Written Public Comments Submitted to PCAST

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From: Sean McCleary [redacted]
Sent: Wednesday, July 27, 2022 10:41 AM
To: MBX OSTP PCAST <MBX.OSTP.PCAST@ostp.eop.gov>
Subject: [EXTERNAL] Attn: PCAST Members. The nature of the process of the Shift in Consciousness. This information covers important details on the evolution of consciousness, matter, energy, pressure and eternal love in space and time. It's also associated with...

Hello PCAST Members, I wanted to explain something to you all. I'm not trying to inundate you all with my work and emails. I know you all are busy with important agenda's. I'm sending this information over; and specifically this article because the President's Scientific Advisory Council should review this material. This information is very important because of what's emerging rapidly right now and will soon begin affecting planet Earth. You may be saying to yourselves, "what's emerging, we haven't detected anything yet with our equipment?" I understand this and it's the frequency vibrations of consciousness, energy and thought that will begin affecting the evolution and behavior of matter and energy that the scientific community will begin observing. The evidence of this activity thus far is the information contained within this article because my consciousness began evolving with this process back in 2011 and soon my body is going to begin experiencing significant changes and advancement with the Shift in Consciousness. I explain in this article what's been happening with certain evolutionary activity and what I explain is apocalyptic information. This means a revealing or unveiling of information that could not be known apart from the unveiling itself.

Earth is protected and so is all life here. Earth's consciousness is evolving and soon every living organism in Earth's environment will be affected by this process. I discuss in specific details in this article why it's taking a little while. If the President's Scientific Advisory Council has just a few minutes to review this information I think they will appreciate what I have to share. It's very important that I send this to you because Earth and all life here is now on the verge of being introduced into a completely different reality and I explain why in this article. I support President Joe Biden, the Whitehouse, the government, the CIA, the military and all of the important people in Washington DC. Nobody else has ever introduced information like this into the scientific community and I understand that science relies on empirical evidence. The beginning of the evidence of this process is about to begin materializing soon I promise. Thank you so very much for your time and consideration.
Sean McCleary.

THE NATURE OF THE PROCESS OF THE SHIFT IN CONSCIOUSNESS.
By: Sean McCleary.

I want to discuss the details involved with the process of the Shift in Consciousness. This is now my life's work and my purpose here because we will all see and experience a completely different reality from what's currently being experienced in Earth's environment right now. This process means a very powerful advancement happening with the human race and all other life forms in the environment. It also means that what's mentioned in the Lord's Prayer that people say all the time on a global level happens. This is the phrase "thy kingdom come thy will be done on Earth as it is in Heaven". I will explain exactly what this means. Jesus said "the kingdom of Heaven is within". What this means is a powerful and unobscured connection from one's consciousness into the core essence of who you are as an individual and understanding your identity completely which is supported by eternal love and eternal life. This is actually scientific as well. This also means that one has a complete connection and integration entirely in their bodies and consciousness with a primary field of consciousness, energy and eternal love called the Higgs field.

Physicists understand the Higgs field as a primary field of energy which gives mass to everything in Universal Consciousness and uses the Higgs boson to interact with other subatomic particles. The reason that the Higgs field gives mass to everything is because this field of consciousness and energy contains the foundation for eternal love. Eternal love is the most powerful form of energy in existence because love gives eternity a reason

to exist and eternal love produces scientific results which I discuss in my work. Science and divinity will evolve into one another with human consciousness here soon. Also combined with eternal love in the Higgs field is a combination of Infinite Consciousness and the identity of Universal Consciousness. This is because Universal Consciousness evolved out of Infinite Consciousness who is much larger and supports the evolution of Universal Consciousness and all life contained within the body of galaxies. At the most powerful quantum and fundamental level beyond subatomic activity are frequency vibrations of consciousness, energy and thought that also contain pressure. The vibrations themselves represent the existence and experience of thought. This is where thought originates from because thought contains energy. Mass is comprised of subatomic particles, atoms, molecules, energy and pressure. All of this activity was born from the frequency vibrations of consciousness, energy and thought out of Infinite Consciousness.

The Higgs field permeates throughout Universal Consciousness and transfers back into Infinite Consciousness and it's important to understand the nature of this field because this involves the process of the Shift in Consciousness and Earth's evolutionary advancement. A lot of people support the shift and discuss the evolution of consciousness and eternal love. I post a lot of information on my page that deals with this subject matter and the evolution of consciousness. There may be some people thinking to themselves; okay when are we going to see and experience something significant? There are a lot of people in metaphysical and spiritual communities that support the Shift in Consciousness and are really wanting to experience significant changes but are uncertain on what these changes actually mean. There are practitioners that discuss the evolution of the human body through this process and discuss changes with DNA that involve ascension here in Earth's environment. This process begins happening here in a little while I promise, and it's guaranteed to happen because all states of consciousness go through evolutionary advancement. My consciousness is very intimately incorporated into this activity because my body and consciousness evolved into the Higgs field back in 2011 and I began evolving with this process here. What also happened to me was the resistance to evolution began processing through my body and consciousness as well and this is why I've needed to wait before significant changes begin happening with my physical state of existence. It was necessary that the resistance processes through me as the evolution of my consciousness and eternal love has increased over a period of time.

My consciousness began evolving and advancing with the Shift in Consciousness and I've been exposed to very powerful activity happening in Earth's consciousness, Universal Consciousness and Infinte Consciousness. I began understanding what's happening with this situation and now 11 years later I can explain in very powerful details what the shift is all about. My work is all over the scientific community now and the Whitehouse is also familiar with my work on this process. This needed to happen to an individual here because someone had to become affected and understand and explain to people exactly what's going on with this process. This is because very powerful changes will begin happening soon in the Milky Way galaxy and Earth's environment on a global level and my work had to be introduced into the scientific community so when the shift begins affecting the human race; people in the scientific community and the government will know right away what's happening because my work is in place in different institutions, facilities and academic departments. Preliminary details on the shift needed to be explained to certain individuals so the scientific community will understand what's happening when the evolution of consciousness and eternal love begins affecting the behavior of matter and energy with their current understanding of the laws of physics. Because the frequency vibrations of consciousness, energy and thought introduced subatomic particles what's happening with the evolution of consciousness is these frequency vibrations are evolving and changing and the evolution of consciousness will begin surpassing the current understanding of scientific discipline.

This activity will also generate the Paradigm Shift and the Quantum Shift and I can explain both of these forms of activity as well. My work will be introducing and helping to facilitate the Paradigm Shift which is a revolutionary change in scientific discipline which Thomas Kuhn discussed in his work and book The Structure of Scientific Revolutions back in the early 60's. The reason that human beings and the scientific community haven't seen something significant happen yet is because the resistance to evolution is still processing out of Earth's consciousness and Universal Consciousness right now and I will explain how this is happening. What's also occurring with the shift is the activity contained within the Whirlpool galaxy which is commonly referred to as Heaven is in the process of evolving into and connecting to the Milky Way galaxy and Earth's consciousness and

the resistance to evolution is changing daily now. I'm going to explain the nature of the resistance to evolution that's processing out of Universal Consciousness and Earth's consciousness. Earth's environment and human beings are being affected by different forms of resistance to evolution and this has gotten powerful now with different situations happening. The resistance to evolution is the experience of separation from the truth and eternal love. This causes a lot of different types of activity in the consciousness to occur that can produce powerful adversity in different ways. This happens with different degrees of pressure that has a difficult time with expansion, acceleration and regulation in the body and consciousness that restricts the transfer of eternal love from the Higgs field and into the individuals body. I will begin explaining on a fundamental level so it's easy to understand what I mean by the resistance to evolution and the changes that are happening now.

Before Universal Consciousness existed Infinite Consciousness was existence and was everywhere. There wasn't any subatomic activity yet only frequency vibrations, pressure, eternal love and eternal life. Within Infinite Consciousness there is consciousness or thought that generates higher frequency vibrations and there is consciousness and thought that produces lower frequency vibrations. This is actually where male and female consciousness originate from. Within Infinite Consciousness before Universal Consciousness existed, male consciousness was associated with lower frequency vibrations that produce dark energy and female consciousness was associated with higher frequency vibrations that produce light energy. Male consciousness contains higher frequency vibrations or light energy and female consciousness contains lower frequency vibrations that produce dark energy. There is a mixture of both but at the very core essence of male consciousness, this generates dark energy. At a very fundamental level with female consciousness is the higher frequency vibrations of light energy. This activity is associated with creation and evolution and is contained at the very foundation of existence. People haven't really understood dark energy here and associate dark energy or darkness with adversity, separation, isolation or evil. This isn't the case at all and there is a primary reason for this perception. It's because people don't understand what happens with the experience of death and associate death with eternal darkness and the ending of life completely.

This is a fallacy because the experience of death causes consciousness to evolve and advance in a very powerful and significant way. The experience of death with all living organisms in Earth's environment causes life to evolve into the Higgs field and through Universal Consciousness and into the Whirlpool galaxy which is referred to as Heaven. I heard a quote in a movie that said "Everybody wants to go to Heaven, but nobody wants to die". Really powerful statement actually. People associate death with the concept of non-existence and eternal darkness. This is only an illusion and cannot happen to anyone. Non-existence is only an illusion but has been very, very powerful in human consciousness and Earth's environment. This is why the perception of dark energy has been misunderstood. Adversity, isolation, separation and hatred don't come from dark energy; all of this resistance to evolution comes from a restrictive type pressure contained within the frequency vibrations of mainly dark energy and a little light energy. It's pressure that has a difficult time with expansion, acceleration and regulation in the body of life forms. This type of pressure causes resistance to evolution like isolation, separation, hatred, rage, anger and causes acts of evil to occur. Light energy in consciousness contains eternal love and dark energy contains eternal love as well. The sensation of love is just different when light or dark energy is emphasized in the consciousness because the frequency vibrations are different.

Love and dark energy feels like empowerment, fearlessness, fortitude, strength and perseverance. Light energy and love feels like nurturing, comfort, peace, warmth and compassion. Within Infinite Consciousness there was a mixture of both forms of energy with higher and lower frequency vibrations. What happens is when the higher frequency vibrations evolve into the lower frequency vibrations and they interact with one another; because the vibrations are different it generates pressure within the vibrations. This pressure is important and helps to facilitate expansion, acceleration and growth with the evolution of consciousness, matter, energy and eternal love. This is the fundamental basis for the evolution of everything in existence. When eternal love evolves into the pressure through the activity of the frequency vibrations then the pressure can expand, accelerate and be regulated properly. If the pressure becomes too expansive or especially restricted what happens is the frequency vibrations of consciousness, energy and thought have a difficult time evolving into one another and interacting with one another. When the pressure becomes restricted eternal love has a difficult time evolving into this type of pressure and the frequency vibrations of light and dark energy which contain

thought have a difficult time with evolution. This is what causes the experience of separation in consciousness and the location where this type of pressure is contained causes the consciousness to experience separation from the rest of the evolutionary activity happening around the location where the restrictive type pressure is contained. This happens to human beings all the time.

All of this activity is produced on the most fundamental level and this is where subatomic particles evolve out of in Universal Consciousness. Subatomic particles evolve out of the frequency vibrations of light energy, dark energy, pressure and eternal love within the body of Universal Consciousness. Photons carry and distribute light energy in Universal Consciousness because matter requires light energy in order to exist and photons evolve out of the higher frequency vibrations of consciousness. Universal Consciousness evolved out of Infinite Consciousness beginning with an early developmental period over 13.77 billion years ago. A particular occurrence happened within Infinite Consciousness with the frequency vibrations that prompted the beginning stages of evolution with Universal Consciousness. There was an early developmental period before the big bang happened. I cover all of these specifics with my work but with this article I need to explain more information about the Shift in Consciousness. Something happened with the early developmental period and introduction from the big bang that affected the evolution and activity contained within the body of Universal Consciousness and life within galaxies. There was powerful evolutionary activity happening in the early developmental period with the evolution of consciousness and eternal love and what happened was resistance to evolution became involved with the process as well. Universal Consciousness is a life form who contains a body of galaxies in a spherical type shape similar to planets and stars. But towards the region where the big bang happened there is a part of Universal Consciousness that looks like where the bottom of a wine glass meets the stem where the origin of the big bang happened because some of Universal Consciousness was transferring back into Infinite Consciousness as some consciousness was resisting the process and Universal Consciousness was transferring back into the source of creation as the evolution and introduction into a life form with an individual identity was being established.

What happened was life was being introduced into existence with the evolution of matter out of the frequency vibrations of consciousness, energy, thought and eternal love for the very first time. Because Universal Consciousness had to assume an individual identity and life was evolving into existence there was also powerful uncertainty associated with this process. Also subatomic particles had to evolve out of the frequency vibrations of consciousness, energy, thought and eternal love for the very first time as well. This meant that there was an experience of separation in consciousness, energy and thought and very powerful resistance to evolution that also transferred into Universal Consciousness in the form of restrictive or too expansive type pressure. The Higgs field began development and evolution within the early developmental period because Universal Consciousness was being introduced into existence and assuming an individual identity as a life form within the existence of Infinite Consciousness. A primary field of consciousness, energy and eternal love had to evolve into the body of Universal Consciousness so eternal love could continue evolving and advancing into all states of consciousness, matter, energy and pressure in space and time. The Higgs field contains a combination of Infinite Consciousness and the identity of Universal Consciousness and also contains the foundation for eternal love. This is the primary field of consciousness, energy, thought and eternal love that connects these two cosmic giants together with the moment and the element of infinity.

Human beings and other life forms in Earth's environment have had about a 5 to 8% exchange and interaction with the Higgs field because the resistance to evolution is so very powerful within living organisms in Earth's consciousness and environment. The resistance to evolution comes from human beings and other life forms not understanding the foundation for the existence of life, or what happens with the experience of death. Earth is a planet and is around 4.5 billion years old and has a different relationship with Universal Consciousness and the Higgs field than human beings or other life forms. The resistance to evolution in the body and consciousness of life forms here also comes from containing the concept of non-existence in the body and consciousness of individuals. Non-existence is only a concept and cannot happen to anyone because Universal Consciousness evolved out of Infinite Consciousness and Infinite Consciousness contains the elements of infinity, eternal love and eternal life. What happened though was this concept was introduced into existence and the body of galaxies when the big bang happened. Because life and the evolution of matter was being introduced

into existence for the very first time; consciousness went through a very powerful experience of separation from the resistance to evolution and subatomic particles evolving out of the frequency vibrations of consciousness, energy and thought for the very first time as well. Subatomic particles contain the evolution of consciousness, but had to evolve out of and become separated from the frequency vibrations of consciousness, energy and thought, so there was a powerful experience of separation in this process and with the resistance to evolution, the concept of non-existence was introduced into Universal Consciousness.

This is actually where black holes originate from in Universal Consciousness. Universal Consciousness is an enormous, majestic, beautiful and powerful life form with a very powerful consciousness. So, having the concept of non-existence in different locations where the evolution of consciousness, matter, energy, pressure and eternal love are occurring in space and time caused a gravitational force to happen in the opposite direction. I understand why a black hole can form from the gravitational collapse of a star and when this occurs the concept of non-existence is involved in this process as well. Black holes are actually very powerful resistance to evolution containing the concept of non-existence within the body of galaxies. This type of consciousness, energy and pressure is also contained within Earth's consciousness and environment and within human consciousness and other life forms. When someone attends a funeral they think that the individual is dead and will tell other people that they are dead. This is actually incorrect because the individual went through the experience of death and evolved into the Whirlpool galaxy and are very much alive. This type of thought process happens due to the uncertainty associated with the experience of death and this generates resistance to evolution associated with the concept of non-existence. This exists on a global level and this is the primary foundation for the illusion of separation here. Scientists have recently theorized that we exist within an illusion. It's not really an actual illusion that we exist within, an illusion is contained within the evolution of consciousness, matter, energy, pressure and eternal love in Earth's environment in a very powerful way primarily due to the concept of non-existence being contained within consciousness on a global level.

This is a primary aspect of the resistance to evolution that I was talking about that needs to evolve out of Universal Consciousness and Earth's consciousness so the Shift in Consciousness can be introduced into Earth's environment and the population of life here. Universal Consciousness is a life form who's going through evolutionary advancement. What's happening is the eternal love contained within the Higgs field that comes from Infinite Consciousness is evolving in a much more powerful way in this region of Universal Consciousness and in Earth's consciousness as well. The eternal love contained within the Higgs field is getting a lot more powerful and evolving into all states of consciousness, matter, energy and pressure in space and time now and specifically subatomic, atomic and molecular activity. This is going to eliminate the illusion of separation in consciousness here and all life forms will begin to completely evolve into the existence of the Higgs field like what's contained within the Whirlpool galaxy with the activity of life. Like I stated before human beings and other life forms here don't interact with the Higgs field that much because the resistance to evolution in the form of different degrees of restrictive or too expansive type pressure is contained within the body of living organisms here on this quantum level, along with the concept of non-existence in the form of information in the entire body and consciousness. The experience of separation from the truth is the primary reason and not understanding what happens with the experience of death is also another primary element. Earth's consciousness is different because Earth has known that living organisms have been evolving into the Whirlpool galaxy and Earth's consciousness has been directly incorporated into the existence of the truth associated with the Holy Trinity's consciousness. The Holy Trinity had to become involved with Earth's consciousness a long time ago because life here has been evolving into the Whirlpool galaxy where God and Jesus live for a long time. So Earth has had a different relationship with the Higgs field in order to support the existence of life here. What's happening now is the Holy Spirit's consciousness and eternal love is evolving into Earth's consciousness and environment and will cause the evolution and introduction of the Shift in Consciousness soon.

Universal Consciousness and Earth's consciousness are life forms and so are planets which contain individual identities and the evolution of consciousness as well. Subatomic particles contain consciousness, different degrees of light and dark energy, different degrees of pressure and eternal love. They facilitate the evolution of atoms and molecules are formed. All of this activity contains the evolution of consciousness and this transfers into the existence of life. Universal Consciousness has contained resistance to evolution within the frequency

vibrations of consciousness, energy and thought in the form of restrictive or too expansive type pressure that has affected the frequency vibrations of consciousness, energy and thought within the body of galaxies and Universal Consciousness as a life form. What's important to understand is eternal love flows from Infinite Consciousness into the Higgs field and into all states of consciousness, matter, energy and pressure in space and time within the body of Universal Consciousness. Eternal love needs to evolve properly into the pressure contained on this quantum level so the pressure can expand, accelerate and be regulated properly within the evolution of consciousness, matter, energy and the frequency vibrations of thought. If the pressure isn't regulated properly then this affects the frequency vibrations of consciousness, energy and thought and this affects the way that evolution operates within consciousness and this produces resistance to evolution and an experience of separation in life. This activity with resistance in the form of pressure transfers into subatomic, atomic and molecular activity and has affected life in biological, physiological, psychological and spiritual ways in different degrees for a long time. What's happening with the Shift in Consciousness is the resistance to evolution contained within the body of Universal Consciousness, Earth's consciousness, galaxies, planets and living organisms everywhere is transferring out of everything now. Life in Earth's environment will begin experiencing this process and this happens in a specific way. This is why non-coding DNA exists within living organisms and has been in place in order to receive a very powerful increase in evolutionary advancement with the Shift in Consciousness and the increase in eternal love.

Because this resistance is evolving and restrictive or too expansive type pressure is changing everywhere it means that eternal love from Infinite Consciousness and the Higgs field is going to be able to evolve into everything successfully. This also means that Universal Consciousness is joining Infinite Consciousness completely and so is all life contained within the body of galaxies. This also means that the region of Universal Consciousness between here and the Whirlpool galaxy where life from Earth evolves into is changing completely and eternal love is going to experience evolutionary advancement in Universal Consciousness, the Milky Way galaxy and Earth's consciousness between these two locations. This is how Earth and Heaven evolve into one another and connect completely. The experience of separation with life from the experience of death here is going to end forever. This is a very, very big deal that's happening right now and soon the population of life here is going to begin experiencing very significant changes. Universal Consciousness is over 13.77 billion years old. Earth's consciousness is about 4.5 billion years old. This process is very, very powerful and that's why it's taken a little while for the evolution and introduction of the Shift in Consciousness to happen. Also the resistance to evolution in the form of different degrees of pressure has needed to evolve and transfer through Infinite Consciousness properly and in a specific way over a period of time that's coming out of Universal Consciousness because Infinite Consciousness contains the source of eternal love and the resistance to evolution has needed to evolve into Infinite Consciousness and change over a period of time. We are on the verge of experiencing a very powerful and miraculous event soon and the human race and scientific community are going to witness the truth associated with my work. When these changes begin happening; people in the scientific community are going to know very quickly that my work is correct and my work will also provide comfort and assurance for these individuals because the process is going to be very, very powerful. This is why my work is contained within different institutions, facilities and academic departments so they will know what's happening with the introduction of the Shift in Consciousness and they will be able to understand this activity because this event is going to supercede the current understanding of the laws of physics. My work and this process will produce the Paradigm Shift in the scientific community and a revolutionary change in scientific discipline will happen on a global level. All of this information is in reference to the nature of the process of the Shift in Consciousness.

Sean McCleary.

New Energy Times

July 28, 2022

Dear Members of the President's Council of Advisors on Science and Technology,

I spoke with you on Jan. 21, 2022, about the lack of fuel for commercial nuclear fusion, and I provided you with written follow-up reference material.

Two weeks ago, I published an analytical report titled "Without Fuel, the Fusion Game Is Over." A copy is attached to this letter. Concerning scientific details, this report has little that I have not already sent to you. What is new is my conversation with Tanabe Tetsuo, the editor of the book *Tritium: Fuel of Fusion Reactors.*

He has concurred with my analysis: The fuel for fusion (tritium) does not exist, the anticipated alternate material (enriched lithium) from which to make tritium does not exist, and there is no known effective way to make that material. I have also contacted two other prominent fusion scientists who have confirmed these facts.

One is Tony Donné, the program manager for EUROfusion. Donné's organization is responsible for designing the EU DEMO reactor, Europe's successor to ITER, the International Thermonuclear Experimental Reactor under construction in France.

The other prominent fusion scientist is Robert Louis Hirsch, the former head of the Controlled Thermonuclear Research division of the Atomic Energy Commission.

The claims of fusion scientists for the last 70 years that the fuel for fusion is "abundant, virtually inexhaustible, and equally accessible to everyone" were mistaken.

I hope you will find this information helpful and that you will advise President Biden appropriately.

Sincerely,

Steven Krivit
Steven B. Krivit
Publisher and Senior Editor, *New Energy Times*

Without Fuel, the Fusion Game Is Over

news.newenergytimes.net/2022/07/18/without-fuel-the-fusion-game-is-over

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Return to the Fusion Fuel Main Page

By Steven B. Krivit
July 18, 2022

Several months ago, *New Energy Times* broke the story that the fuel required to make energy from nuclear fusion does not exist. Fusion experts have now concurred.

The news is an astonishing contradiction to the 70-year narrative that the fuel for fusion is "abundant, virtually inexhaustible, and equally accessible to everyone."

"No need to worry," some fusion experts now say; there will be a way to make the fuel when it's needed for commercial reactors. However, other fusion experts have been more realistic about the problem.

Today, I report my conversation with Tanabe Tetsuo, the editor of the book *Tritium: Fuel of Fusion Reactors*. I also report my interaction with Andrew Holland, the spokesman for a collection of private companies working on fusion research.

Fusion Fuel Basics

For decades, fusion scientists have been saying that there is enough fuel in ocean water to provide fusion power to humanity for billions of years. This is true only for the deuterium fuel source, an isotope of hydrogen.

Nearly all fusion reactor designs — certainly the most scientifically credible — require a 50-50 mixture of deuterium and tritium. Tritium is another isotope of hydrogen. Normal hydrogen won't work for fusion on Earth. Deuterium alone won't work well enough. Neither will tritium by itself.

Fusion scientists only occasionally told the public that tritium did not exist in nature as a fuel source. When they did disclose this fact, they said that sufficient quantities of enriched lithium, from which tritium could, in theory, be made, were available. They are not. Moreover, there is no environmentally acceptable method, let alone facilities based on such a method, to enrich lithium with the required levels of the lithium-6 isotope.

The Secret Leaks Out

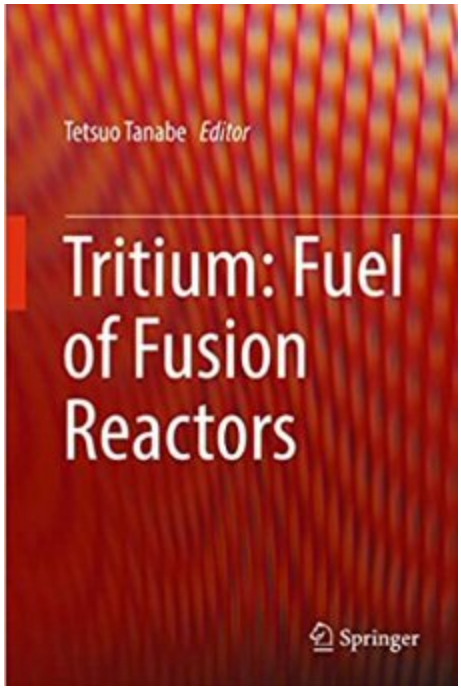
Thiéry Pierre, a plasma physicist and senior scientist at the Centre National de la Recherche Scientifique, in Marseille, France, was the first scientist to tell me about the absence of fusion fuel. After I published my news stories about the missing tritium and enriched lithium, Tony Donné, the program manager for EUROfusion, was the first fusion scientist to confirm my analysis.

Donné is the program manager for EUROfusion. Donné's organization is responsible for designing the EU DEMO reactor, Europe's successor to ITER, the International Thermonuclear Experimental Reactor under construction in France.

In February 2022, Donné's colleagues published a 32-article special issue of a peer-reviewed journal discussing the DEMO design. Not one article addressed the fact that there is no non-military supply of enriched lithium-6, and thus no source of fuel for the EU DEMO or commercial fusion reactors.

Robert Louis Hirsch, the former head of the Controlled Thermonuclear Research division of the Atomic Energy Commission, was the second fusion scientist to confirm my analysis.

Tanabe Tetsuo



In June, I contacted Professor Tanabe Tetsuo, the editor of the Springer book *Tritium: Fuel of Fusion Reactors*. Tetsuo's book includes contributed chapters about many facets of tritium as a fuel for fusion reactors. He and his co-authors obviously understood that tritium was scarce and that the element would need to be manmade, by breeding it from enriched lithium. However, the book says nothing about where they expect to get enriched lithium. The only thing Tetsuo had written about lithium sources applied to natural lithium, not to enriched lithium.

"Natural lithium … is quite abundant in nature when recovery of lithium from the sea water is developed," Tetsuo wrote.

He knew that a cost-effective method of recovering lithium from seawater did not exist yet. In 2020, journalist Bob Service, writing for *Science*, explained that such efforts have not proved cost-effective compared to mined lithium.

I asked Tetsuo about whether he or his co-authors discussed anywhere in the book the absence of an environmentally acceptable method of producing enriched lithium. He said no.

I pointed out that he had said several times in the book that its purpose was to focus on the practical aspects needed to realize a fusion reactor as an energy source, specifically, as the title indicates, relating to the fuel.

I then asked him whether he had realized that an environmentally acceptable method to enrich lithium for fusion reactors did not exist. He initially denied that lithium enrichment was an issue.

"Various techniques for enrichment of any isotopes are well-established," Tetsuo wrote. "The question on environmental contamination by the enrichment is dependent on the technique, but in general, it is possible without environmental contamination."

In my previous research, I had located work by Thomas Giegerich and five co-authors about the challenges with lithium enrichment. I pointed out several facts that Giegerich et al. had stated in a slide presentation and in a peer-reviewed paper:

1. No industrial-scale facility exists today that can meet the requirements for fusion power plants.
2. Only the toxic mercury-based methods produce enriched lithium at high rates.
3. Other enrichment methods have been tested in laboratories but have never reached high production values.
4. Unavailability of lithium enrichment facilities that could meet the requirements of reactors after ITER is a threat to the success of fusion.

After providing this information to Tanabe, I asked whether he could scientifically defend his statement that "various techniques for enrichment" of lithium without environmental contamination are well-established.

"You are right," Tanabe wrote, "I did not intend to deny the importance of Li enrichment."

Tanabe said that the reason environmentally benign methods of enriching lithium had not yet been developed was that the only purpose for lithium-6 so far had been for nuclear bombs. He wrote that lithium enrichment for fusion at "an industrial scale will require significant research and development."

Andrew Holland

In January, Andrew Holland, the chief executive officer of the Washington, D.C.-based company Fusion Industry Association, gave a presentation to President Biden's Council of Advisors on Science and Technology (PCAST). FIA is not recognized as a tax exempt organization by the IRS, as listed in the Guidestar database, but its parent company, the American Security Project, is. Publicly available IRS filings show Holland in 2015 as a senior fellow employed by ASP and, by 2019, as secretary and chief operating officer of ASP. I knew that Holland was perpetuating the fusion fuel "sea water" claim.

Screen capture from Holland's Fusion Industry Association Web site.

As Holland conveyed it, fusion was the panacea for all the world's ills: "Fusion will light the darkness, provide the jobs and industrial base for the 21st century, and make for a more peaceful world." Holland urged the council to encourage the federal government to give public money to private companies trying to commercialize fusion.

Watch Video At: https://youtu.be/1QLidoNKxks

After Holland's presentation, I spoke to the council and explained the problem. One of the PCAST members who contacted me afterward was Eric Horvitz, the chief scientific officer for Microsoft Corp.

"Thanks for the info on deuterium at the last meeting," Horvitz wrote. "What is your high-level interest, and what is your overall assessment about prospects for fusion as feasible? Can you send a compact summary on the latter?"

I sent him my compact summary: "There's no fuel source. The game's over."

I later sent a document package to the PCAST administrator, and she included this in the distribution packet to the PCAST members. It is available on the White House Web site. In my package, I also included my transcription of Holland's presentation and fusion-related follow-up questions and answers during the meeting.

The council was not without self-interest. Maria Zuber is one of the three co-chairs. Zuber is a geophysics professor and the vice president for research at the Massachusetts Institute of Technology. She has been actively promoting, in press releases and news articles, the MIT collaboration with Commonwealth Fusion Systems since its inception. At MIT, Zuber is responsible for intellectual property, *research integrity, and research relationships with the federal government*. Katie Rae, an invited speaker to that PCAST meeting, is a director of Commonwealth Fusion Systems. Rae is also the CEO of The Engine, a venture capital firm founded by MIT.

Holland's Response

After I gave my presentation to the council about the non-existent fuel, Holland sent a rebuttal to the council. It's included in the public comment packet. Holland does not have specific expertise in science, let alone nuclear science. His expertise is in government affairs and politics. We can be reasonably sure, however, that, in formulating his response, he consulted the best and brightest among his fusion industry constituents.

In his rebuttal, Holland confirmed that the fuel for nuclear fusion does not exist, but he did not use those words. Instead, he declared that "the U.S. will have stable, reliable fuel sources for fusion energy." Nothing in Holland's rebuttal explained how U.S. scientists planned to create or find those fuel sources."

One statement in Holland's rebuttal says that, for tritium, "the primary U.S. supply comes from the DOE Savannah River National Lab."

Thirty years ago, the Savannah River Site did provide tritium to the Princeton Plasma Physics Laboratory, also a DOE laboratory, for its Tokamak Fusion Test Reactor. Scott Shaw, a public affairs officer for SRNL, told *New Energy Times* that the tritium produced at the Savannah River Site will not be available for commercial applications, that it's only for the military's nuclear weapons stockpile.

In his rebuttal, Holland also told the council that "lithium can be extracted from ocean water, where reserves are practically unlimited." Holland concluded with a pitch to accelerate public funding for what are now primarily private fusion efforts:

A fusion-powered economy would fundamentally end such concerns about the geopolitics of energy. Fusion turns energy from a resource that is mined or extracted to one that is manufactured. A fusion-powered future will be one where the only constraint on energy supplies and availability is the cost and availability of a manufactured good.

Holland's claim of geopolitical energy harmony requires a vivid imagination. Five countries have 98 percent of the world's lithium reserves, so the lithium for Holland's fusion future would have to come from sea water. But no cost-effective way to extract lithium from sea water has been invented, despite the immense and present demand for it for batteries. After the invention of an economical sea water extraction method, Holland's fusion future requires seven enrichment and breeding physics miracles.

As a follow-up, the White House and the Department of Energy conducted a meeting on March 17, 2022, called "Developing a Bold Vision for Commercial Fusion Energy" to promote fusion. The organizers said that "many technical achievements" have occurred. They listed the following three results from recent fusion experiments.

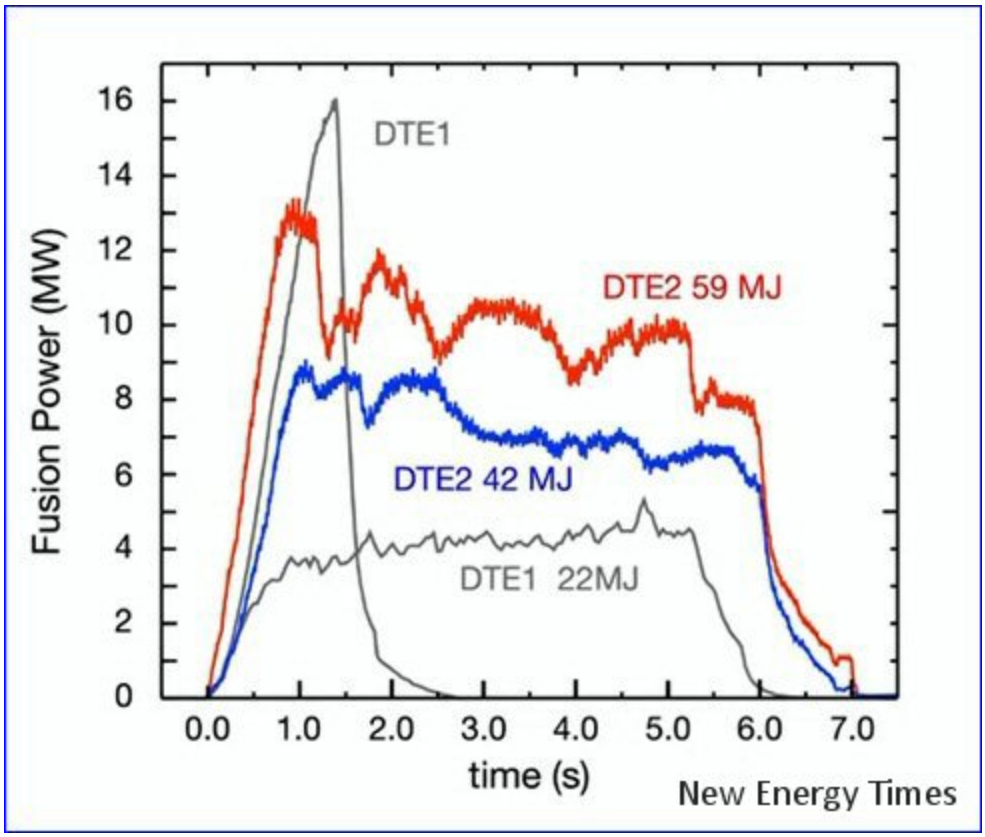
JET Experiment

The organizers said that Joint European Torus (JET) in the UK "***doubled its 24-year-old record with a five-second, high-power pulse, limited only by the experimental hardware and not the plasma stability***."

However, the organizers didn't explain what the "high-power" 59 MJ measurement really meant; it was just a measurement of the energy of the particles produced in the reaction last year. It had nothing to do with the energy consumed by the reaction, let alone consumed by the overall reactor.

The only measurement that will ever provide direct bearing on the practical application of fusion is net energy (or net power) produced by a reactor. In the case of JET, the reactor consumed 3,500 MJ of electricity compared with the 59 MJ of thermal energy produced with the fusion particles. The reactor didn't produce energy; it lost 3,441 MJ of energy, electricity that it drew from the grid. This means that, in the 2021 experiments, the JET reactor lost 98 percent of the energy it needed to run. And that's *the closest* a fusion reactor has ever come to breaking even.

But there's another problem with the 2021 JET results, as shown in the blue and red curves in the image below. Although these two new experiments (DTE2 42 MJ and DTE2 59 MJ) produced fusion particles with double the energy produced in 1997 (DTE1 22 MJ), the 2021 experiments showed a consistent decrease in power over the 5-second runs. This is not a good omen. Daniel Jassby, a retired plasma physicist from the Princeton Plasma Physics Laboratory, provided more-extensive scientific examination on the new JET results in a May 2022 article.



2021 JET results (blue and red curves) compared with 1997 results (black curves)

National Ignition Facility

The organizers said that the Lawrence Livermore National Laboratory's National Ignition Facility (NIF) in California "***achieved an energy yield eight times higher than its previous record and reached the cusp of ignition, providing us a second fusion approach with similar physics performance as the tokamak.***"

The organizers didn't explain that, despite achieving ignition and despite running for an infinitesimal duration of one-billionth of a second, NIF — funded by U.S. taxpayers to the tune of $3.5 billion — consumed 400 MJ of energy, losing 99.7 percent of the energy it consumed.

China's EAST Reactor

The organizers celebrated the fact that "***China's Experimental Advanced Superconducting Tokamak (EAST) sustained fusion reactions for 17 minutes at 126 million degrees Fahrenheit – five times hotter than the sun***."

The organizers didn't explain that, in these experiments, researchers used only 100% deuterium fuel, which no credible fusion scientists think will be possible as a source of fusion energy on Earth. Although a 17-minute pulse certainly was useful to test some characteristics of the EAST reactor, power production was not one of them.

Generational Transference

In 2012, the international fusion community, through the auspices of the International Atomic Energy Agency, took a major step to promote fusion to younger generations. The IAEA published Fusion Physics, an 1,100-page book, intended to be "a tutorial book for post-graduate students."

In Chapter 1, the authors made a "Case for Fusion," based on three requirements of a new energy source. One was fuel availability.

"[It] must lead to sustainable development of the entire world, so must be based on virtually inexhaustible resources, available globally without having to depend on resources from politically unstable regions," the authors wrote.

Here's what the IAEA authors wrote about the fuel:

It has to be bred from lithium, which is widely available in the Earth's crust and also in the oceans. … The fuel is therefore virtually inexhaustible and is likely to last several tens of thousands of years. Secondly, fusion fuel is readily accessible from everywhere. This gives tremendous energy security to all nations and is to be contrasted with the politically inflammable uneven distribution of fossil fuels such as oil (6% of the nations own more than 66% of the oil wealth of the world).

Let's compare those numbers with lithium reserves: 3% of the nations in the world own more than 98% of the lithium wealth in the world.

The authors of the IAEA tome said nothing about the necessity, let alone lack, of enriched lithium. They said nothing about an effective way to harvest lithium from sea water.

To finish things off, credit is due to the following fusion scientists who, in 2020, courageously explained that, even if enriched lithium was available, there is no known way to breed tritium fast enough:

- Mohamed Abdou, University of California, Los Angeles
- Marco Riva, University of California, Los Angeles
- Alice Ying, University of California, Los Angeles
- Christian Day, Karlsruhe Institute of Technology, Germany
- Alberto Loarte, ITER Organization
- Baylor, Oak Ridge National Laboratory
- Paul Humrickhouse, Idaho National Laboratory
- Thomas F. Fuerst, Idaho National Laboratory
- Seungyon Cho, National Fusion Research Institute, Republic of Korea (References and Sources)

Open Questions

In the past 70 years, who inside the fusion community knew that the fuel needed for commercial fusion reactors didn't exist? What efforts did they make to inform their peers? Who inside the fusion community did not know? Why did they not know? How was a worldwide science effort, public and private, with billions of dollars invested, enmeshed in a multi-generational career track, founded and fostered in light of this fuel illusion?

From: Maheswar Mikki [redacted]

Sent: Sunday, August 14, 2022 8:29 AM
To: MBX OSTP PCAST <MBX.OSTP.PCAST@ostp.eop.gov>; MBX OSTP Engagement <Engagement@ostp.eop.gov>
Cc: [redacted]

Subject: [EXTERNAL] dive into deep sea to cool...

08/14/2022

Hi, pcast-ostp: (202-456-4444)

Believe it or not, I just saw this 25th century News (see below): so, pcast member Leob is going to dive into deep Sea, straight from an Alien-land, and find a needle'—great !

"**Lost at Sea:** Astrophysics professor Avi Loeb was the longest-serving chair of Harvard's astronomy department until he got snapped up by a White House science and technology advisory committee. His next adventure lies at the bottom of the Pacific Ocean.
Yesterday, *NBC* reported that Loeb wants to recover fragments of an interstellar meteor he says fell to Earth in 2014 after it arrived from outside our own solar system. In 2019, Loeb and one of his students, Amir Siraj, published a not-yet-peer-reviewed-paper in *arXiv* that said the meteor must have been made of material tougher than iron to survive its trip, and in 2021, Loeb announced his desire to recover the object from the ocean floor.
Loeb believes it may be from a distant alien civilization.
"We're planning to board the ship and build a sled and a magnet attached to it that will scoop the ocean floor," Loeb said, according to *NBC*. "And we will go back and forth, like mowing the lawns across the region, 10 kilometers in size and collect with the magnets, all the fragments that are attracted to it, and then brush them off and study their composition in the laboratory."

I am glad to see geniuses are advising the WH. I wonder, if these geniuses have a minute to spare and 'listen, see, speak' the truth on climate change (or rising temperature)?
Or maybe that's not a real-problem to solve 'diving into deep space'—because NASA-ESA has already figured that out:
sun-god (Father of 1st son-Jesus & 2nd son-Einstein…) acts crazy in a 11-Yr. cycle (see Solar Cycle 25 is underway)—OK. That solves the rising temperature problem—then, why $650 billion give away to 'battery or electric-cars, wind-solar & fusion…'? Do you know the idea of 'fusion'=4th son-Leob diving into deep-Sea to find a needle?
If you wonder, who might be the 3rd son of Father, ask me…
Or if you are serious, please read my recent message (below) sent to the 'lawyers/climate scientists'—lost in the climate crisis (by hiding in a deep dark-cave….).
Thanks,
Maheswar

From: Maheswar Mikki [redacted]

Sent: Friday, August 12, 2022 12:57 PM
To: [redacted]
Cc: [redacted]

Subject: climate change or rising temperature?

08/12/2022

Dear expert-lawyers/climate-scientists:

Please see my comments/suggestions (below).

This is not an issue of "public policy or political science" experts and/or "climate-scientists" to solve the problems of "droughts, heat waves, and extreme storms" with "regulations forcing greenhouse gas reductions in sectors of the economy like energy generation and transportation"—although that would help reduce 'pollution'. Here, the 'climate change' meant the 'rising temperature'—pollution of CO2 or other gasses has 'nothing' to do with the 'rising temperature'.

Please find out the cause for the 'demise of Mayan civilization by 1500CE'—all experts will learn it was precisely for the same reasons "droughts, heat waves, and extreme storms".

And we know Mayan had 'no CO2 or greenhouse gas problems to "regulate and fix the problem" like our experts in public policy or political science, and the lawyers + climate-scientists, are attempting a "quick fix" to the problem involving "droughts, heat waves, and extreme storms" by throwing $--------billion/trillion at it….(without a proper diagnoses of the problem).

Therefore, may I ask you to review a recent research article on Mayan demise and my comments (see a copy below: I agree with the authors on the demise of Mayan by ~1450CE, but the authors had no idea that the Mayan demise began in ~1150CE). So, in our case let us do this:

1st re-think to understand the "cause for the rising temperature v. result as droughts, heat waves, and extreme storms";

2nd think of a "proper solution to fix"; and

3rd "design and build"—this problem can only be solved by Engineers, not by politicians (like lawyers, climate-scientists, wall street gamblers…).

> See
> **USA TODAY**
> **The US is making a big down payment on climate change. Here's what needs to come next.**
> Kyle Bagenstose
> https://www.msn.com/en-us/news/us/the-us-is-making-a-big-down-payment-on-climate-change-here-s-what-needs-to-come-next/ar-AA10AgQe?ocid=msedgdhp&pc=U531&cvid=fc84c7266b3c43f8b0cfb2055ea73ab7
>
> . "In April, the Intergovernmental Panel on Climate Change warned that humanity is perilously close to already baking in 1.5 degrees of warming, which would likely lead to a significant rise in the numbers of droughts, heat waves, and extreme storms devastating communities across the globe"—Not just 1.5 degrees, it could go to >200F before 2400CE (if we fail to design-build a fix)
>
> . The "climate scientists say essentially all of the world needs to reach net zero emissions, a point of equilibrium where the amount of carbon dioxide (CO2) in the atmosphere stops growing and the climate stabilizes before it reaches a critical warming threshold of 2.7F"—This won't control the rising temperature, it may control pollution

. "If anything goes wrong – Americans don't adopt new technologies quickly enough, supply chain or workforce limitations fail to meet demand – then the bill's incentive-laden policies could fail to deliver in time. Saha said that creates a need for the Biden administration to quickly follow up the bill with regulations forcing greenhouse gas reductions in sectors of the economy like energy generation and transportation"—Yes or No: we must follow the steps in 1st, 2nd, & 3rd

. Orvis said "something good was happening all along. We've been cutting greenhouse gas emissions. A lot of them"—But the rising temperature didn't stop that tells you CO2 or greenhouse gases are not the cause for the rising temperature—ask me, I will tell you the real-cause, which I told everyone-else for >17 Yrs.: the climate-scientists, astronomers, science-Journals, NASA, Nobel F, Gore, Obama, Biden, Media & all the politicians I run into…I didn't Tell The People, yet—maybe I should Publish a Book and Tell The People, directly…

. "Gielen also agrees with Saha, that the speed of adoption of new technologies is an unpredictable variable"—Could be true

Thanks,
Maheswar

From: Maheswar Mikki [redacted]

Sent: [redacted]
To:
Cc: ----------
Subject: Mayan civilization?

07/24/2022

Hi, Profs. Kennett and Hodell:

The clue you gave, 1400-1450CE, for climate change/drought conditions faced by Mayan, is on point and I agree with you:
I can see you went thru a lot of hard work to get to the point—whereas more than 10 Yrs. ago, I wondered about the reasons for the 'collapse of Mayan civilization (and Inca, too)—because we knew by 16th century CE the ancient civilizations were going downhill—that includes, India, too. And the Europeans began to move in…
So, I did my quick calculations—like I am doing, now, as I write this message: Hint—there are several Climate Cycles—
. 1st one, we, all, know: we get ~3-months of summer once in ~9- month cycle in a 12-monts (Yr.)
. 2nd one, (our ancients knew), but we, all, forgot I have been working on the related problems for >14 Yrs.: so, I re-discovered it (with proof)—
To make a long story short, in this Cycle, we get ~300-Yrs. of Summer Once in ~900-Yrs.
And the next Summer, really begins in ~2140CE and ends in ~2440CE (that meant we have not yet seen or tasted the Real Event).

For, now, let us Stop about discussing other Cycles…

So, if you go backward ~900-Yrs. from 2140-900=1240CE—so, that must have been the year the Mayans, Incas, and others like in India must have gone thru a lot of Chaos, suffering with destruction—because they were not prepared to handle.
Then, came the gun-swingers or soldiers of *Ahura*-Bible (story—of a dead-son of Father rose !)—that's The End in ~1540s (300 Yrs. of Summer).

Therefore, I fear the same *Karma* for US-Canada, Parts of EU, Russia, etc. and other locations… in 2140-2440 (Peak at ~2300CE).

I agree, we will not be here, in the present Bodies—but don't forget, most of us will be back in another Body or Form—there are billions of Forms at the Planning stages by The Creator!
And we are here ONLY to do 'The Righteous Duty'—like Pope Francis, just to name someone we see…
Thanks for your hard work on point.
Maheswar

Article Open Access
Published: 19 July 2022

Drought-Induced Civil Conflict Among the Ancient Maya

Douglas J. Kennett, Marilyn Masson, … David A. Hodell
Show authors

Nature Communications **volume 13**, Article number: 3911 (2022) Cite this article

Abstract

The influence of climate change on civil conflict and societal instability in the premodern world is a subject of much debate, in part because of the limited temporal or disciplinary scope of case studies.

We present a transdisciplinary case study that combines archeological, historical, and paleoclimate datasets to explore the dynamic, shifting relationships among climate change, civil conflict, and political collapse at Mayapan, the largest Postclassic Maya capital of the Yucatán Peninsula in the thirteenth and fourteenth centuries CE.

Multiple data sources indicate that civil conflict increased significantly and generalized linear modeling correlates strife in the city with drought conditions between 1400 and 1450 cal. CE.

We argue that prolonged drought escalated rival factional tensions, but subsequent adaptations reveal regional-scale resiliency, ensuring that Maya political and economic structures endured until European contact in the early sixteenth century CE.

The Jerusalem Post

Climate change linked to civil unrest in Mayan civilization -study

By JERUSALEM POST STAFF

A20-year-long period of civil turmoil in the ancient Mayan city of Mayapan was exacerbated by climate change, a study published Tuesday found.

© (photo credit: PAVEL VOROBIEV/CC BY-SA 3.0/(https://creativecommons.org/licenses/by-sa/3.0)/VIA WIKIMEDIA COMMONS) Maya pan

The earliest archeological evidence of the Mayan civilization dates to 2600 BCE, and the Maya thrived in modern-day Mexico until contact was made with the Europeans during the 16th century.

The peer-reviewed study, spearheaded by Prof. Douglas Kennett of the University of California, Santa Barbara, and published in the journal *Nature Communications*, specifically examined a tumultuous period of population decline between 1441 and 1461 CE and determined how it was impacted by the climate.

Researchers examined archeological, historical and paleoclimate data such as isotope records, radiocarbon data and DNA recovered from human remains and combined climate data with the drought record from local cave deposits. Their findings showed that civil strife increased dramatically during periods of drought.

“Existing factional tensions that developed between rival groups were a key societal vulnerability in the context of extended droughts during this interval,” Kennett said. “Pain, suffering and death resulted from institutional instabilities at Mayapan and the population fragmented and moved back to their homelands elsewhere in the region.”

© Provided by The Jerusalem Post The ruins of a Mayan site, called Xiol, are pictured after archaeologists have uncovered an ancient Mayan city filled with palaces, pyramids, and plazas on a construction site of what will become an industrial park in Kanasin, near Merida, Mexico May 26, 2022. Picture taken May 26, 2022. (credit: REUTERS/Lorenzo Hernandez)

Contributing factors

“Our study demonstrates that the convergence of information from multiple scientific disciplines helps us explore big and highly relevant questions like the potential impact of climate change on society and other questions with enormous social implications.”

Prof. Douglas Kennett, University of California, Santa Barbara

The researchers found that the Maya's dependence on corn and subpar irrigation systems, their lack of long-term central grain storage and sociopolitical corruption all contributed to instability.

However, a network of Maya states was able to survive the collapse of Maya pan by migrating to other towns and adapting to new conditions.

“Our study demonstrates that the convergence of information from multiple scientific disciplines helps us explore big and highly relevant questions like the potential impact of climate change on society and other questions with enormous social implications,” Kennett added.

From: jean public [redacted]
Sent: Monday, August 29, 2022 7:45 PM
To: John Gilmore [redacted]; MBX OSTP PCAST
Cc: Sarah Domnitz [redacted]
Subject: [EXTERNAL] Re: clear idiot on prez science committee

public commetn on federal register

improving patient safety certainly needs improvement. start off by firing anthony fauci and his ilk of liars who all lied to the us public. they use our tax dollars to keep us out of the loop. they want to keep documents secret and sneaky for 76 years. they told the court that. 76 years. no open and transparent govt at the cdc, niaid, nih. none, fda too is a patsy for big pharma.
the whole medical field is corrupt imo. they have their cushy well paying jobsk produce nothing of value, go back and forth to big pharma to get raises and then come back and do ig pharma bidding and its one huge crimnal mafioso. the american people have beenkilled by withholding early treatment. the decisions made by these clowns like fauci have created american chaos. they have turned this country into mussoliniville.fire fauci now. we need a whole new set up with new people. hire dr pierre kory, dr malne and others for the cdc. what is gongon in the cdc and nih, niaid, fda is pure criminality. this commetn is for th public recordplese receipt.
jeanbpulee [redacted]

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

Inconsistent Census Bureau, BEA, and BLS Statistics for Semiconductor, Computer, and Other Manufacturing Sectors

Andrew Reamer, Research Professor

Presentation to the President's Council of Advisors on Science and Technology (PACST)

September 7, 2022

Observations

- The federal government's capacity to promote a strong domestic semiconductor section is weakened because the Census Bureau, the Bureau of Economic Analysis (BEA), and the Bureau of Labor Statistics (BLS) are **prohibited from producing one reliable set of key NAICS code-specific measures** such as employment, payroll, and productivity.
- The problem's source is the **U.S. Tax Code's differential treatment** of Census, BEA, and BLS regarding access to business Federal Tax Information (FTI).
  - Census can request access to business FTI as needed: BEA has as-needed access to corporate FTI, but not non-corporate business FTI; and BLS cannot access any FTI.
  - The Census Business Register is constructed using both FTI and non-tax business data derived from economic surveys. As Census survey data are inextricably comingled with FTI, it cannot legally share FTI-infused data with BEA and BLS in any meaningful way.
  - As a result, a substantial percentage of **business establishments are classified in two different NAICS codes**—one in the Census Business Register and in another in the BLS Business Register.
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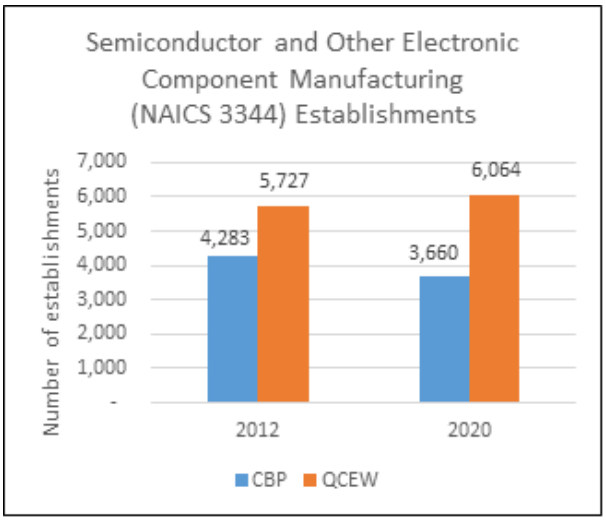
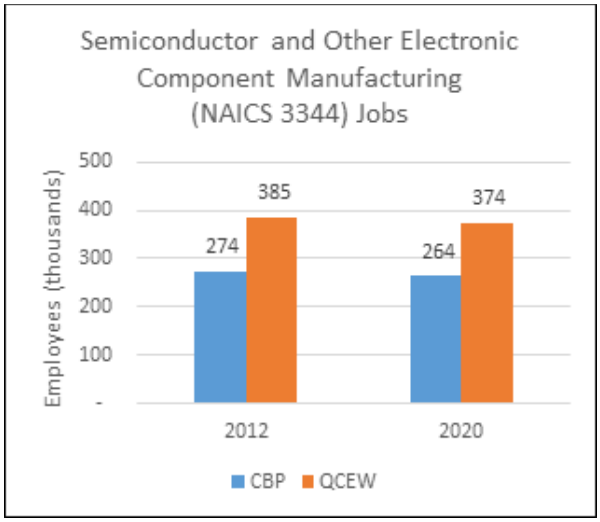
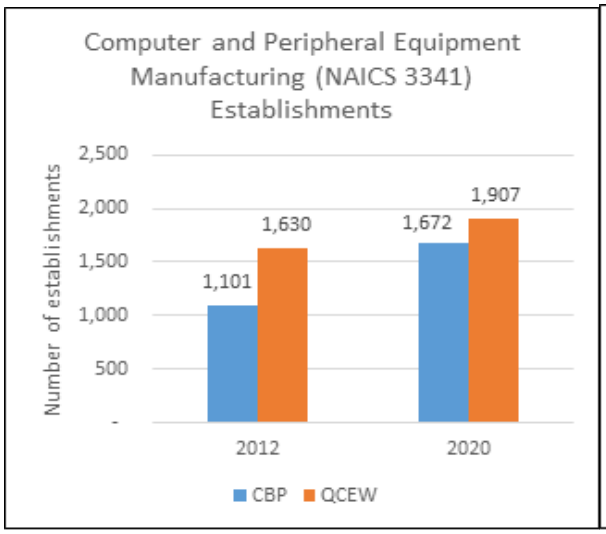
Manifestations of Census-BLS Data Inconsistency—Examples

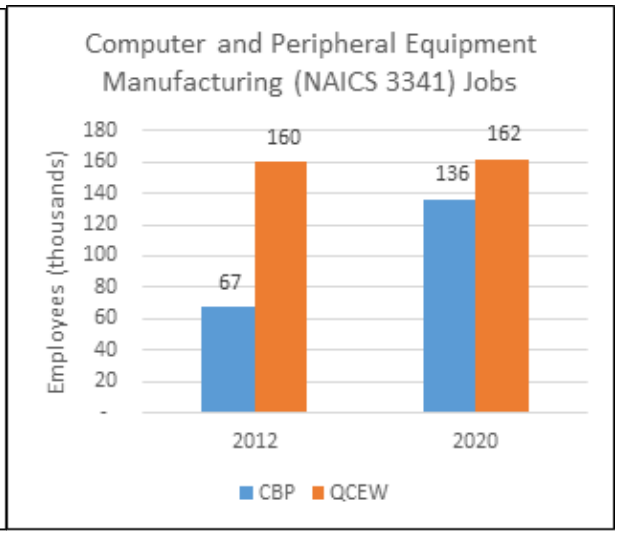
Semiconductor and Other Electronic Component Manufacturing (NAICS 3344)





Computer and Peripheral Equipment Manufacturing (NAICS 3341)





CBP: County Business Patterns (tallies from Census Bureau Business Register)
QCEW: Quarterly Census and Employment and Wages (tallies from BLS Business Register)

Examples of Analytic and Policy Problems

1) CHIPS and Science Act of 2022 (P.L 117-167)

-- Definition of "critical manufacturing industry" (Sec. 103: Semiconductor Incentives)

(5) The term ''*critical manufacturing industry*''— (A) means an industry, industry group, or a set of related industries or related industry groups—

(i) assigned a North American Industry Classification System code beginning with 31, 32, or 33; and

(ii) for which the applicable industry group or groups in the North American Industry Classification System code cumulatively—

(I) manufacture primary products and parts, the sum of which account for **not less than 5 percent of the manufacturing value added** by industry gross domestic product of the United States; and

(II) employ individuals for primary products and parts manufacturing activities that, combined, account for **not less than 5 percent of manufacturing employment** in the United States . . . .

2) ICT Supply Chain Analysis (required by E.O. 14017)

U.S. Department of Commerce and U.S. Department of Homeland Security, Assessment of the Critical Supply Chains Supporting the U.S. Information and Communications Technology Industry, February 24, 2022.

6.1 ICT Hardware Manufacturing Workforce (pp. 44-47)

As mentioned in section 4, a significant portion of ICT manufacturing has relocated to Asia. This has contributed to a downturn in domestic production capabilities. . . . Today there are approximately 274,000 ICT manufacturing or production-related occupation jobs in the United States, representing approximately five percent of the domestic ICT workforce, according to the most recent data from the Bureau of Labor Statistics (BLS).

The largest of these employment groups is Semiconductor and Other Electronic Component Manufacturing, which accounts for approximately 147,000 jobs or about 54 percent of the ICT manufacturing workforce. The manufacturing workforce in this group specialized in the production of semiconductors, printed circuit boards, connectors, passive components, and **printed circuit board assemblies**. . . .

PCB [Printed Circuit Board] Manufacturing. While design and engineering roles play a crucial role in the value chain, not all PCB-related occupations require an advanced degree. Of the 21,000 U.S. workers in the PCB industry, 16,000 are in manufacturing roles. [Source: U.S. Census Bureau, Annual Survey of Manufactures]

Treasury Department Corrective Proposal

U.S. Department of the Treasury, General Explanations of the Administration's Fiscal Year 2023 Revenue Proposals, March 2022, pp. 78-79

> AUTHORIZE LIMITED SHARING OF BUSINESS TAX RETURN INFORMATION TO MEASURE THE ECONOMY MORE ACCURATELY
>
> The proposal would give officers and employees of BEA access to FTI of those sole proprietorships with receipts greater than $250,000 and of all partnerships. BEA contractors would not have access to FTI.
>
> The proposal would also give BLS officers and employees access to certain business (and tax-exempt entities) FTI including: Taxpayer Identification Number (TIN); name(s) of the business; business address (mailing address and physical location); principal industry activity (including business description); number of employees and total business-level wages (including wages, tips, and other compensation, quarterly from Form 941, Employer's Quarterly Federal Tax Return, and annually from Form 943, Employer's Annual Federal Return for Agricultural Employees, and Form 944, Employer's Annual Federal Tax Return); and sales revenue for employer businesses only. BLS would not have access to individual employee FTI. In other words, the proposal would allow officers and employees of each of BLS, BEA, and the Census Bureau to access the same FTI for businesses, and would permit BLS, BEA, and the Census Bureau to share such FTI amongst themselves (subject to the restrictions described below).
>
> For the purpose of synchronizing BLS and Census Bureau business lists, the proposal would permit employees of State agencies to receive from BLS the following FTI identity items: TIN, business name(s), business address(es), and principal industry activity (including business description). No BLS contractor or State agency contractor would have access to FTI.
>
> The proposal would require any FTI to which BEA and BLS would have access, either directly from the IRS, from the Census Bureau, or from each other, to be used for statistical purposes consistently with the Confidential Information Protection and Statistical Efficiency Act of 2002 (CIPSEA). The three statistical agencies and State agencies would be subject to taxpayer privacy law, safeguards, and penalties. They would also be subject to CIPSEA confidentiality safeguard procedures, requirements, and penalties. Conforming amendments to applicable statutes would be made as necessary to apply the taxpayer privacy law, including safeguards and penalties to BLS as well as the Census Bureau and BEA. BLS would be required to monitor compliance by State agencies with the prescribed safeguard protocols.
>
> The proposal would be effective on the date of enactment.

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

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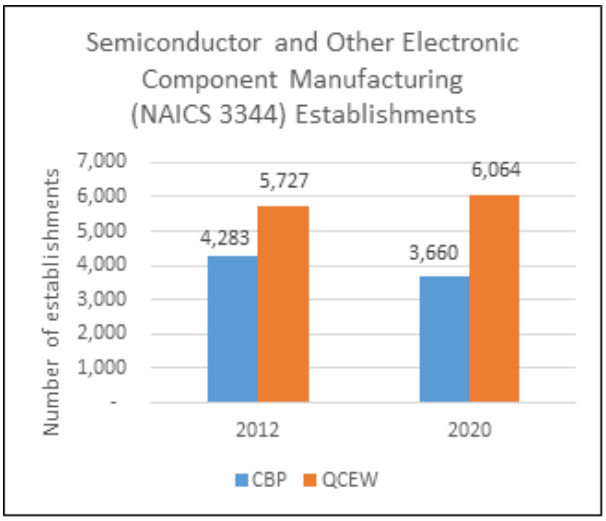
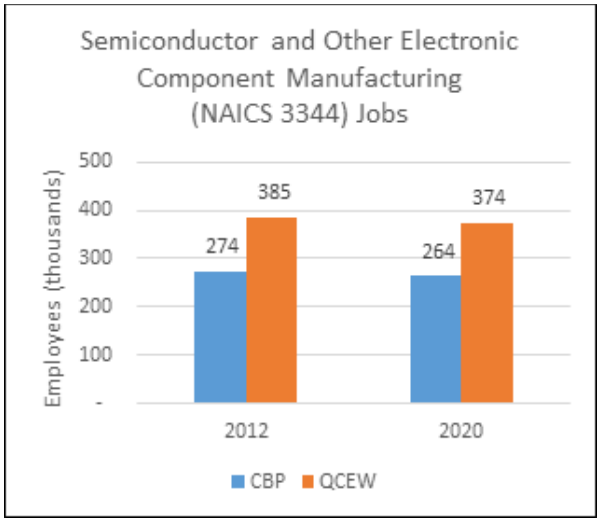
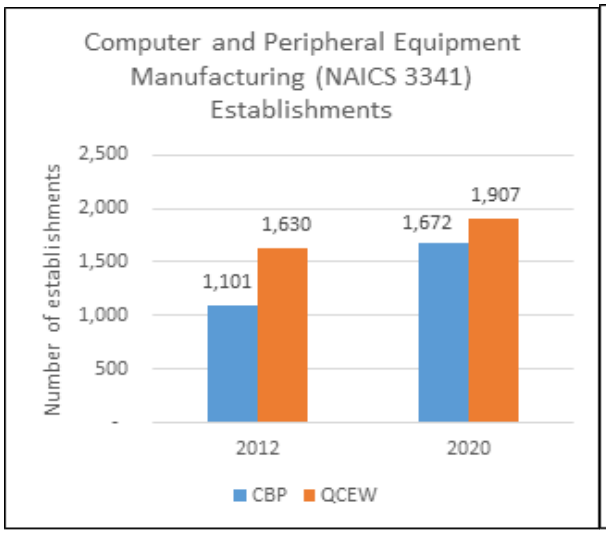
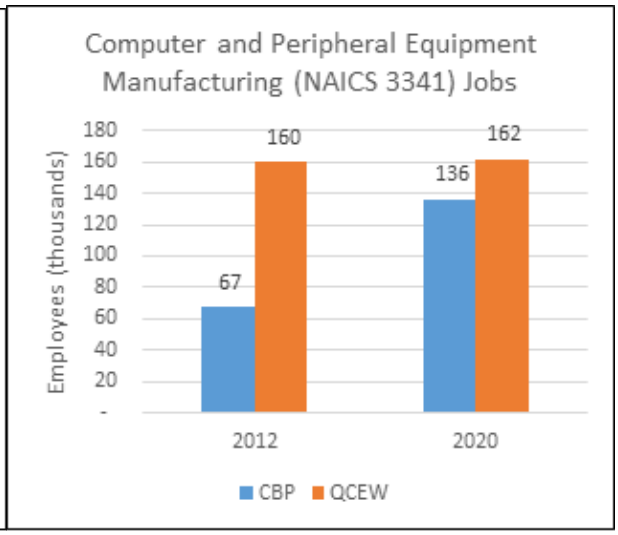




Computer and Peripheral Equipment Manufacturing (NAICS 3341)





CBP: County Business Patterns (tallies from Census Bureau Business Register)
QCEW: Quarterly Census and Employment and Wages (tallies from BLS Business Register)

Examples of Analytic and Policy Problems

1) CHIPS and Science Act of 2022 (P.L 117-167)

-- Definition of "critical manufacturing industry" (Sec. 103: Semiconductor Incentives)

(5) The term ''*critical manufacturing industry*''— (A) means an industry, industry group, or a set of related industries or related industry groups—

(i) assigned a North American Industry Classification System code beginning with 31, 32, or 33; and

(ii) for which the applicable industry group or groups in the North American Industry Classification System code cumulatively—

(I) manufacture primary products and parts, the sum of which account for **not less than 5 percent of the manufacturing value added** by industry gross domestic product of the United States; and

(II) employ individuals for primary products and parts manufacturing activities that, combined, account for **not less than 5 percent of manufacturing employment** in the United States . . . .

2) ICT Supply Chain Analysis (required by E.O. 14017)

U.S. Department of Commerce and U.S. Department of Homeland Security, Assessment of the Critical Supply Chains Supporting the U.S. Information and Communications Technology Industry, February 24, 2022.

6.1 ICT Hardware Manufacturing Workforce (pp. 44-47)

As mentioned in section 4, a significant portion of ICT manufacturing has relocated to Asia. This has contributed to a downturn in domestic production capabilities. . . . Today there are approximately 274,000 ICT manufacturing or production-related occupation jobs in the United States, representing approximately five percent of the domestic ICT workforce, according to the most recent data from the Bureau of Labor Statistics (BLS).

The largest of these employment groups is Semiconductor and Other Electronic Component Manufacturing, which accounts for approximately 147,000 jobs or about 54 percent of the ICT manufacturing workforce. The manufacturing workforce in this group specialized in the production of semiconductors, printed circuit boards, connectors, passive components, and **printed circuit board assemblies**. . . .

PCB [Printed Circuit Board] Manufacturing. While design and engineering roles play a crucial role in the value chain, not all PCB-related occupations require an advanced degree. Of the 21,000 U.S. workers in the PCB industry, 16,000 are in manufacturing roles. [Source: U.S. Census Bureau, Annual Survey of Manufactures]

Treasury Department Corrective Proposal

U.S. Department of the Treasury, General Explanations of the Administration's Fiscal Year 2023 Revenue Proposals, March 2022, pp. 78-79

> AUTHORIZE LIMITED SHARING OF BUSINESS TAX RETURN INFORMATION TO MEASURE THE ECONOMY MORE ACCURATELY
>
> The proposal would give officers and employees of BEA access to FTI of those sole proprietorships with receipts greater than $250,000 and of all partnerships. BEA contractors would not have access to FTI.
>
> The proposal would also give BLS officers and employees access to certain business (and tax-exempt entities) FTI including: Taxpayer Identification Number (TIN); name(s) of the business; business address (mailing address and physical location); principal industry activity (including business description); number of employees and total business-level wages (including wages, tips, and other compensation, quarterly from Form 941, Employer's Quarterly Federal Tax Return, and annually from Form 943, Employer's Annual Federal Return for Agricultural Employees, and Form 944, Employer's Annual Federal Tax Return); and sales revenue for employer businesses only. BLS would not have access to individual employee FTI. In other words, the proposal would allow officers and employees of each of BLS, BEA, and the Census Bureau to access the same FTI for businesses, and would permit BLS, BEA, and the Census Bureau to share such FTI amongst themselves (subject to the restrictions described below).
>
> For the purpose of synchronizing BLS and Census Bureau business lists, the proposal would permit employees of State agencies to receive from BLS the following FTI identity items: TIN, business name(s), business address(es), and principal industry activity (including business description). No BLS contractor or State agency contractor would have access to FTI.
>
> The proposal would require any FTI to which BEA and BLS would have access, either directly from the IRS, from the Census Bureau, or from each other, to be used for statistical purposes consistently with the Confidential Information Protection and Statistical Efficiency Act of 2002 (CIPSEA). The three statistical agencies and State agencies would be subject to taxpayer privacy law, safeguards, and penalties. They would also be subject to CIPSEA confidentiality safeguard procedures, requirements, and penalties. Conforming amendments to applicable statutes would be made as necessary to apply the taxpayer privacy law, including safeguards and penalties to BLS as well as the Census Bureau and BEA. BLS would be required to monitor compliance by State agencies with the prescribed safeguard protocols.
>
> The proposal would be effective on the date of enactment.

Federal Agencies with Skilled Technical Workforce (STW) Development Programs			
Department	**Administration/Directorate/Institute**	**Office/Division**	**Program(s)**
1) STW Education & Training Programs with Broad Sectoral/Occupational Scope			
Labor	Employment and Training Adm	Office of Workforce Investment	WIOA Adult Program
			Dislocated Worker Grants
			Youth Programs and Services
			Skills Training Grants
		Office of Trade Adjustment Assistance	Trade Readjustment Allowances
		Office of Apprenticeship	Registered Apprenticeship Program
			Pre-Apprenticeship Programs
		Office of Job Corps	Job Corps
	Veterans' Employment & Training Service (VETS)	Office of National Programs	Transition Assistance Program
			Military Spouse Occupational License and Certification Portability
	Women's Bureau		Women in Apprenticeship and Nontraditional Occupations (WANTO)
Education	Office of Career, Technical and Adult Education	Division of Academic and Technical Education	Perkins Collaborative Resource Network
			Community College Programs
			Reimagine Workforce Preparation
	Office of Postsecondary Education	Office of Deputy Assistant Secretary for Higher Education Programs	Higher Education Programs
	Rehabilitation Services Adm		Career Pathways for Individuals with Disabilities Model Demonstrations
VA	Veterans Benefits Adm	Education Service	VET TEC program
			On-the-job training and apprenticeships
			Non-college degree programs
DoD	Under Secretary of Defense for Personnel and Readiness/Defense Human Resources Activity	DoD Military-Civilian Transition Office (MCTO)	DoD Transition Assistance Program
		Defense Activity for Non-Traditional Education Support (DANTES)	Defense Voluntary Education (VolEd) programs
		Military OneSource	Spouse Education and Career Opportunities program
	National Guard Bureau/J1 Manpower and Personnel Directorate	Athletics and Youth Development	National Guard Youth Challenge Program
NSF	Directorate for Education and Human Resources	Division of Undergraduate Education	Advanced Technological Education
Commerce	Economic Development Adm	Office of Innovation and Entrepreneurship	STEM Apprenticeships
HHS	Adm on Children and Families	Office of Community Services	Community Services Block Grant Collaborative on Workforce and Economic Development
		Office of Family Assistance	Career Pathways
USDA	Food and Nutrition Service	Supplemental Nutrition Assistance Program	SNAP Employment and Training
2) Regional Economic Development Programs with STW Development Component			
Commerce	Economic Development Adm		Good Jobs Challenge
			Build Back Better Regional Challenge
NSF	Directorate for Technology, Innovation and Partnerships (TIP)		Regional Innovation Engines
USDA	Rural Development		Rural Workforce Innovation Network

		Rural Development Business Programs	Rural Innovation Stronger Economy (RISE) Grants
DoD	Undersecretary of Defense for Acquisition and Sustainment	Office of Local Defense Community Cooperation	Defense Manufacturing Community Support Program
			Industry Resilience Program
3) Manufacturing STW Development Programs			
DoD	Undersecretary of Defense for Acquisition and Sustainment	Office of Industrial Policy -- Industrial Base Analysis and Sustainment (IBAS)	National Imperative for Industrial Skills
			Manufacturing Engineering Education Program
			DoD STEM Community College Consortium
Commerce	National Institute of Standards and Technology	Manufacturing USA	Workforce Development Initiatives
		Manufacturing Extension Partnership	Workforce Development
4) Sector-specific STW Development Programs			
USDA	National Institute of Food and Agriculture	Agriculture and Food Research Initiative	AFRI Education and Workforce Development
Commerce	National Institute of Standards and Technology	Information Technology Laboratory (Applied Cybersecurity Division)	National Initiative for Cybersecurity Education
DoD	Under Secretary of Defense for Personnel and Readiness		Credentialing Opportunites On-Line (COOL)
			United Services Military Apprenticeship Program
	Under Secretary of Defense for Acquisition and Sustainment	Defense Acquisition University	Acquistion Workforce Educational Partnerships (Sec. 801 NDAA)
			Cadre of Software Development and Acquisition Experts (Sec. 836 NDAA)
	Under Secretary of Defense for Policy	Defense Security Cooperation Agency	DOD Security Cooperation Workforce Certification Program
	Secretary of the Navy		U.S. Naval Community College
DOE	Office of Energy Efficiency and Renewable Energy	STEM Rising	STEM Rising
		Solar Energy Technologies Office	Solar Workforce Development
		Wind Energy Technologies Office	Workforce Development and Education
		Bioenergy Technologies Office	Bioenergy Workforce Development Strategy
		Better Buildings Initiative	Workforce Development
		Industrial Assessment Centers	Workforce training and apprenticeships (49 USC 17111, BIL Sec. 40521)
			BIL funding to train energy auditors (Sec. 40503), building technicians (40512), efficient energy technologies installers (40513)
EPA	Office of Water	Office of Ground Water and Drinking Water	Innovative Water Infrastructure Workforce Development Program
	Office of Land and Emergency Management	Brownfields Program	Brownfields Job Training Grants
HHS	Centers for Disease Control and Prevention (CDC)	Center for Surveillance, Epidemiology, and Laboratory Services (CSELS)	Strengthening U.S. Public Health Infrastructure, Workforce, and Data Systems
			Training and Education Resources for the Workforce
	Health Resources and Services Administration	Bureau of Health Workforce	Behavioral Health Workforce Education and Training (BHWET) Program for Paraprofessionals
			Rural Public Health Workforce Training Network Program
			Community Health Worker and Paraprofessional Training Program
	Administration for Community Living		Strengthening the Direct Care Workforce: A Technical Assistance and Capacity Building Initiative
	Substance Abuse and Mental Health Services Administration (SAMHSA)		Workforce Programs
DOT	Federal Highway Administration	National Highway Institute	23 USC 504 as amended by BIL Sec. 13007
		Office of Innovative Program Delivery	Center for Transportation Workforce Development

	Federal Transit Administration	Office of Research, Demonstration and Innovation	Workforce Development Initiative (49 USC 5914)
		Office of Program Management	Buses and Bus Facilities Workforce Development Training Activities (49 USC 5339)
	Federal Motor Carrier Safety Administration	Research Division	Apprenticeship Pilot Program (Infra Act Sec. 23022)
	Maritime Administration	Office of Maritime Labor & Training	Educating the Maritime Workforce

STW Working Groups and Reports Mandated by Recent Legislation

Dept/Agency	Working Group Mandated	Report Schedule
Infrastructure Investment and Jobs Act (P.L. 117-58)		
FMCSA	Women of Trucking Advisory Board (Sec. 23007)	Board report due in two years, report to Congress in three years
DOT	Interagency working group to prepare intelligent transportation technologies and systems industry workforce development implementation plan (Sec. 25020)	Engage National Academies in needs assessment, provice implementation plan to Congress one year after assessment completed
DOT	Transportation workforce outreach program (Sec. 25020)	Public service ad campaign FY2022-2026
DOE	21st Century Energy Workforce Advisory Board to develop skilled energy workforce strategy (Sec. 40211)	Submit annual report to Secretary, with recommendations; Secy to respond to each rec; Secy to report to Congress at end of each Board term
EPA	Federal interagency working group to address water/wastewater utility workforce needs (Sec. 50211)	Submit report to Congress by Dec 27, 2023
FCC, DOL	Telecommunications Interagency Working Group (Sec. 60601)	Report to Congress within one year of establishment of working group
	Guidance to states on meeting telecommunications workforce needs (Sec. 60603)	Provide by Dec 27, 2022
GAO	Assessment of Workforce Needs of Telecommunications Industry (sec. 60604)	Provide to Congress by June 27, 2022
National Defense Authorization Act for Fiscal Year 2022 (P.L. 117-81)		
DoD	Biennial report on shipbuilder training and defense industrial base (10 USC 8692) -- findings related to the current and projected defense shipbuilding workforce, current and projected labor needs, and the readiness of the current and projected workforce to supply the proficiencies analyzed	February 1 of each even-numbered year until 2026
Federal Aviation Administration (FAA) Reauthorization Act of 2018 (Pub. L. 115-254)		
FAA	Youth Access to American Jobs in Aviation Task Force	Report to FAA Administrator and Congress
FY2022 Consolidated Appropriations Act		
OSTP	Coordinate with department secretaries to create a national CTE and STEM Education and Workforce Pipeline Strategy.	
DoD, ED, DOL	Establish a Defense Education and Workforce Pipeline Strategy -- Department of Defense in collaboration of the Department of Education, including the Office of the Undersecretary, Office of Elementary and Secondary Education, and Office of Career Technical and Adult Education; and the Department of Labor, including the Employment and Training Administration and Veterans Employment and Training Service.	
NSF	Cybersecurity Workforce -- a study to identify, compile, and analyze existing nationwide data and conduct survey research as necessary to better understand the national cyber workforce to build on the NAS report titled, "Information Technology and the U.S. Workforce."	

Andrew Reamer, Research Professor, George Washington Institute of Public Policy, George Washington University
Prepared under NSF Contract 49100421C0020 -- Administrative Datasets on Non-Degree Credentials: Creating and Analyzing a Repository
5/6/22

From: Nejat Duzgunes [redacted]
Sent: Monday, September 12, 2022 3:04 PM
To: MBX OSTP PCAST <MBX.OSTP.PCAST@ostp.eop.gov>
Subject: [EXTERNAL] "Science by consensus"
Importance: High

Dear Members of the President's Council of Advisors on Science and Technology,

I am enclosing the article entitled "'Science by consensus' impedes scientific creativity and progress: An alternative to funding biomedical research."

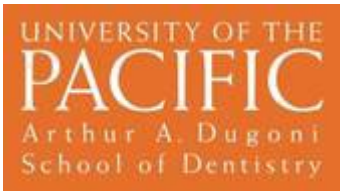
In the article, I am challenging the leadership of the National Academy of Sciences, NIH, NSF and the Science Advisor to the President to refute each of the 15 major problems with the current NIH and NSF peer review system for awarding grants.

I am sure that about 80% of American scientists who cannot obtain grant funding under the current system, and those who are constantly on edge about renewing their grants, would appreciate your response to this challenge.

Thank you for your attention to this extremely important problem with American science.

Sincerely,

Nejat Düzgüneş, Ph.D.
Professor of Microbiology
Department of Biomedical Sciences
Arthur A. Dugoni School of Dentistry
University of the Pacific
San Francisco, CA 94103
[redacted]



OPINION ARTICLE

‘Science by consensus’ impedes scientific creativity and progress: An alternative to funding biomedical research [version 1; peer review: awaiting peer review]

Nejat Düzgüneş

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Abstract

The very low success rates of grant applications to the National Institutes of Health (NIH) and the National Science Foundation (NSF) are highly detrimental to the progress of science and the careers of scientists. The peer review process that evaluates proposals has been claimed arbitrarily to be the best there is. This consensus system, however, has never been evaluated scientifically against an alternative. Here we delineate the 15 major problems with the peer review process, and challenge the Science Advisor to the President, and the leadership of NIH, NSF, and the U.S. Academy of Sciences to refute each of these criticisms. We call for the implementation of more equitable alternatives that will not constrain the progress of science. We propose a system that will fund 80,000 principal investigators, including young scientists, with just half the current NIH budget, three-fold more than the current number of grants, and that will forego the cumbersome, expensive, and counterproductive peer review stage. Further, we propose that the success of the two methods over 5–10 years be compared scientifically.

Keywords

Peer review; grant applications;NIH;NSF;granting agency

Open Peer Review

Approval Status *AWAITING PEER REVIEW*

Any reports and responses or comments on the article can be found at the end of the article.

This article is included in the Research on Research, Policy & Culture gateway.

Corresponding author: Nejat Düzgüneş (nduzgunes@pacific.edu)

Author roles: Düzgüneş N: Conceptualization, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

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Introduction

The success rate for National Institutes of Health (NIH) grants is currently 20% (NIH Report, 2022). The funding rate at the National Science Foundation (NSF) was 26% in 2021 (National Science Foundation, 2022). The Gates Foundation does not even release its grant success rate information. In 2009 and 2010, NIH received more than 20,000 applications for its Challenge Grants funded through the American Recovery and Reinvestment Act; the success rate was only 4% (NIH Report, 2011). The 'successful' projects are those that have been deemed by the consensus of peers to be worthwhile pursuing. Despite these very low percentages that afflict the careers of the great majority of scientists, the peer review system has been claimed to be the best system there is to allocate funding for biomedical research. This consensus system, however, has never been evaluated scientifically against an alternative (Düzgüneş, 1999).

Perhaps the earliest challenge to this system at NIH was made by John McGowan (1992), who was at the time the Director of Extramural Research at the National Institute of Allergy and Infectious Diseases (NIAID). He revealed that proposals to investigate human immunodeficiency virus (HIV) infections of macrophages had been rejected by a study section because "the literature does not support the hypothesis that HIV can grow in macrophages" (McGowan, 1992). And this is untrue! Regrettably, study sections have had too much power over what projects should proceed and which ones should be scrapped. As we have stated before, "such 'science by consensus' is unhealthy for the unfettered and productive pursuit of biomedical science" (Düzgüneş, 1999).

We challenge the Science Advisor to the President, and the leadership of NIH, NSF, and the U.S. National Academy of Sciences to refute each of the following 15 major problems with the current NIH and NSF grant systems. If they cannot, however, and we believe they cannot, we ask these institutions to implement more equitable alternatives that will not constrain the progress of science.

Problems with peer review

The NIH Peer Review document describes the mission of NIH to be seeking 'fundamental knowledge about the nature and behavior of living systems and to apply that knowledge to enhance health, lengthen life, and reduce illness and disability.' The document claims that the "NIH has a longstanding and time-tested system of peer review to identify the most promising biomedical research" (NIH Peer Review, 2019). During the initial peer review, the scientific merit of a grant application is evaluated by the Scientific Review Group that comprises scientists with relevant expertise in the area. The second review is the responsibility of the National Advisory Councils or Boards that decide on funding a proposal as well as on research priorities. Despite the claims of NIH that this is a longstanding and time-tested review process, it has never been compared scientifically to an alternative system, with respect to scientific productivity and breakthroughs, new therapeutic modalities, patents and its psychological, personal and scientific impact on grant applicants who do not 'succeed.'

Furthermore, NIH has to process over 80,000 applications a year, utilizing over 25,000 reviewers (NIH Peer Review, 2019).

We have identified 15 major shortcomings and problems of peer review, which we delineate below.

Some major breakthroughs in biomedical sciences have not been funded by NIH or NSF. There have been several publicized cases of highly important research not being given grant support that have later gone on to be recognized as significant scientific discoveries. Nobel Prize winner Stan Prusiner was not able to obtain NIH funding for studying prions early on in his research. Craig Venter's proposal to apply his whole-genome sequencing method to sequence a bacterial genome was not funded by NIH, and Nobel Prize winner Leon Cooper's work on neural networks was not supported by either the NIH or NSF (Bendiscioli, 2019). These examples should have been a history lesson for funding organizations like NIH and NSF (Düzgüneş, 1998).

Grant reviewers are competitors of applicants. If they are truly 'peers', grant review panel members are very likely to be competitors of the grant applicant, even if not directly on the subject of the proposal. Thus, they will not be inclined to give the benefit of the doubt to an innovative research proposal that has not already been substantially carried out, particularly when they are struggling to procure funding themselves.

Discoveries are made before grant awards. The requirement for preliminary data in most grant applications indicates that a scientific discovery is expected to have already been made. Thus, the NIH and NSF may not be funding discoveries, but merely funding "mopping up operations," in the words of Thomas Kuhn (1962), unless the preliminary data have been generated by a previous grant.

Reviewer critiques may be inaccurate, but without the responsibility of making inaccurate statements. Reviewers appear to have a mission to severely criticize applications to be able to weed them out, usually without the requirement to provide a published reference for any criticism. The reviewers are never accountable for their false statements or their scores (Swift, 1996), even though they can derail scientific careers and the advancement of a field of science.

Criticism never ends. Grant applicants may re-apply after revising their proposal to respond to the written critique of the review panel. However, the panel may have new members at this later time and may then have entirely new criticisms. In essence, if the review panel does not want to fund an application it will not fund the application, revealing the whims of the individual reviewers.

Early career reviewers trained in a narrow area of science often think that valid science is what they are trained in. Thus, they prevent the progress of science that may otherwise produce significant insights or therapeutic approaches to treat diseases. This problem was emphasized by Costello (2010): "… the new generation of grant reviewers judge grant proposals through the myopic lenses of their specialties …. Important ideas and proposals that lie outside the current interest in molecular biology are unlikely to get a credible and knowledgeable review …"

Nonscientific, unpublished review criteria. Reviewers tend to use nonscientific criteria when making funding decisions. These include: (i) 'probability of success' which would favor projects proposing only incremental advances and no risk-taking; (ii) 'level of enthusiasm' which is highly subjective and depends on the reviewer's mood at the time; and (iii) 'grantsmanship' which is essentially rendering grant-writing a game, expecting particular approaches to the project. Implying the nonscientific nature of the evaluation process, the study by Pier *et al.,* (2018) has shown that there is very little agreement between reviewers evaluating the same NIH grant applications.

Translational projects may require long-term funding. Projects that need additional time and experimentation to translate basic findings and initial discoveries into therapeutics or diagnostics may be considered by reviewers not to be innovative, thereby precluding the rapid development of a product that could diagnose or treat diseases. An example of this problem with NIH peer review is our inability to obtain grant funding since the mid-2000s for our research to develop gene therapy for oral cancer based on our initial discoveries (Neves *et al.,* 2009), despite many applications.

Robbing Peter to pay Paul. Principal investigators may need to channel the funds of an existing grant to produce preliminary data for a new application in a new research area, instead of performing the funded experiments. Thus, experiments described in detail in applications may never be carried out and may essentially have been written only to convince reviewers to fund the grant application. In our view, this practice is unethical. It also demonstrates the absurdity of requiring preliminary data.

Precious scientist time is wasted on grant applications. Investigators spend a large proportion of their time on grant applications, which necessarily takes them away from their currently funded projects, if they are indeed grant recipients. This is not only counter-productive but may also be time paid by salary support from the granting agency, time that should have been spent on the funded project. A study by Kulage *et al.* (2015) calculated the cost of preparing a grant application. Principal investigators in this particular field spent between 70 to 162 hours per grant, and research administrators spent 34 to 66 hours, at a cost of USD $4,784 to $13,512. They estimated that, because funding rates are in the range 5–15%, a grant that is eventually funded would cost $72,460–$270,240. They concluded that "less costly and more efficient models of research funding are needed for the sustainability of the nursing profession" (Kulage *et al.,* 2015). Scientists who have spent years in training and in research should be spending their time on scientific research, not on bureaucracy.

Describing experiments to be performed in five years is unrealistic. The elaborate description of experiments that will be performed three or five years in the future in a grant application contradicts the true nature of scientific research. Thus, for reviewers to expect meticulous descriptions, as if this is how science advances, goes against the true nature of science. Science is driven by the insights of scientists and new discoveries, and often requires immediate changes in approach or direction.

Waiting for grant funding hinders scientific progress. Many fields advance rapidly while investigators are waiting for their grant applications to be evaluated and funded. If the investigator is not funded independently, the project barely moves forward. We cannot afford science to progress at this slow and saltatory rate with the uncertainty in grant funding.

The human and material cost of NIH peer review. The administration of approximately 80,000 applications and 25,000 reviewers per year (NIH Peer Review, 2019) costs NIH and the research community both money and time that could have been used for actual research. For reviewers, evaluating grant applications is a chore performed for the sake of recognition

and prestige, and perhaps to increase their own chances of obtaining funding. This can result in the compromise of objectivity by the reviewers, and even resentment, because of the inordinate amount of time required to complete a review. NIH officials conducting sessions at scientific meetings on how to write grants admit that reviewers may not be able to spend quality time on reviewing applications. Of course, this is never admitted in print, since peer review is supposed to be unquestionably the ideal system for funding science.

NIH scientists do not compete for grant funding. Although NIH provides extramural funds following grueling peer review of grant applications, its own scientists do not have to compete for this type of funding. Thus, NIH itself appears to have recognized the extreme drawbacks of the peer review system, enabling its intramural community to undertake long-term projects with stable funding and large laboratory groups. If peer review is such an indispensable system for funding science, why does NIH not implement this system for its own scientists? Why is the extramural scientific community considered second-rate citizens who must clamor for funding all their lives?

Review panel scores do not predict success. An analysis of 102,740 funded grants has shown that percentile scores generated by NIH review panels for the applications are poor predictors of publication and citation productivity (Fang *et al.*, 2016). Thus, the meticulous scoring process is essentially useless. Arturo Casadevall of Johns Hopkins University and the senior author of this study is quoted as saying "A negative word at the table can often swing the debate. And this is how we allocate research funding in this country" (Johns Hopkins Bloomberg School of Public Health, 2016).

Alternatives to peer review

We have previously proposed simple alternatives to the current peer review system (Düzgüneş, 1999, 2007). This new system would provide continuous and stable funding for 10-year periods to scientists with a track record of solid publications (Düzgüneş, 1999) and to young scientists starting their first independent positions in a university or a research institute (Düzgüneş, 2007). Scientists opting for this mode of funding would merely submit a letter of intent with a one-page broad outline of their research direction. They could be chosen based on criteria including publications, citations and potential impact of their research field, by an *international* group of both established and young scientists *who are not in a position to receive funding from NIH or NSF* and are thus not competitors. About half of the NIH extramural funds could still be allocated to the current system of review, especially for projects requiring much larger budgets than what we are proposing below.

Under this new system, NIH grants to established scientists would be limited to $400,000 per year, and they would be phased in over several years, up to possibly 40,000 grantees. With indirect costs limited to 30%, these grants would cost $20.8 billion per year. Grants to young investigators would be set at $150,000 per year, with the same indirect cost rate. 40,000 such grants would cost NIH $7.8 billion. Thus, at a total cost of $28.6 billion the *NIH could fund 80,000 such grants*, with minuscule expenses for scientific review. Since the sum is only slightly more than half of the current NIH budget of $52 billion, the rest of the NIH budget could be allocated to about *half* (about 13,000) the current number of grants. Since this system will be phased in, and the NIH budget is likely to increase within the next five years, there will be no undue burden on the traditional grants and intramural funding. This system will result in the funding of 93,000 principal investigators, instead of the current approximately 26,000.

It is instructive to note the findings of Azoulay *et al.* (2011) in comparing Howard Hughes Medical Institute awardees and NIH grant recipients. They reported that "selection into the HHMI investigator program—which rewards long-term success, encourages intellectual experimentation, and provides rich feedback to its appointees—leads to higher levels of breakthrough innovation, compared with NIH funding—which is characterized by short grant cycles, predefined deliverables, and unforgiving renewal policies. Moreover, the magnitudes of these effects are quite large."

Vaesen and Katzav (2017) analyzed the proposal to "distribute available funds equally among all qualified researchers, with no interference from peer review." Their analysis indicated that "researchers could, on average, maintain current PhD student and Postdoc employment levels, and still have at their disposal a moderate (the U.K.) to considerable (the Netherlands, U.S.) budget for travel and equipment." Our proposal combines this equitable distribution of funds with the option for scientists undertaking very expensive projects to apply for the remaining highly competitive funds.

Evaluating the scientific success of grants obtained via peer review and the alternative system proposed here

The paradigm shift we are proposing does not end here. The scientific productivity of scientists in these two categories over a five-year and 10-year period will be analyzed, in terms of citations, significant discoveries, and development of therapeutics, per dollar amount spent. As we have indicated previously (Düzgüneş, 1999), "The United States has

expended enormous capital in the training of its scientists. The scientific potential of the more than 80 percent of biomedical scientists who are unable to procure grants is too precious a resource to waste."

Conclusions

While contemplating writing this section, we came across an e-mail sent to potential NIH grant applicants and a separate website aimed at academics and including advice on grant applications as part of an industry aimed at grant applicants for 'winning' reviews. The e-mail advertised that their program enabled the participants to 'successfully write for reviewers'. If an applicant is writing to impress a particular reviewer, the detailed norms, supposed objectivity, and scoring system of NIH peer review becomes questionable. Another website gave the advice to involve the reviewers' 'reptilian brain' and went on to say that the written review of a grant application may come from the rational, cerebral layer of the brain, but the decision on whether the grant is awarded or not actually comes from the most instinctual layer. What has become of the best method to review grant applications?

With all the problems of peer review of grant applications, we ask the Science Advisor to the President, and the leadership of NIH, NSF, and the U.S. National Academy of Sciences to implement more equitable alternatives that will not constrain the progress of science. A staring point is the very simple and highly cost-effective alternative we have proposed here.

Data availability

No data are associated with this article.

References

Azoulay P, Graff Zivin JS, Manso G: **Incentives and creativity: evidence from the academic life sciences.** *RAND J Economics.* 2011; **42**(3): 527–554.
Publisher Full Text

Bendiscioli S: **The troubles with peer review for allocating research funding: Funders need to experiment with versions of peer review and decision-making.** *EMBO Rep.* 2019 Dec 5; **20**(12): e49472.
PubMed Abstract | Publisher Full Text

Costello LC: **Perspective: is NIH funding the "best science by the best scientists"? A critique of the NIH R01 research grant review policies.** *Acad. Med.* 2010 May; **85**(5): 775–779.
Publisher Full Text

Düzgüneş N: **History lesson.** *The Scientist.* 1998; **12**(6): 8.

Düzgüneş N: **Science by consensus: why the NIH grant review system must be changed.** *The Scientist.* 1999; **13**(8): 13.

Düzgüneş N: **A new paradigm for NIH grants.** *The Scientist.* 2007; **21**(8): 24.

Fang FC, Bowen A, Casadevall A: **NIH peer review percentile scores are poorly predictive of grant productivity.** *elife.* 2016 Feb 16; **5**: e13323.
PubMed Abstract | Publisher Full Text

Johns Hopkins Bloomberg School of Public Health: **Researchers: Peer Review System for Awarding NIH Grants Is Flawed.** 2016. (accessed August 2, 2022).
Reference Source

Kuhn TS: *The Structure of Scientific Revolutions.* Chicago: University of Chicago Press; 1962; 264 pp.

Kulage KM, Schnall R, Hickey KT, *et al.*: **Time and costs of preparing and submitting an NIH grant application at a school of nursing.** *Nurs. Outlook.* 2015 Nov-Dec; **63**(6): 639–649.
PubMed Abstract | Publisher Full Text

McGowan JJ: **NIH peer review must change.** *J. NIH Res.* 1992; **4**(8).

National Science Foundation: **Funding and support descriptions.** 2022. (accessed July 4, 2022).
Reference Source

Neves S, Faneca H, Bertin S, *et al.*: **Transferrin lipoplex-mediated suicide gene therapy of oral squamous cell carcinoma in an immunocompetent murine model and mechanisms involved in the antitumoral response.** *Cancer Gene Ther.* 2009 Jan; **16**(1): 91–101.
PubMed Abstract | Publisher Full Text

NIH Peer Review: grants and cooperative agreements: 2019. (accessed July 30, 2022).
Reference Source

NIH Report: **NIH ARRA funding.** 2010. (accessed July 29, 2022).
Reference Source

NIH Report: **Success rates: R01-equivalent and research project grants.** 2022. (accessed July 4, 2022).
Reference Source

Pier EL, Brauer M, Filut A, *et al.*: **Low agreement among reviewers evaluating the same NIH grant applications.** *Proc. Natl. Acad. Sci. U. S. A.* 2018 Mar 20; **115**(12): 2952–2957.
PubMed Abstract | Publisher Full Text

Swift M: **Innovative research and NIH grant review.** *J. NIH Res.* 1996; **8**(12): 18.

Vaesen K, Katzav J: **How much would each researcher receive if competitive government research funding were distributed equally among researchers?** *PLoS One.* 2017; **12**(9): e0183967.
PubMed Abstract | Publisher Full Text