SOME ISSUES OF GOVERNMENT-SPONSORED RESEARCH IN INDUSTRY

J. P. Sheerin
Department of Physics and Astronomy
Eastern Michigan University

This paper examines the relationships between government and industry in the pursuit of research. The government plays a pivotal role in the sponsorship of research. In areas where the government also plays the role of a practitioner in research conflicts may arise. A few selective case histories are examined to illustrate these issues. Understanding and addressing the issues that result from these interactions is critical to the success of sponsored research and the vitality of our economy.

We begin by defining a few terms. We then discuss the rationale for government-sponsored research in industry. This discussion reveals some of the issues that come into play. Specific examples are discussed as a means of illustrating these issues. Some conclusions are drawn with respect to the issues involved in government-sponsored research in industry. However, resolution of conflict issues awaits further debate.

What is "Research"?

"Research" for our purposes is taken to mean investigations prior to applications. This implies "long-term" development. What is meant by long-term is defined by context, but usually is taken as some period in excess of five to ten years. Some projects, like fusion energy, take much longer. Other projects, like computer development, may take fewer than five years but are still considered "long-term" in the context of that industry.

What is "Industry"?

We will take industry to mean organizations organized for profit. To a certain extent, all organizations, including those that are non-profit, exhibit certain behaviors toward self-preservation. This should be kept in mind when applying the remarks made here.

Why Government-Sponsored Research?

The government sponsors research primarily for the benefit of its citizens and constituents. At times it is important to remember the distinction between citizens and constituents. We will illustrate this later on.

Why Research in Industry?

Research is performed in industry in order to continue to provide products and services. It is important to note that research is often considered a product or service.

Why Government-Sponsored Research in Industry?

The government may find it useful to sponsor research in industry in order to fulfill its mission of providing for the welfare of its citizens and constituents. Specifically these missions may include:

A Defense capability
Risk sharing on projects of economic importance, but of high risk
Technology transfer to and from government laboratories
Industrial policy guiding development of technologies.

We will adopt the view that some government-sponsored research in industry is necessary for one or more of the above missions. Once adopted, the details of the mission do not dominate the issues raised by the interrelationships between government and industry.

Conflicts of interests are inherent in government-sponsored research.

Some issues:

Some issues that arise illustrate some of the areas of conflict:

Setting research spending priorities.

Determining the "players/winners".
> Lobbying plays a role
> "Peer Review" and the role it plays,

"Classification", what information is withheld or available to each of the parties involved,
Property Rights, who "owns" the research,

Industrial Policy:
Pure vs. Applied Research, who should do which kind of research,
Vendors and Sponsors, who may play which role

Role of Industry in setting Government Research spending priorities

The main role industry plays in setting government priorities in research is through lobbying. This may be considered an extension of industry's traditional role in selling products and services. In this relationship however, it has a far deeper impact.

"Big Science"

While not a very large slice of the government's budget, so-called "big science" projects illustrate well the wider impact and potential impact of industry lobbying efforts. Three current examples of "big science" projects include the Hubble Telescope, the Supercollider, and the Space Station. The first two resulted from the lobbying efforts of scientists themselves. In this regard, groups of scientists first agreed as to the resources most important to their field of research and with varying success, lobbied and convinced the government to sponsor their research. Because of the size of the budgets involved (measured in billions of dollars), while not a large slice of the budget, both of these examples encouraged close scrutiny and attention.

The third project, the space station, however, differs from the first two in many respects. The primary difference is that its constituency is mainly from industry. Its support amongst practitioners, that is the scientists themselves, is tepid at best. Indeed the American Geophysical Union (AGU) representing the interests of space scientists, formally came out against the space station. At the time of this writing the Supercollider has been canceled, yet the space station continues. We may take the contrast as evidence of the importance of industrial lobbying efforts in setting priorities in government spending on research.

International Science Projects

Big science projects have been pushed to broaden collaborations to share the expense of conducting the associated research among nations. There are many examples existing today of the efficacy of this cost sharing. One important point to remember is the importance of being a reliable partner. While cancellation of projects that are supported by a single government has obvious consequences, cancellation of participation in an international project may preclude future collaborations as a cost-sharing option. As an example, the U.S.

wished to share the expense of a mission to intercept Halley's comet. It successfully formed an international collaboration. When the U.S. decided to end its participation and cancel the mission, many countries found their considerable investments wasted. More than the loss of a single mission, the consequences plague future collaborations where cost-sharing for large science projects is even more critical.

"Peer Review" - Who are these "Peers"?

'Peer review refers to a review process whereby proposals for research funding are scrutinized by supposedly disinterested but knowledgeable third parties who are to render an unbiased appraisal of the proposed research, its reasonableness of cost, and likelihood of success. As the size of the project grows, reviewers fitting the ideal just described become more difficult to find. In the case of the Hubble telescope and the Supercollider, many of the knowledgeable potential reviewers were involved with the proposal, so the actual effectiveness of a peer review may decrease with a large project involving a substantial fraction of practitioners from a single field.

There is a more critical issue concerning peer review that involves the use of government referees. This accrues to the dual role government may play as both a sponsor of research and as a provider. The examination of this issue will take place as we proceed

Role of "Classification"

As mentioned above, "classification" concerns the control of the accessibility of information (and sometimes other resources like equipment). The government's unique role in determining the accessibility of information may lead to abuse of the peer review process. The government's unique legal position can also allow it to determine property rights.

Property Rights

"Government free-use license" is the term applied to intellectual properties spawned by the research it has sponsored. This usually provides for a two-year grace period (not in all cases), which allows the organization sponsored to acquire patent rights, or equivalent, to protect its stake. The government retains free-use of the property to avoid repaying for the same research sponsored. Departures from this norm include involuntary licensing, where the government can retain property rights for itself or even another organization.

Classification issues may affect property rights in cases where the property is itself protected by government secrecy. Because of the government's pivotal role in both the granting of property rights and determining the disclosure of information, the possibility for abuse exists.

Vendors versus Sponsors

Many if not most, of the issues raised so far can be traced back to the government's role as both a sponsor of research providing funding to the organizations that perform the research, called generically the vendors, and its concurrent role as a vendor, itself performing research through its national laboratories.

By way of illustration, we will examine a specific case to see how many of the issues described came to the forefront.

Some History of Laser Fusion: KMS Fusion, Inc., v. DOE

The idea of using powerful lasers to release fusion energy grew in the national laboratories in the middle to late 1960's out of the weapons program. In the early 1970's Kieve M. Siegel (KMS) sponsored this research forming a company KMS Fusion, Inc.. The initial success of this company, achieving the first controlled fusion reactions in May 1974, embarrassed and dismayed the national laboratories and some in government. Nonetheless, the Atomic Energy Commission (later to become the Department of Energy) began to fund the research at KMS.

In 1978, new owners took over with the passing of Prof. Siegel. These owners had no

previous knowledge in fusion energy, however, they came with a familiarity of how lobbying may aid in increased funding. Their efforts were successful and government funding grew for KMS. By this time the national labs were having their own successes and missteps.

In the late 1980's, on the occasion of an overall increase in the funding for all of laser fusion, (promoted by KMS), most of the national labs shared in increased funding. One national lab however felt left out and began a concerted effort to use its powers to eliminate KMS which it now viewed again as competition. This lab was allowed to use its state representation in Washington to launch a Government Accounting Office (GAO) probe of KMS. KMS would be subjected to a "peer review". The government would use the national labs as reviewers. It is cautionary to note how simply a vendor, the national lab, could manipulate the government towards its ends.

In the course of the GAO investigation, reliance had to be made on the DOE and the national labs for technical input. This allowed the conveyance of allegation to become fact. Classification protocols were then used to control dissemination of the "facts" in the investigation to KMS, even those provided by KMS.

In the end, the government ended its sponsorship of research at KMS in favor of another vendor. As for the property rights, presumed to accrue to KMS, the government may avail itself of its prerogative in assigning those rights to a new vendor.

In this case history, we can see most of the issues that arise in government funding of research in industry from lobbying and peer review, to classification and property rights. Most of the conflict of interest issues may be traced back to the dual role the government plays both as sponsor and as vendor.

"Industrial Policy"

As the focus for sponsored research in industry turns away from its defense mission to one of economic vitality, we can anticipate the issues described above to become more prominent. Examples include: the Advanced Research Projects Agency (ARPA) support of "non-defense" research and development (e.g. high definition television), the National Science Foundation's new mandate to earmark sixty per cent of its funding toward strategic technologies, the Department of Commerce's Advanced Technology Program supporting "Pre-competitive Technology" by funding consortia in a way like a "Civilian ARPA", as it has been called.

Conclusion

The conclusions must be left to the individual, but some are offered here as a starting point for the debates which should come.

Government-sponsored research is useful, and even necessary. However, because the government continues to play the role of a vendor as well as a sponsor, conflicts of interests are inherent. Issues such as use and abuse of lobbying, the conduct of peer reviews, "Classification", and property rights will become increasingly important, as will the role of the government as both sponsor and vendor of research.

DISCUSSION

Other motivations for government sponsored research include prestige for the government itself. A successful research endeavor can be something that the government points to with pride as evidence for achievement. More recently, some research funding has bypassed traditional peer review mechanisms, being dictated directly by Congress. In this situation, some argue that part of the motivation comes from a desire on the part of Congressional representatives to demonstrate clout by bringing a project back to the home district.

There has been some conflict in the academic community arising from University participation in classified research, one of the arguments being that such research violates the principle of openness. It is worth noting that industry in general does not work under that principle (for proprietary reasons) and hence may provide a more natural environment in which to perform such research.

The mechanism by which funding decisions are made raises some interesting questions. While one might wish to rely on peer review, can such objective review exist for large scale projects? The "peers" would likely come from one of a limited number of other groups active in the field. However, in a situation involving limited resources and a small number of active groups, any funding decision will have direct or indirect impact on all of the groups, giving rise to a conflict of interest. Does industry have too much influence in determining the winners in the scramble for funding? It may rely more on lobbying and other political means as opposed to scientific argument for achieving its funding goals. Finally, can peer review reasonably exist for classified projects?

It has been pointed out that conflicts of interest are inherent in the government's dual role of sponsorship of research in industry and manager of its own research labs. When it turns to members of its own labs for advice or "peer reviews" regarding an industry-based project, its own scientists may be directly affected by funding decisions they recommend. However, the mere existence of a conflict of interest does not imply that the resulting peer review is necessarily biased. Are there other procedures which could be implemented when such a conflict of interest arises, which would improve the chances for a fair review?

Some projects are of sufficiently large scale that international cooperation is the most likely means for attempting them. To what extent is the maintenance of a commitment to participate in an international science project an ethical requirement? Clearly there is an economic fallout when one country suddenly backs out of an agreement. On the other hand, some would argue that an obligation itself is not a sufficient reason to pursue a bad idea.

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