The Origins of “Basic Research”

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In any discussion of government **science policies**, it rarely seems to take long for someone to invoke the notion of "**basic research**." For instance, writing in *The Washington Post* last month, Alan Leshner, CEO of the American Association for the Advancement of Science, and US Representative Jim Cooper (D-TN) announced the "Golden Goose Awards" to "recognize the often-surprising benefits of science to society."

In their appeal for more **funding** for **scientific research**, Leshner and Cooper argued that: "Across society, we don't have to look far for examples of basic research that paid off." They cite the creation of Google as a prime example of such payoffs: "Larry Page and Sergey Brin, then a National Science Foundation [NSF] fellow, did not intend to invent the Google search engine. Originally, they were intrigued by a mathematical challenge ..."

The appealing imagery of a scientist who simply follows his curiosity and then makes a discovery with a large **societal payoff** is part of the core mythology of **post-World War II science policies**. The mythology shapes how governments around the world organize, account for, and **fund research**. A large body of scholarship has critiqued postwar science policies and found that, despite many notable successes, the science policies that may have made sense in the middle of the last century may need updating in the 21st century.

In short, investments in "**basic research**" are not enough. Benoit Godin has asserted (PDF) that: "The problem is that the academic lobby has successfully claimed a monopoly on the creation of new knowledge, and that policy makers have been persuaded to confuse the necessary with the sufficient condition that investment in basic research would by itself necessarily lead to successful applications." Or as Leshner and Cooper declare in *The Washington Post*: "Federal investments in R&D have fueled half of the nation's economic growth since World War II."

A closer look at the actual history of **Google** reveals how history becomes mythology. The 1994 NSF project that funded the scientific work underpinning the search engine that became Google (as we know it today) was conducted from the start with **commercialization** in mind: "The technology developed in this project will provide the 'glue' that will make this worldwide collection usable as a unified entity, in a

scalable and economically viable fashion." In this case, the scientist following his curiosity had at least one eye simultaneously on commercialization.

Since graduate school in the early 1990s, I have observed the durability and sustainability of the mythology of "basic research" as a key political symbol in science policy. So several years ago I started a research project (funded by the NSF) to document the origins of the phrase. My findings have recently been published in the 50th anniversary issue of *Minerva* ("Basic Research as a Political Symbol" PDF).

I discovered that the phrase "**basic research**" originated around 1920 in the **United States'** agricultural community, where "research" was described as "the basic work" of the Department of Agriculture. The phrase was shortened to simply "basic research" and its usage slowly expanded in the 1920s and 1930s, but without the meaning it carries today. Ironically, "basic research" began as a phrase meaning what today we call "**applied research**."

During the period between the **World Wars**, scientists in both the **US** and **UK** sought to expand their role in government, as well as government's role in supporting science – in both instances with limited effect. During this time, scientists continued to appeal for government support of "fundamental" or "pure" research conducted with little or no consideration of its application. On both sides of the **Atlantic** such arguments, not surprisingly, found little political support.

Not until **World War II** did governments decide that large-scale support of **scientific research** was an appropriate role for public investment. As has been well chronicled, the change in orientation was reflected in **Vannevar Bush's** *Science – The Endless Frontier*, which marked the transformation of "**basic research**" into a political symbol representing a powerful conception of the role of **science in society**.

Bush's decision to use the phrase was conscious and strategic, as he explained in his memoirs: "To persuade the Congress of the pragmatically inclined United States to establish a strong organization to support fundamental research would seem to be one of the minor miracles ... When talking matters over with some of these [people on Capitol Hill], it was well to avoid the word fundamental and to use basic instead."

Up to that point, **science policy** in government had been almost exclusively the domain of **agriculturists**. **Henry A. Wallace**, who served as secretary of agriculture under **President Franklin Roosevelt** and later as his vice president, is an important figure in science policy whose role has been largely overlooked. At the start of the war, Wallace was the key figure in science policy and the leader to whom **Vannevar Bush** reported. By the end of the war, Wallace's political fortunes had fallen and the **physicists** were in charge of science policy, a role that has continued until today in the position of science advisor to the US president, which has been occupied by physicists for more than 50 years.

After the war, the usage of the phrase "**basic research**" increased dramatically in the **elite media**, in **Congress**, and within the **scientific community**. Interestingly, the usage increased and peaked first in the media, next in Congress, and lastly within the scientific community – a pattern supporting **Bush's** claim that the phrase was politically expedient. Yet, despite its fall from favor, it remains a core concept in contemporary discussions of science policy.

A key reason for the durability of the phrase is that it can simultaneously convey opposite meanings to different audiences. For many scientists, "**basic research**" means "**fundamental**" or "**pure**" research conducted without consideration of practical applications. At the same time, policy makers see "basic research" as that which leads to **societal benefits** including **economic growth** and **jobs**.

The mechanism that has allowed such divergent views to coexist is of course the so-called "**linear model**" **of innovation**, which holds that investments in "**basic research**" are but the first step in a sequence that progresses through **applied research**, **development**, and **application**. As recently explained in a major report of the US National Academy of Sciences: "[B]asic research ... has the potential to be

transformational to maintain the flow of new ideas that fuel the economy, provide security, and enhance the quality of life" (Rising Above the Gathering Storm).

In recent decades, use of the phrase "**basic research**" has been in decline. The **scientific community** has tried out an impressive range of alternative phraseology – "**fundamental**," "**transformative**," "**transformational**." Academics have also provided suggestions – "**use-inspired**," "**collaboratively assured**," "**Mode 2**." To date, no key symbol has displaced "basic research" for the simple reason that no model of **science policy** has yet displaced the postwar consensus. If and when such a shift occurs, it will not only be our institutions that change but our language as well.

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