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Guest Editorial

New tools for establishing veracity in the information age

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Science and technology are advancing at an exponential rate. In fact, the US Patent office has logged more patent applications in the last decade than in the previous 10 decades. The number of peer-reviewed papers and citations in international journals is also increasing. By almost any measure the human race is developing a vast and impressive understanding of our universe and our place in it.

The frequency of making a discovery or invention that can radically change the human condition is increasing, as well. In early human history, the domestication of animals, development of agriculture, and invention of the wheel were estimated to have taken hundreds to thousands of years. During more modern history, innovations and inventions that changed human affairs such as the long bow, roads and aqueducts, navigation, and accurate time keeping, all occurred about once per generation. From World War I until the 1960s, technological advances that impacted almost every aspect of life (radio communication, the airplane, TV, nuclear technology) occurred about every 15-20 years. Since the 1970s, world-changing technologies have been created about once per decade (digital technology, the Internet, decoding the human genome, nanotechnology, and neurotechnology).

There is every reason to believe that this trend will continue. Currently, most modern countries spend one to two percent of their GDP on science and technology. This is a significant increase from the 1970s and 1980s when only three countries invested in science and technology at these levels. Even more important is the decrease in the time required for science to translate into technology that is available to- and used by- some sector of the population. It took 25 years from the invention of the TV to reach the point when one million TVs were sold. In contrast, Apple sold one million Ipods in just a few hours after its release.

But, these developments also incur a difficult challenge in that new information technologies can undermine or render outdated many of society's accepted policies and procedures. One such example is the difference between foreign and domestic intelligence collection. In the past, it was easy to distinguish between foreign intelligence collection methods and those of domestic intelligence collection that are highly regulated and controlled to ensure our civil liberties. In the modern age of the internet, such a distinction is almost meaningless. Foreign commination often transits US soil. Is collection of foreign intelligence within the US allowable? This question stirred almost a decade of debate surrounding the PATRIOT Act, which modified the 1980s law known as the Foreign Intelligence Surveillance Act (FISA). In fact, during the time it took the US Congress to resolve this issue, technology changed significantly enough to create the need to modify and update the law even as it was being passed. Other recent examples of scientific and technological advancement that have been the source of public and policy debate include stem cell research and use, cloning technologies, and bio-engineered products. Less obvious are examples such as the use of cell phones (particularly while driving) and identity theft via cyber crime.

Therefore, it becomes evident that science and technology that changes the way we live and work axiomatically will change our needs for government. Science- and its technological tools and products- can empower and threaten at the same time: Nuclear technology can answer many of our energy needs but poses serious threats to our environment and safety. Bio-technology can enable a healthier and longer life, while also providing means for new weapons that threaten our survival. Balancing and controlling the use of technology *is* a science (policy/political science) that humanity has yet to master.

While the pace of science and technology development has increased, our political structures for dealing with these types of challenges have become more polarized and the rate of policy formulation evermore enburdened. It is obvious that our ability to address and resolve controversial and difficult issues through the process of public policy is slowing down.

The US form of governance was designed to be metered and methodical. Checks and balances were built into the system to ensure a thoughtful, deliberative, and purposefully slow process. Thorny issues that divided the population were to be debated and tabled until consensus or compromise could be reached. This creates a conservative (i.e., literally, not politically) and reactive government. Thus, US government reacts rapidly when the populace is united, and slowly when it is not.

This also creates a governing structure that does not act strategically: We do very little strategic planning, preferring instead to react to a crisis rather than avoid one. In an environment where conditions change rapidly (e.g.- due to technology or other factors) we tend to be paralyzed in efforts to solve the last problem or crisis, while lamenting new challenges that are rapidly approaching on the horizon of scientific, technological and social possibility.

The situation is augmented by the technological progress we have made in the past few decades. The rapid advance of information technology puts all news on most everyone's cell phone and serves as a tool to disseminate and emphasize issues and problems to the masses. Reports about identity theft in New York City scare farmers in Iowa who realize that we all use the same internet. Reports (even though dubious, at best) about a potential link between childhood vaccinations and autism cause thousands to forego immunizations for their children. Some claim that the current negative financial environment is accentuated by modern communication that keeps investors from investing and employers from hiring.

Each and all of these issues sustain the need for a more enlightened process for developing policy and law to deal with the rapid changes that challenge our society. Some have advocated a "protectionist" approach that is based on the principle that no science or technology should be allowed to mature unless we can either prove it is "benign" (which is nigh impossible), or have developed the processes necessary for control. The Potomac Institute for Policy Studies has argued for the development of analytic process, policy, and law based upon the concept of "best available science". This states that science and policy are interactive and inter-reliant: science can be employed to assess the effects and results of policy being considered, and we should use well-accepted science and technology to inform and assist the policy formulation process.

Of course, this then raises the question of the veracity and validity of the science and information we use to guide our decisions. This is becoming a much more difficult and challenging problem. Prior to the Internet Age (IA), one trusted libraries, card catalogs, and published books. It once cost a sizeable amount of money to publish a book, and only well-established publishers could accomplish the task. Publishers hired researchers and editors to ensure that the product was sound before embarking upon the great expense of publishing. Further, libraries required books to be registered (ISBN numbers) and cataloged. Academic material required reference to other, already established (i.e., published) academic material. If the information was from a reputably published source it was considered to hold some veridicable relationship to "the facts".

Today most researchers use Google or some other internet engine to search for needed information. Unfortunately, Google does not come with a card catalog that lists all of the registered books and references, rather it simply lists all that it has found in the broad palette of the unregulated internet. The result is a combination of valid and (often very) unvalid, if not frankly false material. There are few tools to help the user understand the difference between the "diamonds" and the "detritus", as much of the false information is often packaged to look authentic and/or authoritative. Worse is the fact that many assume Google and other search engines are providing the most relevant and important information first on the list. In fact, Google lists results based on complex formulas that they will not share with the public, but which are seemingly biased toward mere frequency of citations on the web, or the use of services that escalate citations or elevate search listings (i.e., a paid service).

There are a few IA efforts to address this unregulated environment. Wikipedia is an example; this site is a "peoples' encyclopedia": the information contained is provided, edited, and maintained by the internet public. If one believes in societal Darwinism- that thousands or millions of individual decisions and inputs from individuals will tend toward the right answer- one could envision how the

"Wiki" approach might result in a weeding of false and/or invalid information. But, such a process is iterative and in the most fundamental sense of the term, "evolves". Thus, at any point in time, a site such as Wikipedia may be in a transitional "evolutionary" state of informational veridicality. At present we do not have a band-pass filter or calculation capable of discerning veritable and valid "signals" from false and/or invalid "noise". And history demonstrates the ability of large populations to delude themselves in many ways. Popular opinion does not necessarily equal scientific fact.

So, how is one to evaluate the veracity of information in the Intenet Age? I contend that the old tools still work, and they work even better when empowered by technology. In "the old days", the difficultly and cost of publishing stood as a barrier that encouraged critical review of data. Peer review and academic referencing helped to ensure the veracity of what was published. Today, information technology allows us to conduct peer review, cross-reference and uphold the veracity and validity of data at greater speed. This technology will also allow us to expand our processes of peer review and maybe even find ways to utilize a 'Wiki approach' to data review, discernment and scrupulous dissemination. The power of information is undeniable, and perhaps the speed of its possible use makes the validity of information even more urgent.

If the science and technology sectors of society are to assist our leaders and policy makers as they address the challenges created *by* science and technology, scientists and engineers will need to better communicate the information our leaders will need in the decision process. To do this we must find new and better ways of both establishing the veracity of scientific and technological data, and communicating the resulting information so as to empower the decision-making process.

The internet and the printed media can play a role in this process, as the relationship between different types, and forums of information develops and "evolves". The challenges facing any journal that obtains and communicates information about science and technology are how best to engage these resources in informational ways that maximize the best of the old and the new, how to both be part of- and contribute to- the evolutionary trend, and ultimately to serve some social good by providing information that will make meaningful impact upon the public and/or the policies that affect public life (as well as science and technology, itself).

We at the Potomac Institute for Policy Studies will strive to ensure that *Synesis* is one of the new tools our society needs to address these challenges.

Disclaimer

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Conflict of interest

The author declares that he has no competing interests.