientists from other disciplines, e.g. computer scientists, mathematicians, physicists, and engineers.

Enabled in part by the rapid progress in nanoscale science and engineering, and the growing sophistication of computers and cyberinfrastructure, systems biology is a field coming of age. The potential impact on medicine and health is enormous. Nanoscience can accelerate this field in a number of ways. First, it provides the ability to examine the properties of individual nanostructures rather than the average properties measured by techniques that require ensembles for adequate signal to noise. Work at the nanoscale enables the study of single molecule properties previously very hard to measure, such as protein folding/unfolding [194, 195], molecular motors [194], and DNA/RNA sequencing [196-199]. Second, as microfluidics and sensing technologies become further miniaturized, there will be growing capability to provide arrays that can potentially detect and identify many constituents in a biological sample in time frames of minutes rather than hours or days. Two microfluidic foundries are now available for the academic community [200]. Third, somewhat incidental but still important, the advent of nanoelectronics is continuing the increase in computational power that will be essential to model a system as complex as a cell.

The complexity of biological systems will continue to require the sampling of multiple cells. However, as with single molecule studies, the capability to probe individual cell behavior is essential to rapid progress. Microfluidics offers analytical devices with length scales that are: a) comparable to the intrinsic dimensions of prokaryotic and eukaryotic cells, organelles and, b) the length scale of diffusion of oxygen and carbon dioxide in tissues [108, 201]. The growing availability and sophistication of microfluidic chips will accelerate single cell studies [202-204]. As examples of new capabilities, nano-enabled probes have been shown to physically penetrate the cell membrane with minimal disruption [205], improve the resolution of optical probes with 3D resolution at the nanoscale [206], acquire spectroscopic [73] and fluorescent signatures [72, 207], actuate membrane receptor mediated signal transduction [208], probe cell mechanical behaviors [98, 209, 210], characterize calcium release [211], grow and probe neurons [212, 213], and probe single cell motility and metabolic calorimetry [214].

In addition to the controlled study of single cells previously mentioned, microfluidics is being utilized to study processes such as blood clotting [215]. Scaling (thousands of identical microfluidic structures) is of increasing importance in biology as the field moves toward quantitative data because it allows multiple parallel experiments under identical conditions [202].

Research issues and opportunities include:

- Microfluidic structures utilizing biocompatible materials.
- Improvements in pumping and valving.
- Improvements in on-chip sensitivity (excitation/detection) to permit single molecule detection in biological media, including inside a cell.

- Detailed understanding of single macromolecular folding/unfolding events and the role of chaperone molecules.
- Technologies that include electronic and/or communication components in forms of nanowires and nanopores for the stimulation and biosensing of cells.

IIIe. Innovations in Medical Instrumentation and Devices

Work at the nanoscale requires the continued miniaturization of measurement devices, both for spatial localization and for augmented sensitivity to the small signals associated with a nanostructure. Adaptations of these new devices for medical applications are forthcoming. As examples, the force microscope is capable of measuring differences between cancer and normal cells [98] and bone viability [216, 217]. Carbon nanotubes (CNTs) function better than glass pipettes for cellular delivery [218]. The incorporation of micro-nano-devices into catheters and other instruments is growing [219], including incorporation of Ag nanoparticles to impart antimicrobial activity [220]. Nanostructures are enabling electronic circuitry on flexible substrates, including high performance circuit elements (e.g., Si or CNT devices) [221, 222]. One can envision the incorporation of signal processing and sensing capabilities into mechanically flexible implants and even surgical gloves that might detect important parameters [75]. Nanopore-based devices show considerable promise for low cost, rapid DNA sequencing [223].

IV. Present Federal Programs

There are several U.S. Federal agencies that fund pertinent health research. The foremost is the National Institutes of Health. In addition, NASA is interested in medical practice in space; DOD has an interest in warfighter health issues and battlefield medicine; NSF provides the foundations of medicine in systems biology; EPA is concerned with impact on living systems in the environment; and USDA is concerned with impact on agriculture. The total Federal investment in the National Nanotechnology Initiative is given in Table 1. Table 3 provides an estimate of the investment more directly relevant to medicine and health.

Table 3

Approximate Federal Investment in Nanoscale Science/Engineering Relevant to Medicine/Health

Agency		FY08
NIH		
	NCI - Alliance for Nanotechnology (largely centers)	30M
	NHLBI – Centers of Excellence in Nanotechnology	10M
	Nanomedicine Centers	10M
	Other	140M
NSF	Chemical, Biological, Environmental, and Transport Systems Div	25M
	Biological Sciences Directorate	25M
DOD	Multidisciplinary Univ. Research Initiative (MURI) efforts	5M

IVa National Institutes of Health (NIH)

There is an individual investigator-initiated research investment in nano-enabled medicine of about $140M/yr distributed throughout the NIH; an additional $50M is invested in centers. The NIH investment in nano-enabled medicine is monitored by a Trans-NIH Task Force.

Nanomedicine Initiative

The NIH has a Nanomedicine Implementation Group with membership from the various institutes [6]. Under its Roadmap for Medical Research – New Pathways to Discovery, NIH has established a national network of eight Nanomedicine Development Centers (NDC, see Table 4), which serve as the intellectual and technological centerpiece of the Nanomedicine initiative. These collaborative centers are staffed by multidisciplinary research teams comprising biologists, physicians, mathematicians, engineers and computer scientists. In the initial phase of the program (FY2005-FY2010), research has been primarily directed toward gathering extensive information about the chemical and physical properties of nanoscale biological structures. A second phase for the program has been approved during which the acquired fundamental knowledge and developed tools will be applied to understanding and treating disease. The Centers reach out to clinical investigators with ongoing opportunities for potential medical applications that build on the science emerging from the NDC.

National Institute of Biomedical Imaging and Bioengineering (NIBIB)

Unlike any other NIH Institute or Center, the National Institute of Biomedical Imaging and Bioengineering's mission is focused on emerging technology development. The Institute has a mandate to enable and promote fundamental discoveries, and to support the design, development, translation, and assessment of technological capabilities in biomedical imaging and bioengineering. NIBIB has programs in Micro/Nano systems [224] and Nanotechnology [225]. In addition, NIBIB sponsors Centers that are pertinent to nanotechnology. The pertinent Biotechnology Resource Centers include the Biomicroelectromechanical Systems (BioMEMS, Mass General Hospital), Biophysical Imaging Opto-Electronics (Cornell), National ESCA and Surface Analysis Center (Univ. Wash), Tissue Engineering (Tufts Univ.), and Computer Integrated System for Microscopy and Manipulation (Univ. North Carolina). The pertinent Point-of-Care (POC) Technologies Research Network includes centers on Emerging Neurotechnologies (Univ. Cincinnati), Rapid Multipathogen Detection (UC Davis), Diagnostics for Global Health (PATH, Seattle), and Sexually Transmitted Diseases (Johns Hopkins Univ.). These centers coordinate development, clinical evaluation, and reduction to practice of new POC devices. NIBIB sponsors an Interfaces Initiative for Interdisciplinary Graduate Research Training (T32) program with $3-4M/yr devoted to nanotechnology, and works with NSF and Howard Hughes Medical to address interdisciplinary training.

Table 4

Federal Multidisciplinary Center Programs Relevant to Medicine/Health

Program	PI Name	Institution Name	Center Title
NIH			
CCNE	Rudolph Juliano	Univ. of North Carolina	Carolina Center of Cancer Nanotechnology Excellence
CCNE	Sanjiv Gambhir	Stanford Univ.	Ctr for Cancer Nanotechnology Excellence Focused on Therapy Response
CCNE	Robert Langer	MIT	Center of Cancer Nanotechnology Excellence
CCNE	Sadik Esener	UC, San Diego	Ctr of Nanotechnology for Treatment, Understanding, & Monitoring of Cancer
CCNE	Shuming Nie	Georgia Inst of Technol.	Nanotechnology Center for Personalized and Predictive Oncology
CCNE	Chad Mirkin	Northwestern University	Nanomaterials for Cancer Diagnostics and Therapeutics
CCNE	James Heath	California Inst of Technol.	Nanosystems Biology Cancer Center (NSBCC)
CCNE	Samuel Wickline	Washington Univ.	The Siteman Center of Cancer Nanotechnology Excellence
CNPP	Douglas Hanahan	UC, San Francisco	Detecting Cancer Early with Targeted Nano-probes for Vascular Signatures
CNPP	James Baker	Univ. Michigan	DNA-Linked Dendrimer NP Systems for Cancer Diagnosis & Treatment
CNPP	Kattesh Katti	Univ. of Missouri	Hybrid nanoparticles in Imaging and Therapy of Prostate Cancer
CNPP	Scott Manalis	MIT	Integrated System for Cancer Biomarker Detection
CNPP	Panos Fatouros	VCU	Metallofullerene Nanoplatform for Imaging & Treating Infiltrative Tumor
CNPP	Paras Prasad	SUNY, Buffalo	Multifunctional Nanoparticles in Diagnosis & Therapy of Pancreatic Cancer
CNPP	Miqin Zhang	Univ. Washington	Nanotechnology Platform for Pediatric Brain Cancer Imaging and Therapy
CNPP	Jan Schnitzer	Sidney Kimmel Cancer Ctr	Nanotechnology Platform for Targeting Solid Tumors
CNPP	Mansoor Amiji	Northeastern Univ.	Nanotherapeutic Strategy for Multidrug Resistant Tumors
CNPP	Chun Li	UT Anderson Cancer Ctr	Near-infrared Fluorescence NP for Targeted Optical Imaging
CNPP	Ravindra Pandey	Roswell Cancer Inst.	Cancer Nanotechnology Platforms for Photodynamic Therapy & Imaging
CNPP	Tayyaba Hasan	Mass General Hospital	Photodestruction of Ovarian Cancer: EfbB3 Targeted Aptamer-NP
PEN	Karen Wooley	Washington Univ.	Integrated Nanosystems for Diagnosis and Therapy
PEN	Gang Bao	Georgia Inst of Technol.	Nanotechnology: Detection & Analysis of Plaque Formation
PEN	Jeffrey Smith	Burnham Institute	Nanotherapy for Vulnerable Plaque
PEN	Ralph Weissleder	Mass General Hospital	Translational Program of Excellence in Nanotechnology
NDC	Wah Chiu	Baylor College of Med.	Center for Protein Folding Machinery
NDC	Chih-Ming Ho	UC, Los Angeles	Center of Cell Control
NDC	Wendell Lim	UC, San Francisco	Engineering Cellular Control: Synthetic Signaling and Motility Systems
NDC	Gang Bao	Georgia Inst. of Technol.	Nanomedicine Center for Nucleoprotein Machines
NDC	Michael Sheetz	Columbia Univ.	Nanotechnology Center for Mechanics in Regenerative Medicine
NDC	Eric Jakobsson	UIUC	National Center for Design of Biomimetic Nanoconductors
NDC	Ehud Isacoff	UC, Berkeley	Optical Control of Biological Function
NDC	Peixuan Guo	Univ. of Cincinnati	Phi29 DNA-Packaging Motor for Nanomedicine
NSF			
NSEC	Dawn Bonnell	Univ. Pennsylvania	Center for Molecular Function at the Nanoscale
NSEC	Vicki Colvin	Rice Univ.	Center for Biological and Environmental Nanotechnology
NSEC	Richard Siegel	RPI	Center for Directed Assembly of Nanostructures
STC	Harold Craighead	Cornell Univ.	The Nanobiotechnology Center
MRSEC	Mehmet Sarikaya	Univ. of Washington	Genetically Engineered Materials Science and Engineering Center
DOD			
MURI	Jimmie Xu	Brown Univ.	Direct Nanoscale Conversion of Biomolecular Signals
MURI	G. Oberdorster	Univ. of Rochester	Physicochemical Characterization & Toxicology for Air/Space
MURI	Naomi Halas	Rice Univ.	Nanoscale Optical Imaging with Integrated Spectroscopies
MURI	H. Abarbanel	UCSD	Chem. Discrimination & Localization Using Bio-Based Olfactory Processing
MURI	Chad Mirkin	Northwestern Univ.	Bioinspired Supramolecular Enzymatic Systems

National Cancer Institute (NCI)
Initiated in 2004, the NCI Alliance for Nanotechnology in Cancer encompasses four major program components: Centers for Cancer Nanotechnology Excellence (CCNE, see Table 4), the Nanotechnology Characterization Laboratory (NCL, in collaboration with FDA and NIST), the Cancer Nanotechnology Platform Partnerships (CNPP, see Table 4), and a multidisciplinary research training and team development program. The funding level for the Alliance is projected at $144M over five years [226]. The partnerships are designed to develop technologies for new products in six key partnership areas: molecular imaging and early detection, *in vivo* imaging, reporters of efficacy (e.g., real-time assessments of treatment), multifunctional therapeutics, prevention and control, and research enablers (opening new pathways for research). NCI and NSF are collaborating in training programs for U.S. science and engineering doctoral students through the Integrative Graduate Education and Research Traineeship Program (IGERT) – Rutgers (nanopharmaceutical), Northeastern (brain-machine), University of New Mexico (micro-nano-bio interfaces) and University of Washington (nanotechnology workforce).

National Heart, Lung and Blood Institute (NHLBI)
Starting in 2004, the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health (NIH) has made four 5-year awards to initiate a unique, diverse, and nationwide Program of Excellence in Nanotechnology [227] (PEN, see Table 4). This program brings together bioengineers, materials scientists, biologists, and physicians who work in interdisciplinary teams to spur the development of novel technologies to diagnose and treat heart, lung, and blood diseases.

National Institute of Environmental Health Sciences (NIEHS) / National Toxicology Program (NTP)
The National Institute of Environmental Health Sciences administers the National Toxicology Program which has research activities focusing on 4 classes of nanostructured materials [228]:

- Metal oxides: the initial focus is on nanoscale titanium dioxide and zinc oxide due to their presence in cosmetics.
- Fluorescent crystalline semiconductors (quantum dots): the initial focus is on cadmium selenide/zinc sulfide spheres and rods of varying sizes and surface chemistry as a model system.
- Fullerenes: the initial focus is on carbon based fullerenes of varying cage size and surface derivatization.
- Nanotubes: the initial focus is on single walled carbon nanotubes. Through a NIEHS-NIOSH (National Institute for Occupational Safety and Health) interagency agreement the NTP is supporting the development of exposure systems for inhalation toxicity studies of single walled nanotubes.

National Institute of General Medical Sciences (NIGMS)
The National Institute of General Medical Sciences (NIGMS) has research on, and development of, new and improved instruments, methods and technologies for nanoscience, and for the analysis of single protein and nucleic acid molecules and their complexes both *in vivo* and *in vitro.*

National Center for Research Resources (NCRR)

The National Center for Research Resources (NCRR) consortium is to transform how clinical and translational research is conducted, ultimately enabling researchers to provide new treatments more efficiently and quickly to patients [229]. Clinical and Translational Science Awards (CTSA) support clinical and translational research by providing access to clinical and translational research resources developed by the CTSAs, government sponsored research communities, government agencies or private sector. The NCRR consortium could become a powerful tool in the translation on nano-science/engineering discoveries.

NanoHealth Enterprise, public private partnerships

NIH is exploring a NanoHealth Enterprise which would comprise an integrated, interdisciplinary program that draws upon the expertise and interests of the NIH institutes and centers, in partnership with private industry, to address critical research needs for the safe development of nanoscale materials and devices. This initiative outlines an integrated, interdisciplinary program that draws upon the expertise and interests of the NIH institutes and centers, and addresses critical research needs for the safe development of nanoscale materials and devices. The initiative proposes five components: Materials Science Research, Basic Biology Research, Pathobiology Research, Informatics, and Training.

Small Business Innovative Research (SBIR) / Small Business Technology Transfer Research (STTR)

NIH is one of several agencies that have a "nano" specific topic in its SBIR/STTR announcement. Few small businesses possess the highly specialized resources needed for nanoengineering, so applications are encouraged from teams of investigators from commercial, academic and other sectors of the research community. The NIH Pipeline to Partnerships is a virtual space for NIH SBIR/STTR awardees to showcase technology and product development for an audience of potential strategic partners and investors.

IVb. National Science Foundation (NSF)

While much of the extensive (~$350M) NSF investment in "nano" has the potential to impact medicine and health, the most directly involved programs are located in the Biological Sciences Directorate and in the Chemical, Biological, Environmental and Transport Systems Division of the Engineering Directorate. Biological Sciences has the role to promote and advance scientific progress in biology. The Chemical, Bioengineering, Environmental and Transport Systems Division (CBET) supports research in bioengineering (among other topics). These two programs provide much of the underlying science and engineering base for medicine and health applications, which is critical to rapid advancement.

The CBET Division has programs in "Integration of Life Sciences with Engineering", as well as "Nanoscale Science and Engineering." The current high-emphasis research and education areas include: post-genomic engineering, tissue engineering, biophotonics, and nano-biosystems. CBET has approximately $25M invested in nano-bio projects.

The Molecular and Cellular Biosciences (MCB) Division effort under the Biological Sciences Directorate at NSF emphasizes systems biology; it has approximately $25M invested in nano-bio projects. The research includes databases and informatics, instrument development, biomolecular systems, cellular systems, and genes and genome systems. The latter three

encourage multi-disciplinary approaches, including research carried out at the interfaces of biology, physics, chemistry, mathematics and computer science, and engineering.

The National Nanotechnology Infrastructure Network (NNIN) is an integrated partnership of thirteen user facilities, supported by NSF, providing unparalleled opportunities for nanoscience and nanotechnology research [230]. The network provides extensive support in nanoscale fabrication, synthesis, characterization, modeling, design, computation and hands-on training in an open, hands-on environment, available to all qualified users.

IVc. Food and Drug Administration (FDA)

The regulation of nano-enabled products may involve more than one traditional FDA category, for example a "drug" delivery "device". In these cases the assignment of regulatory lead is the responsibility of the Office of Combination Products. To facilitate the regulation of nanotechnology products, the Agency has formed a NanoTechnology Interest Group (NTIG), comprised of representatives from all its Centers. The NTIG meets quarterly to ensure there is effective communication between the Centers. A FDA task force report on nanotechnology is available [21]. The FDA is a cosponsor of the Nanotechnology Characterization Laboratory, along the NCI and NIST, and the nanostructure evaluation in the National Toxicology Program with NIEHS. There is a FDA intramural research program, but it does not presently have any "nano" focused projects.

The FDA and Alliance for NanoHealth co-convened a workshop on nanomedical regulatory science in Houston in March 2008 to identify the top scientific hurdles in bringing nanoengineered products to patients, specifically in the pre-clinical, clinical and manufacturing phases of product development [231]. Six priority areas were identified:

- Determination of the distribution of nanoparticulate carriers in the body following systemic administration through any route.
- Development of imaging modalities for visualizing the biodistribution over time.
- Understanding mass transport across compartmental boundaries in the body.
- Develop new mathematical and computer models that will lead to predicting risk and benefit parameters.
- Establish standards or reference materials and consensus testing protocols that can provide benchmarks for the development of novel classes of materials.
- Realization of an analytical toolkit for nanopharmaceutical manufacturing, accompanied by specification sheet of toxicological, safety, and biodistribution properties obtained through standardized, validated methods.

IVd. Department of Defense (DOD)

The DOD does not have any appreciable program in nanomedicine *per se*. The DARPA Defense Science Office has thrusts on tactical and restorative biomedical technologies that may exploit nanotechnologies. There are some limited efforts from the various service research offices are examining how to exploit nanotechnology with medical implications; five such Multidisciplinary University Research Initiatives (MURIs) are listed in Table 4 and ONR has a recent initiative on Autonomous Devices for Advanced Personnel Treatment. The Army funds the Institute of Soldier Nanotechnologies (MIT University Affiliated Research Center) that addresses some

medical applications. The Army Telemedicine and Advanced Technology Research Center (TATRC) oversees a diverse portfolio, largely Congressional adds to the DOD budget, ranging from new nanomaterial-based contrast agents for cardiac and brain imaging to novel drug delivery systems for the treatment of cancer. In each case TATRC assists the program in identifying military needs, defining metrics, and comparing the new technology to existing methods.

IVe. Department of Energy (DOE)

The DOE Nano Centers are user facilities for interdisciplinary research at the nanoscale. Each of the five Centers is co-located with other large scientific facilities to take advantage of complementary capabilities, such as the Spallation Neutron Source at Oak Ridge, the synchrotron light sources at Argonne, Brookhaven and Lawrence Berkeley, and semiconductor, microelectronics and combustion research facilities at Sandia and Los Alamos. The Centers contain clean rooms, laboratories for nanofabrication, one-of-a-kind signature instruments, and other instruments (such as nanopatterning tools and research-grade probe microscopes) not generally available except at major scientific user facilities.

IVf. European Union (EU)

The Framework 7 included an ERA-NET (European Research Area – network) on nanomedicine project - NMP-2008-4.0-13 - with the expectation of: improved coordination and reduced overlapping and fragmentation; achieving critical mass and ensuring better use of limited resources; sharing good practices in implementing research programs; and promoting transnational collaborations and generate new knowledge. In FY08 approximately €8M was allocated for the first call ERA-NET plus (of which nanomedicine is a part).

As another example, the project "Healthy Aims: Developing New Medical Implants and Diagnostic Equipment" is a €23M, four year project to develop intelligent medical implants and diagnostic systems. While not constrained to nanotechnology-enabled, products under development will almost certainly benefit from nanoscale capabilities. The funded projects include: retinal implant, functional electrical stimulation of systems for restoration of upper-limb movement as well as bladder and bowel control, cochlear implant, glaucoma sensor, intracranial pressure sensor, and a sphincter sensor for monitoring bladder pressure [232].

The European Technology Platform: Nanomedicine – Nanotechnology for Health identifies the following as strategic research priorities [7]:

Diagnostic issues

- *In vitro* diagnostics.
- *In vitro* and *in vivo* imaging.

Drug/Delivery/Therapeutic Issues

- Improving targeting agents.
- Formulation and stability of pharmaceutics.
- Easier routes of administration – crossing biological barriers.
- Nanodevices for targeted delivery.
- Bioactive signaling molecules.
- Cell-based therapies.

Implant/Tissue Regeneration Issues

- Interactions between biological systems and artificial nanostructures.
- Intelligent biomaterials and smart implants.

Overarching Issues

- Basic science deficiencies.
- Medical devices.
- Moving established and novel nano-therapeutic delivery systems from the laboratory to the clinic.

V. Recommendations

Research opportunities and challenges have been identified in each of the subcategories in Section III; they are many. It should be noted that more generic questions were addressed in this workshop, and that the research funding levels and prioritization amongst these opportunities and challenges was beyond its scope. From the discussions at the Re-Engineering Basic and Clinical Research to Catalyze Translational Nanoscience Workshop at USC, augmented by literature search and subsequent evaluation by other experts, the following overarching recommendations are made:

- Medicine enabled by nanoscale science and engineering
    - The continuing progress in nanoscale science and engineering promises to create revolutionary opportunities for medicine and health; the investment in the basic discoveries should not be diminished. Rather additional funding should be found for the translational efforts.
    - The Trans-NIH Nano Task Force deserves kudos for its efforts to inject nanoscience into the NIH portfolio, but only a handful of the NIH Institutes (NCI, NHLBI, NIBIB) have created explicit programs to exploit the nanoscale. As progress at the nanoscale continues to progress, other NIH Institutes should be encouraged to develop explicit efforts to engage the nanoscience and nanoengineering communities.
    - The NIBIB website (Nanotechnology at NIH), which provides a central location for the various NIH programs, is a valuable resource for the science/engineering communities, and should be kept up to date.
    - As nano-enabled improvements are incorporated into functional medical devices and systems, it will become more difficult to track the "nano" impact. NIH is encouraged to make that effort, both to better understand where nanotechnology provides viable solutions, and to document those contributions for inclusion in social and political debates.
    - Continue and expand the efforts to build bridges between the physical sciences, engineering, the medicine/health professionals, and the medical technology industries. Centers are a means to accomplish this goal, but affect only a limited number of individuals. There are several extant professional forums that address translational nanomedicine, including the BioMaterials Society, but the cross-fertilization between clinical physicians and the nanoscience research investigators is minimal. Gordon Conference-like meetings with limited attendance and a site designed to encourage full participation over a weeks span

should be encouraged. It may be necessary to offer financial assistance or continuing education credits as incentives to clinicians to enable their participation. One of the more promising outcomes from the Re-Engineering Basic and Clinical Research to Catalyze Translational Nanoscience Workshop was interaction amongst the participants with the anticipation of fruitful collaborations.

  - The NIH should encourage its employees and grantees to contribute to the much needed efforts in developing standards by the American Society of Testing and Materials (ASTM), American National Standards Institute (ANSI), and International Standards Organization (ISO). The development of good standards – terminology, nomenclature, metrology, materials specifications, and standard materials – is a real challenge and desperately needed. It will involve a good deal of hard work.
  - The Nanotechnology Characterization Laboratory (initiated by NCI, NIST and FDA), or its equivalent(s), should be expanded for access by all nanomedicine research. Because of their relative newness and the difficulty in their analysis, nanostructures tend not to be well characterized. This can lead to erroneous interpretations of experimental work and has been a source of problems.

- Translation
  - The Clinical and Translational Science Awards (CTSA) program should explicitly encourage injection of nano-enabled technology into clinical settings. The National Center for Research Resources (NCRR) consortium is meant to transform how clinical and translational research is conducted, ultimately enabling researchers to provide new treatments more efficiently and quickly to patients. Nano-enabled medicine and health technologies will be rapidly maturing; facilitating their translation into the clinic will be highly worthwhile.
  - The Bioengineering Nanotechnology SBIR/STTR announcements provide a useful approach to translation. With due attention to return on investment, continuing these explicit SBIR/STTR announcements is encouraged.
  - There should be a translation program identified and publicized for nano-enabled medicine/health. Several NIH Institutes have a cooperative program in translational research. Those programs facilitate solicitation, development, and review of therapy-directed projects to accelerate the translation of basic research discoveries into therapeutic candidates for clinical testing. Since multidisciplinary approaches are important to nanomedicine, and many of the contributors are not familiar with NIH, the NIBIB 'Nanotechnology at NIH' website should provide explicit mention of this, or similar, opportunities.
  - The NIH should explore partnering with NSF and DOE to expand the nanoscale user facility capabilities with specific focus on nanomedicine needs. While the NNI has funded a number of User Facilities for Nanoscale fabrication/ characterization, they are not focused on medical needs. Biocompatible materials and materials processing are frequently not compatible with traditional semiconductor processing. In the UK, a joint venture has been formed between the University College of London and Imperial College BioNano Consulting to better enable industry to access the UK leading research capability in the field of

bionanotechnology. It is meant to help companies with prototyping and characterization.
    - There is need for a science base to develop understanding of the critical parameters that can provide generic guidance to the FDA approval process. The FDA and Alliance for NanoHealth Workshop (see section IVc) identified six priority areas for research. Since the FDA research budget is limited, NIH (and NSF) should work with the FDA to create programs addressing those areas.
    - The Department of Commerce should work to ensure well constructed patents in the highly multidisciplinary nano-enabled biotechnology topic and to facilitate workable licensing arrangements amongst the various commercialization partners. Establish a nanomedicine group within the USPTO. Given the complexities of incorporating nanostructured technologies into medicine/health applications, there will likely be multiple patents associated with any given technology. There will be need for cross-licensing arrangements such as seen in integrated circuit technologies. That ethos has not yet evolved for the nano-enabled technologies appropriate for medicine/health.
    - Provide mechanisms for better interfacing between industry, academia and government. Establish protocols and technology transfer policies that foster translation of nanomedicine. Some suggestions are: a) Simplify the pathway from invention to innovation/commercialization though new IP practices. The time and expense required for negotiating collaboration and licensing agreements must be reduced; b) Encourage industry participation in NIH Nanomedicine Centers, both as advisory board members and researchers; c) Encourage industrial participation on NIH peer review panels; and d) To accelerate translation, encourage industrial participation on NIH grants, both as consultants and where appropriate as researchers.
    - NIH should explore mechanisms such as the DARPA programs and the NIST Technology Improvement Program whereby industry can participate in translation efforts. The pending NanoHealth Enterprise effort to promote public-private partnerships could have real value in accelerating translation (as well as ameliorating ESH concerns). However, care must be taken to fully engage the private sector rather than impose government priorities.
- Environmental / Safety / Health (ESH) Concerns
    - The NNI reauthorization legislation specifically identifies this topic for augmented investment. However, the size of any investment must be carefully examined to ensure that adequately characterized materials are utilized; otherwise improper conclusions may be drawn from a study. As noted above, the Nanotechnology Characterization Laboratory, should be either expanded to service all of the nanomedicine efforts or a sister laboratory created to serve that function.
    - There is a challenge to create and maintain databases that will be easily accessed by all. The NIH NanoHealth Enterprise is looking to develop public-private partnerships about three topics – nanobioinformatics, nanostructure characterization, and nanostructure/bio interactions – and is one possible approach to addressing this need.

    - The funds identified for ESH research in the NNI is growing. The ESH work will also be relevant and important to medicine/health. Conversely, research in medicine/health will certainly involve fate and effects of nanostructures in living systems and will be useful for ESH. Looking for harmful and beneficial effects of a nanostructure are two sides of the same coin; there is need keep the two communities working closely together.
    - ESH concerns are not unique to the U.S. The NSET agencies, and NIH in particular, must be aggressive in fostering international collaborations to take advantage of other programs.
- Systems biology
    - To address the breadth and complexity of the science and engineering challenges inherent in systems biology, a concerted national program is warranted. Given the complexity involved, and the need for moving research discovery into innovative technologies, there is a need for a national laboratory focused on this topic. While systems biology is not uniquely "nano", the existing U.S. Nanoscale Science, Engineering and Technology (NSET) subcommittee of the National Science and Technology Council has all of the pertinent Federal agencies represented and could serve as a starting place for examining such a program.

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6-17-2010

Dear PCAST HIT Working Group Co-Chair, PCAST Co-Chairs, and PCAST Executive Director:

The Federation of American Societies for Experimental Biology (FASEB) would like to share our thoughts regarding health information technology and the potential to improve public health through biomedical research. Please find our letter attached (We will also summit the letter through the general OSTP "Contact Us" page). We are delighted to have the opportunity to share our views with PCAST and look forward to working with you on this important issue.

Best regards,

Tyrone Spady

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— Quality Life Through Research —

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June 17, 2010, 2010

Christine K. Cassel, MD
Health Information Technology Working Group
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Dear Dr. Cassel:

The Federation of American Societies for Experimental Biology (FASEB) is pleased to share its thoughts with the Presidents Council of Advisors on Science and Technology on how health information technology (HIT) can be employed to improve public health through biomedical research. FASEB is composed of 23 societies with more than 100,000 members, making it the largest coalition of biomedical research associations in the United States. Our mission is to advance health and welfare by promoting progress and education in the biological and biomedical sciences. As such, FASEB is deeply interested in ensuring the accessibility of electronic health record data to biomedical researchers.

The Administration has recently initiated a considerable effort to increase electronic health record (EHR) adoption by health care providers across the country, while increasing investment in the development of the National Health Information Infrastructure. This is a golden opportunity to connect clinical care and biomedical research on a national scale to meet several of the Administration's grand challenges and would significantly enhance the ability of scientists and engineers to develop new therapeutic treatments that lead to enhanced quality of care, better health outcomes, and improved public health.

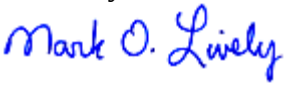
The aggregate EHR data of hundreds of millions Americans would represent the largest health information data resource in the world and would arm researchers with unique tools to fight disease and illness. First, the large number of participants would dramatically enhance researchers' ability to detect medically relevant trends and contributions to risk with regard to complex disease. Knowledge of specific underlying causal gene mutations can allow for more personalized therapeutic intervention. The identification of appropriately qualified candidates for clinical trials would also be greatly enhanced by the inclusion of research among the nation's health information technology strategic goals. Particularly for rare diseases, having patient-consented access to health information from a broad segment of the American public could result in increased participation among affected individuals in biomedical research studies. Similarly, this would facilitate the inclusion of minorities and other groups underrepresented in biomedical and clinical research. In addition, researcher access to patient-consented EHR information would support the real-time, post-marketing surveillance of pharmaceuticals and medical devices. Because pharmaceuticals and medical devices are approved on the basis of results of

clinical trials carried out among controlled groups of study participants, those results are not always representative of the general population.

The integration of clinical care and scientific research is absolutely critical to the rapid realization of many of the Administration's biomedical grand challenges. Because EHR data represents a unique resource, we strongly urge PCAST to advise the Administration to maximally leverage emerging EHR usage by integrating biomedical research into the broader strategic goals of the nation's health information technology initiatives. As part of this initiative, FASEB recommends modifying the Health Insurance Portability and Accountability Act (HIPAA) Privacy Rule. A number of recent reports, including a study by the Institute of Medicine, indicate that the implementation of the Privacy Rule impedes research vital to improving human health by limiting researchers' access to and utilization of protected health information. The administration could facilitate biomedical science by exempting research from the Privacy Rule and working with the scientific and information security communities to develop and implement improved methods to insure that the privacy of study participants and the confidentiality of their data are protected. Additional information on FASEB's recommendations with regard to HIPAA are enclosed.

We are pleased to have been able to share our thoughts on some of the opportunities enhanced implementation of HIT could create with respect to improving health though biomedical research and look forward to working with PCAST and the Administration on these issues.

Sincerely,



Mark O. Lively, Ph.D.
FASEB President

cc: John Holdren Ph.D., Harold Varmus M.D., Eric Lander Ph.D., Deborah D. Stine, Ph.D.

enc: FASEB Statement on the HIPAA Privacy Rule and Research

Federation of American Societies for Experimental Biology (FASEB)
Statement on the Health Insurance Portability and Accountability Act (HIPAA) Privacy Rule and Research

The Federation of American Societies for Experimental Biology (FASEB) affirms that the ethical conduct of research and the protection of human research participants are of paramount importance. Consistent with this view, we believe that researchers and research institutions have an obligation to protect the privacy and confidentiality of study participants and their clinical data. FASEB is concerned, however, with the process by which human subjects research and the data generated through that research, are regulated. Of particular concern is the Health Insurance Portability and Accountability Act (HIPAA) Privacy Rule, which a number of reports indicate impedes research vital to improving human health. In the interest of advancing health science and ensuring the protection of study participants, FASEB recommends that research be exempted from the Privacy Rule and that data privacy and security protections be strengthened through the Department of Health and Human Services (HHS) Common Rule, which currently regulates most federal funded human subjects research. These and other recommendations are described below in greater detail.

- **Research should be exempted from the HIPAA Privacy Rule.** Since its implementation in 2003, the HIPAA Privacy Rule has had a significant, negative impact on health research. A recent report conducted by the Institute of Medicine (IOM)[1] concludes that the Rule has made it more difficult to design consent forms that participants can understand, increased the cost and time associated with recruiting research subjects, caused delays in institutional review board (IRB) approval, and contributed to selection bias, among other impediments to research. Such obstacles slow the progress of research critical to developing treatments for human illness and disease. FASEB believes that research should be exempted from the HIPAA Privacy Rule. Such an exemption is not without precedent: HIPAA does not restrict the use and disclosure of sensitive health information collected in the course of public health and quality improvement activities. If research is to be exempted from the Privacy Rule, FASEB would recommend that the Common Rule be extended to non-federally funded research currently regulated by the Privacy Rule.

- **HHS should strengthen data privacy and security protections.** The HHS Common Rule and Food and Drug Administration regulations provide mechanisms for protecting research participants. Both require that IRBs determine that risks to research participants are minimized, that adequate provisions are in place to protect the privacy of subjects and confidentiality of their data, and that researchers provide participants with a statement describing the extent to which the confidentiality of records identifying them will be maintained. These measures are an important component of our human subjects protection process. Nonetheless, HHS should do more to protect the privacy and security of data. FASEB recommends that HHS work with the research and information security communities to identify and implement improved data security methods. We suggest creating a process to certify as “safe harbors” institutions that adhere to sound security and privacy practices and that establish standards for investigators with respect to ethical research practices. In addition, we recommend that HHS establish and enforce appropriate penalties for the intentional breach of privacy.

Approved by the FASEB Board of Directors on April 6, 2010

FASEB recognizes that exempting research from the Privacy Rule, extending the Common Rule, and enhancing data security measures will be challenging; thoughtfully implementing these recommendations will take time. In the interim, we urge HHS to make the following modifications to the Privacy Rule in order to mitigate the negative impact it has on health research.

- **Consistent with the Common Rule, the Privacy Rule should allow individuals to authorize the use of stored protected health information (PHI) for future unspecified research.** The Common Rule allows participants to consent to future research with biological samples or information stored in databases if such future uses are reviewed by an IRB and described in sufficient detail to allow informed consent. However, HHS has indicated that under the Privacy Rule, each purpose of the requested use or disclosure described in the authorization form must be study specific, meaning that unspecified future research is not permitted. To conduct further studies with stored data, researchers are required to re-contact individuals for every project for which the samples could be used in order to obtain consent. This is the case even if participants have consented to those future uses via an IRB-approved consent form. Impractical, at best, this process could be impossible for research involving a large number of samples. In addition, it adds confusion to already complicated authorization forms.[2] Indeed, a number of studies report that language added to the authorization forms as a result of HIPAA has made the forms more difficult for participants to understand.[3,4,5]

  FASEB believes that the Privacy Rule should allow individuals to authorize the use of their PHI for future unspecified research if those uses are reviewed by an IRB and described in sufficient detail to allow informed consent. Such uses are already permitted under the Common Rule. Harmonizing these regulations would facilitate the conduct of IRB-approved research and allow research participants to exercise greater control over how their data could be used.

- **HHS should create a modified deidentification standard for research purposes.** Neither the Privacy Rule nor the Common Rule applies to health information that has been deidentified. However, the standards for deidentification under the two rules differ significantly. The Privacy Rule specifies that data can be deidentified by stripping 18 direct identifiers from data sets (i.e., the "safe harbor" method). It also permits the creation of limited data sets, allowing covered entities to disclose data with only 16 direct identifiers removed provided that they enter into a data use agreement with the recipient. Under the Common Rule, data is considered to be deidentified if data or specimens have been coded in such a way that investigators cannot readily ascertain the identity of the individual to whom the information pertains. In practice, therefore, some information is considered individually identifiable under the Privacy Rule, but not under the Common Rule, adding to confusion regarding what is permissible under current regulations.

  The Privacy Rule standards also make it difficult to conduct certain kinds of vital health research. The safe harbor method requires the removal of so much important health information that it diminishes the utility of the data for many research projects. For example, one study of pharmacy, administrative, and financial files of patients discharged from a

hospital system found that creating a deidentified data set via the safe harbor method resulted in a 31% loss of unique data elements compared to creating a limited data set of that information. Much of the information lost was important to research.[6] While limited data sets provide greater flexibility to researchers, it is not always possible to link data sets from multiple sources, making it difficult to generate a complete record of a participant's health history.

Moreover, the strict deidentification process mandated by the Privacy Rule does not guarantee that PHI will be protected. One study shows that even after deidentifying data via the safe harbor method, individuals could be reidentified with a moderately high expectation of accuracy by applying only diagnosis and medical combination information.[7] Advancements in technology and the availability of large public data bases are likely to make it even easier to reidentify anonymized data. FASEB appreciates that HHS is currently reviewing the Privacy Rule deidentification standards. We hope this review will result in the creation of a modified deidentification standard for research purposes that is more closely aligned with the Common Rule.

- **HHS should require Privacy Board/IRB approval for research activities conducted preparatory to research by all researchers.** The Privacy Rule permits covered entities to use and disclose PHI without authorization for activities that are preparatory to research. However, according to current HHS guidance, only internal researchers (that is, employees or members of a covered entity's workforce) are able to contact potential subjects regarding enrollment. External researchers, or those affiliated with but not part of a covered entity's workforce (e.g., those in an organized health care arrangement), must either enter into a business associate agreement with the covered entity or obtain a waiver of authorization from an IRB/Privacy Board in order to do so. This distinction is made even though internal and external researchers may be subject to the same institutional rules and regulations and the jurisdiction of the same IRB. At the same time, the Common Rule requires that activities preparatory to research, including record review and participant recruitment, be reviewed and approved by an IRB regardless of the investigator's relationship to the covered entity.

  FASEB agrees with the Secretary's Advisory Committee on Human Research Protections (SACHRP)[8] that the confusing guidance on this topic and the lack of harmonization between the Privacy Rule and the Common Rule undermines rather than enhances the attention that must be paid to the protection of research participants during the recruitment process. Consistent with SACHRP's recommendation, FASEB urges HHS to eliminate the distinction between internal and external researchers with regard to conducting activities preparatory to research. We also recommend that HHS harmonize the Privacy Rule with the Common Rule by requiring Privacy Board/IRB approval for all of a covered entity's researchers prior to contacting potential subjects regarding study recruitment.

- **The accounting for disclosures requirement should be eliminated for research.** Under the Privacy Rule, individuals have the right to request that a covered entity provide them with a comprehensive list of the disclosures of their PHI made in the six years[9] preceding the request. The accounting must include the date the disclosure was made, the identity of the individual receiving the information, a description of the information disclosed, and a

statement of the purpose of the disclosure. Disclosures for research pursuant to a waiver of authorization, research on decedents' information, and reviews preparatory to research are all subject to this accounting requirement. Although HHS created an exception for research involving groups of 50 more subjects—allowing covered entities to provide a general list of all protocols for which their PHI may have been disclosed—reports indicate that tracking and storing the details of each disclosure is extremely costly for institutions. As a result, some healthcare providers are reluctant to provide patient data to researchers.[10]

The time and expense expended in compliance with this regulation is not offset by added privacy protection since the accounting is made after the information has been disclosed. In addition, the Privacy Rule already requires that investigators demonstrate that they will protect patient privacy before being granted a waiver of authorization or access to information for review preparatory to research. FASEB recommends that the accounting for disclosures requirement be eliminated for research. Instead, institutions should focus on fully investigating reports that PHI was inappropriately disclosed and taking appropriate action if wrong doing is confirmed.

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[1] Institute of Medicine. 2009. *Beyond the HIPAA Privacy Rule: Enhancing Privacy, Improving Health Through Research.* Washington, DC: The National Academies Press.
[2] Secretary's Advisory Committee on Human Research Protections. 2004. *Letter to Secretary Thompson.*
[3] Greene SM, Bennett B, Kirlin KR, Oliver R, Pardee R, and Wagner E. 2008. *Impact of HIPAA Privacy Rule in the HMO Research Network.* Seattle, Washington: Group Health Cooperative Center for Health Studies.
[4] Breese P, Burman W, Rietmeijer C, and Lezotte D. 2004. *The Health Insurance Portability and Accountability Act and the informed consent process.* Annals of Internal Medicine. 141: 878-898.
[5] National Committee on Vital Health Statistics, Subcommittee on Privacy and Confidentiality. *Susan Ehringhaus's testimony on behalf of the Association of American Medical Colleges.* November 19, 2003.
[6] Clause SL, Triller DM, Bornhorst CPH, Hamilton RA, and Cosler LE. 2004. *Conforming to HIPAA regulations and compilation of research data.* American Journal of Health-System Pharmacy. 61(10):1025-1031.
[7] Ibid.
[8] Secretary's Advisory Committee on Human Research Protections. Ibid.
[9] The HI-TECH Act modified the accounting for disclosures requirement such that covered entities will be required to provide individuals with a list of all disclosures made within 3 years of the request. This modification will go into effect in 2011 or 2014 depending on when the entity adopted electronic health records.
[10] National Committee on Vital Health Statistics, Subcommittee on Privacy and Confidentiality. Ibid.

6-20-2010

Dear Deborah Stine and Mary Maxon of OSTP:

I am a petroleum and environmental engineer worked for Exxon and other US oil companies for 30-years. I have 12-US patents in energy and environmental fiedls. I have a simple but workable solution for stopping the oil leak at the Deepwater Horizon.

Attached please find the description and the drawing of my system. Would you please arrange a meeting for me with the responsible people at the US Coast Guard or BP to whom I may explain my system design.

If you give me go-ahead, I can come up with the system hardward and will stop the oil leak within two weeks.

Please treat this information as a proprietary and confidential as this is my own innovation and design.
My phone is 949-559-4845 and cell phone is 949-351-1197. I live in Irvine, California.

Charles Choi

(3-Pages total) Email (Horizonsupport@OEGLLC.com)

Mr. Barack Obama
The President of the USA
Whitehouse, D. C.
(fx) 202-456-2461 or (202)456-6021

June 2, 2010

RE: A Solution for the Gulf of Mexico Oil Spill

Dear President Obama,

Here is a simple but powerful system that will stop the Gulf of Mexico oil spill. I have designed a heavy metal bell-shaped cover which would surround the leaking Blow-out-Preventor(BOP) and suck out the mixture of oil/gas from the Christmas Tree to an oil tanker at the surface of the sea.

Please see the next page drawing of the Bell and Cap method showing the simple diagram of the system and the equipment necessary to solve this problem.

My background is in petroleum and environmental engineering. I studied at Princeton University and worked for the Exxon Oil Company. I have 40 years of experience in designing environmental clean-up systems specializing in petroleum production and processing fields.

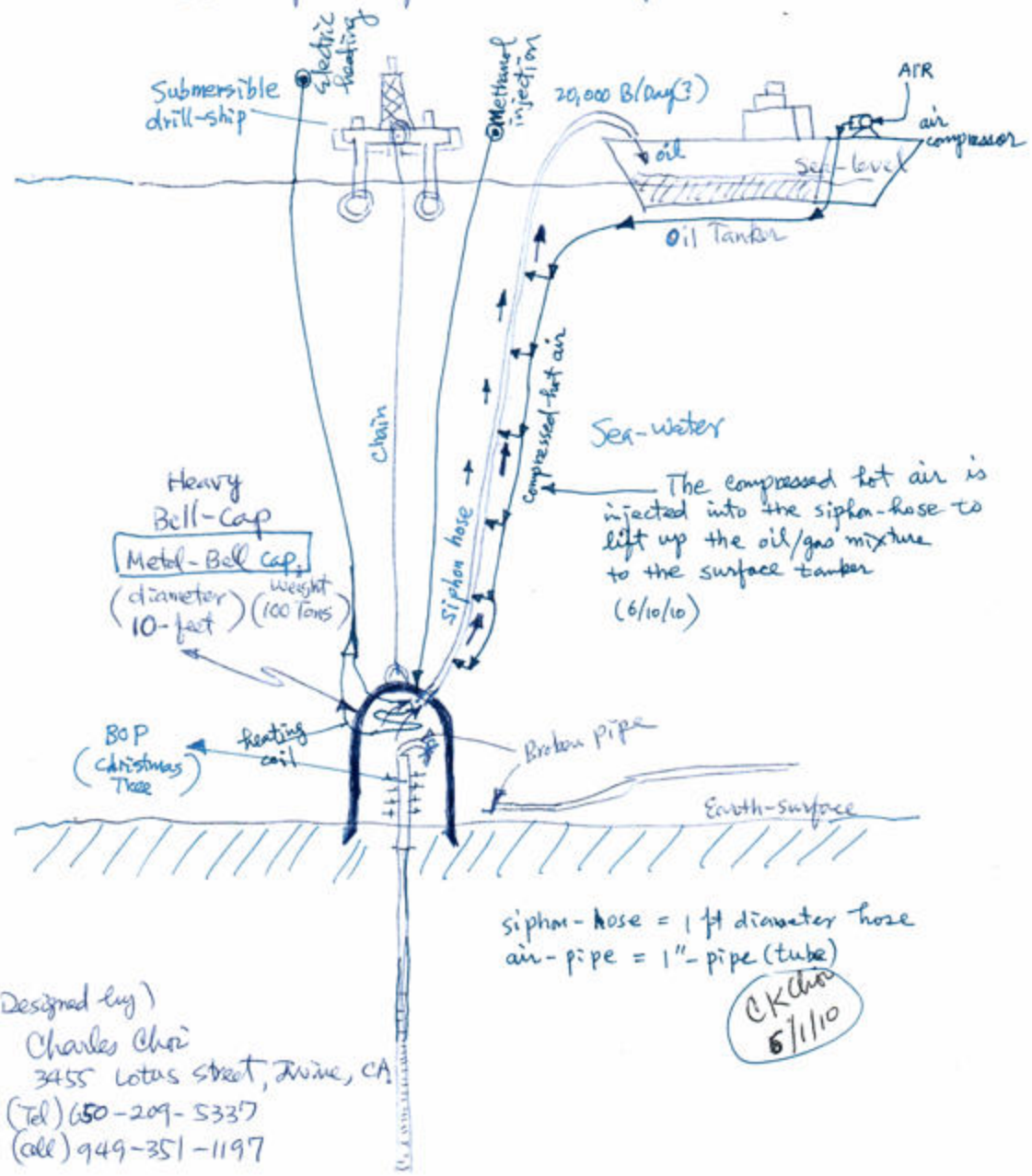
Sincerely,

Charles Choi

Charles Choi
H - 650-209-5337
C - 949-351-1197
kchoi3455@yahoo.com

Attachment (Design Drawing)

Bell-and-Cap Method.
(To stop oil spill from a Deepwater)



(Designed by)
Charles Choi
3455 Lotus Street, Irvine, CA
(Tel) 650-209-5337
(cell) 949-351-1197

Charles Choi, 3455 Lotus St., Irvine, CA. 92606, (949)55904845, cell 949-351-1197

Solution for Deepwater Horizon Oil Leak Problem: "Bell and Cap Method"

1. **As shown in the attached drawing, use the existing metal dome that may weigh more than 100-tons.**
2. **Attach an oil sucking out hose(8-10 inch diameter). Along this hose, there Will be compressed air-injection nozzles attached for every 100-yards. This compressed air injection will maintain the density of the liquid flowing in the such-out hose lighter that the density of the outside sea-water. This will have an effect of lifting the liquid in the hose to go upwards.**
3. **In order to thaw out any ice-formation in the bell-dome, there will be A hose connection for Methanol Injection and also an electric heating Coil system inside the upper portion of the bell-dome. As there is no oxygen in the bell-dome, there will be no danger of any Fire or explosion in the bell-dome even though we insert the heating coil in the bell-dome.**

4. **As we lower the bell-dome, the suck-out hose should be maintained with the injection of the compressed air in order to lift up a smooth flow of liquid upward in the suction hose. As the Bell-dome is lowered from a floating submersible vessel, there should be maintained a smooth flow of liquid flowing in the suction hose, and as the Bell-dome is sitting on the sea-bed surface, it should be sealed such that no liquid is leaking from the Peripheral bottom of the bell to be submerged into the bottom of the sea-bed.**
5. **As the Bell-dome is situated onto the sea-bed surface, there will be a smooth up-flow of liquid/air mixture in the hose, any oil/gas mixture coming out of the BOP will be directed to the hose, because there will be low pressure at the inlet of the hose. This is all balance of static pressure In the system.**

Charlie Choi, 3455 Lotus Street, Irvine, CA. 92606, 949-559-4845

6-22-2010

Dear Shirley Ann Jackson, Eric Schmidt, and PCAST:

Your workshop questions intrigued me.

I work on two projects: one is a large data-gathering software enterprise for a government agency, the other is the Zyvex-led Atomically Precise Manufacturing Consortium's Patterned Atomic Layer Epitaxy project funded partially by DARPA's Tip-Based Nanofabrication program.

NNI has been spending over a billion dollars a year on useful research, but I don't see any focus or much progress on Mike Roco's four stages (static nanostructures, active nanodevices, complex nanomachines, and systems of nanosystems-the last of which can only be built by productive nanosystems). Looking for novel properties is well and good, but why doesn't NNI encourage the exploitation at the nanoscale of properties of manufacturing that we do understand--like deterministic hierarchical assembly, programmed control, subunit test, and rework? After all, this machine-based view of nanotechnology is what Richard Feynman described in his famous "Plenty of Room at the Bottom" speech.

At the rate we're going, by 2012 we (the Atomically Precise Manufacturing Consortium) expect to be able to position with atomic precision (and low error rate) about a billion atoms per hour, mostly in silicon. We have a few applications that should be commercially viable, but to change the world, we need to be able to extend our process to bootstrap our way to much higher throughputs. The NNI funds places like the Center for High-Rate Nanomanufacturing to address this problem for near-term technologies, but as far as I know, there is no funding specifically aimed at high risk/high payoff capabilities like bootstrapping. All software engineers are familiar with the concept of using a firmware BIOS to load an Operating System. We need to do the same thing with nanotechnology, for example using nanoprobes to build other, more precise and powerful nanoprobe systems. This bootstrapping is the central premise of productive nanosystems and key to mature nanotechnology, but other than a few contrarian voices (like Tom Kenny at DARPA), it is being ignored by NNI.

In addition, the NNI needs a policy that encourages long-range funding for positional mechanosynthesis (see recent work by Freitas, Merkle, et. al). The UK is investing a very small amount.

There is plenty of government and private funding for DNA Origami (though it would be a good idea to encourage the use of DNA to assemble other flexible molecules--like silsesquioxanes or dendrimers--in addition to carbon nanotubes). Unfortunately, the similar but more powerful bis-

peptide synthesis approach struggles to survive (see Chris Shafmeister's work in this area). This is probably because you can buy M13 microphage and synthesized DNA on the web, but not bis-amino acids. This also means that a government policy that encourages funding for bis-peptide research would be worthwhile.

Sincerely,

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(410) 796-3464 (office) (734) 646-3418 (cell)
General Dynamics Advanced Information Systems
Annapolis Junction, MD

6-23-2010

Attached are my comment for the July OSTP meeting

Owen Morris
Former Manager of the Apollo Spacecraft Program

Looking Ahead at the US Manned Exploration Program

1. Assume that the administration's proposed 2011 NASA Budget is approved:
    A. Transportation of US personnel to LEO will be turned over to Russia and later to commercial contractors.
    B. The Constellation program will be cancelled except for conversion of the Orion spacecraft to a crew rescue vehicle.
    C. NASA will be refocused toward a research oriented toward an undefined mission objective
    D. ISS will be continued until at least 2020
    E. Heavy lift launch vehicle studies will be conducted leading to a design selection in 2015
2. Now fast forward five years, to 2016, and examine the results:
    A. Commercial manned transportation to LEO will be in development but not available. The NASA Administrator has stated his estimate of first availability is 2017.
    B. The Constellation program management personnel, engineers, and workers, except Orion rescue vehicle project personnel, will have been reassigned or have left their employers or NASA. There will have been no launches of major spacecraft from NASA KSC for the last five years and launch operations personnel, both contractor and NASA, will have been reassigned or have left NASA
    C. Project and Program management personnel are not necessarily equipped to conduct research and will be square pegs in round holes to a certain extent. This will result in a turnover in personnel and will result in a loss of capability in Program Management and Operations
    D. Manned access to the ISS will be entirely by the use of Russian launch vehicles and further ISS continuation will be in budgetary conflict with the start of the new programs

E. A selection will be made of the heavy lift launch vehicle configuration and although not addressed in the NASA budget it would be logical to assume a spacecraft configuration selection will also be made. The start of both programs will result in a massive increase in funding requirements being required in addition to continued ISS funding requirements and NASA will have to rebuild their Program Management capability.

3. Now fast forward another five years, to2021, and examine the state of affairs:
   A. Commercial manned transportation to LEO may be available if the selected companies have been able to continuing financing the development programs and have not encountered significant difficulties.
   B. The Orion project spacecraft will have to be expanded to its original scope if it is a part of the new program or a new manned exploration spacecraft started
   C. NASA will have to reduce the extent of their research activity or commit further funding.
   D. NASA KSC will not have launched a major spacecraft for ten years.

4. I do not believe that this is the kind of legacy that the present leaders want to leave or that the American people would approve of. Seven or more years is to long to go without having American astronauts launched on American vehicles. *It is the face of American leadership in the technical world.* Some things that can be done to prevent this are:
   A. Cancel the immediate shift of all American human LEO space flight to commercial control. A continuation of the current program to promote commercial launch of cargo to LEO should be continued and then as this matures the addition of manned commercial space flight could be added if a reasonable business plan can be developed to support it
   B. Continue the development of the Orion spacecraft, optimized for LEO, to provide the quickest and surest return of American human space flight capability after the Shuttle is terminated. This also makes maximum used of the four years of development and billions already spent on Orion and it can also be used as the emergency return vehicle for the ISS recently proposed by the President.
   C. Launch the slimmed down Orion on either the Atlas or the Delta advanced launch vehicles, either of which has the required capability

D. Reduce the proposed massive research effort on new technology to primarily address those things that can be brought to an acceptable level of maturity in five years to support the commitment to the new heavy lift launch vehicle
E. Start the development of the heavy lift launch vehicle in 2016 or sooner if maturity of the research supports it and the budget permits.

5. I believe that the course of action described in 4 above will result in the earliest availability of a US capability to launch humans into LEO after Shuttle termination and at the same time provide a leg up on the manned exploration beyond LEO while staying within the budget proposed by the Augustine Committee for a viable program.

Concerns About the Basis of Proposed Changes in U.S. Space Research.

by Fred H. Francis

ver.3
7/5/2010

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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, 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? What of the analysis provided in the Augustine Report on human spaceflight?

Assumptions; Scarcity of Financial Resources:

Time presses, so I shall only attempt to address the most fundamental assumptions implicit in the discussions published so far. Most fundamental to all discussions of NASA programs is money: what I call the "Curious Politics of Scarcity". That is to say that in the current situation, Constellation is lamented as being on 'unsustainable path' because there is not now, and cannot in the future be, enough money available to properly fund it. 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; counting only active U.S. military (using published 2008 numbers) we get 1,385,122 service members x 3 meals/day @ $5/meal x 365 days/year at a cost of $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 also 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, this is not a significant amount of money, so the average taxpayer, observing hundreds of billions flowing out of the treasury for military operations, regular DoD budgeting, TARP, etc., can be forgiven for wondering what all the fuss is about. Indeed, the less-informed sometimes assume NASA's budget is comparable to that of the DoD because of the perennial "hoo-rah" over the "high cost" of spaceflight.

As the space agency is smaller, even, than the Department of Agriculture, one can only imagine the chaos which would ensue throughout the governmental if $4 billion were the budgetary threshold triggering the kind of public hand-wringing and exhaustive blue-ribbon analysis for all our other expenditures. To quote the vernacular again: “that dog don’t hunt”. The President would thus be well-advised, not and for the future, to dispense with this particular approach; while it is convenient, it undermines his credibility by making him look like just another Nixon taking an axe to the program of a hated predecessor. Dispensing with the “Curious Politics of Scarcity” protects all science funding by reducing the extent to which non-factual assertions can poison public debate on project funding.

Assumptions; "Stunts" for Program Support:

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. While President Obama has done much to reduce public apathy by his efforts to increase government transparency and public outreach, the "Flexible Path" (Option 5) the President has chosen from the Augustine report caters to precisely this "bread and circuses" mentality with it's emphasis on "major events" and "firsts". Unfortunately, because human nature has not changed in thousands of years, and public appetite for spectacle is as fickle in its tastes as those tastes are short-lived, the vulnerability of "Flexible Path" to future cancellation is only increased by the fact that it "kicks down the road" even modest milestones like cis-lunar flight to the 2025 time-frame, long after this President will have left office. To put it bluntly, if Nixon was able to kill Apollo, a mature program just hitting its scientific stride after working-out its technical issues, what makes this President believe that future politicians won't be easily able to do precisely the same thing to HIS approach to human spaceflight?

Recognition of such facts of human nature are essential, both for correctly ordering national research priorities and for the survival of whatever is ultimately selected. During the Apollo Program, Americans, led by a poorly-informed media and several key members of Congress, collectively asked: '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, himself as part of his rationale for canceling the Constellation Program. The fundamental flaw in this line of reasoning lies in seeing the establishment of a permanent base on the moon as a goal in and of itself; as yet another 'amazing "first" for America's space program'; rather than as a logical adjunct to our existing National Laboratories, one of which is now in Earth orbit.

The establishment of a permanent outposts like the ISS and our facilities in Antarctica, provide this nation with durable, stable environments in the field from which to conduct long-term research. Where once merely traveling to Antarctica was a goal in and of itself, it is now a research base. The ISS accomplishes the same function in the near-Earth environment, protected by the Van Allen belts and programs of basic scientific and engineering research gain as much from these facilities as do highly-focused programs like efforts improve terrestrial water resource management or to put Man on Mars. National commitment to such facilities is essential for Science and technology innovation because as Thomas Edison said: "The three great essentials to achieve anything worth while are, first, hard work; second, stick-to-itiveness; third, common sense." "Genius is 1% inspiration and 99% perspiration. Accordingly a genius is often merely a talented person who has done all of his or her homework"; "Opportunity is missed by most people because it is dressed in overalls and looks like work."

This is precisely what must be communicated to the public for ANY program to survive future administrations: space research is a worthwhile investment in the nation's future; the same kind of investment as parents make for their kids' education: a work of faith in a process whose results can't fully be known in advance, but with great faith that those results will have been worth the investment when they come to fruition in the long run. Given the need recognized by the President for investing in science, technology and education, he must see that advances in these fields are not at all helped by program requirements designed to entertain the public with "bread and circuses". Given the fact that the Augustine Report places their Option 4: "Moon First" on a par with Option 5, the "Flexible Path", the President clearly has a solid basis from which to reconsider killing the Constellation Program, or at least the nature of its planned successor.

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 the generation and 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. To the extent that those businesses produced goods and services controllable under ITAR, they support jobs which must stay in America. Moreover, although NASA-funded research is sometimes patented, it's public financing also precludes such work from 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.

Unfortunately, it seems that no comprehensive study exists which analyses in detail the economic affects of space research on our economy. Instead, there is merely the anecdotal, qualitative knowledge of the origins of particular pieces of technology. Much the same is true of WWI (mass production, motions studies and management theory, mechanized logistics & combat tactics, etc.); WWII (mass-production/preparation of food stuffs (which led directly to both modern restaurants and grocery stores), advanced epoxies, guidance/control technology, nuclear power, etc., etc.,). Instituting a series of such studies should be considered and the results incorporated into space policy for program planning.

Economics; Job Creation and Social Improvement:

Though NASA is not now, 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.

What distinguishes NASA spending from most defense spending is its unclassified status; American companies can have nearly immediate access to technological and scientific advances without having to wait decades for declassification. The advantage of large-scale programs is that they can serve as a massive impetus for transformative industrial change, much the was the previous two world wars and the Apollo Program did, while a large number of smaller projects can cover more technological “ground” and identify promising areas for further work.

The President has begun work to create new jobs programs and to urge more aggressive spending on education and public outreach to encourage young people to consider technical and scientific career paths. Well and good, but greater funding for unclassified research programs, plus increased effort to promote technology transfer, 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. In terms of national space policy, higher overall funding levels will further the President’s stated goals and the benefits of high-quality jobs, economic expansion, and entrepreneurial opportunity touted as opportunities for successful bi-partisan work in Congress.

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 able to perform in a satisfactory manner, history shows that the competing demands of reliability, profitability, and availability often render this impossible, even in much more mundane, non-safety-related efforts like passenger rail service, or the deliver of U.S. mail. The decline in U.S. Mail delivery standards, for example; shows the folly in this. In the years since Reagan-era requirements the U.S. Postal Service support itself financially, postage rates have continued to clime, 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 frequently 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, but this again flies in the face of experience. For example, the abolishment of the Civil Aeronautics Board, begun under President Carter in 1978 and finished under President Reagan in 1984 resulted in the formation of an NTSB without any enforcement powers. Moreover, the Board's well-considered safety recommendations are mired in a years-long backlog and subject to the non-technical analysis and regulatory approval of the FAA. Even the existing NASA management scheme has found it difficult insure things like the hold-down components on the Shuttle's SRB's are properly installed, to say nothing of the long-term non-technical idiocy which precipitated the deaths of the Columbia and Challenger crews.

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. 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.

With respect to planned cuts to NASA staffing and facilities, any cuts which reduce the "depth" of the NASA "team" force 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 for it is because of the technical staff and culture we've been able to build and preserve we ARE the "world's leading space-faring nation". If we cut that staff and/or eliminate facilities, we simply insert another unnecessary impediment to getting the job done.

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 agency's physical assets. Even from a purely budgetary point of view, this is simply folly for two basic reasons: the cost of any technology program are directly affected by both design and manufacturing issues. Cutting NASA's workforce and facilities will create costly deficiencies in both institutional knowledge and facilities (as their use relates, in this context, to training and professional development) in both areas. This, in turn, will result in higher immediate costs for operations and mission support, as well as for design, development, and manufacturing costs, not to mention operational expense, unless reliability requirements are dropped. Dropping such requirements was tried in the Daniel Golden era of "faster, better, cheaper" and was found not to work.

JPL was gutted of most manufacturing personnel in the 1980's and 1990's, and policy changes aimed at cutting costs led to drastic reductions in the retention of core staff and the consequent whole-sale hiring and firing of contract staff on a commodity basis as the needs of a given program dictated. The result was (and is) a host of difficulties with much money wasted "reinventing the wheel" each time a new program rolls around because lack of institutional knowledge. Coupled with tight performance requirements, there is little other 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.

A personal anecdote is illustrative: a couple of years ago 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 engineers, but scientists; the knew only how to design bench-test circuits, not how to manufacture finished, flight-ready devices. Unfortunately for us, their lack of expertise didn't relieve them of any responsibility for oversight, and left them with well-considered manufacturing specifications which were, nevertheless, not based upon manufacturing reality.

As a result, successful completion required countless Engineering Change Orders covering materials selection, components, component placement, assembly order, test conditions, testing methods: you name it. In the end, JPL got their instrument, but my company "took a bath" to the tune of more than 200% of our planned costs due to changing JPL requirements. We sustained these costs, as we had before, in the national interest and out of individual and collective patriotism, but such losses could not be sustained during tough economic times like these and my (now former) company continues to lay-off personnel and has had to decline-to-bid on several subsequent NASA projects for this reason. Had JPL been allowed to retain a substantial design and process engineering layer, between the scientific and the manufacturing layers, the problems could've been avoided through more a informed specification and manufacturing decision-making process. The Augustine Committee addressed this in their report by suggesting that NASA curtail its role in the detailed production of flight hardware in cases where it did not have the capacity to entirely manufacture a given system itself. It decried the lack of system-engineering expertise and correctly identified lack of experiential "scarring" as one of the key problems. Unfortunately, it did not seem to recognize lack of retention and training/mentoring as being a key part of the problem.

As the Committee's work suggests, this is neither an isolated example or an extreme one and I fear that this is precisely the kind of thing we will see NASA-wide, should cuts now under consideration be implemented. An example which comes to mind was the closing of the 80 by 120 Foot Wind Tunnel at NASA Ames Research Center. In the face constant political pressure for budgetary cuts, and 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 "aging facility" (built in the 1940's) and to the foolishness of trying to politically manage technology.

It would be one thing if one could be certain that only the most logical, technically-appropriate choices would be made, but real policy-making must take into account human weakness. As it is, the high costs of replacing large-scale infrastructure, given the low quality of most political debate, make them unlikely to ever be replaced. Once lost, the nation looses just as surely as a university science department would suffer if it lost its laboratories. I urge the Council to strongly advise the President against any action which poses this kind of risk to our national infrastructure and institutional capability.

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 then ask why, with their long history of rocket development, did neither GE (the Redstone); Convair (the Atlas); Lockheed (the Titan I/II); Chrysler (Saturn 1B/C); McDonnel-Douglass (Mercury & Gemini capsules, Saturn SII stage); Martin-Marietta (SIC stage of the Saturn V); North American (Saturn V); or Boeing (Dyna-Soar, Lunar Rover, Shuttle) 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. 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. With the foregoing in mind, it is simply fatuous to pretend that the contracting-out of human spaceflight is anything more than corporate welfare. Allowing this would be a waste of (allegedly) scarce financial resources in both the short and long terms.

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? How would the tax-payer be prevented from experiencing the kinds of losses as occur when allegedly profitable tool road projects are ballyhooed as savings and their operators given generous helpings of “incentive” money, only to go belly-up a few years later to burden the taxpayers with paying for yet another ill-conceived project? 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?

Conclusions/Recommendations:

If we must 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 protect the President's stated desire for scientific advancement, while eliminating the stunt-like mentality of "firsts' from manned spaceflight programs and its attendant political vulnerability. Doing so would allow technologists, and the public at large, to focus on meaningful scientific and technology development and the broader use of the Moon for scientific research of all kinds, just as is done at the nation's other research facilities.

The only caveat I would add to planned spending is to urge, despite funding scarcity, the full funding to develop an Orion-compatible liquid-fuelled booster and to require liquid-fueled boosters, only. for all future U.S. manned launches. This is simply a matter of safety. 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 a prudent use of tax dollars, or of the potential for future scientific research, to sacrifice Orion, or its long-duration capability, for any reason or purpose. Rather, a liquid-fueled booster should be developed to accommodate it.

If we don't accept the "Curious Politics of Scarcity", the answer is mostly simple: urge President Obama to repudiate cuts to Constellation while adding the funds necessary to hew to the Program's ESAS design baseline and add money wherever else in NASA it's technically valuable to do so; return U.S. to exploration at an aggressive pace. Again, as a matter of safety policy, manned launches should be transitioned back to liquid-fueled boosters, only, and an open bid created for the development of one capable of accommodating the Orion capsule in its long-duration form.

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. I urge the Council to recommend a series of economic studies to quantify the economic effects involved as an tool for space policy program planning.

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.

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. As the Augustine committee acknowledged, this technology has the potential to cut the baseline to Mars from 2 years to 39 days, successful development would be a great boon to both manned and unmanned programs of all types. Developing it will 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. I urge the Council to consider space policy towards exploration in the light of establish a never-ending series of installations and programs to provide technological advancement and economic expansion.

I agree

375
votes

I disagree

Rank **1**

Idea# **217**

FEDERAL GOVERNMENT ROLE »

Create and implement a scientific integrity plan for federal agencies and departments

A government wide scientific integrity plan is an essential way for the government to enable new breakthroughs in the technology sector. It is time for OSTP to follow through on the president's pledge to "restore science to its rightful place" and release its plan, which is now nearly a year late.

Federal scientists have contributed to many of the largest technological breakthroughs of the modern era, from the creation of the Internet and GPS to decoding the human genome. Such technological breakthroughs can only be achieved when federal researchers are able to carry out their work free from political interference. Unfortunately, many federal scientists had their work altered or suppressed if it didn't support the administration's predetermined policy decisions.

Significant structural reforms must be enacted in federal agencies and departments, including better 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; and protections for scientists and other federal employees who blow the whistle on political interference in science. OSTP should also open up science-based decision-making to public scrutiny by making scientific documents public once they leave an agency or department to ensure that the White House does not meddle with an agency or department's scientific analysis.

In March 2009, President Obama directed his science advisor to develop recommendations within 120 days to guarantee scientific integrity throughout the federal government. Dr. Holdren asked for public input (just as PCAST is doing now). But more than a year later, the Office of Science and Technology Policy (OSTP) has been mostly silent on the issue. While the principles put forward by the president last year represented a good start, they can only be made meaningful with leadership from OSTP. Action is long overdue.

Michael Halpern

Scientific Integrity Program Manager

Union of Concerned Scientists

tags: scientific integrity innovation

Comment

Submitted by mhalpern 17 days ago

Comments (38)

tmmcguire said:

I'd like to see the federal government implement and follow a plan for saving the NW wild salmon based on scientific findings

16 days ago

lopezjohn649 said:

I'd like to see PROOF that Monsanto GMO food is SAFE for everyone and that it WILL NOT contaminate organic foods/fields. Also, I would like to see the USDA stop hiring former Monsanto employees to make decisions regarding Monsanto foods product usage and safety. This is unethical and should be illegal.

16 days ago

hlabws said:

The government has no right to set limits on scientific research which leads to discovery of new scientific facts and principles. So rather it alternative energy, new ways to breed animals and grow crops that is safe for everyone, the government should not interfere. The government should be the protector of the people if the new scientific findings could lead to the harming of people or if the new methods in growing animals and

plants for human consumption is harmful to people. To set standards because of a political or religious bias should not be permitted.

16 days ago

Community Member said:

Make sure that no chemicals via chemical companies and genetically bred animals and plants are in our food. Clean farms, clean streams and rivers for fish.

16 days ago

michele.smith1 said:

The teaching of scientific method of inquiry has suffered in our educational system for years now. From the refusal of school boards to include the Theory of Evolution to Senators who say that climate change is a hoax rational debate has truly suffered. It is time for government agencies in every department to increase their standards tenfold and counteract this enormous lack of ethical integrity.

16 days ago

Community Member said:

USDA should be legally barred from hiring any employee of any company regulated by the agency----if not permanently barred, at least barred for a period of 5 years or more

16 days ago

dirkfaegre said:

I'd like to see a plan that takes into account that we are an amazingly smart country (much of the time, anyway), capable of doing fantastic things. We have some exceptionally smart scientists who would love to tackle difficult problems. You need to set up the culture in government so that this moves ahead of it's own accord -- that is, form it such that it becomes a way of life or even a tradition so that we don't even need to think about it, we just do it as an obvious matter of course. And whatever you do get rid of the revolving door between govt and private enterprise. It turns your whole enterprise into a failure even before you get moving.

16 days ago

krusedianna said:

I would like to see the USDA require all companies to fully disclose product ingredients on consumer labels. They could start with Arm & Hammer.

16 days ago

jeaneen.andretta441 said:

I hope that all this will lead to our being non-dependent on oil and tnherefore freeing our oceans from the pollution of oil spills.

16 days ago

G Weiss, MD said:

In order to initiate a logical reason based mindset to our challenges as a Nation in the 21st Century a movement away from anointing via political patronage the Lawyer Cabal to hold positions of oversight MUST be discouraged.

Too many agencies are being populated by lawyers trained to manipulate and obsfuscate for political aims which conflict with the Missions of the Agencies.

This pattern is a prescription for bad decisions, bad policy and continued wrong minded direction.

Ideas & actions in Washington are dictated from the top down.

16 days ago

see3d said:

Outside of politicians directly altering a scientific report, the greatest threat to scientific integrity is conflicts of interest. Scientists and their managers should be free of government or industry influences in defining test criteria, experimental methods, and interpretation of results. Purposefully engineered conflicts of interest (everyone has their price), by large corporations have set science back by decades. A lot of money has been wasted on research to "prove" a product is safe and works, which is in fact inferior to low cost alternatives. This slight of hand is the hallmark of conflicts of interest.

16 days ago

peacetoyou said:

Science should be objective and if checks and balances are needed to be sure of this then that is what we will do. I am encouraged by the movement of this administration to correct some of these governmental over-sights. Let's get to work. Apathy is a kind of Death.

16 days ago

Community Member said:

Definitely, the idea that one could ignore who pays for research is unreasonable. If let's say Koch industries, the largest independently owned energy company in the US paid to have scientists do a report on global warming, i would definitely have my head in the sand if I didn't think the Koch billionaire brothers would want the report to say anything else except there is no such thing as global warming. I don't know if they have funded scientists, but I do know the Cato institute was started by one of the brothers. I do know too that David Koch puts some of his fortune to attack those fighting global warming. So why is it Koch can fund a massive campaign costing millions to attack those fighting global warming and the conflict of interest isn't commonly pointed out? What oil and energy company is going to say there is a problem with global warming?

16 days ago

democrats said:

Truth in labeling: All GMO-containing products must contain a list of all GMO ingredients!

16 days ago

rsnstndvd said:

The lack of scientific rigor (or total absence of science as a consideration) during the Bush Administration was devastating for our county in many ways including the environment. I am disapointed the President has not move aggessively to create a scientific integrity plan.

16 days ago

davisje said:

I hope there will be a requirement to include meaningful input from scientists who are independent of government and big business in the development of this scientific integrity plan.

16 days ago

chermoelin said:

George Bush stifled and gagged the scientific community in this country for 8 long years. President Obama MUST do the right thing on behalf of all Americans and let the information flow. Pushing education initiatives etc. doesn't do any good, when our most brilliant minds are not permitted to speak for the good of our earth and to act upon their findings.

16 days ago

mnkhgreg said:

A government wide scientific integrity plan is an essential way for the government to enable new breakthroughs in the technology sector. It is time for OSTP to follow through on the president's pledge to “restore science to its rightful place” and release its plan, which is now nearly a year late.

16 days ago

dlipman said:

The research and findings of scientists working within government should not be altered or suppressed, nor should academic science be ignored in order to further the administration's political goals or to enhance corporate profits.

Moreover, the precautionary principle should become a driving force in governmental regulation.

16 days ago

annvioli said:

i'm with the fellow on monsanto. getting away from monoculture and employing organic practices for health and soil retention,foiling insects and avoiding the need for pesticides,etc. , etc. is the way for our ag. system to go. these gmo's should be scrapped.

see NOVA AND THERE IS A THINK TANK, COMING UP WITH A METHOD TO decontaminate nuclear wastes. wouldn't that be a boon? any ideas that free us from oil

dependence are, obviously, in the interest of national security and should be, therefore, given full government support.

16 days ago

sharon.haywood said:

Thank you for this action. It is so needed.

16 days ago

bcham said:

Beware Supreme Court nominee Elena Kagan, who supports letting Monsanto put GE alfalfa on the market--even without normally required testing--in fact,as solicitor general, she went out of her way to do so!

16 days ago

knoctover said:

Organic food, the dangers of GMO organisms, the testing of chemicals in the environment - all these issues must be investigated by independent scientists whose integrity is not in question. Without it we risk exposure to health hazards and an erosion of the public trust - both of which have been happening with much too much frequency.

16 days ago

Community Member said:

Pass a law that insists all GMO products be labeled as such.

16 days ago

sonjand said:

It is essential that government identify and eliminate conflict of interests. There should be a significant gap between being an employee of a regulated industry and working for the agency doing the regulation. Perhaps only industry employees who have lost favor with the industry through being a whistle blower should be considered for employment in a regulatory agency. What is needed is the development of professional boundary rules not unlike the dual relationship prohibition for a therapist, and serious consequences given for violation. If you are a regulator it is a conflict of interest to have a buddy relationship with those whom you regulate.

16 days ago

1276931406 said:

I think this problem is of a different order, and cannot easily be resolved.

The reason is that in the early 21st century we live in a postmodern society where people believe that concepts like 'good' and 'true' are nothing more than opinions that we happen to agree upon. For example, in that view Evolution Theory is the opinion of biologists and you are entitled to a different opinion.

Postmodernism is the single greatest threat to Western Civilization. Tackling this issue might take as long as it took us to walk into this quagmire: 40 years.

I voted "agree" to this idea because it might be a first step on a long journey back to where we came from. But don't expect miracles: this is not going to be easy.

16 days ago

alysonlhayes said:

Why on earth would you NOT want our government to work with scientific integrity? It would be putting a blindfold on so we cannot see that which we know is there, thus risking harming ourselves and our environment.

16 days ago

2brenners said:

I would like to see honesty and integrity return to our government. Compassion and humanity wouldn't hurt either. Greed and self-interest have taken over.

16 days ago

marypen211 said:

Climate change mitigation and adaptation is critical right now.

15 days ago

fasssster said:
death to politicians that promote scientific untruths

15 days ago

nastalbald said:
We need to go back to scientific integrity after the reign of President Bush. Science should be as honest as it could possibly be if it is going to be of use.

15 days ago

johnpaulbremer said:
The Supreme Court, dominated by ideologues, rules the US. Until reasonable people gain control of the bridge, our ship will continue to plow through the darkness and rough seas created by our blundering crusades.

15 days ago

greenrose9505 said:
We must have integrity and truth in our science so we can move forward towards finding solutions to the climate crisis. If not then we and all life shall parish from our greed and stupidity

15 days ago

Community Member said:
It's time to take action through science instead of sitting back debating ideologies and waiting to agree on politics. It'll never happen if we don't.

14 days ago

Community Member said:
watched a great documentary last night on HBO called "Gasland." Sadly, I cried several times during the 2+ hrs. for those land owners, the people being interviewed, our wild and farmed animals, and the fact that we allowed Bush & Cheney to literally choke the life out of us. Hold on to your seats folks, we are so screwed by the oil & gas companies -no joke - our drinking water is being destroyed b/c of a 2005 law allowing them to bypass the EPA's Safe Drinking Water Act. "Fracking" is going to be on everyone's mind and we can't stop it. WTF?

14 days ago

see3d said:
Here is an example of the type of politically unpopular thinking that we must be free to engage in with rational scientific thought if we are going to survive the next 100 years. Science is able to ask the tough questions and look for answers, even though the politicians would like to ignore it. There are larger issues at stake than just things like global warming.

http://www.NaturalNews.com/z029056_environmental_protection_population_control.html

14 days ago

Community Member said:
FOXES ARE GUARDING THE CHICKEN COOPS AND WHISTLE-BLOWERS ARE DESTROYED IF THEY COME FORWARD.

NIH and NIMH and NSF etc are supposed to be overseeing the integrity of Federal research at universities and other institutions. They do not do their job any more than BP's federal overseers did their jobs. It is imperative that scientific integrity is upheld by independent entities that are not in bed with the grantees. The offices within these agencies are corrupt and do nothing when faced with evidence of misconduct. Furthermore, we need solid, strong PROTECTION OF WHISTLE-BLOWERS, so that insiders who know of wrong-doing will come forward and protect the public.

13 days ago

earthtec said:

We need to become more consious of what we are doing to our home, planet Earth, in so many ways ... the coruption, food production, our water, pharma/drugs, addictions, our air, our homes, dead zones, our oceans, our climate, energy, our cultural dysfunction, overpopulation, and become more open minded to what is happening around us all over the world, before as we know it and have become comfortable with ... it is gone!

1 day ago

Write a comment

Submit

I agree

29
votes

I disagree

Rank **8**

Idea# **207**

FEDERAL GOVERNMENT ROLE »

Invest into a robust toxicological study of nanomaterials

Nanomaterials and nanoparticles are enterinng most markets and products including foods, cosmetics and clothing. No company in the world can afford to invest into a wholistic toxicological study of these materials. It is up to the government to fill the void.

Comment

Submitted by Dr Denis Koltsov (nanotechnology consultant) 18 days ago

snoero said:

Industry should foot part (most) of the bill for toxicological and other assessments of these materials' human and environmental health impacts. With the privilege of making money from these materials comes the responsibility of funding health impact studies and proving the safety of your product before it enters the market. In addition, health impact assessments should be not be carried out by the industries that would profit from the approval of their product.

16 days ago

see3d said:

Industry will just pass the cost onto the consumer. Therefore, it is the consumer that is funding it. By giving industry a direct funding role, they end up influencing the outcomes of the research. Funding should be independent. Funding perhaps should be general, like a special tax on the products -- think cigarettes, liquor, or gasoline taxes that are used to fund related expenses (like road repair). One of these days, we will do impact studies to assign the real cost of a product to the future environment or health. Then an impact tax could be added to fund research and mitigation of the damage caused.

16 days ago

I agree

24
votes

I disagree

Rank **15**

Idea# **246**

UNIQUE OPPORTUNITIES AT INTERSECTION »

Create a national repository for research data

The Federal Government should set up a repository for data collected as part of all publically-funded research. Such a repository would enable the reuse of existing data for new experimental purposes; promote the comparison of different analysis methods on the same data set; promote the verification of results presented by the initial data collector; and provide an archive of collected data. Initially, committees would have to be put in place to seek broad input, survey existing systems both domestic and abroad, and arrive at consensus guidelines for administering the national data repository. These guidelines would: define the formats, annotations, and metadata to be associated with the data; define criteria for inclusion of a dataset in the national repository; define standards for ensuring the integrity of submitted data; define policies and processes for public access to the data; and provide guidelines regarding the length of time data should be stored. In addition to providing tremendous value to the national research agenda, such a national resource would create jobs for IT specialists and scientists with domain expertise to be responsible for curating the data repository.

Comment

Submitted by Community Member 15 days ago

rgmark said:

The NIH requires investigators to release their data to the research community after publication of their results. However, there is no national archive for storing research data, and no standards for its management. As a result, most publicly funded research data is lost. A National Repository makes tremendous sense, and is long past due!

15 days ago

Community Member said:

It is a good idea to compile and store all of the data, but in addition, there needs to be an emphasis on use of this information. Currently there is a lot of publicly available, open-source information, but it is not clear if others are taking advantage of this information. This should be measured to show the benefits of requiring openness.

14 days ago

claxtonh said:

I Completely agree with this. One of my projects has ended as a negative result--the protein was never active. As a young grad student, I saw the lack of kinetic data on these proteins as an opportunity to make my mark in science. As a more experienced grad student, I now believe the lack of data is because others have failed in this attempt. The worst part about this is that others will make the same mistake that I have, wasting money, time and other resources. Scientific culture frowns on negative results and my work will never be published, and as such, never be shown to society. I wish there was a databank that I could simply submit my experiments too. (without a journal article attached) So that others may avoid the same mistakes that I have made.

14 days ago

claxtonh said:

Perhaps google would be willing to set up and house such a database with support from NAS, NSF, or NIH? A database that may be searchable by compound, protein, author, any other characteristic deemed relative.

14 days ago

psz said:

NCBI stores and curates databases something like what is proposed here, for genetic and genomic data. This has led to tremendous success in researchers being able to explore new ideas by re-using data collected often for unrelated purposes. There is no comparable resource for the growing collections of clinical research data that should be shared in the same way, subject to protection of individual privacy. Creating such a repository is an excellent idea.

8 days ago

I agree

23
votes

I disagree

Rank **16**

Idea# **229**

FEDERAL GOVERNMENT ROLE »

URGENT: Order an Executive Order Needed

Executive Order: All refineries/drilling projects must have an emergency plan and emergency off switch before continuing business; in which the White House and Department of Interior will confirm every company in action has a plan, and if not they will be required to stop production and pay (x) amount for endangering the public, wildlife, and water system.

Comment

Submitted by caleb.gluad 16 days ago

I agree

21 votes

I disagree

Rank **19**

Idea# **196**

FEDERAL GOVERNMENT ROLE »

Regulate Emerging Technologies to Protect Public Health & the Environment

It is the government's role to properly regulate emerging technologies, such as nanotechnology, biotechnology, and information technology. It is not the government's role to help private industry be more profitable; rather, the government must protect its people from potentially dangerous technologies. With proper regulations in place for nanotechnology, biotechnology, and information technology, industries will be able to safety and profitably make and sell products while understanding the legal framework in which they do business. The federal government must put people and the environment before corporate profits by using precaution when regulating these emerging technologies and placing the burden of proof to show that these technologies are safe on private industries.

tags: regulation emerging technology

Comment

Submitted by ehoffman 21 days ago

Community Member said:

Once systems become autonomous they are likely to be turing complete. Basic computer science theory will tell you that the KEEL system will not really work and just imposes unnecessary restrictions on technology.

16 days ago

sdavis said:

The federal government should develop regulations for emerging technologies that protects public heath. That's its job. Currently, there is a lack of data on how industrial nanomaterials impact workers, or the environment. The government should at least require information on environmental toxicity,and require environmental monitoring and clean up plans.

16 days ago

see3d said:

While I agree that it is the government's job to protect the health of the people and environment from threats created by industry. It is also impossible for every novel substance to be tested in a way that proves it can do no harm to anyone. To require it, is the same as banning all forward progress, since the innovative companies will not have the financial resources to do such a thing. It is in everyones interest to have both the products of progress, and assurances of safety. As a public need, the government (everyone) should fund research into the safety of novel substances. Cost/benefit tradeoffs should also be taken into consideration. For instance, a new expensive, patented drug that provides more side effects and works worse than low cost alternatives should never be approved by the FDA. However, because the drug manufactures fund the FDA, the first priority is to make profits for the company, rather than provide a better product. Companies charged with proving their new product is safe, will almost always prove it is (even if it is not).

16 days ago

jhanson said:

Our organization, the International Center for Technology Assessment and about a dozen other groups, have petitioned both the EPA and the FDA to require data on the health and environmental effects of nanomaterials. The FDA petition was made in 2006 some four years ago. The FDA has not responded at all, not even said that it is concerning the petition. The EPA has said that it is working on our petition on nanosilver.

The government has been promoting nanotechnologies for some years, but it has been VERY SLOW on developing ways to assess the health, safety and environmental effects of these technologies. If the government wants to promote technologies, the best way is to make sure they are safe before they are every where in the market. Some of these new technologies will be the next lead paint or asbestos, we have a chance still to avoid such failures, but need to move fast and get the regulatory apparatus in place.

Jaydee Hanson

Policy Director

Interntional Center for Technology Assessment

15 days ago

I agree

16
votes

I disagree

Rank **31**

Idea# **220**

UNIQUE OPPORTUNITIES AT INTERSECTION »

Freedom to Understand

The freedom to support the reverse engineering of technology for educational research must be upheld.

It is imperative if we are to create a safe and reliable future that our brightest minds can explore and understand complex systems without placing themselves into legal jeopardy.

Today the DMCA and the chip copyright act of 1984 both provide provisions to protect researchers. Unfortunately these exceptions are insufficient.

There are numerous cases where researchers from the fields of cryptography, microelectronics, and software engineering are unable to even publicly discuss flaws they have discovered in networks and computers.

These flaws place our national infrastructure and economy in great peril. One only has to look at recent attacks on multinational American corporations. Not allowing accurate, independent research to be performed greatly harms all of us now that our lives have become inseparable from the internet.

If we are to have a nation with reliable, trustworthy digital systems, legislative action must make strong, clear, and powerful provisions for protecting research.

It should be noted that EU nation states have already begun to go towards the other direction, making it illegal by placing liability on computer researchers if they publish information which could be used in a computer intrusion. A proper analogy would be punishing gun manufacturers for violent gun crimes. Clearly the economic and legal incentives are being misplaced over there in Europe. America is not Europe though.

Please enable us to continue to have the freedom to understand the world we rely on.

tags: cybersecurity freedom america technology leadership

Comment

Submitted by Community Member 16 days ago

I agree

15
votes

I disagree

Rank **33**

Idea# **205**

IMPEDIMENTS TO COMMERCIALIZATION »

Education, Education, Education!

Education. None of these disciplines will amount to much without drastic changes in curricula and pedagogy. Quit teaching secondary school that produces manufacturing workers and start producing workers who can cope with complex problems.

Comment

Submitted by steve 19 days ago

daviddoria said:

I completely agree. I started looking at this problem at a post-secondary school level, but it is impossible to start at this end of the cycle. The answers I came up with pointed to "the education the students have received before coming here was inadequate". If you look one level back (secondary school) I believe you would come to the same conclusion. It is time for a complete overhaul, starting at the very beginning of a students academic career!

David Doria

16 days ago

Community Member said:

I think education should be our top priority as a not only a nation but as a people. We need to invest in our future and education is the answer in my opinion.

15 days ago

I agree

13
votes

I disagree

Rank **38**

Idea# **203**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Provide ongoing education for teachers

In order to create a steady stream of creative, innovative young minds to feed the perpetual advance of technology, few bottlenecks offer more leverage than that of the teachers at the K-8 levels. The government is in a unique position to broker and help finance partnerships between elementary/middle school teachers, universities, and private IT companies to help keep teachers up to date with the leading edge of technololgy. Even one week programs in the summer can keep classroom content fresh, keep teacher motivation levels high, and create an exponential impact because each teacher reaches hundreds of students.

tags: technology education teaching

Comment

Submitted by erichardson 19 days ago

daviddoria said:

This goes not only for K-8 levels, but all the way up through universities! In fact, at the university level, the problem is much worse. At least in secondary education teachers are (typically) required to have a masters degree in education. Faculty at the university level, while experts in a technical field, are required to have absolutely no background in education techniques. This "one week per summer" that is suggested above would wildly benefit students, as faculty would then be exposed to modern methods coming from the fields of Education and Psychology (modern learning styles, etc).

David Doria

16 days ago

Community Member said:

I completely agree with the above comment. While the professors in the college I attended were no doubt very smart individuals, some of the most intelligent couldn't teach a fish to swim.

15 days ago

I agree

13
votes

I disagree

Rank **38**

Idea# **255**

FEDERAL GOVERNMENT ROLE »

Build a nationwide freely accessible Wireless Broadband network NOW

The single greatest thing that can be done to speed up innovation in EVERY area is to completely remove the telecoms from control of the internet. The internet is the nervous system of the world, and it is daily growing in it's ability to allow communication between scientists, the common people, and even nations.

Science and innovation are COLLABORATIVE efforts. The more widely available the net is, and the less restrictive it is, the more collaboration occurs, and the faster technological breakthroughs can happen.

But telecoms are driven by profits. They cannot and will not provide the kind of massive infrastructure that will be needed as we advance into new ultrahighspeed computers and even Virtual Reality over the next decade. They've decided that there should be limits on communication, and tolls on the information highway. They ignore low profit areas of the nation, robbing those who live there of their ability to connect to the rest of the world.

It is vital to change that. Building a nationwide wireless infrastructure to ensure every American has access to the Internet freely, without being forced to pay outrageous fees for that privilege is key to keeping America's technological edge. And yet, we've allowed ourselves to become the nation paying the most for the least access to a technological miracle THAT WE INVENTED.

Failure to create the needed highspeed wireless infrastructure that we needed a decade ago has already cost America enormously in our leadership in numerous scientific fields, and exposed us to ridicule for our failure to acknowledge the need to make internet access a right to all citizens. It's allowed our nation to stagnate technologically and cost us millions of jobs that could be created building, maintaining and administering a nationwide highspeed wireless network.

Our world is advancing daily at a breakneck pace. Already third world nations have access to technologies which our own nation is lacking in. We've allowed the telecoms to hobble us just to keep their profit margins high without having to work and upgrade their services to justify those profits. It's long past time that Internet access became a Utility, not a luxury.

Comment

Submitted by lsmcgill 14 days ago

victoryismine06 said:

I completely agree with what you are suggesting. I'd just like to add a link to a graph showing where the US ranks with the rest of the world in broadband speed. There should be no reason why everyone in the US doesn't have 100 megabits per second connection for free. Sadly enough I read (don't know the credibility) that the government already gave the telecom companies $200 billion (our money) to expand fiber throughout the states, yet here we are paying 30 times what Japan pays. Check out the article and decide for yourself.

http://www.worldpoliticsreview.com/blog/1088/top-30-countries-for-broadband-internet-access

12 days ago

victoryismine06 said:

Well Finland has just made broadband a 'legal right', check it out for yourself.

http://news.bbc.co.uk/2/hi/technology/10461048.stm

6 days ago

I agree

11
votes

I disagree

Rank **48**

Idea# **193**

FEDERAL GOVERNMENT ROLE »

Entrepreneurship

Set up a national idea submittal process online with the top 10 companies participating as reviewers in each field (IT, Bio, Nano). Let people easily submit their ideas, proposals and innovations etc. to the companies online in an easy manner. These companies can review submittals and proceed with submitter if proposal is innovative.

Comment

Submitted by bpmosullivan 22 days ago

I agree

11
votes

I disagree

Rank **48**

Idea# **254**

FEDERAL GOVERNMENT ROLE »

Protecting the United States from an Electromagnetic Pulse Attack

Until we have an approach to effectively deal with an Electromagnetic Pulse attack on the United States, which is only a mater of time, all other Science and Technology activities will be in vain.

http://www.empcommission.org/

We must establish as soon as possible the hardening of our electrical grid against an EMP attack. We also need to connect up the lines of communications between our militaries ability to detect a launch with those that can safe the electrical/communications grid before the high altitude detonation.

Beyond providing EMP resistant boxes around critical infrastructure, we need to fuse or have the ability to initiate physical disconnects of key systems from any EMP chargeable wire. Ideally by providing a path to ground for these wires we can discharge the EMP harmless into the ground, thereby prevent the complete destruction of system that took us more than century to build.

Just about every technology we depend on today or are planning for in future absolutely depends on the electrical/communication grid. As the commission correctly pointed failing to protect against such an attack is not recoverable and will result in 9 out of 10 American's losing their lives within a year of the attack. Even the EMP hardening that the military has done won't work on many systems because they largely fail to address the wires that lead into the harden boxes, the primary source of the EMP damage.

Why this isn't the focus of our nation is beyond me. The scenario above is worse than 1,000 9-11 attacks yet would consume less than one months of defense spending to solve.

tags: electromagnetic pulse attack | electrical grid | communications grid

Comment

Submitted by Community Member 14 days ago

I agree

10
votes

I disagree

Rank **55**

Idea# **219**

UNIQUE OPPORTUNITIES AT INTERSECTION »

scientific integrity

Get on with restoring science to its rightful place which is not with the cHRISTIan right.

Comment

Submitted by gerda 16 days ago

Community Member said:

you need to be more specific bro

16 days ago

I agree

10
votes

I disagree

Rank **55**

Idea# **194**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Open Internet Television with Open Video Markup Language

Fund the emergence of independent nonprofit standards bodies that can each propose an open video markup language(OVML) which will allow people to watch video through the web. Require all video produced using public funds (NPR, etc.) to use one of these OVMLs on all the video they put on the web. This will massively accelerate the emergence of Open Internet Television, break the cable and Studio monopolies into pluralistic networks with tens of thousands of specialty channels, and greatly improve the quality of information available to all American citizens.

More on this at: http://www.accelerating.org/articles/televisionwillberevolutionized.html

tags: internet television

Comment

Submitted by Community Member 22 days ago

Community Member said:

This is extremely important. Recent media standards that are being pushed as "open" are actually a tightly controlled standard that marginalize some groups in exchange for patent royalties.

16 days ago

I agree

9
votes

I disagree

Rank **58**

Idea# **248**

FEDERAL GOVERNMENT ROLE »

Build 21000 flexible fabrication facilities across the USA

Being able to make things is an important part of prosperity, but that capability (and related confidence) has been slipping away in the USA. The USA needs more large neighborhood shops with a lot of flexible machine tools. The US government should fund the construction of 21,000 flexible fabrication facilities across the USA at a cost of US$50 billion, places where any American can go to learn about and use CNC equipment like mills and lathes and a variety of other advanced tools and processes including biotech ones. That is one for every town and county in the USA. These shops might be seen as public extensions of local schools, essentially turning the shops of public schools into more like a public library of tools. This project is essential to US national security, to provide a technologically literate populace who has learned about post-scarcity technology in a hands-on way. The greatest challenge our society faces right now is post-scarcity technology (like robots, AI, nanotech, biotech, etc.) in the hands of people still obsessed with fighting over scarcity (whether in big organizations or in small groups). This project would help educate our entire society about the potential of these technologies to produce abundance for all.

For more details, see my post here:

http://groups.google.com/group/openmanufacturing/msg/07204d7025a50265?hl=en

Or here:

http://opengov.ideascale.com/a/dtd/8412-4049

tags: cnc biotech nanotech education

Comment

Submitted by pdfernhout 15 days ago

I agree

8
votes

I disagree

Rank **62**

Idea# **197**

IMPEDIMENTS TO COMMERCIALIZATION »

Alternative financing for innovation

One of the major impediments to commercialization is lack of financing - the so-called Valley of Death. One promising alternative funding source that has emerged over the past few years is intangibles-based financing. Companies have long been able to raise money based on their physical and financial assets. Such assets can be easily bought and sold, borrowed against, and used to back other financial instruments. As such, these assets provide companies with a source of the investment funding needed for the U.S. economy, allowing it to grow and prosper. In contrast, intangible assets are largely hidden, and therefore unavailable for financing purposes.

Two specific actions can help unlock this financing mechanism:

1) Development of SBA underwriting standards for IP. SBA should work with commercial lenders to develop standards for the use of intangible assets as collateral, similar to existing SBA underwriting standards. Allowing IP to be used as collateral will increase the amount of funds a company, such as one in the high-tech sector, would qualify for.

2) Create an IP-backed loan fund. Other nations have developed special programs to encourage IP-based finance. The U.S. should set up similar programs on a pilot basis, ideally run by the SBA to take advantage of its lending expertise. Technical support could be provided by the SBA's Office of Technology, which already coordinates the Small Business Innovation Research (SBIR) program. The SBA technology office also works with the U.S. Commerce Department's National Institute of Standards and Technology (NIST) on its Technology Innovation Program and has a hand in other federal science- and technology related initiatives. Such a direct lending program would be a step beyond SBA's current loan guarantee programs—direct lending is needed to jumpstart the process. Once the process of utilizing IP as collateral is fully established, the program could be converted to a loan guarantee structure.

tags: intellectual capital | knowledge economy | intangible asset financing

Comment

Submitted by kpjarboe 20 days ago

1276931406 said:

I voted "disagree" because I think that IP that is valuable is used either to rake in royalties or to protect products. Both bring in money. IP that doesn't do either of the two, simply has no value. We have been doing enough lending against future profits in the recent past.

19 days ago

kpjarboe said:

You are absolutely correct on both counts. The value in IP is in its utilization -- either as an enabler of protecting a product directly or as a revenue stream to the owner based on someone else using it to protect a product. The same can be said for any other asset -- a piece of machinery only has value because someone uses it to make a product. You are also correct that the financial system has had an orgy of lending on future profits. And these are exactly the reasons why we need to create standards for lending on IP. That lending already occurs. IP is included in financing deals -- either explicitly or implicitly through blanket liens. This presents both a danger (where financial institutions are dealing in assets they do not understand) and opportunity (to unlock a secure and safe source of financing capability for companies). While the market that is still in its infancy, now may be the best time to begin the process of ensuring that the appropriate policies are in place to help it develop responsibly.

Ken Jarboe

15 days ago

len8x said:

I generally agree with the original post about small business grants. Whether one is using SBIR, STTR, or SBA grants, it is essential to have a review panel comprised of individuals with commercial or scientific experience, preferably both. We can make blanket statements about lending being bad, as someone has done above, but developments in science and technology require taking the long view and investing in education and translational research grants. We know this.

15 days ago

I agree

8
votes

I disagree

Rank **62**

Idea# **242**

FEDERAL GOVERNMENT ROLE »

More assistance with defining and meeting regulatory data needs

Expand efforts to provide a clear regulatory pathway for nano products, and to help companies develop data needed to proceed along this pathway. Regulatory uncertainty has repeatedly been identified as an impediment to nanotech companies, and the perception of such uncertainty among the investment community as an impediment to raising private funding.

There should be more programs like the the NCI Nanotechnology Characerization Laboratory and the NIOSH nanotech field teams, where agencies work directly with companies to address characterization and measurement issues in specific regulatory contexts.

These kinds of programs allow

regulators and innovators to collaborate in determining how to best assure that environmental, health, and safety concerns are adequately considered. This helps move commercialization forward while safeguarding workers and the public. Of course, there needs to be thought given to how to allow for additional stakeholder inputs in such public-private ventures, while protecting confidential business information.

Comment

Submitted by phlippel 15 days ago

I agree

7
votes

I disagree

Rank **69**

Idea# **228**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Government must do what business can not do for itself

Government must educate and regulate and insure business is fair. It would be nice if the gov could start by leveling the field when it comes to government bid jobs by eliminate the continued problem or practice of creating a rejection criteria. When a product is offered as "an equal for intended use" different or any product that saves money should be considered; based on the merit of the offering. Often the company who got their product specified is the only bidder as being called out with some odd minor alleged oh so important features that makes it the only product that meets the specification. Second important for small business is the legal advantage that big business has over small. Litigation till the smaller company is finanically ruined is legalized robbery. Something needs to be done to stop predator behavior of larger business upon smaller firms.

Businesses are governed by people, corporate officers need to be held accountable for actions of those business they run when they do financial harm to others. This is racketeering, they need to think that they could be in trouble with federal law and if crimminal they need to be held accountable. Shelling out corporations and moving on and doing it over needs to be monitored as small businesses are hurt as crimminal operator move from one state to another and bad business hurts all business. Just like shoplifters cost us all - bad business needs to be dealt with.

Educate new business, how to protect themselves would be a great place to start. Keep a master list of alias and failed business names and complaints so cross state problem businesses can be stopped or punished or at least recognized.

tags: educate small business | regulate predator business practices

Comment

Submitted by laboratoryinteriors 16 days ago

I agree

7
votes

I disagree

Rank **69**

Idea# **247**

FEDERAL GOVERNMENT ROLE »

Science Will Save

Put money into K>12grade science classes and programs it is the only way humans will have a chance for solving the problems we have created.

Comment

Submitted by herb13 15 days ago

I agree

6
votes

I disagree

Rank **79**

Idea# **223**

UNIQUE OPPORTUNITIES AT INTERSECTION »

Invest in Green Chemistry

I suggest you substantially increase the US Government's investment in Green Chemistry, in much the way USG has made a targeted investment in nanomaterials. The existing portfolio of toxic chemicals in the US marketplace creates an enormous economic drag in the form of adverse health effects on workers and consumers, wasted energy and raw materials, and Superfund sites and other economic dead zones. Greater investment in Green Chemistry offers the prospect of eliminating this economic drag and enhancing productivity. For suggestions on moving forward through public endeavors, private efforts, and public-private partnerships, see, e.g., http://www.greenbiz.com/blog/2010/04/23/formula-building-green-chemistry-future and http://www.greenbiz.com/blog/2010/04/26/game-plan-accelerating-green-chemistry. For one of many available descriptions of the health care burden from toxic chemicals, see http://iehn.org/publications.reports.fiduciary.03-07.php

The downside of the USG investment in nanomaterials is inadequate characterization of the environmental health hazards of many materials that potentially can produce enormous environmental and other social benefits. See, e.g., http://www.greenbiz.com/blog/2009/09/09/nanomaterials-why-your-company-should-sweat-small-stuff

tags: green chemistry | nanomaterials | environmental health

Comment

Submitted by rliroff 16 days ago

I agree

6
votes

I disagree

Rank **79**

Idea# **244**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Examples of Basic and Applied Science Topics; Points of Intersection

Where do Nanotechnology, Biotechnology and Information Technology intersect? Investing in basic and applied sciences to fill future Science and Technology gaps

DNA-based computing

Though usually viewed as “the building blocks of life,” nucleic acids and proteins have a large potential to form the basis of future computers. At their core they represent nano-technology as they generally can be measured on the size scale 1-100 nm. A DNA-based computing chip would utilize nucleic acids site specific binding capacity to process and store greater amounts of information than typical silicon based computing. These essential building blocks provide the ability to perform a very complex set of processes, essential in a cascade of events, utilizing Adenosine triphosphate (ATP) hydrolysis to generate energy to power the DNA-based computers. This computing power may be particularly bio-compatible as inserting DNA-based computers in-vivo should both perform a number of functions and processes, e.g. the ability to analyze and store great quantities of retrievable data.

Chem-Bio Defense

The current soldier’s uniform provides essentially no proactive chemical or biological protection. A bio-functional uniform can be engineered to mimic in-vivo physiological conditions such as temperature, pH, glucose concentration and atmospheric pressure in nano-environments providing an optimized environment to detect multiple select pathogens/agents. Utilizing the concept of molecular scaffolding, it may be possible to develop an organized network of various nano-laboratories within the uniform. The utilization of a dual-use hydrophobic/hydrophilic functionalized textile offers the ability to "attract" and “repel” a myriad of biological and chemical agents based on an agent’s chemical polarity. Furthermore, the ability of single molecule nucleic acid sequencing through nanopores offers real-time sequencing analysis and biological agent detection on the uniform. Once the agent(s) is detected the release of nano-prophylactics ensures the soldier is diagnosed, treated and managed at the point of contact.

Intelligent-chemotherapeutics

Traditional drug therapy is often administered in large doses, to maintain minimally effective drug levels. Current research efforts have focused on developing inexpensive nano-scale vehicles to deliver chemotherapeutics to tumors with high specificity, cutting the necessary dosages of the drugs while preventing side effects through interactions of the drug with unaffected areas of the body. These vehicles could carrying a “pharmacy” worth of chemotherapeutics, calculating optimal dosages of an appropriate chemotherapeutic for a particular cancer type while potentially having the ability to release and activate their therapeutic payloads at particular points in the body. Essentially, the intelligent-chemotherapeutic delivery vehicle has the ability to discriminate between healthy and diseased tissue so that it may diagnose, treat and manage cancer effectively and efficiently. This technology has the potential to minimize cancer deaths substantially.

Food Safety & Security

The magnitude and extent of recent food-borne disease outbreaks, such as the widespread Salmonella and E. coli. incidents, highlight the potential disasters that could occur should the U.S. food infrastructure become the target of a terrorist attack. These outbreaks are often difficult to investigate and contain because the processing chain of plant and animal food products can be so complex involving first a disperse network of farms, producers and distributors, then restaurants or stores, and many consumers. Plants or animals from a large industrial farm can end up in the products of several different companies. A DNA-genomic tag in each plant or animal, indicating its original source, would make it much simpler to pinpoint the source of an outbreak, limiting its scope and potentially saving many lives. The J. Craig Venter Institute recently incorporated a nucleotide ‘alphabet’ code into the genome of their synthetic self-replicating bacterial cell, proving that genes can be constructed and inserted into the genome of a plant or animal without being expressed, thereby posing no risk to food quality. The ability to precisely locate the origin of infected food products would improve the safety of all Americans as well as saving money by reducing unnecessary recalls.

The Artificial Cell

Engineering a cell from the bottom-up presents an interesting challenge. Starting from non-living organic and inorganic matter, science may create nano-sized cells with life-like properties. This cell would need to be a self-enclosed entity with the ability to self-replicate, metabolize, and interact with other cells and the environment. Current attempts have resulted in light-catalyzed reactions that produce lipid micelles and, within, the replication of RNA. Other experiments include the creation of chips with tiny chemical channels controlled by computers. Despite considerable progress, artificially engineering parts that mimic enzymes, creating algorithms that govern them, and integrating all of the necessary components remains an ambitious task. However, the creation of an artificial cell would allow us to create complex, evolving nano-systems useful towards many ends.

About the Authors

Michael A. Morgan, PhD is an expert and published author on the subject of Bio-nanotechnology. He currently works as consultant supporting the Basic and Applied Sciences Directorate at the Defense Threat Reduction Agency.

Emily Osborn supports the Defense Threat Reduction Agency, Basic and Applied Research Division, while working on her Master of Science degree in Information Systems at George Mason University.

Timothy Lee is a 2010 Defense Threat Reduction Agency summer intern. He is currently pursuing his Bachelor of Science Degree in Chemical and Biomolecular Engineering at the University of Maryland.

The comments and views expressed are our own and not reflective of any of our current or past employers

Comment

Submitted by mikemorgan55 15 days ago

I agree

5
votes

I disagree

Rank **86**

Idea# **226**

IMPEDIMENTS TO COMMERCIALIZATION »

Mr

repeal the bush bankruptcy act of 2005, so small business can thrive again

Comment

Submitted by rxxgary 16 days ago

I agree

5
votes

I disagree

Rank **86**

Idea# **265**

FEDERAL GOVERNMENT ROLE »

Explore proposals for sustaining the economy despite ubiquitous automation

The book, “The Lights in the Tunnel,” addresses the issue of an ever increasing percentage of jobs being lost to automation. The basic thesis is that the trend toward lost jobs will only continue to accelerate and many of the “green collar” jobs will be one-time building and installation work; therefore, a fundamental change will be needed to sustain markets and consumerism so that we do not revert back to a feudal economy where only the wealthy corporations trade with each other: companies will need to be taxed for much of the profits accrued by innovative automation technology and the proceeds should be given back to the public in meritocratic, pro-social ways that also foster the advancement of science, technology, and innovation and the sustaining of markets via inclusive consumerism. Money could be granted for people to further their education, especially in the areas of science, technology, business, and a wide array of “open-source innovation” projects, including community building efforts. America still has the market to sustain business interest, and will continue to sustain business interest as long as most citizens can remain active consumers (ones increasingly rewarded for pro-social investments). The Obama administration can make this necessary revolution happen before the economy crashes again in an dramatic, unsustainable boom-bust cycle. Business-as-usual no longer will be sufficient to sustain our markets this decade.
http://www.thelightsinthetunnel.com/

tags: automation consumerism consumers markets sustainability pro-social education investment revolution business opportunity

Comment

Submitted by neurobionetics 12 days ago

vbgraphix2003 said:

Hey, love the idea of confronting the issue of technological unemployment. Though, I think the best ways of confronting the issue include:

-Stronger Overtime Laws

-A Basic Income funded by our common inheritance of the bounty of the Earth, as with the Alaskan Permanent Fund

Taxing automation is contrary to the public good. In fact, if anything it should have more tax deductions.

We just need to make sure the work is spread out and that people all benefit from the abundance which is generated.

12 days ago

I agree

4
votes

I disagree

Rank **93**

Idea# **200**

FEDERAL GOVERNMENT ROLE »

Create and Enforce Auditable Policies for Automation

Recent problems with the financial industry and with the oil spill in the gulf highlight the weaknesses in government and corporate policies. Policies in use today are used as guidelines that may or not be followed, and they are essentially untraceable. This results in an environment where in-appropriate decisions are made for personal gain or because of poor judgment. Other decisions that should be made quickly are often delayed because of lack of commitment, laziness, or fear of negative consequences. In other cases, the policies (described in volumes of textual information) are too complex for most humans to understand (assuming they actually took the time to read them); again providing an excuse not to follow them.

A new technology is available to describe the complex behaviors (policies) that could be implemented and measured. Compsim's KEEL Technology would expose all the items that need to be considered, all the pro's and con's that need to be valued, and all the interactions that need to be taken into consideration. While this could be accomplished using higher mathematics, doing this would be impractical because the cost to generate the "formulas" would be prohibitive. And, most people responsible for creating and evaluating the policies would not be able to understand them. Compsim's KEEL Technology is supported with a "dynamic graphical language" that makes it relatively easy to define complex (dynamic, non-linear, inter-related, multi-dimensional) behaviors / policies.

Additionally, to provide effective policies to operate in an ever-more complex world, they must be able to be automated. Policies described in the KEEL dynamic graphical language can be packaged as KEEL Engines and embedded in devices and software systems. This would make it easy to audit and examine the behavior of these systems since they would be traceable to the implementation of the policy. Unlike textual documentation, every piece of information could be immediately traced to its source.

Examples:

In oil drilling, it should be possible to integrate safety policies into the drilling equipment so that ignoring certain safety considerations in pursuit of speed and profit would be blocked by the equipment. The equipment would just refuse to work and could broadcast the problem to management and to regulatory organizations.

In financial and medical systems, ethical policies could be integrated into systems that would warn consumers and regulatory organizations of unethical practices.

Summary:

Policies are often provided in order to guide users between conflicting issues (short term gain vs. long term strategy, risk vs. reward, speed vs. safety) for the overall objectives of an organization. Decision-makers are often reluctant to describe how they valued the drivers they used to make their decision. But as the world gets more and more complex, the potential for disaster will get larger and larger (and happen more and more frequently) unless some means is established to automate the execution of auditable policies. Compsim's KEEL Technology should be evaluated for this purpose for the overall good of the nation.

tags: regulations policies enforcement automation technology behavior financial medical safety military industrial

Comment

Submitted by Community Member 19 days ago

Community Member said:

Once systems become autonomous they are likely to be turing complete. Basic computer science theory will tell you that the KEEL system will not really work and just imposes unnecessary restrictions on technology.

16 days ago

I agree

4
votes

I disagree

Rank **93**

Idea# **237**

UNIQUE OPPORTUNTIES AT INTERSECTION »

biotech companies

biotech companies have not provided sufficient proof of the safety of their products. They must be required to fund independent research and to make publich all results. Until this proof is provided, they should not be allowed to market these products. Sufficient protection for organic farmers is required, and the safety of agricultural chemicals (such as roundup) has to be documented. Lobbyists or former employees of these companies should not be allowed to serve in any government agency. The FDA has been infiltrated with company representatives who have the interest of their companies more in mind thanb the health of the public, a thorough housecleaning is required. Similar considerations surely exist for other agencies.

Comment

Submitted by Community Member 16 days ago

I agree

3
votes

I disagree

Rank **111**

Idea# **257**

IMPEDIMENTS TO COMMERCIALIZATION »

Lack of Venture Capital

Working with a University Technology Transfer Office in the midwest, one of the biggest issues is finding venture capital. Many of our midwest start-ups must re-locate to either the east or west coasts to be close to the venture capitalists.

Illinois has started to address this problem by offering a state-run venture capital fund, allowing companies to stay within the state. If the US government could help states set up some of these funds, or provide regional venture funds, I think it would help states like Michigan and Ohio that are hemorrhaging highly paid technical jobs.

Comment

Submitted by claxtonh 14 days ago

I agree

3
votes

I disagree

Rank **111**

Idea# **264**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Research the primary cause of degenerative diseases: aging / biological senescence

At present a sum 457.2 billion dollars is devoted to U.S. health care. Much of that money is devoted to researching late-stage progressive diseases associated with biological senescence that comes with increases in chronological age. A small fraction of that money, say one million dollars over ten years, could be redirected to biotechnology / information technology companies advancing legitimate science and technology that could slow and eventually halt the biological degradation of human aging, resulting in immense reductions in health care costs and a significantly healthier workforce. The Obama administration has the opportunity to advance the pace of this revolution considerably this term or next term with a relatively modest fiscal allocation to research and development coordinated by the SENS Foundation (Strategies for Engineering Negligible Senescence) and the Methuselah Foundation. Again, the result would be a healthier workforce and drastically reduced health care costs. http://www.sens.org http://www.mprize.org

tags: aging | biological scenescence | sens | methuselah | cure | revolution | cost | reduction | life | youth | old

Comment

Submitted by neurobionetics 12 days ago

I agree

2
votes

I disagree

Rank **117**

Idea# **221**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Forget about solar cells, there are many solar alternatives

The problem with solar cells is that they depend on precious metals which are scarce.

Instead there are other systems that apply heat engines to transfer the energy of the sun into power. For example, take a look at the Sun Catcher

http://www.tesserasolar.com/

tags: alternative energy | sun | http://www.tesserasolar.com/ | sun catcher | sterling | heat engine

Comment

Submitted by Community Member 16 days ago

I agree

2
votes

I disagree

Rank **117**

Idea# **201**

FEDERAL GOVERNMENT ROLE »

FDA Recalls

This has been an on going campaign on my blog for a few months now, consumers, hospital CIOs, pharmacists and others are 100% in this. Rather than write a book will give you links to where it was featured on Microsoft Gov and MSDN. By the way, the White House could use this technology too for their next event to make life easier on the Secret Service and maybe buy a Surface computer too.

http://ducknetweb.blogspot.com/2010/05/microsoft-tags-microsoft-msdn-posts.html

It is also kind of fun and enough of a gimmick to engage consumers and everyone else with healthcare information as well to be able to use your cell phone to scan for FDA recalls. FDA would benefit with compliance with maintaining a synchronized data base and it would help the DEA and other law enforcement agencies with identifying counterfeit and stolen drugs, cures a lot of ailments with one technology.

tags: healthcare | health it | barcoding | tags | drugs | recalls | fda

Comment

Submitted by ducknetservices 19 days ago

I agree

2
votes

I disagree

Rank **117**

Idea# **222**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Clean Energy Development Fee

Based on an average 12,000 mi. per year @ $3 per gallon

35 miles per gallon or 343 gallons per vehicle as the break even point.

A car getting 30 mph estimate over 12,000 miles uses 400 gallons and at the time of sale would pay a 57 gallon Energy Development Fee of 57 gallons X $3 per gallon $171 each year for driving a car getting less than the federal guidelines for fuel consumption..

This fee would go to a dedicated Green Energy Fund to develop green energy and green energy manufacturing in the USA. It is time for the citizens of this country to feel a little of the pain to achieve energy independance.

THIS WOULD BE VERY PAINFUL POLITICALLY AND WOULD REQUIRE BIPARTICIAN SUPPORT BY POLITICAL LEADERS WHO HAVE A GREAT DEAL OF COURAGE. TIME TO WALK THE WALK.

Comment

Submitted by yankdj 16 days ago

Community Member said:

I'm not against achieving energy independence but I don't think taxing those who do not meet a proposed standard is a liable solution. I understand your point of this fee to help persuade people into buying more efficient vehicles. However, the standard would need to be continually raised, which would in turn cause a turnaround time on a car to be every two years or so (just a guess). Now that may not be much different from our present economy, but I think used vehicle sales would be hit very hard if a buyer was going to be penalized for buying a used vehicle. I have not met too many people who would not readily buy a newer vehicle if they could afford it. Many people just cannot afford to purchase a new vehicle and I don't see this fee making a profitable difference in either money or energy.

15 days ago

I agree

2
votes

I disagree

Rank **117**

Idea# **225**

FEDERAL GOVERNMENT ROLE »

I don't like this little form

I can't see the question; and this little box does not move. This is preventing me from make a response. So the first idea is get rid of this dumb box.

The next is the creation of a metadatabase. A database of the scientists in a given field (nanotechnology, biotechnology) and have a collection of their data. There should be a description of the data collected; and a form to request access to the data.

We must have a database of long-term data. This is something only the government can really do, similar to the Library of Congress.

Then we need to have expert systems. There should be priorities made for which scientists are most important to store their knowledge; and would be willing to share their knowledge. Then create an expert system.

Comment

Submitted by tmguynup 16 days ago

I agree

2
votes

I disagree

Rank **117**

Idea# **224**

UNIQUE OPPORTUNTIES AT INTERSECTION »

FREE HEALTHCARE TO FREE OUR GENIUS

With free healthcare, America's collective genius is freed to do its wild western thing, namely outthinking the world, instead of tiptoeing through life shivering in terror at the possibility of getting too sick to protect their family. For goodness' sake, half the over-50 executives would quit to write and paint and invent overnight, opening up a million jobs for new college grads. Moneycare is intellectual slavery.

Comment

Submitted by robinsband 16 days ago

robinsband said:

A week in a hospital bed "costs" more than a year's average salary, because Moneycare seduced hospitals into betting on overbuilding. Nothing-- NOTHING-- else has gone up a hundred times in price since the '60's. And it's why college tuition, property taxes, and all the rest go up as fast as they do, with no visible benefit. With free healthcare, cancer is history in 5 years, guaranteed. Thinking is cheap. Fear is unbelievably expensive.

16 days ago

I agree

2
votes

I disagree

Rank **117**

Idea# **258**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Encourage universities to start offering entreprenure-track positions

Many technological breakthroughs happen at universities.

And, for these technologies to make it to the commercialization stage, they really need the technical support from the original inventor (i.e the faculty member.) However, as a faculty member at a research university, your priority is basic research, publications, and teaching -- not patents and start-ups. And because of the time commitments of the former, inventors can't spend the required amount of time advising, and consulting the resulting start-up. Thus the technology flounders.

I would like to see universities offer an entrepreneur-track position. One in which the goal of the researcher is to eventually commercialize a break-through technology. These faculty members would not have the teaching obligations and publication requirements typical of faculty members. Instead, these faculty members would focus on transferring and advising the further development of their technologies in the commercialization stages

Comment

Submitted by claxtonh 14 days ago

claxtonh said:

Additionally, or alternatively. I would like to see universities offer entrepreneurial sabbaticals. Such that if a faculty member is able to patent and license a technology, they may take a year off and continue to further develop the technology with the resulting company.

14 days ago

I agree

2
votes

I disagree

Rank **117**

Idea# **266**

IMPEDIMENTS TO COMMERCIALIZATION »

EDA/SBA Matching Grant Program to Foster Commercialization through Venture Capital

Create a new matching venture capital program jointly administered by the EDA and SBA. The goal of the fund would be to foster commercialization for specific technologies that could serve national needs (e.g. energy independence, high performance buildings, IT, biotech, health care innovation etc.). Venture capital groups would apply to the EDA/SBA and could be awarded matching funds for commercialization of promising technologies.

tags: venture capital | economic development administration | small business administration | matching grants

Comment

Submitted by mbronstein12 11 days ago

I agree

1
vote

I disagree

Rank **144**

Idea# **198**

BASIC RESEARCH DIRECTION »

new solar cell

if we use both of nanogold p[articles with the berkely lab silcon nanowire Feeling the Heat: Berkeley Researchers Make Thermoelectric Breakthrough in Silicon Nanowires we wil;l get high efficent solar cell

Comment

Submitted by saifelislam.mostafa 20 days ago

Community Member said:

there are better alternatives to cell technology:

http://www.tesserasolar.com/

We don't need to rely on precious metals.

16 days ago

I agree

1
vote

I disagree

Rank **144**

Idea# **227**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Petrolium eating Microbes

Use the petrolium eating microbes befoe we kill the oceans and all life in it! Expensive? Not compared to killing the waters that keep us alive and earth in balance! BP/Hliiberton/etc need to step up to the plae here

Comment

Submitted by Community Member 16 days ago

I agree

1
vote

I disagree

Rank **144**

Idea# **206**

BASIC RESEARCH DIRECTION »

Does cell division controlled by brain?

In the organisms with out brain the cell division occurs.. and the simple actions like asexual reproduction, transformation into other farms also occurs.. i think those are controlled by the nuclear material in them... so the nuclear material is hitler i.e., the controller of the cell actions in them. and in mother womb, the embryo was not connected to any nerves of the brain of mother.and in plants there was no controlling organ.. so, i think that the brain does not control the cell divisions.. DNA or RNA, which ever the nuclear material controls the cellular actions. so if we absorve the changes occured during the cell division.. we can make every living cell into a stem cell.thus curing diseases very easily and also we can control the over reprodution of cancer cells.. and if it was false, there must be a controlling organ in plants.. and in the organisms without brain...WILLING THAT MY IDEA MAY ALSO HELP YOU TO SERVE BETTER TO THE WORLD.thankyou.

tags: biotechnology limits | nanotechnology | stemcells

Comment

Submitted by sprasanth999 19 days ago

sindhu023 said:

super thought.. but, some research shud be done..

18 days ago

I agree

1
vote

I disagree

Rank **144**

Idea# **240**

UNIQUE OPPORTUNTIES AT INTERSECTION »

GULF problems

All the chemicals B.P has put into the gulf need to be identified and who gave permission to use them . also when water evaporates will these chemicals become part of the rain?

Comment

Submitted by genesteam 16 days ago

genesteam said:

The laws are made to protect the enviorment, then new politicans can change the laws to suit lobbists . greed kills

16 days ago

I agree

1
vote

I disagree

Rank **144**

Idea# **241**

IMPEDIMENTS TO COMMERCIALIZATION »

Encouraging first use

Identifying and gaining suport from first customers are always an issue for emerging technologies. In nanotechnology (and probably many other emerging technologies) this means the commercialization path for work originally funded by, say, NSF or NIH is quite different from that for work funded by DOD or NASA (where the government or a major gov't supplier is usually the first customer).

Think about programs to create government-sponsored or funded first-use opportunities for work coming from those agencies that don't have their own substantial late-stage development and deployment funding.

Comment

Submitted by phlippel 15 days ago

I agree

1
vote

I disagree

Rank **144**

Idea# **249**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Innovation and Technology Advisory Committee (PITAC)

The creation of a framework that is based on scientific integrity for any policy would be a good start. We've had many years now of political spin and pandering to fear-based emotions instead.

Comment

Submitted by ccselavy 15 days ago

I agree

1
vote

I disagree

Rank **144**

Idea# **253**

UNIQUE OPPORTUNITIES AT INTERSECTION »

Space shuttle

Why space shuttle must continue to fly

Discontinuing the Space Shuttle program is reversible. Retaining the Space Shuttle capability for two flights per year until 2015, or until another U.S. launch vehicle provided by either NASA or private sector is available, is a national policy decision.

By Congressional direction, shuttle contractors continued to be funded until April of 2009. Thus many are still in the process of closing their contracts. To restore contractors ability to maintain STS flights will require additional money. GAO should be asked to perform an immediate analysis of the funding impact of continuing to launch the shuttle until 2015. The cost per launch at two flights per year, also should be reevaluated.

If we retire the Space Shuttle after the next scheduled flights, we are giving up our national capability to launch our own astronauts into Earth orbit for a period of five years or longer. This means relying on Russia to ferry our astronaut scientists, along with astronaut scientists from other countries. The cost per astronaut ticket to the ISS is $51 million for the next two years. After that time the cost will increase.

We will be completing the construction and outfitting of the ISS during the next four shuttle flights. At that point the laboratory will finally be ready to do its best work. We need to make sure that we get every bit of research and advanced technical knowledge we can from our nation's investment, to date of over $50 billion.

Half of the U.S. portion of the ISS was designated a "National Laboratory." Universities and other research entities will be funded to use this incredible research platform. Two or more US crew should be on the ISS at all times to assist those US experimenters who wish to utilize the ISS. The Shuttle can support this effort with equipment, consumables, and researchers more fully than either the commercial efforts now under development or Soyuz-Progress.

It is possible the US private sector, with major funding provided by congress, and other countries, may develop spacecraft and boosters capable of carrying crews to the ISS. However, at this time it is not possible to predict if or when this capability would be available.

While Russia has a limited capability to supply the ISS, it is not able to carry large and heavy components if something should fail. It is possible, however unlikely, that the ISS could be incapacitated after shuttle is retired and have to be abandoned long before the end of its currently projected operational life, 2020. The possibility of impact damage that might result from increasing amounts of orbital debris should not be ignored.

Flying the Shuttle safely means managing the risk…as we have always done. A re-certification might be in order to answer various concerns and cautions from the NASA Safety Advisory Panel, however, as NASA managers have stated, the shuttle is re-certified before every launch.

Although STS technology goes back to the 1970's, it has undergone continuous upgrades, including the External Tank, SRBs, and the shuttle itself. There is presently one spare External Tank and one spare set of solid motors, but there are more than 20 SSME motors currently in storage along with some spare structural components.

One scenario, probably the most cost effective, and save thousands of jobs at KSC, Michoud and ATK, is to keep the shuttle flying at a rate of two flights per year. There is no hard requirement to fly the last two missions this year. By stretching out these flights until the end of 2011, it would allow contractors to get back up to speed and close the gap when we would not have a US capability to send crews and supplies to the ISS.

Another reason to stretch out flights until at least 2011. Goddard Space Flight Center has been studying in flight refueling. They have been developing a demo that needs to be carried by a shuttle. But it won't be ready until 2011. In flight refueling you might remember was a recommendation of the Augustine Committee.

Comment

Submitted by db1030 14 days ago

I agree

1
vote

I disagree

Rank **144**

Idea# **260**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Revolution in transportation

A new transportation paradigm is needed to avoid excessive oil consumption. Energy should come directly from the sun. New biothechnologies, nanotechnologies and other technologies are needed to achieve this.

tags: energy transportation

Comment

Submitted by Community Member 13 days ago

I agree

1
vote

I disagree

Rank **144**

Idea# **261**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Fundamental research

The private sector is driven by commercialization of near-term technology development, and understandably reserves research resources for applied research. The government is the only source of support for fundamental research, the research that lays the foundation for future discovery and unforseen innovations. Government research is becoming too enthralled with applied (buzz word "transformational") research, and needs to maintain support for fundamental research as the priority. This is so across the physical and life sciences.

Comment

Submitted by metzilla 13 days ago

I agree

1
vote

I disagree

Rank **144**

Idea# **262**

UNIQUE OPPORTUNITIES AT INTERSECTION »

Organic food and a healthier America

I encourage support for organic farmers which in turn will bring prices down so more people can buy it, resulting in a healthier American people which leads to a strong economy through right ecology. Thank you.

Comment

Submitted by marshaj11 13 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **199**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Shared IP resource grant and tax incentive

There are currently established programs sponsored by the goverment relating to new technology development through universities, Many of the companies developing these technologies, or intrested in ultizing the outcomess, do not have the resources nessary to invest in the capital required for the initial research or prototype development. Pooling such reasources and grant through the established university programs and finding willing corporate partners who are willing to assume part of the risk for developing prototypes whould all share in the fianl IP rewards. This is quite different from the typical capilist model in which companies fight to own every single piece of IP. A goverment establishment that would eliinate the cost of such infighting and legal issues associated with IP ownership would establish a basis for the initial development and prototyping for all companies involved, A goverment sponsored organization would own the IP and only be allowed to lience it to the partispating sponsoring companies, little or no fee would be charge for such liencing by the goverment owned corporation. Once a sucessful prototype and manufacturing system was established and initial liencing underway, The companies would then be free to alter and upgrade the intitial protypes based on their skills and ingenuity to further develop their internal IP. This would reduce the high cost of the inital prototying stage (one of a kniond) so that a mass production stage and multipe copies could be established for cost reduction.

Comment

Submitted by umchoas 20 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **269**

UNIQUE OPPORTUNITIES AT INTERSECTION »

International Forum on Cancer, Materials Science and Nanotechnology

On July 15, 2010 at 8:00 am (Los Angeles) the Egyptian Cultural and Educational Bureau is holding a videoconference, entitled "International Forum on Cancer, Materials Science and Nanotechnology." The videoconference is a prelude to 2011 US-Egypt Year of Science. Other venues include Cairo University, UCLA, University of Texas Health Science Center and Georgia Institute of Technology.

Agenda

11:00 am (Washington, DC)

Egyptian Cultural and Educational Bureau—Maha M. Kamel, MD, PhD, Director, moderator

National Cancer Institute Health—Piotr Grodzinski, PhD, Chairman, NCI's Nanotechnology Alliance, speaker

University of Texas Health Science Center—Mauro Ferrari, PhD, speaker

11:30 am (Washington, DC): CNSI Auditorium at UCLA

CNSI (UCLA)—Paul S. Weiss, PhD, Director, speaker

CNSI (UCLA)—Jeffrey I. Zink, PhD, speaker

CNSI (UCLA)—Fuyu Tamanoi, PhD, speaker

12:00 noon (Washington, DC):

Georgia Institute of Technology—Mostafa A. El-Sayed, PhD, speaker

Civilian's Research and Education Foundation—Eric J. Novotny, PhD, Senior Vice President, speaker

12:30 pm (Washington, DC):

Cairo University—Abdel Rahman Vikri, PhDPresident, National Cancer Institute (Egypt), speaker

Cairo University—Ahmed Galal Helmy, PhD, Dean of the Faculty of Science, speaker

Future titles for videoconferences include:

Materials Science Applications to Archaeology with a focus on the Valley of the Queens

Entertainment Technology for Cinema and Ancient Egypt

tags: 2011 year of us-egypt science

Comment

Submitted by wedjohansen 20 hours ago

I agree

0
votes

I disagree

Rank **173**

Idea# **202**

UNIQUE OPPORTUNITIES AT INTERSECTION »

Auditable Behavior for Autonomous Devices and Systems

Controlling biological and nanotech systems demands that their behaviors can be audited to maintain safety, especially when large volumes of these systems will be created. These systems cannot be allowed to evolve on their own in some unknown manner without risking the entire population of the earth.

There is an obvious move to utilize technology to solve more and more complex problems. In the military and certain industries, autonomous systems are being challenged to take over safety critical tasks where human error due to lack of attention, lack of situation awareness, task complexity, or just poor judgment cannot be tolerated. Many of these systems will utilize biotech and nanotech sensors and actuators. Information technology will provide the coordinating and behavioral modeling glue to monitor and control advances in these fields. It can be noted that, for the most part, the biotech and nanotech space is analog rather than digital. So to use conventional “digital” technology to accurately describe the behavior of analog systems requires a translation from analog to digital and back when conceptualizing solutions. Today, complex mathematics may also be required to describe complex behaviors. Complex formulas have to be translated into conventional computer programs and debugged before they can be tested. This is a costly exercise.

Compsim has invented a new way to process information (Knowledge Enhanced Electronic Logic, or KEEL Technology) that effectively provides a new way to address complex (dynamic, non-linear, inter-related, multi-dimensional) problem sets (a.k.a. analog behaviors where interaction between analog entities is taking place). As a “technology”, KEEL provides a new way to process the information. Part of the KEEL technology umbrella is the KEEL “dynamic graphical language” that allows one to capture, test, package, audit, and explain these behaviors, so that they can be deployed as “KEEL Engines” on conventional computing platforms. KEEL Engines have a very small memory footprint, making them suitable for very small systems. These small KEEL Engines can still provide the needed complex behaviors. KEEL Engines can even be packaged as analog circuits.

Unlike complex mathematics, where one translates concepts into numeric values and writes formulas to describe behaviors, the KEEL dynamic graphical language allows one to describe behaviors in a visual / analog manner without translating to textual values. Behaviors (functional relationships) are described by wires. The modeler thinks about the behaviors, not the formulas required to describe the behaviors. The modeler “thinks in curves” and interacts with the design as the behavior takes shape. A KEEL “Engine” is being automatically created behind the scenes. This greatly accelerates the creation of complex models.

The behaviors of analog systems are often complex to audit. With KEEL tools and extensions to the KEEL Engines (automatically generated), a user can “watch a system think”. In this case we are talking about how the system reacts to complex, non-linear reactions to analog influences. KEEL models are easy to modify and extend as the biological systems may evolve on their own.

Summary:

It is necessary to have a control system that complements the biological and nanotech components that exhibit complex analog behaviors. This will become increasingly more important in the development of more capable autonomous systems. The government should become aware of this new technology and its potential strategic to impact military, medical, industrial, financial, energy, transportation markets.

tags: information technology | behavior | auditable control | c2 | analog systems | policies | military | medical | industrial | organic | auditable behavior | safety | strategic | disruptive technology | nano control

Comment

Submitted by Community Member 19 days ago

Community Member said:

Once systems become autonomous they are likely to be turing complete. It won't work. Basic computer science theory will show you that turing equivalent computation can not be perfectly analyzed. So, it is unlikely any proof system will succeed.

Don't impose unnecessary restrictions on technology.

16 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **218**

UNIQUE OPPORTUNTIES AT INTERSECTION »

OpenPCAST Technical Issue

Thanks to those of you who have pointed out a technical difficulty we have been having with the OpenPCAST website. In response to the questions, you are seeing all the comments that have been submitted on this topic -- either on the top page or the four categories. However, the technical challenge we are having is that although we have archived our previous discussion on advanced manufacturing, it is still including the ideas received there as part of the count for our new dialogue on information technology, biotechnology, and nanotechnology. We are attempting to correct the problem.

tags: technical problem

Comment

Submitted by PCAST Moderator 16 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **209**

IMPEDIMENTS TO COMMERCIALIZATION »

OpenPCAST Seems to be broken

Reconfigure this program so that participants are able to view more than the 15 most recent ideas. There are 192 ideas that are invisible on 19 June 2010. The search function also appears to be nonfunctional.

tags: software failure | lack of transparency | defective software | configuration error

Comment

Submitted by c0030180 18 days ago

c0030180 said:

The controversial H-1B Visa program should be terminated immediately as it is an impediment to the development of new technology in the U.S. Milton Friedman called the H-1B Visa program a "government subsidy" in a 2002 article as it allows employers access to high-skilled labor at below-market wages as a consequence of the gaping loopholes designed into the employer-designed program which was created in 1990. Commerce Minister from India, Kamal Nath correctly labelled the H-1B Visa program as the "Outsourcing Visa" in a 15 April 2007 New York Times article. People from India are trained in the U.S. in taxpayer-subsidized college programs, then hired to work in the U.S. via the H-1B Visa program, and then return to India with considerable technical knowledge. This competition is decimating U.S. firms.

Millions of U.S. citizen technical professionals have become prematurely obsolete as a result of the workforce gluts generated by bloated government subsidy programs such as H-1B. Cumulative H-1 and H-1B Visa admissions to the U.S. between 1975 and 2005 are in excess of 4 million.

You may learn more by using Google to locate the PDF version of the 2007 article, "The Greedy Gates Immigration Gambit." While William Gates, III has repeatedly raised the false claim that H-1B Visa holders are "the best and the brightest," the reality is that Microsoft and Gates hired the best and brightest lobbyist and his team in December, 1994. That lobbyist's name is Jack Abramoff. Team Abramoff helped Microsoft to channel about $100 million in politically connected expenditures between 1995 and 2000 to less-than-ethical legislators. Microsoft helped to procure 3 employer-friendly changes to H-1B Visa law in 1996, 1998, and 2000. The cited article provides more documentation. More details are available in Exhibit 40 in the case USA v. Abramoff, available via PACER. (For many individuals, access to exhibit 40 will be free after they register.) Exhibit 40 is a 110 page legal filing that summarizes the corrupt roots of the H-1B Visa program.

Work visa programs such as H-1B enrich the economic elite by billions annually. These benefits are privatized while the social costs of the H-1B Visa program are socialized.

18 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **210**

BASIC RESEARCH DIRECTION »

Terminate the H-1B Visa program immediately

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tags: competitiveness loss | h-1b visa | political corruption | microsoft | abramoff

Comment

Submitted by c0030180 18 days ago

c0030180 said:

The URL for The Greedy Gates Immigration Gambit is http://tinyurl.com/37l8ry

18 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **245**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Create trans-disciplinary expert ramification panels

Create trans-disciplinary expert ramification panels to work with researchers as the research unfolds, (not after it has been concluded) to create exploratory scenario plans of the environmental, social, ethical, and economic ramifications of the potentialities of research outcomes. Such thinking should also be part of the funding application structure and incorporated into the fabric and thinking of future researchers and business ventures. This can help to ensure safety while also fast tracking research to market delivery.

Comment

Submitted by ruiz 15 days ago

ruiz said:

It is of the utmost importance that the experts on the trans-disciplinary ramification panels be from outside of solely self interested parties. We have seen too many failures of corporate self regulation.

13 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **250**

IMPEDIMENTS TO COMMERCIALIZATION »

Towards building a 21st-century society in the USA through open research

An emphasis on commercialization and job creation is ultimately misguided since the need for human labor will diminish in the post-scarcity world we are creating as we develop these technologies, resulting in a world full of material abundance. As suggested in "The Triple Revolution Memorandum" to President Johnson in 1964, the "income-through-jobs link" is breaking, due to robotics, automation, better design, better materials, voluntary social networks, and other advances (though it has taken longer than predicted there), so ultimately solutions to that are things like a basic income, a gift economy, resource-based economics, and/or increased local self-sufficiency in stronger communities.

Thus, we should be focusing government funds on free and open source projects and explorations of alternative economics, not on subsidizing proprietary projects by trying to prop up a system whose scarcity assumptions are rapidly being invalidates by modern technology. The biggest challenge of the 21st century is the irony of technologies of abundance in the hands of those thinking in terms of scarcity.

I make related comments at these three links:

http://www.pdfernhout.net/open-letter-to-grantmakers-and-donors-on-copyright-policy.html

http://www.pdfernhout.net/on-funding-digital-public-works.html

http://www.cnewmark.com/2009/12/making-govt-work-a-huge-step.html#comments

"With the beginning of the second decade of the 21st century starting in a couple of weeks, it would be nice for the USA to try something different than a system than an academic research system that does not fit our current needs as a high tech society. We need to learn to let go of obsolete 19th century schooling and a collapsing 20th century science publishing model and build something new for the 21st century. And it is happening, bit by bit, around the globe, using the internet, in various different ways from homeschooling through FirstMonday.org. The deeper question is how will the US government as a funding agency using post-scarcity public dollars relate to all that? Will it remain on the side of using post-scarcity public dollars to create artificial scarcities to benefit certain preferred groups? Or will the US government try to use post-scarcity public dollars to help America transcend past concerns about scarcity for most things (including by giving everyone in the USA the chance to think about science and technology as much as they want)?"

Here is a chart of the four long term heterodox alternatives mentioned above to consider on how to rethink our society for the 21st century (taken from a Wikipedia page on Jobless Recovery that I helped put together, available on that page as of June 23, 2010):

http://en.wikipedia.org/wiki/Jobless_recovery#Four_long-term_heterodox_alternatives

"These alternatives can be seen as reflecting two major choices. One choice is between emphasizing individualistic control versus emphasizing communal decision making. The other choice is between emphasizing one-for-one exchanges (like with currency or barter) versus emphasizing acting mainly from values. These choices are summarized in the chart below:

.....Exchange-based.....Values-based

Individualistic....Basic Income.....Gift Economy

Communal.....Localism/Communitarianism...Resource-based Economy"

The government should be devoting more resources to exploring all those long-term possibilities in a variety of ways -- in practice, through academic studies, through simulation, and through supporting social and physical infrastructure (like my other suggestion here of 21000 local flexible manufacturing centers, one for each US town).

Marshall Brain talks about related issues, like in his essay Robotic Nation and in his short story "Manna", as do many other authors like Jeremy Rifkin, Bob Black, Juliet Schor, Martin Ford, and many others. We need to accept what our technology is capable of and adapt our society to get the best out of it, rather than just randomly accept the worst from it. As has been said, change is inevitable, but progress is optional (and requires thought and effort as to a choice of which direction to progress in based on shared values).

tags: post-scarcity | education | abundance | open source

Comment

Submitted by pdfernhout 15 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **251**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Golden Triangle

Invest heavily in nano-bio-robotics. This will solve a GREAT deal of society's ill. The fear mongers will halt all progress. The free world must have the lead on this front. Let the technical experts lead the way, not uneducated, uninformed loud mouths. Poverty and disease could be erased.

Comment

Submitted by prrod1 14 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **252**

UNIQUE OPPORTUNTIES AT INTERSECTION »

How we can participate to minimize between rich and poor people !

There is increasing and really shocking life difference between poor people and rich people. Most of the problem of developing country have so suffered and instability because of that space. So, everybody from world who are participating here, think again about that.

Comment

Submitted by Community Member 14 days ago

Community Member said:

Its really gud topic, I think.

14 days ago

obelisktron said:

its only there to share, as long as you never share it. The moment you share it, peopel produce less, so what is shared is less. You actually get more along every measure toward capitalism, though the inequality is greater. But who cares? in communism you are very equal, but you are dirt poor.

Man, some of the ideas Ive seen been floating around, such as cap and trade, from the fed gov, and some of the socialist inclings, that do not comprise most of the US population but do a small subset of the unions, who are politically powerful, scare me a lot.

Someone needs to vote these people out quickly, before they

14 days ago

obelisktron said:

can do any more damange to the US economy.

14 days ago

obelisktron said:

I don't know what these people want, but Obama isn't going to create anymore jobs with these strategies.

14 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **256**

UNIQUE OPPORTUNTIES AT INTERSECTION »

hydrogen engine

create research grants or tax incentives for the first hydroengine by 2015

Comment

Submitted by k_pisarski 14 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **263**

IMPEDIMENTS TO COMMERCIALIZATION »

Build on existing programs and public-private partnerships

Tech Transfer and SBIR projects often get stalled bridging the "valley of death" from product concept to design, prototype, test/qualify, manufacture, and commercialize. The government funds R&D but not the essential steps along the commercialization pathway. Why not focus more government support on promising SBIR Phase II technologies, providing funding for market and technical feasibility studies and in-depth commercialization planning for those products and technologies that demonstrate the greatest promise for market acceptance. Profit and jobs are not created until products are manufactured, commercialized and sold in the marketplace.

tags: sbir commercialization government support funding market feasibility

Comment

Submitted by dannapolis 13 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **267**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Virtual Reality / Internet Crowdsourcing for Participatory Experimentation / Invention in Science and Technology.

Information, data, the latest experiments/research should not be secretly restricted to industry or academics/universities. There should be an open-source attitude to emerging technology and science thereby allowing members of the public to remotely (virtually) participate. There is a great untapped resource in the millions of minds within our civilization. For one reason or another not everyone has been university educated regarding science and technology therefore they've been unable to get a job working in the field of cutting-edge science and technology. Despite a lack of scientific education many unqualified people are very inventive; they possess sharp minds. People of all ages and from all walks of life could make valuable contributions to science and technology research. Experiments could easily be presented online in a manner allowing the vast majority of the general public to comprehend and thereby contribute. Fully immersive virtual reality would be the preferable medium for this proposed "crowdsourcing participation" but the internet in its current state would be adequate to allow great strides forward technologically, socially, and economically.

The role of the Government is to facilitate open communication, interaction, participation, and sharing between businesses, universities, and the general public.

LINKS REGARDING EMERGING VIRTUAL REALITY

http://singularityhub.com/2010/07/02/presentation-for-minority-report-interface-that-blew-peoples-minds-at-ted-video/

http://oblong.com/

http://www.physorg.com/news197186879.html

http://www.informationweek.com/news/security/client/showArticle.jhtml?articleID=225702022&cid=RSSfeed_IWK_News

tags: post scarcity | singularity | crowdsourcing

Comment

Submitted by singularity.utopia 3 days ago

I agree

0
votes

I disagree

Rank **173**

Idea# **268**

IMPEDIMENTS TO COMMERCIALIZATION »

Re-Establish Solution Architecture Innovation Lab (SAIL) in support of innovators

The concept of a virtual Solution Architecture Innovation Lab (SAIL) was created by a group of non-profits, universities and federal agencies seeking to improve the governments ability to embrace innovative solutions and small businesses who are often left out of the federal IT acquisition process. With 95% of all major IT contracts going to the top 6 defense contractors, small innovative companies and open source developers are left out of the equation. Given the estimated $200Billion spent each year on IT, and nearly half spent on needless custom development, having a virtual lab where key decision makers can explore "the realm of the possible" and better direct their prime contractors in embracing these innovative solutions.

SAIL has been operationalized by the Interop. Clearinghouse, a govt chartered non-profit created to capture interoperable processes and technical solutions already proven in the market.

This concept was first embraced in the early 90s via a project called Highway 1, and is needed again if the US is going to regain its technical leadership in the world.

tags: it governance sail non-profit

Comment

Submitted by john.weiler 2 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **211**

FEDERAL GOVERNMENT ROLE »

PCAST site issue

Please fix the web site so that users can see more than the first page of ideas. Also, be sure to test the site with mobile devices as I am using the site from an iPad, sitting in a restaurant.

tags: pcast site testing issue

Comment

Submitted by chrisfussell 18 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **212**

BASIC RESEARCH DIRECTION »

The Global 50/50 Lottery

Dear Sirs, Please google 'The Global 50/50 Lottery' and scan that idea for a global lottery to fight global warming in the Techrex blog on the 11thHourAction.com website. It's a way to raise the massive funds needed to pay for the enormous arrays of clean electricity generating wind, solar and water power sources to displace the CO2 made by coal-burning electric power plants. Further, if we gave 'green' Credo cellphones to everyone in the world, finally connecting everyone, the cellphones could be an honest venus to award people with this lottery.

tags: global warming | green | lottery | cellphones | co2 | clean energy

Comment

Submitted by rgschreib 18 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **213**

BASIC RESEARCH DIRECTION »

Goff's Hair

Please google Goff's Hair, and scan that R & D idea for making very long superconductive Nanotubes in the Techrex blog on the 11thHourAction.com website. That is, if we COULD make very long superconductive Nanotubes, we could CHEAPLY interconnect a national and global electrical power grid, so that we could send electrical power from massive windmill farms in the USA midwest cheaply to the megacities on the coasts to resolve our energy crisis. It could be a valuable weapon in our fight against global warming.

tags: global warming | nanotubes | superconductive | nanotechnology | green

Comment

Submitted by rgschreib 18 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **215**

UNIQUE OPPORTUNTIES AT INTERSECTION »

supermind

I would like to use the brain computer interferance ans the computer brain interferance to let your mind be supermind by making small chhip capabe to so do

Comment

Submitted by saifelislam.mostafa 17 days ago

saifelislam.mostafa said:

I WISH YOOU HELP ME

17 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **216**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Desalination using Nanotechnology

If you knew of a process that would remove the salt from sea water using nanotechnology and NO HEAT, who would you contact for funding?

tags: desalination nanotechnology

Comment

Submitted by met 17 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **208**

BASIC RESEARCH DIRECTION »

Development of a tissue feedback controlled bioreactor

It is widely accepted that Wolf's Law can be applied to bone as an axiom. It has also been theorized that soft tissue would follow a similar, yet uniquely defined set of similar principles. Current bio-reactor technology has attempted to incorporate these concepts by introducing various mechanisms through which loading may be imparted on the underlying tissues or cells. While some degree of success has been achieved by employment of these methods, long-term sustainment of biomechanical integrity has thus far been elusive. One of the most obvious reasons for these results is that in all cases loading is performed in a static or predetermined and fixed dynamic manner.

Mechanically, the application of Wolf's Law would produce a biological response to modify or generate tissue in order to balance the applied load. Once this load is sustained, there is no need for additional biological efforts to continue.

The investigator proposes that a loading mechanism that imposes a dynamically applied load with stress levels determined by the proliferation and strength of the tissue will provide a more realistic and hence more accurate determination of in-vivo bio-mechanical interactions.

While each loading regimen will be tissue specific, success of such a device will permit incorporation of large amounts of viable healthy tissue extracted from the individual that has been grown for several weeks or months. Repacement of diseased (i.e.osteoporosis), damaged (i.e. cartilage) tissue may provide long term and less invasive methods of treatment

Comment

Submitted by avaldevit 18 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **230**

UNIQUE OPPORTUNITIES AT INTERSECTION »

mr

I suggest you...

Comment

Submitted by Community Member 16 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **231**

UNIQUE OPPORTUNTIES AT INTERSECTION »

MESSAGE FROM CONCERNED AMERICAN

President Obama and his Administration need to ensure that a plan is implemented to maintain scientific integrity in all judicial departments. If such a plan is not formulated, there will be constant division as to which methods of new technology should be utilized. As a concerned American citizen, I look forward to urgent action on this matter - thank you.

Comment

Submitted by elissedesio 16 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **232**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Nanotech investment, AI investment, synthetic biology. Here's your idea

First, you should probably not have this open to the public, your just going to generate the equivalent of a blog. Now thats fine, but if you want constructive solutions you should probably go directly to the scientific community. Or, as you correctly reason, want the input of that wayward genius, and so perhaps this venue is the platform. Nevertheless, its very unlikely that you will find such an idea, or let me put it another way, hard dto find it amongst all the other jokesters that are likely to put it on the feed. But Im sure you have a filtering system.

Second, Im not a wayward genius neither am I part of the scientific community, but here are a few ideas you might concider:

Nanotechnology is revolutionizing both the fabrication, efficiency, and the amount of energy as well as discharge/charge cycles of batteries and super-capacitors. This makes you very very lucky, because you could be on the verge of seeing the actual energy revolution so many before you have been waiting for. Nanotech based batteries could very well pave the way to an affordable EV, its just a matter of time. Second nanotech enabled solar cells lower the cost of production and usage of raw materials through nanowires. By increasing the surface area for greater efficiency yet using only 3% of the material required, often silicon, often organic compounds, solar cells that are cost effective will appear by mid this decade. As you might also expect, this progress has also been seen in fuel cells. Yes, nanotech is a very very big deal. You could potentially have water from the street be 'sucked' in by capillaries through a tube that reach the top of a roof of a house, due to the same mechanisms used by a tree to suck water up to its leaves (the capillaries get smaller as you go up, promoting passage). Once there, you could have one of the advanced solar cells I was talking about, and use synthetic photosynthesis catalyzed with nanotech enabled dyes, to split water into hydrogen and oxygen. The hydrogen could then travel along another set of capillaries down to a fuel cell, this could be a house fuel cell or a community fuel cell. Then the hydrogen is used by the fuel cell to produce water and electricity, the water going back to the street where the whole process starts all over again, and the electricity used to power a car that uses the advanced nanotech enabled battery and supercapacitor I mentioned above.

This would solve our energy problems in the states and with mass production the planet, because the hydrogen does not need to be expesnively stored, distilled, or transported. It is simply produced on site and used up. Now, granted, some advances are needed, but its much closer than you might think. Just keep up to date with current developments and exponential discovery in nanotech, each progressive development leading to a timeframe shorter for the next one, and you could very well have what I describe by 2020 or even 2017. This would solve our energy problems, this idea. While at the same time protecting us from solar storms or unecessary grid overload and inefficiency (if you produce electricity locally its a lot more efficient, hence cost effective on large scales)..the fuel cell would be shield, and the solar panels could be covered after a forecast or repalced easily, while the capillaries in tubes would be like the tubes going up and down under the street. It would decentralize electricity and reduce dependency and demand on a centralized grid. However, if you go jump the boat with cap and trade, you might destroy more jobs than create new ones, and hence slow down the economic recovery necessary for these techs to gain steam. But I guess thats something youll have to decide by yourself.

Now, the other approach when it comes to the grid is to also use these advanced nanotech batteries to store energy, as well as the supercapacitor. Just as a supercapacitor charges up quickly during decelerations and discharges quickly for accelerations depending on a driver's need in a potential future EV vehicle, the same can be said about demands on the grid. You could have these dual techs that save the energy generated from advanced solar cell based tech during the day, and then release it during the night. Alternatively, you could have nuclear fission-fusion power hybrids to do the heavy lifting for industry. This would be very environmentally friendly, because the fusion reactor would instead be used as an accelerator of the fission process through neutron discharge, not actual energy release, although if that were possible it would be desirable but tech for that will likely only become available around 2050. Once you use the fusion reactor, can be a small one mind you, that uses some energy of the fission reactor, it discharges neutrons that 'eat' up the fissile material faster, both getting more efficiency, and less radio-active waste...Much much less. In fact, this is largely beleived, to my knowledge, to be the future of nuclear energy during the transition to fusion in the upcoming decades. Combining this approach with solar cells, nanotech battery-supercapacitor discharge charge cycles, wind turbines, and this nuclear fission-fusion hybrid, could very well wean us off fossil fuels while being very environmentally friendly. Sure, it would have us on a limited energy source, but we have enough to keep us going for a while, and during that time-frame I imagine other nanotech technologies, perhaps even antennas built along side of future space-elevators, will supply most energy to earth. In fact, space based solar power may become the main source of energy during one of the transitions, even though it can be risky due to solar storms.

Thats where space comes in, the US government is investing heavily in scramjet technology. Scramjets can be used in re-usable space planes that agencies in the US have been working on for decades, but have often failed, and is largely concidered the holy grail of cheap access to space, right before the space elevator. The space elevator would require a tensile strength of 90GPA, and thats enormous. It was first thought in the early days of this decade that it could be accomplished with carbon nanotubes, which have a theoretical upper limit to this requirement. However, on scaling, imperfections

disallowed this revolutionary technology to come to pass. One idea that has recently been floating around has been a diamond based space elevator, which, if the monopolies in africa could be convinced through mass production scales.....(the price of diamonds is artificially high, if a deal could be struck, it could fall dramatically, and a diamond based space elevator might not be that out of reach), could allow for a cost effective diamond space elevator perhaps. Before going back to scramjets however, do realize we currently have the technology to go to space in a cost effective manner. The orion project of the 60's could, just one such spaceship, could deploy perhaps 1000 solar sattelites, these are sattelites that generate electricity on earth through space based solar power. They would become effective. However, I understand if the fallout of even from ONE such space-ship would be controversial. However, it would solve many of our energy problems overnight, at least until a solar storm hits. But then again, better fore-casting could solve this problem, and the fallout associated with the launch would be quantitatively minimal, even though the psychological effect is speculative. Another old idea that might work for cheap access to space is the launch loop which uses a moving belt to effectively have a fixed structure by which loads can be ferried into space. This would perhaps cost around 2 trillion, but I beleive it would be worth it, especially more than the stimulus bill. It would put people to work (1), and it would unite the country under a vision (2), the other reason is that once we had access to space, we could monopolize a space based economy that could revolutionize things in many ways unimaginable today (3). For example, we could mine asteroids if it became significantly cheaper to travel to orbit and beyond, this could solve our resource problems when it comes to minerals. Alternatively, as I just suggested, we could set up space based solar power at dirt cheap prices, providing most of our electricity needs on Earth. A new zero g manufacturing industry would open up, and although quite expensive due to oxygen etc...eventually due to self-sufficiency by adquiring good in space and having say, a biodome that genertes oxygen, water, and a fuel cell that powers a base from such water as electricity..more or less with the same process I described for homes and communities, you could start having things be made entirely in space over the course of three decades, limiting costs and having a complete 'green' economy, if you really want to be that ideal, in many cases, opening up space to cheap access if too good to be true. It will require hard work and much sweat and effort. A launch loop is currently feasible with our current technological capabilities, same goes for the old project orion, but it would be costly, controversial, and anything but green. So some very serious sacrifices would need to be made...But once we acheived our goal, nothing in the universe will be more worth. Now, back to scramjets, if we cannot ammass the political force to do any of these magaprojects (perhaps we can delegate that to China), perhaps we can go the spaceplane route. Scramjets acquire oxygen from the atmosphere, hence they require less fuel to reach orbit, and most importantly, they can be re-usable. Now, currently, the technology is precocious primarily due to the material fatigue experiences at such high temperatures as you barrel outward away in the atmosphere. But if we could revolutionize material science, as nanotechnology is doing, and make materials stronger on the sub-atomic scale and make it cost competetive, such as with CNT's, we could very well create a material in the next two decades that allows for cost effective trave lto space with a scramjet. There would be three stages, the turbine, that would take us to the highest mach possible, then a ramjet would take over, then a scramjet, and finnally perhaps, a ionic propultion system. I know the last bit sounds out there, I put it in, it has not been tested, but at such high speeds, perhaps it is possible to ionize the air around the vehicle and shape it in a way to create a feedback loop for propultion. Let me explain, the nose of the craft will likely create a wave or 'oval' that follows tightly the surface of the aircraft to the back. If you could ionize the air stream, which is not impossible at such speeds, you could 'push' back with a magnetic nozzle on the ionized particles, and create an even faster rush of air, and even more propultion as the magnetic field pushes on the stream, and so on. Until you blast through the atmosphere. But anyway, thats neither here nor there. Basically, it goes from turbine, to ramjet, to scramjet, and then once outside the atmosphere, I guess it could have a small ion engine like most space-craft have. Such a vehicle with a couple trips and re-usability could drasticallly increase the amount of payload into space, reducing costs, and making space a new frontier. An actual one, not just one for expensive science experiments.

Nanotech could be imperative in the implementation of such a vehicle and also the various potential mega-projects I mentioned above, as well as the energy systems even previously. It is essential that such key technologies in battery technology, supercapacitors, solar panels, and now materials to be used on a scramjet based space-plane, be developed for any one of these wonderful dreams come pass.

If both an energy alternative to fossil fuels is found (such as the nanotech based cycle I suggested, solar panels-fuel cell-battery hybrid for homes and communties), and a cheap access to space, we could satisfy our resource scarcity problems overnight.

Also, lab on a chip technology and nanotech has paved the way for cheap de-salination, this will be imperative technology to weather the droughts expected in the mid- and late 21st century. By investing in such technologies, we save ourselves from California having to invade Canada or Colorado for water.

Synthetic biology is also interesting, but I think the vague applications should be left to the private sector, the public sector should focus on a few set of goals that are clearly definable. Microbes are currently undergoing testing in corporate labs that could potentially transform grass into ethanol, making the fuel non-competetive with food grain. If such a thing can be developed, and say, tracktors cannot use my nanotech battery idea for food production because say changing tractors is too expensive in developing countries...Such fuel could easily replace oil with a revolutionary self-replicating biologicaly entity that had a gene allowing it to produce ethanol from cellulose. Hands down. I think the public sector should focus synthetic biology toward those aims. Either through genetically engineered algae or bacteria, to get altneratives to oil in a cheap fashion from cellulosic material.

Finnally, I think the US government would be wise in getting ahead of the curve and invest in memristic based devices along with the AI infrastructure required to generate

true computer intelligence. Memristors were concidered to be the theoretical 'missing link' for circuits by Leon Chua in the 70's, it has not recently been discovered in 2008 and found to display synaptic-like acitvity and time dependent platicity the way the human brain displays it. I would not recommend tampering with it now, since its too nascent, but I would concider it for future investigation. Memristors could size up a supercomputer the size of a building into a soda can. Not only do they work as memory, but perform logic functions on site, hence, computations could be done at the memristor and embedded instead of data being transported from ram onto CPU and back again. This totally revolutionizes computers from now and and computer science. HP is trying to mass produce it in servers at the moment, making it sellable. Once it is mass produced, it could seep into laptops allowing instant on computers, since the memory is still stored even if turned off. Thereafter, we could start seeing revolutions in AI. Right now, the problem has always been that various fields in AI are not communicating, in many ways because there is no over-arching code by which programmers can form a 'data-base' for face detection for example. Its teams of 5 working on the same problem, instead of 100's of people using the same code, same infrastructure, etc...THe private sector is not interested because its not past the 'proven' stage, this is where the public sector could be instrumental. If a future administration could organize teams of AI researchers under one format, and have them create a huge database, we could very likely have suboncious robots that could clean our clothes and do our bed in a decade and a half. I know it sounds crazy, but many of the technology is there, its just that people have not gotten coordinated in a fashion to do so, everyone is writting in different codes, and no database ever reaches a critical mass for machine learning to take off.....See, its just inefficiency and disorganization, not the technical itself that prohibits it. Havn"t you ever been in a group and many of the underlying mechanics is what prevents things from getting done? Not the actual interpersonal relationships but mechanics, say, the funds are not there or you all speak a different language...Thats what is going on, AI could sufficiently advance to create semi-intelligent robots that do many of our chores, but if people don't get organized and united under one format, none of it will.

I think the public sector could be instrumental in such a thing, because many academics could naturally just be united under such a government heading, with one program, perhaps even mandatory. However, it may be prudent to wait for the evolution of the memristor, then we can get the hardware as well as the software up to par with neural networks such as the human brain.

The applications of such investments are numerous. I know people often site terminator as an objection of such progress, but a self-aware machine would be unlikely to strike at us if it found us useful (assuming the most pessimistic approach), and could even engineer us to its level fo perfection and vice-versa instead of just creating mini-robots of its same variety which would likely bore it. Furthermore, the self-aware machine could design AI for us that could be implemented in subconcious machines and robots to perform manual tasks. In 2 decades or less from such a discovery, which has largely been hailed by technocrats as the 'singularity' (read up on ray kurzweil), all labour could potentially be replaced by subconcious robots who build other robots and then go on to build mega-projects, such as giant cities.

If you combine such an advance with the advances from above, the energy and the material advance, as long as we implemented a 2 child policy worldwide, humanity could enjoy an existance of material excess and non-existant labour and would likely seek to self-actualize through other means, say, competition (evolved version of sports), knowledge, and bettering mankind through scientific contribution or otherwise. All needs and even desires would likely be satisfied.

Genetic engineering could enhance the human race, raising intelligence, and having robots do the manual labor. Perhaps the intelligent machine could design, with its evolved intelligence, something like the matrix, a machine-brain interface, by which students in a future class-room could see each other's thoughts while solving a problem..In time, the smartest math whiz helps the whole class, triggering protein expressions, and elevating intelligence. By looking at the thoughts of the genius, you become the genius. By improving on them, you help the genius, and so forth. Until you get an intelligence singularity. Doesn't mean we will all be the same, just means when solving problems in class, we will very likely acquire the most efficient thought processes and skills.

Anyway, these are the reasons to invest in nanotech, Ai and hardware, as well as synthetic biology and genetic engineering at the current time. I think cap and trade would be a bad policy at the moment, because it could stifle such innovation necessary to acheive the very goals set by cap and trade. We could at least wait till 2025, if things have not improved through technology, then we will have no other choice to cut back on resource consumption not due to co2 emissions but resource depletion. People say we have 300 years of coal, but we really only have about t40, with exponential consumption we are likely to start having unminable mines in 3 decades. Hence, by forcing a price on carbon, we could wean ourselves to renewables which would eventually be even more expensive when coal prices go up...Hence, we would dodge a bullet as far as energy, perhaps with the solar cell tech I spoke of as well as the nuclear-fission-fusion hybrids, but perhaps not for the lofty goal of decentralized power or material consumption...We would need to consume less and I guess through sacrifice, transition to an economy that is not as vibrant but sustainable, and give a bigger time window for the innovation I have described to take off.

However, at the moment, I beleive the goals you seek in cap and trade are both premature and too idealistic to be implemented at the present time.

I hope the following ideas help you out. It is in times of crisis that great excitement and innovation comes about. Use it to your advantage, do not squander it.

tags: nanotech revolution | artificial intelligence | synthetic biology

Comment

Submitted by alangmarek 16 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **234**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Progress report internet based projects

Have certain projects, like health care, and various mathematical models compute efficiencies, then set up a system and track progress...

People who affiliate themselves with the project on this non-existant website, like crowdrise, would then donate money to see it exist...As the progress bar advanced, they would see how much more is needed to reach the goal, such as a new bullet train system....

Advertising and marketing could then be assigned with the current funds to attract more affiliates who would donate, until project termination, or project completion.

Taxes don't have to be the be all and end all of megaprojects. With the internet and nimble minded entrepreneurs, the same can be accomplished today with a central government. The the that would be needed would be lower taxes so that people could invest in projects of their choice. That way a conservative wouldn't need to be forced into health care, he wouldn't pay, but liberals would and would gain THOSE benefits from the greater pool..All possible through lower taxes and some nimble thinking.

:)

tags: internet crowdrise megaprojects lower taxes

Comment

Submitted by alangmarek 16 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **235**

UNIQUE OPPORTUNTIES AT INTERSECTION »

video game based political involvement

People could sign up for a subscription on say WOW, or HALO, and then as they earn points, they delegate funds to a cause of their choice...Hence, people can play a game, and feel they are progressing not only in the virtual world in their basement, but in real life.

Plus, robots could be devised that construct huge megaprojects...big and small, and humans that usually play a lot of video games could do it for free in exchange for points or something. The only problem is...we need to design the robots.

I know the humans are out there. There are plenty of people who love to waste time on the internet. Just get a couple nerds together that play a lot of games then have them build a building for you with such robots with excessive practice. They would likely not require much pay.

tags: video games

Comment

Submitted by alangmarek 16 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **236**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Invest in bio-printers and industrial printers for houses and industrial parts

With new tech, 'cement printers' etc are now becoming more common. This has the opportunity to lower the price of building housing, especially low income housing. If a printer head with cement could be used, in a computed sequence to 'print' layer after layer...A house could be completed overnight, with plumbing and everything required.

Bio printers have the potential to print hearts and livers and can already print a kidney. They generate the scaffold, then let the printing of cells start 'being absored' and integrated onto the scaffold, until you get a whole organ. MIT has been playing around with this over the course of 5 years, you should keep a close eye on this. It could reduce the amount of livestock to produce meat, hence releasing more grain, hence feeding more poor people. Not to mention the possibility of replacing organs on demand for regular americans. It really is something you should watch for and definitely invest in. It would help many american lives and people around the world. The tech will likely reach maturity by the 20's, but the public sector can do much to accelerate the process.

tags: bio-printing industrial printing

Comment

Submitted by alangmarek 16 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **239**

UNIQUE OPPORTUNITIES AT INTERSECTION »

Medical Diagnosis Artificial Intelligence machine

As suggested in the NY Times article last Sunday, develop a computer system that assists health care professionals in diagnosis by analyzing all the data about a patient and suggesting diagnosis / treatment options for the health care professionals to consider. This system could provide potential answers along with confidence factors.

Comment

Submitted by lpatrick 16 days ago

I agree

-1
votes

I disagree

Rank **214**

Idea# **243**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Sub Biosphere 2

The first self sustainable, self sufficient underwater habitat to act as a global seedbed for sustainability.

tags: sub biosphere 2 | sustainable | underwater | habitate | philpauley

Comment

Submitted by info 15 days ago

I agree

-2
votes

I disagree

Rank **237**

Idea# **204**

FEDERAL GOVERNMENT ROLE »

Burmuda Triangle

Although Information Technology, Biotechnology and Nanotechnology are definitely important in the years to come, it is not a given that they form a 'Golden Triangle'.

The idea that they somehow belong together might be nothing more than science fiction.

In terms of government policy, that might erroneously lead resources spend searching in the wrong places.

Comment

Submitted by 1276931406 19 days ago

Community Member said:

good point

16 days ago

I agree

-2
votes

I disagree

Rank **237**

Idea# **238**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Safety first

The only way we can truly progress is through honest scientific investigation and verification. This means that toxic chemicals, nuclear fission products and genetically engineered life forms MUST be removed from all uses until we know they are actually and truthfully safe and can be actually contained for the long term of human history. They are not innocent until proven guilty. Chemicals, nuclear materials and genetically altered life forms simply must be investigated honestly by third parties BEFORE they continue to be created, spread, released and sold. Scientists will lead us out of this economic mess, if we facilitate their work. But technology without verification of safety leads to destruction, for example, Chernobyl and the Gulf Oil Spill. NEPA is designed to help us make thorough and wise decisions. The use of it can no longer be ignored.

Comment

Submitted by cherielj 16 days ago

I agree

-3
votes

I disagree

Rank **244**

Idea# **233**

UNIQUE OPPORTUNTIES AT INTERSECTION »

Visionary idea for government in the 21st century, only competetive strategy against china.

Also, you could legalize prostitution and some drugs, then use the revenue from the sale of those to invest in health care. You run the Governmemnt like a bussiness. You offer free education, but in return, 4 years of public service. People are put to work in green jobs and eat and sleep in trailers or government housing. You can then take over the telecom, broadband, and phone industries and make them all free. You put the people coming out of college to work into such industries. Hence, the internet, phone calls, and cable would all be free and operated by such free agents. You could also take over microsoft and keep everybody there, except force the shareholders to sell, and the pricing strategy on software to be much lower, enough to pay software engineers and management but not so much that it starts becoming the source of new departments like the gaming department or the source of income for shareholders. I think it would raise productivity if software were cheaper, and that is why I say it.

Everything else, the government should probably go tea-party, repeal the 17th ammenment, and have strict one term limits for senators and congressmen. The government could in a deal, have broad authority to buy HUGE CORPORATIONS or banks for the collective good in exchange.

Use our vices to pay for our needs, prostitution for health care. And offer free education in return for operating in certain industries no charge...creating a cheap source of labour....

use that labor to diviy out free broadband, cable, cheap software....megaprojects.

Your libertarian, yet progressive..You let the natural selection of ideas through the states yield the best pilot programs which are then emulated naturally by other states and then COORDINATED by the central government.

You got freedom but on the other hand you have control. Instead of being a collectivist communist party with a capitalist engine...we are free market founding fathers libertarian using the capitalist engine with a progressive federal government staying in power, in control, and afloat, by running things like a bussiness....

You don't have to go into the public system and work for free. But you get an education at no charge. You don't have to adopt the program in your state, but then you don't get cheap labour. You can not allow prostitution and pot in your state, but you won't get the pay necessary for a partly subsidized health care system, which would be very popular. Which is it going to be, your irrational resentment for people who can pay for sex and smoke some dope, or your desire to take care of your blood pressure? Your desire not to work in a government program or a free of charge public school system? It makes ends meet for the government without debt, yet it doesn't require an increase in taxes. Its decentralized by having a more libertarian mentality and having more power in the hands of the states, but before its implementation (repealing of 17th ammendmenet) a strong federal government keeps in power through the measures suggested above, being progressive and visionary at the same time.

If you want to opt for even more control on the federal level while still being decentralized, You can give the representatives 30 million dollars if they do certain things desired by the people, or they are alternatively fired and put in jail if found to be corrupt. Gets rid of pork, probably lessens unecessary waste, not increase it. After all if they think they will get 30 million, why pay attention to lobbyists? its an incentive. They can be appointed, don't have to run in elections. The high pay will naturally give rise to the most qualified candidate through competition, no test needed. That or have 70 year olds with billions of dollars making the decisions, they would have no desire for corruption other than help the country. You could justify this meritocratic sort of system by lowering taxes on the federal level to say 5%, and giving most of the power to the states. Then the federal gov, as I have stated above, would be run like a company and its federal programs could be opted out of, but if opted in, you are legally binded to certain duties. The necessary critical mass will be there, and it will be enough to have a strong federal government that serves the peoples needs and desires, without having to tax or exactly be representative, except when someone crosses the line, or they cross the line themseves..you would have the seperate chamber of congress and the senate who would hold the meritocratic elite accountable. If an ivnestingation through FBI or otherwise turns out to show corruption, then they are put in jail, under the incentives and disencentives suggested above. They work like a company acquiring very little taxes, but they are still representative of the american people. Being held accoutnable by congress, the senate, various agencies, and the american people through the internet.

I hope you like it.

tags: idea for a reformed government

Comment

Submitted by alangmarek 16 days ago

alangmarek said:

they don't necessarily have to do everything the people want, but what is most effective in bettering the services provided to the american people. They would be a true elite, but HIRED BY the american people, with certain objectives in mind, and no elections

required. Simply voting on objectives for the federal level, and then they are chosen by a selection process more or less like an application applying for a job.

16 days ago

alangmarek said:

I know its not science, but it can have applications...If we evolve the political system, and run things like a service, maybe even integrate the internet, have people not differ responsibility..Organizations can be devoted in your area to distributing funds to highways etc, with no federal involvement for example, and this sort of innovative spirit can seep into technology.

There is no reason we should give taxes to a federal government to then have it distributed again amongst the states. Its unfair, inefficient and immensely wasteful. Just have the judiciary, police, fire dep and other essential services be on the state tab. Then have funds funneled through things like crowdrise to projects of interest in a community and in a state. The federal gov just becomes powerful by providing services and being extremely libertarian but at a charge, hence still having power but not needing to be in enormous debt.

16 days ago

alangmarek said:

The fed gov was once essential to distribute funds in an era without the internet. Now its quite different, grass routes organizations can further goals of their own, there need not be a top down approach, which is both oppressive and highly divisive. A one size fits all does not work, this a country of many ideologies and cultures. Through liberty and choice we stand united, through oppression and empire we are divided, and fall. It makes no sense to bet the whole board on one idea...isntead of letting states test out their solutions and let the winning one be emulated across the board.

16 days ago

alangmarek said:

natural selection amongst the states will pick the winning strategy, and then the fed gov can emulate it across the board.

Sponcer individual and group based interest groups through the internet, to further goals, and let a service that distributes funds for state highways, green projects, be developed. If your a liberal and want to pay more in taxes for health care, good, go for it, join a group and you will join this system. Wnat to invest in green projects, think the state should do more? fine, invest in that, a significant pool of such likeminded folk must exist in your state...There is no need to argue, just put your money where your mouth is, and things will work out from there.

People differ responsibility because they assume the fed gov has that tken care of, or it would be looked at badly to challenge it, hence such groups usually get assimilated by the current system, bloated in beaurocracy and inefficient. Get rid of it, and let it evolve by itself, and you get more efficiency, nore nimble mindedness, more things done.

Look what is happening in the gulf, everybody assumes the fed gov and state gov and BP is handling this...Its called differing responsibility. People look at a person that is having trouble on the street, perhaps dying of a heart attack, and they walk by, assuming someone around them will call...but everyone assumes this, hence the person dies.

Get rid of the differing of responsibility, and the possibilities are boundless..

progressive states become more progressive by banding together, the same for conservative ones.....

There is no limit to where this can go.

16 days ago

alangmarek said:

people a re angry because they don't like being forced to do things...If you give them the choice, they could very likely opt for your system out of necessity, being the best system. Choice and control are not necessarily mutually exclusive. There is nothing more convincing to someone who doesn't beleive gravity attracts objects to the earth than getting them out of the debate room and throwing them over the edge of the building...

an air mattress obvcourse, below.

16 days ago

alangmarek said:

either go for full fledged empire, like china, or opt for this founding fathers version. They are both quite good. If we go China, there will be no competetive system to maybe challenge it and yield a better one. If we choose the founding father alternative ,at least there is some competition in the realm of ideas, and the best system can be found. Perhaps it is china, but how will we ever know unless we allow ideas to flourish! The US is best at this, China, control. Let us find the winning system by betting on our ideas. Lets stop argueing, start betting. My state your state, lets go. You lose, we all win, we found the winning system, for the best system will be the one emulated. No one loses in this game, only those who refuse to play.

16 days ago

alangmarek said:

I lose, we win. No way we can lose. By betting we unleash the winning strategy naturally through natural selection. And we all want the best system, we agree on this, what we disagree, is how to get there. Hence, proof is the only thing that stands in our way of being united!

In Logic and/or God, we trust.

May truth and proof unite us.

16 days ago

alangmarek said:

As robin hood would say in the recent movie, the only difference between a man and a knight is the clothes he wears...

let us bet, and blast into space with the same spirit of adventure of our forefathers, for we shall reach greatness in no time my lads....armour or no armour. Strip it, let us see the winning strategy.

BLAST OFF.

16 days ago

I agree

-30
votes

I disagree

Rank **268**

Idea# **214**

FEDERAL GOVERNMENT ROLE »

Keep the Government Out If You Want Nanotechnology to Soar!

Government regulation and involvement in anything has proven to be an impediment to its development. Even in its main Constitutional edict, it is sorely lacking, humongous cost overruns, redundancy and politicization in the military and the total lack of border security are cases in point.

Keep the Government out if you want nanotechnology to be all that you want it to be.

tags: science big government

Comment

Submitted by bucyrus 17 days ago

tom.meacham said:

As long as business runs on a for-profit basis, and not for the public good, it will continue to put profits before people and public safety. The Federal Government is the only power that can push them to do the right thing.

16 days ago