

PROBLEMS OF SCIENCE RESEARCH AND TECHNICAL PROGRESS

ALEXANDER BOLONKIN
NYCU, ABOLONKIN@JUNO.COM
SHMUEL NEUMANN
DOMEMOUNTAIN@GMAIL.COM

Abstract

At the present time the USA's Federal Government spends enormous sums of taxpayer money for Scientific Research and Development (R&D). How to best organize this vast governmental activity, how to best estimate its ultimate utility and profitability (real and potential), how to best increase efficiency of innovation and production, how to best estimate the worth of new discoveries and innovations, how to properly fund R&D of new concepts and innovations, and how to correctly estimate their results are all complex and pressing questions that require answers for further industrial progress and scientific improvements. These are critical macro-problems which because of its scope have evolved into new macro-systems that require a new approach for successful planning of scientific research. The authors consider these major-system problems and offer many remarkable innovations in organization, estimation, suggestions for entirely new research efficiency criteria, development, new methods for assessments of new ideas, innovations in science and industry, and new methods in patenting technology. These suggestions are based largely on the personal experiences of one of the authors, A.A. Bolonkin who worked for many years within the USA's Federal Government entities (scientific laboratories of NASA, Air Force), and USSR and USA universities and industry.

Keywords: Organizing scientific research, planning of research, funding research, funding new ideas (concepts), funding inventions and innovations, estimating research cost, assessment of research results, research efficiency criteria, innovation in organizing of scientific R&D.

1. Introduction

America has led the world in technology innovation for almost two centuries. While Europe kick-started the industrial revolution, America took it into high gear: Mississippi steamboats, giant steam shovels, the telephone, the assembly line, the light bulb, typewriter, sewing machine and so more came out of the USA. That trend continued in the 20th Century as high tech came to the fore as Silicon Valley gave the world a host of semiconductor and computer breakthroughs. Since the beginning of the 20th Century, science discoveries and improving technology have held the main role in human progress. Humanity has amassed more knowledge than during all previous centuries. People researched aerodynamics, flight dynamics and the design of aircraft, developing rocket theory which enabled travel into outer space and which enabled the successful landing, and people walking on the Moon by 20 July 1969. Organized research which focused on nuclear physics initiated the exploration of nuclear energy and the creation of powerful computers, which in turn now is an invaluable aid to the further fast-paced study of Nature. Astronomy's devices allow humans to see and study extra-Solar System planets, possibly even worlds inhabited with forms of life, located millions of light-years beyond our homeland, the Earth.

The power and influence of any modern ecosystem-State in our world is now defined by its science, technology, and industry capabilities. The United States is a world leader because, for many years the USA's industry and national government spent more money than any other country on R&D, science-based technical innovations. For example, the USA funds space research more than all other countries combined. Until recently, all the main scientific advances in space, aviation, and computers originated in the USA.

If the citizens of the United States still desire to continue to be science and technology's world leader, they must continue this practice and further refine this public and private policy. The impetus of major scientific discovery was often been the initial efforts of competitors in a peaceful competitive struggle. Men on our nearby Moon became possible because the former USSR launched the first satellite (4 October 1957), commencing humankind's Space Age, and the USA's leaders at that critical time clearly understood the USA had temporarily lost global leadership in the important field of science and technology. Only in 1969, after the first manned flight to the Moon, did the USA return to undoubted leadership in space exploration and exploitation. That program effectively ended in 1972. However, before its collapse in 1991, the USSR launched more satellites than all the rest of the World's space-faring ecosystem-States together, including the USA! The USA decided to restore this program only when China, that is the communist People's Republic of China, publicly announced its 21st Century program for a manned Moon exploration. However, the United States now declined to pursue this goal.

The second very important side of scientific R&D is the efficient use of available funding. The financing of any project is limited everywhere, every time. Unlimited funding is inconceivable. The right organization of scientific funding and research is a very important element of scientific progress. That includes: Organization and careful selection of the most feasible prospective ideas and innovations for research, selection of a "can do" principal investigator - scientists who are the authors or enthusiasts of this idea, its champion, a real hard-headed estimation of the macro-project cost, potentially reachable results, and practical application perspectives.

These assessments require very complex investigations. However, there are common criteria that help solve the problems of selection and comprehensive organization which can save considerable taxpayer money and which in the past has achieved practical success in short period of time. However, the evolution of scientific research into a macro-system with its own macro-problems requires first an analysis of current systems of research and frank criticism of its disadvantages. The authors suggest new criteria and new forms of organizing science funding that were tested and/or applied in limited particular cases herein, and which show a high specific efficiency. They also offer new criteria for evaluation of science results which allows more evenly for an observer to estimate the honesty of finished scientific work reports by specialists and to separate pseudo-scientific or non-honest works from real ones.

Correct estimation of the cost of an offered research, a capability of principal investigator, group, or organization to do this research requires leadership and management however, entrusting the selection process to the wrong people result in frequent mistakes which can easily cost millions of USA Dollars (and the EU's Euros)! Herein, authors suggest a straight-forward set of simple rules that will permit avoidance of the strategic mistakes and awkward and embarrassing tactical slips in the planning of future research efforts.

It is the human factor which confounds the selection and distribution of limited monetary funding. In many organizations government money distribution—money shifted from all national taxpayers—is channeled by the directives of just one man. Inevitably over time, he or she begins to give money to his/her friends, to his/her colleagues or worse - to take bribes. Such a person keeps elementary information about the activities of his/her organization secret. Authors, herein, offer a method for the best selection to foil this insidious practice, making it exceedingly difficult to initiate or, if revealed, to continue.

2. Support of New Concepts

Venture Capital firms and Angels whose money is the fuel in launching new innovations are in the business of risk management so that they invariably favor “safe” inventions, those that are clear improvements over current models but just one JND “just noticeable difference” from existing models. Large companies often reward innovations in monetary bonuses or promotions. Some companies will pay for the lawyers to write the patents and pay the patent fees and may even allow the inventor some percentage ownership in the patent. However, those innovations will be restricted to innovations relating to that company’s business. If inventors had to rely on funding sources or business, the major technologies of today would never have been actualized. Sadly, government funding similarly is funding minor innovations. As a result, although there are a lot of scientists in the United States, most of them do conventional research to merely perfect well-known ideas and to make small improvements in them, to ensure a good career path and for their company to show a safe profit margin. Government and private laboratories develop ONLY known concepts and ideas because their purpose is to get the maximum profit in the shortest time. This means that in order to produce and substantiate new ideas, the creative scientist can only use his own private time.

This practice appears to be worldwide. All countries are funding science and research, *but they do not usually fund new ideas or concepts*. Rather, they assimilate known technology, often developed in other ecosystem-countries. The net funding for radically new concepts and ideas are close to zero in the world as a percentage of gross funding. Break-through funding, practically-speaking, almost does not exist!

The current reality is that there is an inverse relationship between the degree of innovation and the extent and/or probability of funding: the more innovative the less likely it will be funded and if funded, will be granted pitiful sums almost guaranteeing its failure. All useful things, which we see around us every day, were developed from new concepts, ideas researched in the rather recent past. This fact is gracefully, eloquently, and comprehensively outlined in Robert Friedel’s **A CULTURE OF IMPROVEMENT: TECHNOLOGY AND THE WESTERN MILLENNIUM** (MIT Press, 2007). But, let us consider the state of affairs now existing. Science and technology are very complex and have a very high level presence globally.

The production of new valid concepts and ideas, and the effort to fully substantiate them, can ONLY be done nowadays by highly educated people, not by tinkerers and private-sector putters. The USA has hundreds of thousands of conventionally-trained scientists of every stripe possible. New concepts and ideas are generated only by a very few talented (genius-level) people supported by skilled workers. They are but a small percentage of every thousand scientists. That requires (from them) very much time and hard work that is not going to be fully paid time in government or company laboratories.

In all countries the composers, writers, artists receive a royalty for performance of their musical compositions, books and artworks. Why must scientists gift their hard work to the world, as they labor on new concepts, ideas, theories, and equations for computations? It is perhaps the bizarre legal structure where the only people with assured income from innovations are the readily-despised lawyers. Oddly, in the USA at every known level of governmental over-sight, administration and law-formulations, most of the professionalized politicians are derived from the class of persons known as “attorneys”—them and realtors!

3. Studies of Innovation

The development of any new concept and idea can be presented in four essential stages (figure 1). Efficiency, E , is possible profit, P , divided by cost, C , of realization.

$$E = P/C. \quad (1)$$

The innovation development has four stages:

1. The first stage is discovery of new concepts or idea. That stage includes an appearance of new idea and INITIAL RESEARCH of its possibilities and main conditions that are requisite for its practicability, initial proof of reality. A person can be only author of a new concept or idea if he/she made initial research and showed that this idea may become a future technical reality. A person who ONLY gave the idea (point 0 in Figure 1) is NOT its author because it is easy to produce a lot of ideas that are beneath or beyond realization. For example, the fantast Jules Verne (1828-1905) penned his famous book about the first manned flight to the Moon using a truly huge metal cannon cast *in situ* in the ground of Florida, USA. Is he the author of the idea for manned flight to Moon employing a big gun? No. Even primitive research shows that a human cannot tolerate the acceleration that is caused by this method, where the vehicle is a cannonball.

The first stage is ONLY theoretical; strong individual and talented enthusiast in own time without any support because unknown concept or idea cannot be in government or company plan.

2. The second stage started after publication or public announcement of the primary idea during a scientific conference. Other researchers join the investigation of the new idea and make more detailed researches. Most of this new idea research is theoretical, and only a small part may be experimental.
3. The third stage includes the production of appropriate experimental examples, an early form of materialization.
4. The fourth stage is actual production of marketable versions of the idea.

We show the development of one innovation (curve 1 in Figure 1). However, any concept exhausts itself and its inherent efficiency possibilities over time. The new concept (idea) appears which promises even more efficiency (curve 2 in Figure 1). Conventionally, in initial time a new concept has less efficiency than a highly over-developed old idea, but as refinements occur in the future, the innovation efficiency becomes significantly more than the old idea.

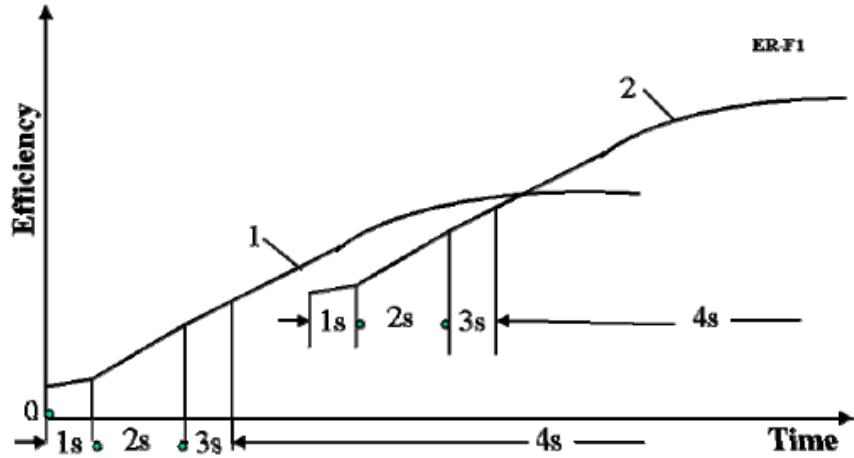


Figure 1. Four-stage innovation development.

For example, the original idea of a vehicle was startlingly original: People had the idea to connect a vehicle to a horse. Later they invited a motorized vehicle. Then they developed aircraft. At present, humanity is developing space transiting vehicles. People laughed at the first automobiles; the first airplanes were captured collapsing in amusing old movies; the first rockets tended to explode. What American can ever forget the USA's "Flopnik"? But as they matured, they opened—literally—new worlds of possibility.

4. Criteria of Scientific Works

There are two main simple criteria which allow recognition of the difference between true scientific research and that of some pseudo-scientific works by educated or merely clever persons. There should be the requirement in all scientific publications that:

1. The author in special paragraph or article conclusion must enumerate: *What is new (unknown before!) he/she offered and/or made in work offered?* That may be a new concept, an idea, multiple innovations, new mathematical models (equations), new non-conventional result of computation, new design of old or well-known macro and micro object (show its advantages), et cetera.
2. The author must DETAIL all his computation (equations and their receiving!) and initial data, which ALLOW to repeat (check up) his new equation and computation. If he offered new project, he must estimate its cost. If offered idea, research and innovation are close to old or known idea or research, the author must enumerate all difference of his idea, innovations and results from earlier works (What NEW he/she offers/made in his/her work). If nothing on the list is actually new, that means the presented work is just idle talk. If author does not give the proof of the new equations, full data for computation, he deprives other scientists the means to check his equations and computations and the value of these equations and computations are virtually zero. That means the author(s) is afraid to let his/her work to endure a thorough examination. Not only should there be the possibility of peer review of the computations, but its feasibility should be assessed by the author by assessing its cost. Work offered which could include new macro-projects must contain the estimation of their cost. Without this estimation, the value of scientific work is very low.

Numerous “scientific” works are presented as results of funded scientific research for government organizations. That means the burdened taxpayers pay for these works. The Scientific Committee of Auditing “Science”, a member of the organization “Citizens Against Government Waste” (CAGW)*¹ applied these simple criteria to show whether it was scientific or pseudo-scientific work. Those criteria also allow conventional or especially well educated people to recognize pseudo-scientific works (see details in <http://auditing-science.narod.ru> and <http://www.geocities.com/auditing.science/>, <http://NASA-NIAC.narod.ru>).

There is the third criterion which is applied ONLY to works funded by Government:

3. If this work is funded by Government (taxpayers), the sum of money received by any author (or a research organization) must be made public!

Note, sometimes the author(s) announce: this work was supported by (Government or funded by Government) organization. But if they did not show the exact monetary sum of “support”, that means the reader can understand this work was done without spending any taxpayer money.

The sum allows other scientist (and interested people) to estimate the difference between the real cost and payment for the presented work.

Most taxpayer-funded works run by Government departments and agencies do not satisfy this simple criterion. Why? Most likely, because these so-called “researches” are really worthless pseudo-scientific products! The grant is received on the quiet (by backstairs influence). For example, in NIAC, former director Mr. Robert Cassanova and this defunct group, probably, stole more than 150 millions of USA taxpayer money (see details in <http://auditing-science.narod.ru> and <http://www.geocities.com/auditing.science/>, <http://NASA-NIAC.narod.ru>).

4. Organization of Scientific Works

Government Relations

Currently, the most important First Stage is the most difficult situation because invariably there is no Federal or reliable private-sector funding and no extraneous technical support of any kind. This work can be done ONLY by individual enthusiasts and at one's own expense in time and money. Funding of the new perspective concept or idea is needed AFTER its initial theoretical research by an encompassing system of awards and prizes. There is only one solution of this macro-problem – the United States of America’s Federal Government must install a series (3 - 5) of annual special national Government prizes (awards of about \$100K should be sufficient) in every important scientific field (space, energy, computing, biology, physics, et cetera.) for new-concept scientific researches that are:

- (1) Given ONLY for new concepts and ideas developed by author and published or presented in sufficient qualifying detail at a scientific conference or on the Internet (stage 1 in Figure 1).
- (2) The awards must be given ONLY to qualified individuals.

¹ Citizens Against Government Waste is the nation's largest taxpayer watchdog group with over one million members and supporters nationwide. It is a nonpartisan, nonprofit organization dedicated to eliminating waste, fraud, abuse, and mismanagement in government. CAGW has helped save taxpayers \$825 billion!

- (3) The competition must be OPEN, advertised widely in public notices. ALL contenders and their work and proposals announced BEFORE any awards.
- (4) The awarding Committee must be from *independent* well-known scientists in given field.

The same awards may be also in stage two (developing new concept or idea by non-author of this idea if the author of idea is awarded; or non-author make significant innovations which develop or solve problems important for progress this idea). In stage three the grants can be given ONLY for experiment or model.

The United States government engineered a project to nurture new concepts which despite its expensive price tag, was an abysmal failure. Only by learning from their mistakes can an efficient system be devised. For the sake of illustration, two programs will be evaluated in order to determine where they went wrong and how programs such as these can be rehabilitated. The monetary support of new aviation and extra-terrestrial space concepts is the basic element of mankind's ongoing scientific and technical progress so the first program to be evaluated is a NASA program.

5. NIAC (*the “NASA Institute for Advanced Concepts”*)

The program which was touted as supporting new concepts and ideas in aerospace is called NIAC (NASA Institute for Advanced Concepts). The NIAC spent more 150 millions USA dollars during eight years of its existence, but they did not really put forth any really new concepts or ideas! Most NIAC final "research" reports are "idle talk" as they include no scientific results, no pre-production models, no correct scientific report, numerous scientific mistakes in the content of final reports and so on). For example, final reports which do not have any scientific results include: Space Elevator (award about one million dollars), Bio Suit (awards about one million dollars), Chameleon Suit (award about 1 million dollars), Weather Control (awards about one million dollars), Winglee M2P2 MagSail (award about two million dollars), Cocoon vehicle (work contains only scientific mistakes), anti-matter sail (empty useless non-scientific seven page work), and so on ad nauseum (see Final Reports in <http://NASA-NIAC.narod.ru>).

Hundreds of millions of American tax dollars were awarded by NIAC Director Mr. *Robert Cassanova* for theoretical works before they were ever presented to an established scientific society! As a result, the applicant received money before researching and presented "research" that was more an exploration of an idea with potential for revolutionary discovery than an actual development of the idea itself. Mr. Cassanova (NIAC) announced that every proposal is reviewed by 6 reviewers (3 internal + 3 external reviewers), but he refuses to identify or present these reviews. Why? Perhaps, he did not send the most obvious and really revolutionary proposals to any reviewers. Perhaps, he was afraid, apparently, to show them even to his marionette NIAC Research Council (Chairman Mrs. *Robert Whaterhead, Dava Newman* (MIT), *T. Wang, C. Bowden, L. Goff*, et al.).

What kinds of proposals are awarded money supports by Mr. Cassanova? For example, Mr. Robert Cassanova awarded four million of dollars to the following persons: *Howe S., Colozza A., Nock K., Cash W., Dubowsky S.* He also awarded three or four times millions of taxpayer contributions to these persons: *Hoffman R. Maise G., McCarmack E., Rice E., Slough J. Kammash N., Winglee R., Newman D.*

The Science Committee of the organization "*Citizens Against Government Waste*" (CAGW) awarded NIAC and Mr. Cassanova the "Pseudo-Nobel Prize-2005" (and "Pseudo-Nobel Prize-2006" for wasting millions of taxpayer dollars by pseudo-scientific works (GOTO: <http://www.geocities.com/auditing.science> or <http://auditing-science.narod.ru>).

Recommendations:

The President and Congress of the United States of America, must, thoroughly investigate the NIAC situation and remove, NASA and USRA leaders who allow any abuse and corruption on their watch. The Science Committee of CAGW stands ready to present to a Special Investigation Commission the documents that confirm the statements presented and outlined in this article.

In this saddening and costly national situation, it is the best decision, to stop the wasteful and ineffective financing of NIAC and pass their functions to Independent Committees employing only well-known scientists, or NASA can create its own Committee from eminent volunteer scientists or to pass selected managerial functions to the National Science Academy, or National Science Foundation and to send awards only to finished scientific works in OPEN competition, or pass these vital functions to the growing and historically relevant and important International Space Agency Organization (<http://www.international-space-agency.org> or <http://www.isa-hq.net>) which would be better suited, and able, to stimulate, enable, and promote advanced space launch, propulsion, power, orbital, and planetary grant disbursements, R and D and implementation. This is based on an ever-increasing need for global cooperation, collaboration, common effort, and universal viewpoint. The International Space Agency's Directives, Charter, Purpose, Goals, and Certificate of Incorporation reflects this reality far better than the USRA or NIAC directives or charters. The many millions in Government-dispensed tax monies and private sector money and other relevant resources would be better used under the management and oversight of the International Space Agency Organization.

The CAGW Science Committee has available already an offer to NASA for a detailed plan on how to improve the work of NIAC, making it more open and its product more useful.

This plan includes three conventional conditions:

- (1) Independent selection Committee having widely-known E-mail address.
- (2) Open competition with publication of all nominated scientific works on Internet, including assessments made by scientists before any funding awards.
- (3) Awarding ONLY actually achieved, not speculation about, scientific works not supported from other sources.

Discussion

The CAGW Science Committee considered, in detail, seven of about two hundred awards made by Mr. Robert Cassanova (GOTO: <http://www.geocities.com/auditing.science> or <http://auditing-science.narod.ru>). Amazingly, 90% of the "final reports" are just idle talk giving the impression to readers that there are NO talented scientists in the USA! That means, obviously, that the system of funding and awarding of scientific works is wrong. Mr. Cassanova is a university system employee and he evidently tries strenuously to fund his friends and protégés within his system of work. However, universities take the funded money and do not pay them over to professors who receive their fixed salary. Often, a

professor is overloaded by lectures, direct work with talented students and ordinary classroom examinations. Such a person does not have time or the possibility to make serious research that requires huge efforts and much time. That's why he/she wrote the idle talk report, pseudo-scientific work!

The USA found the best solution of this problem – one sends scientists to government research centers or laboratories and they work full time 1-2 years on a problem there, shielded from busywork. Government centers and laboratories must directly invite the needed scientists without going through favored groups such as National Research Council (NRC) and ORAU (Oak Ridge Associated Universities). That would save much money and stop favoritism toward friends and weak scientists-- often non professionals in a given field of study. The Laboratory scientists know well the talented scientists in his field and they must solve what scientists must be invited.

Conclusion

The best way is to withdraw this function and this money from NASA-NIAC-USRA, pass them to a special government committee (or the National Academies, or ISA) including famous and reputable scientists and to award the published works (researches) containing new concepts, ideas, inventions, and innovations. Make it an open competition!

In 2007, after critics in international press spoke, after many letters from scientists in Government, Congress, NASA stopped funding the NIAC and discharged Mr. Robert Cassanova. However, in 2011 NASA created a new NIAC and awarded 30 future researches by \$100K each, repeating their major mistake of awarding the mere the PROMISE to research which never materialized to a READY work! Some of them are authors of previous NIAC pseudo-scientific researches.
[. http://www.nasa.gov/offices/oct/early_stage_innovation/niac/2011_phase1_selections.html](http://www.nasa.gov/offices/oct/early_stage_innovation/niac/2011_phase1_selections.html).

Recommendation:

NIAC was feeder for friends (see References). One spent about \$150-200 millions with zero results (more 30% of them to Mr. Cassanova and his bosses in USRA). New NIAC are repeating its mistake. NIAC of NASA must put a stop to awarding the 1st study proposals (\$100K) who only promise to initiate research. For one hundred thousand dollars, the researcher must present **ready, made research**, NASA must publish in Internet the presented proposals and after 2 months public discussion award (\$50-100K) the best of them and decide about awarding the 2nd study. Nobel Committee do not award the promises to make the genius discovers! One awards AFTER the made Discovery!

For example, the ENI gives the annual awards (4 awards of 250K EURO in individual or group scientists) for researches in an energy and environment) ONLY for MADE researches in last 5 years!

To further illustrate how meta-systems must be modified to adequately nurture scientific discovery and technological advancement, a second program will be scrutinized.

6. Fellowship and NRC (National Research Council)

The United States government created a good initiative to temporarily attract talented scientist for solving difficult scientific problems (Research Associateships) and established the mechanism in NRC

(National Research Council). However, the NRC used this for profit as they received the right to select of candidates (main aim – to be the moderator at sinecure) which allows them to take money for themselves (NRC employees and NAS) or to promote friends (Fellowships), to create a charitable organization for untalented scientists but useful people.

Example, the senior author of this article A.A. Bolonkin knows a well-known scientist – he has, so far, had a 30 year-long experience with the acquaintance, authored more than 180 scientific articles and books and tens inventions in given field. This scientist developed a new method, contacted with Government laboratory which gave an excellent review of his proposal. He sent the application to NRC. NRC program administrator Mr. *E. Basques* informed applicant: *NRC did not present his proposal to the (2007) NRC Pier Review, as applicant has a low a scientific score (7.4). The NRC deprived him the right to reapply his proposals for one year!* He asked Mr. Basques: send to him detail computation of his score; and to explain why his score is so very low. How many years of experience; how many scientific works and how many inventions must he have for admission to any NRC review. He further asked how much years of experience, scientific works and inventions the selected candidate has; who is chair of NRC and NRC Advisory Committee. Mr. Basques answered, that such information are secret!

Very early in the game, NRC was accepting three different proposals from just one applicant in one Panel review and had four Reviews in every year. That was true competition which allows the talented active scientists to promote new ideas and develop America's technology. But now Mr. *E. Basques* accepts ONLY one application per year from one applicant including the candidates who he did not admit to review! By this self-limiting approach he has converted the NRC, scientific COMPETITION to *charitable organization* for untalented, dull scientists, his friends and other such useful persons.

We call your attention to the following abnormal economic situation. The Air force, Army, Navy, NASA and other well-known USA government scientific laboratories are staffed with leading scientists in their various fields. Laboratories can estimate and select new ideas, concepts and innovations. They do not need a skewing mediator (NRC) for selection of proper, potentially very productive research candidates. The NRC mediator produces ONLY additional expenses (up to 50%) and imposes on such laboratories and facilities the good friends of a NRC moderator, but the bad scientists contracted make few useful or worthwhile discoveries.

We have same situation, when the mediator (NRC) stands between seller (scientist) and customer (Government Research Laboratory). When the laboratory wants to hire the scientists, the moderator stops buying, request the big moderation payment and sale (imposed) customer the other, own, bad goods.

Conclusion: The Associate-ship Government Program is a truly excellent and economically useful idea, but Government Research Laboratories do not need a NRC moderator to function successfully. They know best the specialists in their active investigational fields than any over-paid, biases current NRC bureaucrat and they can select the best scientists without NRC moderating, thus saving millions of taxpayer dollars and, at the same time, greatly accelerate America's further technical progress.

7. Publications

There are well-known organizations such as the American Institute of Aeronautics and Astronautics which performs great work in organizing aerospace conferences and publishing a series of aerospace journals. But it doesn't have support from government and NASA and it became a strictly commercial organization. As a result, the cost of participation in AIAA conferences is very high. That means only employees of government and large organizations can take part in scientific forums. But, almost by definition, they will display only conventional R&D plans of the type the system currently favors. The new revolutionary ideas and researches are made by talented individuals, enthusiasts in their free time. They can make a revolutionary research, but they do not have much money (some thousands of dollars) for payment of trip, hotel and conference fee. *Literally, the USA loses these revolutionary researches.*

Editors of AIAA journals do not get a salary for their arduous efforts. That means they want to see their name in every copy of journal, but they do not want to work as editor. They pass an article to a reviewer, and pass the review to author. That function can be done via computer. Some of them have allegedly converted their journal to essentially a private edition for their friends and protégés. For example, all 20 revolutionary researches which were published in the recent comprehensive book "*Non-Rocket Space Launch and Flight*", Elsevier, London, 2006, offered for publication in AIAA "*Journal of Power and Propulsion*" (*JPP*), but all were rejected by editor-in-chief *Vigor Yang* as researches were written in a non-American style and having poor English diction. What is "American style" he cannot explain, poor English-- the readers can see the book and decide: Is it a sufficiently important reason in refuse revolutionary innovations? From notes of *Vigor Yang*, it is seen he has poor knowledge of extant aerospace and vehicle propulsion systems. For some last years the "*JPP*" have not published any revolutionary ideas, but published many articles having serious scientific mistakes. The same situation with AIAA "*Journal of Spacecraft and Rockets*" (Editor-in-Chief *Vincent Zoby*).

It is a bad situation that the USA has only a single journal about power and propulsion system or spacecraft and American authors must publish new ideas and researches in journals abroad.

It is a bad situation that commercial publishing houses do not want to publish scientific literature, because it is not profitable. As a result, the scientific literature (and text-books) are very expensive and prohibitive not only for students, but for scientists.

It is a bad situation that there is no free scientific Internet library (which would pay the government back by factors of 1000 in terms of net scientific development generated) to enable individuals of talent and enthusiasts to pursue their researches by using open sources of data and other information.

It is a bad situation that the AIAA requests about \$1000 for every publication in its journal and sells each copy of every Conference scientific small manuscript for \$10.

There are numerous commercial scientific open access journals which will publish any research for \$300 – 800 USD. The scientist invested his labor and wants to gift the fruits of his labor which may be a revolutionary advancement for Society! But Society answers the poor scientists: only if you give us money will we publish your research!

In contrast, commercial scientific journals publish scientific research without the author charge but because these scientific journals selling at a high price, other scientists and many libraries cannot afford to buy them. As the result, the work published in the paid journal is a buried research.

There is an excellent method to publish the scientific research in present time with today's internet technology. To nurture scientific and technological advances there needs to be a free exchange of ideas. The Government must organize or support research internet libraries in every main field of sciences (energy, space, aeronautics, environment, biology, etc). Every scientist may load his research. They may be same the <http://arXiv.org> in physics of Cornell University. But these libraries must have the known Science Board which can stop the arbitrariness of moderator. (The ArXiv moderator Jake Weiskoff who is just a conventional librarian has made wild arbitraries in his refusal the publications of well-known scientists and Nobel laureates!

Recommendations:

- (1) Government must organize or support the internet libraries which openly publish the scientific researches in given field very much the way www.arXiv.org of Cornell University publishes physics research. But these libraries must have a known Science Board which can stop the arbitrariness of moderator.
- (2) The USA must have minimum two rival journals in every scientific field. (These may be Internet journals). Every journal must have an Appeal Commission where author can complain if he/she does not agree with editor's *clearly stated reasons* for article rejection.
- (3) Every National Conference must have a small fund for supporting the individuals presenting revolutionary research and give them possibility to address a meeting.
- (4) The US Government and the NASA must support with appropriate funding the points 1-3 above (free scientific internet library, free scientific journal and virtual scientific conferences), the AIAA (and all big old Scientific Societies), the internet scientific publishing houses.
- (5) The AIAA (and all big old Scientific Societies) must freely publish on the Internet all manuscripts presented in AIAA Scientific Conferences. (Paper copies, of course, are its business and may be small charged for as the publishers please).
- (6) The government must create the free Internet Libraries of the technical, mathematic, physic textbooks.

The Government and country lose more on the obstacles outlined above, which stop the generation and filtering and developing new ideas, than the output of the most talented individual researchers of this generation. The loss is incalculable and should stop immediately.

8. Patenting

The USA's magnificent Constitution proclaims a support of science and, as well, time-constrained protective patenting. Unfortunately, the USA's PTO (Patent and Trademark Office) had become a powerful means to extract money from inventive people. The Payment for PTO equals some thousands of dollars and is prohibitive for individuals. The patenting approval process continues for at least 1-2 years. If the inventor complains, the PTO can sabotage submitted for review inventions. A.A. Bolonkin personally knows of an instance when an inventor paid for invention but the PTO did not award a patent! The PTO creates a lot of rules that permit the pumping of money from people and that allows the sabotaging of the patenting process.

Recommendations:

There must be the creation of a new invention category "Announced Invention". These are inventions written in PTO style and presented without PTO examination in special Internet websites or Patent Library. No, or an extremely small, fee (less \$2) may be for publication this invention on Internet (without editing). If author think the company used his invention without his permission, he passes its patents application in PTO for examination, applies to a conventional or the Patent Special Court and requests compensation. That compensation cannot be more 5% of user income from this single invention.

- (1) The PTO (or special library) must publish all PTO application in Internet, but PTO must request the PTO fee for examination (and others) AFTER the inventor will ask the examination! That may be in during the patent rights (20 years).
- (2) The Government must give permits to 3-5 competitive companies for giving patents. These companies compete with the cheapest patenting (who wishes to receive patent).
- (3) Now, the PTO has rates tailored to big Companies and to small Business. It must be a **special rate for individuals** and the FULL payment (application, patenting, and maintenance) must be not more \$100 for all these stages. The maintenance fee is usually what kills the ability of an individual to finance his own patents; sometimes corporations count on that and wait him out.
- (4) There must be a new category of "important patents for Defense of the USA". If a Special Committee recognized a patent application as necessary (important) for Department of Defense or the US national security, the applicant should have a right to a free patent (he receives only a author certificate, the Government gets all patent rights), all American organizations or companies can use this patent but they must pay its author 1% and the PTO 1% from the gross-cost of the products incorporating this patent.
- (5) All income received by PTO must be used for support of individual inventors programs, *not as an income center for the bureaucracy itself.*

9. Final Recommendations

Current system organization and funding of science researches is not efficient, especially for NRC, PTO, NIAC, NASA, DARPA, DOD, AF, SBIR and the NSF. They need re-organization. Main components of this reformation must be the following:

- (1) Government
must organize or support the internet libraries which openly publish the scientific researches in given field. These libraries must have a known Science Board to prevent arbitrariness of a moderator.
- (2) Government
must install 3-5 annual Government Prizes (about \$100K) in every important field of science (space, aviation, computer, physics, biology, energy, environment, etc.) for important THEORETICAL achievements MADE by individuals. Practical results will flow from these if such are forthcoming from enthusiasts; but the way forward must be pointed out. It takes genius to do it, and genius needs its physical as well as spiritual rewards!
- (3) The unwise and wasteful practice of advance funding of primary theoretical researches must be stopped (as 1st study NIAC of NASA) and changed to OPEN competitions of the READY researches in any

given field and in given topics. Moreover, the main method funding of research must not be funding through Universities but it must be the work of University scientists done during 1-3 years ‘sabbatical’ as Fellow researchers in big Government laboratories. The NRC must be closed and Government laboratory straight invite the needed scientists.

- (4) Innovation must be rewarded. Any company using new methods of computation must pay small (\$1000 or less) royalties to the authors for every licensing use. PTO must accept the application about new methods of technical computations. Must be also the additional form free registration inventions without PTO (PTO examination and PTO fee).
- (5) The PTO (or special library) must publish all PTO application in Internet, but must request the PTO fee for examination (and others) AFTER the inventor will ask the examination! That may be in during the patent rights (20 years).
- (6) The Government must support adequate open scientific journals (publication without editing), publishing houses, free Internet scientific libraries; individual scientists should be aided to presented important researches to scientific national conferences. Government must also make special small rates apply (<\$100) to individual inventors, free patenting of important for DOD and National defense inventions and to use all PTO profit for support of individual inventor programs important for DOD and the USA.
- (7) NASA, DARPA, Government laboratories must engage a head and main specialists of every project in OPEN competitions, preferably the authors of project (proposal) and scientists who made the main contributions in the project idea or concepts. NASA must be divided into at least two independent rival organizations. NIAC was feeder for friends: One spent about \$150-\$200 millions (for 8 years) with zero results. The new NIAC repeats its mistake. NIAC of NASA must stops to award the 1st study proposals (\$100K) promised to make the research. Researcher must present the **ready, made research**, NASA must publish in Internet the presented proposals and only after 2 months of public discussion, to award the best of them. The World Bank follows this procedure on all mega-projects and this formula should be adopted by those who fund scientific and technological innovation. This procedure must be streamlined so that funding is immediate before the “new” idea becomes an old one.

References

1. GOTO:
<http://NASA-NIAC.narod.ru>.
2. GOTO: <http://auditing-science.narod.ru> or <http://www.geocities.com/auditing.science>.
3. Bolonkin A.A., Cathcart R.B., Macro-Projects. Environment and Technology, NOVA, 2008, 537 pgs.
4. Bolonkin A.A., “New Technologies and Revolutionary Projects”, Scribd, 2008, 324 pgs, <http://www.scribd.com/doc/32744477> , <http://www.archive.org/details/NewTechnologiesAndRevolutionaryProjects>,
5. Bolonkin A.A., LIFE. SCIENCE. FUTURE (Biography notes, researches and innovations). Scribd, 2010, 208 pgs. 16 Mb. <http://www.scribd.com/doc/48229884>, <http://www.archive.org/details/Life.Science.Future.biographyNotesResearchesAndInnovations>

6. Bolonkin A.A., Universe, Human Immortality and Future Human Evaluation. Scribd. 2010г., 4.8 Mb.<http://www.archive.org/details/UniverseHumanImmortalityAndFutureHumanEvaluation>,
<http://www.scribd.com/doc/52969933/>