Research Tool Access in the Age of the IP Society: Results from a Survey of Japanese Scientists

A Report Prepared for the Project on Science and Intellectual Property in the Public Interest

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Contact Information:
Directorate for Science and Policy Programs
American Association for the Advancement of Science
1200 New York Avenue, NW
Washington, DC 20005
Tel: 202 326 6790
Fax: 202 289 4950
E-mail: sippi@aaas.org
URL: http://sippi.aaas.org

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John P. Walsh*

Hsin-I Huang

* School of Public Policy
Georgia Institute of Technology
685 Cherry Street
Atlanta, GA 30332-0345 USA
Tel: 1-404-385-0400
Email: john.walsh@pubpolicy.gatech.edu

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Contents

Abstract

Japan has becoming increasingly "pro-IP" over the last two decades and Japanese universities and public research institutes are encouraged to be more involved in patenting, licensing and start-ups. However, this raises the question of whether these initiatives may be adversely affecting "open-science" in Japan. Based on a survey of almost 1000 researchers in Japan, we analyze the flows of patented and published research results and whether researchers have had problems accessing necessary research inputs at any time over the last five years. We find very little evidence of problems accessing patented technologies (including research materials that are patented), with only about 1% of respondents (11% of those who needed to acquire such technologies) having any problems and less than 1% of respondents having adverse effects from not being able to access patented technologies. In contrast, almost 20% of respondents had some difficulty accessing copyrighted publications, and 16% of these (3% of the population) report having to delay their research for more than a month as a result. We also find that researchers are likely to withhold their own research results, with 7% having decided not to publish, 25% having delayed one of their own publications and 43% having published incompletely. Publication withholding is associated with patents, but not with industry funding. Thus, we find that Japanese university and public research institute scientists are rarely affected by others patents, but that secrecy and IP associated with publications may be interfering with "open science" in Japan.

Introduction

In recent years, Japan has implemented a series of policy changes in order to strengthen IP protection. Over the last ten or so years, there has been a shift from a "catch-up" IP regime to a push for making Japan an "IP-based nation" (Nakayama 2003). These changes paralleled Japan's changing role in the world economy. With the rise of Japan's international competitiveness, there was a shift in Japan toward an IP regime that emphasized excludability over disclosure (cf. (Cohen, Goto, Nagata, Nelson, and Walsh 2002; Ordover 1991)). More recently, due to competition from Korea and now China in markets such as automobiles and electronics, Japanese firms and policymakers are pushing to use IP to protect Japanese innovations and position in domestic and world markets. This transition is reflected in a variety of changes to the IP system, including adopting the doctrine of equivalents, changing the opposition system from pre-grant to post-grant, and, in March, 2003, creating the Intellectual Property Strategy Headquarters, under former Prime Minister Koizumi (Nakayama 2003) and in April, 2005, creating the IP High Court to hear appeals on IP cases (similar to the CAFC in the US)(Intellectual Property High Court 2005).

In addition to this more general shift toward an IP-based nation, there has been a specific emphasis on patenting and technology transfer for universities (especially the former national universities). Changes include subsidizing patent application and registration fees, creating TLOs to increase the licensing of university patents, the Hiranuma Plan to generate 1000 university startups and, with incorporation, the creation of central IP headquarters offices in universities (Walsh and Saegusa 2003).

These changes parallel similar shifts toward a pro-patent regime in the US that began in the 1980s that included the creation of the CAFC, the validation of biotech patents (Diamond v. Chakrabarti) and business methods patents (State Street Bank) and, again, toward more patenting and licensing by universities, especially the Bayh-Dole Act, and the creation of TTOs in American universities (Mowery, Nelson, Sampat, and Ziedonis 2004; Walsh, Arora, and Cohen 2003a).

In both countries, we have seen a substantial increase in patenting, and in university patenting (although in Japan the major increase has started only recently). We have also seen a growth of university-based start-ups and university licensing. However, this increasing commercialization of university research is generating concerns that the basic scientific commons may be threatened. While commercial application of scientific discoveries and university inventions is broadly encouraged, critics are raising questions about whether this may undermine the free flow of basic knowledge that is critical for the smooth function of the science system in each country (Andrews, Paradise, Holbrook, and Bochneak 2006; Eisenberg 2001; Nelson 2004; Nelson 2006).

Over the last two decades, there has been substantial growth in patents associated with genes and other research tools, although the growth seems to be slowing down (Pressman, Burgess, Cook-Deegan, McCormack, Nami-Wolk, Soucy, and Walters 2006). However, such technologies are much less likely to be patented in Japan (Hopkins, Mahdi, Patel, and Thomas 2007). Interviews with managers, scientists and patent counsel from firms and universities confirm that not just genes but all types of research inputs are more likely to have some related patents than in the past (Walsh, Arora, and Cohen 2003a). This growth in research tool patents is driven in part by the increasing propensity of universities to patent, and if possible, license, their professors' inventions (Association of University Technology Managers (AUTM) 2004; Pressman et al. 2006). The growing number of patents on the inputs to, and outputs of, academic research, and especially biomedical research, raises several concerns about possible adverse effects on academic research. The first concern is that a proliferation of patents, in itself, is a problem, because of the difficulty in negotiating access to a large number of patented technologies, the anti-commons problems (Heller and Eisenberg 1998). A second problem is that the owner of a basic discovery will keep exclusive control of the technology, thereby losing the advantage of having multiple actors with different competences address the problem of how this technology might be developed, the access problem (Merges and Nelson. 1990). This problem is considered especially serious if the patents cover "basic scientific facts" (Andrews, Paradise, Holbrook, and Bochneak 2006). In addition, the growth of commercial incentives for academic research might lead researchers to become more reluctant to share research tools with colleagues, the secrecy problem (National Research Council 2003). Similarly, scientists might delay publication of research results to maintain their commercial lead time (Blumenthal, Campbell, Anderson, Causino, and Louis 1997; Campbell, Clarridge, Gokhale, Birenbaum, Hilgartner, Holtzman, and Blumenthal 2002). Finally, scientists lured by the promise of commercial success, or drawn by access to industry funds, might redirect their research away from scientifically interesting or important problems and toward those with higher commercial potentials, the redirection problem (Thursby and Thursby 2003).

However, before we make interventions into the science system, it is important that we focus our discussion by clarifying which of the above concerns seem to be empirically grounded and which are still only potential concerns. This will allow us to much more fruitfully target out energies on the areas of greatest concern and possibly avoid unintended negative consequences associated with unnecessary changes. In addition, most of the prior work in this area has focused on biomedical research, and much of the research has been done in the US. However, we have strong reasons to believe that differences in the science system, in patent policy and in the incidence of patenting between Japan and the US could produce very different effects on the ease or difficult of accessing necessary research inputs. In addition, while there is substantial research on restrictions due to patenting, and from secrecy, there has been less focus on copyright, and the high cost of access to copyrighted journals, as an additional barrier to access to scientific research results. Thus, there is a need for empirically grounded research from Japan, and with an explicitly comparative policy focus, to help us understand how this new pro-IP environment may be affecting Japanese scientists' access to critical research inputs.

Data and Methods

In order to see how this new pro-IP regime has affected Japanese scientists, and to broaden the empirical work to include publication access and data access as well as access to research materials, AAAS and IFTECH/NISTEP conducted a survey of Japanese public researchers (universities and government labs). We asked about patenting activity, difficulties accessing patented technologies, withholding of research results (publication delay, editing publications, etc.) criteria for choosing publication outlets, including considerations of open access and problems accessing copyrighted publications and publicly funded datasets. We use these survey data to estimate the incidence of problems of access and of withholding of research results, how these vary by field and by sector (university and government lab), how these compare to similar populations in the US. We also analyze the relationships between commercial activity and withholding of research results.

We used the list of public researchers as our sampling frame. We drew a sample of 6700 researchers, stratified by field. We received a total of 1267 responses, representing a 19% response rate. If we exclude the approximately 600 cases where the invitation email was returned as undelivered, we have an adjusted response rate of 21%. In order to improve comparability and interpretability for cross-national comparisons, we limited our analyses to those respondents from three aggregated fields: life sciences; chemistry, physics and astronomy; and engineering, math and computer sciences. We also restricted our sample to include only those from universities and government labs. We also limited the sample to researchers with doctorate or masters degrees. Table 1 gives the descriptive statistics on the sample, including the distributions by aggregated fields and by sector. While the sample is dominated by life sciences researchers (62% of the sample); chemistry, physics and astronomy (14%); and engineering, math and computer sciences (24%) are also well represented. The sample has mostly university researchers (59%), but with a substantial number of government lab researchers as well (41%). The average seniority is almost 20 years. Ninety-one percent of our sample have a Ph.D.

We divide our analysis into the following sections: Acquiring research tools; terms and difficulties with acquisition; patenting and licensing activity; publishing activity; withholding behavior; and access to published results.

Technology Acquisition

We begin by examining the process of acquiring others' patented technologies. Table 2 shows the results for the full sample and broken out by field and sector. Twelve percent of our respondents said they had acquired patented technologies from outside in the last five years. This is significantly lower than in the US, where 32% say they had to acquire patented technologies since 2002. Of those who acquired outside technology 92% said the technology was primarily a "research tool", i.e., that the primary use of the technology was to facilitate research, rather than the object of study. Life scientists were most likely to say they were acquiring the technology as a research tool (95%), while engineering researchers were least likely (79%). We also found that almost half the respondents said the need to license outside technology has increased over the last five years. Engineering researchers were most likely to report an increase in licensing (53%) and those in chemistry/physics are the least likely, although still 40% reported an increase in licensing. This is substantially higher than the 16% of American researchers who reported that licensing had increased.

We asked a series of questions about their most recent acquisition. Over half (57%) said that the technology included a research exemption retained by the licensor. These exemptions are becoming increasingly common in the US as a way to

create contractually a free space for academic research. Our results show that this retained rights clause is most common in the life sciences (63%). Only 3% of the sample (all of which are life scientists) reported that there was a humanitarian use clause in the transfer agreement. These clauses are much more common in the US, again, as an attempt to generate contractually a free space for research and production of medical inventions targeted toward those in developing countries. We might think of these two cases as "positive" restrictions on use, in that they use the transfer contract to open access to the technology. We also find "negative" restrictions that limit public researchers' use of the technology, or make claims on the research results the technology enables. There has been substantial concern in the US that patent licenses and material transfer agreements are restricting scientists abilities to freely disseminate their findings or else are being used to expand the reach of a patent to cover derivative inventions through reach through claims and royalties on the products of research (Eisenberg 2001; National Research Council 1997; Walsh, Cho, and Cohen 2005a). We find such restrictions in Japan being fairly uncommon, though not unheard of. Ten percent reported that the license included a restriction on publication. These restrictions were most common in chemistry/physics (15%), and least likely in engineering (6%). Also, these were more common for public research organizations (13%) than for universities (6%). Five percent of the licenses included a royalty or reach through claim, with these most common in engineering (13%) and least common in life sciences (4%).

We also asked if they had any difficulties acquiring patented technologies. Forty-four percent reported that their most recent acquisition took longer than one month. Public research organizations also reported more delays (48%) compared to university researchers (40%). Eleven percent of respondents reported some difficulty acquiring a patented technology in the last 5 years. Of those reporting some difficulty, almost half (45%) said that the difficulty was that the individual royalty was too high. Less than 10% of those who had some difficult (or less than one percent of those who acquired a technology, or less than 0.1% of all respondents) said that the difficulty was that the necessary patents were not licensable, that they were denies a license, that negotiations broke down or that there were multiple royalties required. Thus, there is very little evidence of an anti-commons problem for this sample. Of those who respondent to the question about difficulties with technology acquisition (N=107), 2% reported that their research was delayed, 6% reported that they had to change the project, and 1 person (1% of those who acquired technology or 0.1% of the whole sample) reported abandoning the project. Thus, although there is some concern that the price of patented technologies may be too high, the vast majority of researchers have been largely unaffected by others' patented technologies. These results are consistent with prior research from the US, especially (Walsh, Cho, and Cohen 2007). This is especially remarkable because the AAAS survey included both pure IP acquisition (a license to use a patented technology) and research materials that are patented (for example, a cell line or genetically modified mouse), which should produce somewhat higher rates of adverse effects than pure IP alone (cf. (Walsh, Cho, and Cohen 2007)).

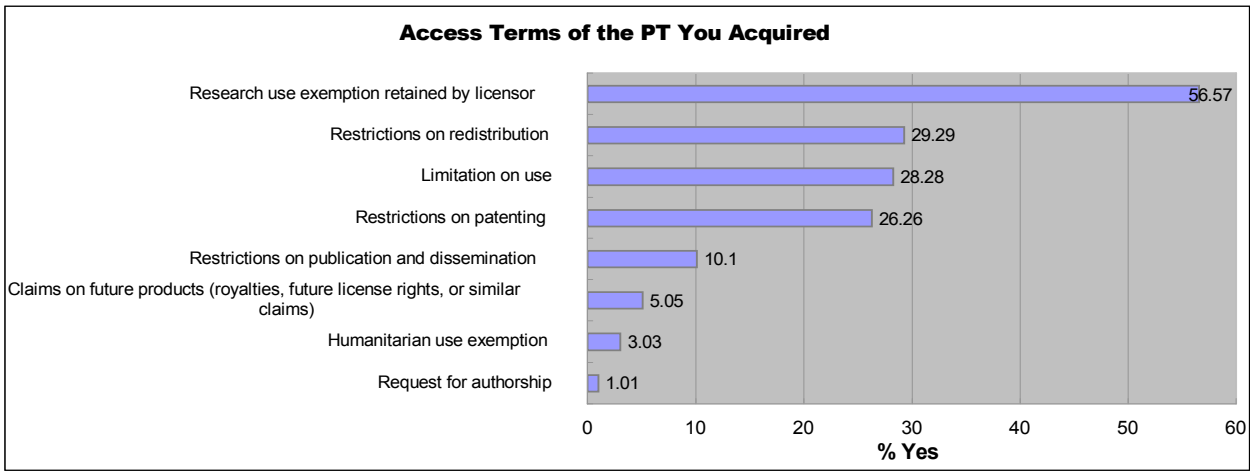

Figure 3-1: Access terms for most recently acquired technology.

Patenting and Licensing of Research Results

We also asked our respondents about their production and distribution of patented technologies. Thirty percent report that they had submitted one or more patent applications in the last five years. Engineers were the most likely (50%), with

chemistry/physics in the middle (31%) and life scientists least likely (22%). Those at public research organizations (36%) were more likely to have a patent application than university researchers (25%). Twenty percent of respondents had an issued patent. These numbers are somewhat lower than in the US, where 60% of university respondents and 47% of public researchers had a patent application. The results are also somewhat lower than a recent survey of Japanese academics in engineering and biomedical fields, which found that 63% had ever submitted a patent application, although the different time periods may account for some of the difference (Baba, et al. 2006).

Figure 5-1 shows the reasons to patent, reporting the percent of respondents who said that a given reason was at least moderately important ("3" or "4" on a four-point scale). The most commonly cited reason (73%) was to acquire public R&D funding. This was more important than protecting the technology from imitation (62%). Blocking competitors from patenting (59%) was also an important reason to patent, as is using the patent to facilitate cooperation with other institutions (61%). Using the patent to help secure private funding was also mentioned by the majority of respondents (56%), but this was still lower than those who felt the patent would help secure public funding.

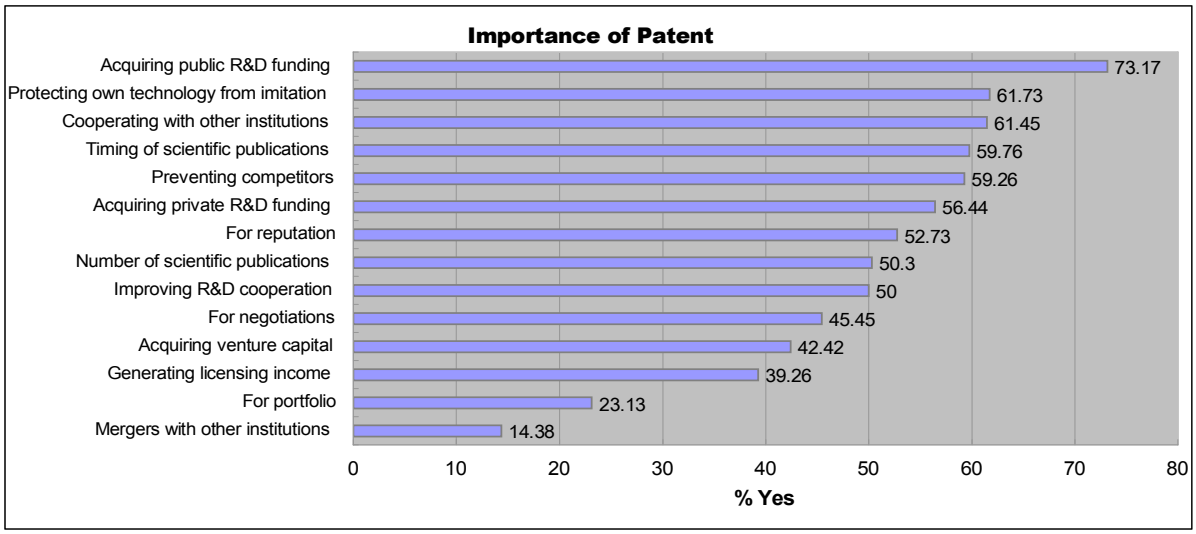

Figure 5-1. Reasons to patent.

When we asked how they disseminated their patented technologies, 40% said they used an exclusive license and 21% said through a non-exclusive license (Table 4-2). Exclusive licenses were most common in life sciences (50%). They were also much more common for universities (52%) compared to public research organizations (27%). In contrast, 41% of public research organizations issued non-exclusive licenses, compared to only 4% for universities. Thus, of the university inventions that were licensed, 93% (52/56) were exclusively licensed. Exclusive licensing seems to be much more common in Japan than in the U.S. For example, according the AUTM licensing data, only 54% of university licenses were exclusive (Association of University Technology Managers (AUTM) 2004). For both sectors, the most common recipient was industry (about 80% for both groups). Thirty-two percent of these licenses contained a research exemption clause, with these retained rights clauses being much more common for university licenses (38%) than public research organizations (17%). There was no use of humanitarian use clauses for out-licenses.

Publications and Open Access Journals

While technology transfer through patenting is important, publications are generally considered even more important for disseminating technology from universities and government labs to industry (Agrawal and Henderson 2002; Cohen, Nelson, and Walsh 2002). Nearly all of our respondents had published in the last five years. We asked them a series of questions about how they choose publication outlets (Table 6). The most important criterion 77%) was the prestige of the publication outlet, tied to funding and promotion. The second most important (68%) was the goal of disseminating the results to a wide audience or to a relevant readership. Timeliness and ease of retrieval were each nominated about just over a third of respondents. Timeliness was somewhat more important for university researchers (41% v. 33%). Open access publishing is still fairly rare, with only 3% reporting use of this publication strategy. However, it was more com-

mon in chemistry/physics, where 12% reported using an open access model for their most recent publication. Thirty-nine percent report their use of open access has increased in the last three years and almost 70% report that access has become easier (although this is somewhat less true for engineering, 59%). Twenty-one percent of respondents report that copyright restrictions caused them some difficulty related to disseminating their own papers, for example, through their own web page or by sharing it with colleagues. Thus, a significant fraction of researchers feel that their publication strategy may inhibit their ability to independently disseminate their own research results.

We also asked about secrecy or withholding of research results (Table 7-1). Seven percent reported not publishing at least once in the last five years, including 9% of life scientists. Twenty-five percent reported delaying a publication. And 44% report publishing incompletely in order to protect the value of their discovery. Publication delay was most common in the life sciences, and somewhat more common in public research organizations. Partial publication was also more common in public research organizations (50% v. 38%). When compare these results to a sample of life science researchers from the US, we find that delay and not publishing are similar in the U.S., but that editing publications is more common in Japan than in the U.S., with an average of almost 9% per year in Japan and under 2% per year in the U.S. (Walsh, Jiang, and Cohen 2006). Thus, we see some evidence that university and public researchers are willing to withhold their research results from full dissemination.

Prior work has found that in the U.S., such withholding behavior is associated with patenting and commercial activity, industry funding, and scientific competition (Blumenthal et al. 1997; Campbell et al. 2002; Cohen, Florida, and Goe 1994; Walsh and Hong 2003; Walsh, Jiang, and Cohen 2006). We tested a series of logistic regression models predicting the various forms of publication secrecy in our sample. The results are in Table 7-2. We find university researchers are generally less likely to withhold research findings than are those in government labs/non-profit research institutes (although only the effect on incomplete publishing is significant). We also find that researchers that have submitted a patent are more likely to withhold research results, consistent with prior findings from the U.S. Industry funding does not have a major independent effect on withholding. We did not have measures of scientific competition or of academic productivity, so we were not able to control for the possible confounding effects of these influences on withholding (cf. (Walsh and Hong 2003; Walsh, Cho, and Cohen 2005b; Walsh, Jiang, and Cohen 2006)). We should also interpret these results with some caution, as the overall variance explained is small (less than 10% in each model).

We also asked about problems getting access to others' published works (Table 8-1). Nineteen percent reported difficulties gaining access at least once in the last five years. Interestingly, this is substantially higher than the number that had difficulty gaining access to patented technologies (10% of those who had acquired, or about 1% of the whole sample). Almost 40% of those who had some difficulty reported that this inability to access delayed their research, with 16% (3% of the total sample) saying that it delayed their research for more than one month. Eleven percent (2% of the total sample) had to change their research approach and just over 1% (3 people) had to abandon a project due to inability to gain access to copyrighted materials (representing less than 1% of the total sample). Again, these numbers are substantially higher than those who were adversely affected by patented technology access problems. However, almost three-quarters of respondents report that access is becoming easier, which gives us some hope that these problems may be lessening over time.

Conclusions

Thus, our results indicate that despite the increasingly pro-IP environment for Japanese university and public researchers, we see little evidence that patents are interfering with their research. Over a five year period, approximately 1% of those who tried to acquire a patented technology had to abandon a project, or, put another way, over a span of five years, approximately 0.1% of our sample of researchers abandoned a project due to the inability to access a patented technology. Similarly, in a five year period, less than 1% of our total sample were delayed or had to modify their research because of the inability to access others patented technology.

We do see some problems with accessing others copyrighted materials, with about 19% reporting difficulties in gaining access at least once in the last five years and with 3% of the total sample saying that it delayed their research for more than one month, 2% saying they had to change their research approach, although only 0.3% (3 people) having to abandon a project due to inability to gain access to copyrighted materials. We also see that many respondents report occasionally withholding their own research results, with 7% not publishing something, 25% delaying publication and 44% editing or modifying the publication to withhold information. This secrecy is associated with patenting (which may be a proxy for

commercial activity), but not with industry funding (cf. Walsh, et al., 2006, Walsh and Hong, 2003, Campbell, et al., 2002).

Also, although we do not see much evidence of patent-related problems for public researchers, we do note that many university-generated inventions are exclusively licensed to firms. While these licenses often contain research use exemptions, these exemptions may not extend to industry researchers. However, the combination of the relatively lower rates of research tool patenting in Japan (Hopkins, Mahdi, Patel, and Thomas 2007), the existence of research use clauses in university licenses, and, perhaps, rational forbearance on the part of patent owners (National Research Council 1997; Walsh, Arora, and Cohen 2003b), have created a free space for Japanese researchers to conduct their research, despite the growing commercialization of university research. We might still see problems in the future, and industry researchers may have different experience. But, for now, there does not seem to be strong evidence suggesting a need for policy interventions to facilitate university or public researcher access to research tools.

There is reason to be concerned about access to research findings. We need to explore further the causes and consequences of publication-related secrecy. However, the finding on the growth of open-access models of publication suggests that these may help alleviate some of the problems. Of course, the strong emphasis on the legitimacy of the publication outlet (i.e., its prestige and its readership) suggests that there is a strong conservatism in scientific publication strategies and that new publication models will have to address prestige and dissemination issues. The use of peer-review and high-profile editorial boards, as well as affiliations with professional societies or prestigious institutions, may help overcome some of these legitimacy barriers. And, these models will not overcome the lack of access caused by the researchers withholding their results from the published literature, whether open-access or not. Thus, we should explore further the causes and consequences of such secrecy and see if there may be some mechanisms for encouraging Japanese scientists to be more open with their findings.

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Appendix 1: Survey Design

Basic Methodology

The *AAAS-SIPPI 2006 Effects of Intellectual Property Protections Survey* was a multinational effort focusing on four specific pools of potential respondents as follows:

- In the United States, a random sample of 8,000 AAAS members were invited to take the survey; details of the sample selection are given below;
- In the United Kingdom, multiple scientific professional societies invited approximately 5,000 scientists in sum to participate;
- In Germany, the approximately 1,600 members of Union of the German Academies of Sciences and Humanities, the employees of the Max Planck Society,[1] and the 1,272 AAAS members who live in Germany[2] were invited to participate; and
- In Japan, the Institute for Future Technology invited a random sample of 5,000 mostly academic scientists to participate in the survey.

The timing for each respondent group was slightly different. For the United States and United Kingdom samples, the same survey instrument was used and the survey was administered to both groups between March and April of 2006. The survey instrument subsequently was modified slightly for use with German respondents, and made available to those respondents between May and July of 2006. The German questionnaire (administered in English) subsequently was translated into Japanese and made available to Japanese respondents between November of 2006 and January of 2007.

The questionnaire was Internet based and self-administered; further details of the questionnaire design for the Japanese survey are given below.

Questionnaire Design for Japan

The questionnaire design for Japan was subsequent to the questionnaire design for the United States/United Kingdom and for Germany.

The United States/United Kingdom questionnaire was based on the questionnaire used for the *AAAS-SIPPI 2005 Patent Survey*.[3] That survey was intended as a pilot for the larger *2006 Effects of Intellectual Property Protections Survey* described here. Two sections of questions were added to the pilot: a section on experiences with publications, initially written by Stephen Hansen, and a section on experiences with publicly funded data, initially written by Paul Uhlir of the National Academies.

After a thorough study of the results of the 2005 survey, as well as an in-house review of the new questions for the 2006 survey, the questions were mounted on the survey Web site by the staff at the Social and Economic Sciences Research Center of Washington State University. The survey instrument was then thoroughly reviewed again by AAAS staff for accuracy of skip patterns, grammar and clerical errors, and quality of questionnaire design.

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[1] The Max Planck Society is comprised of 75 institutes and 3 additional research facilities. Together, they are staffed by 12,000 employees and 10,000 junior scientists and guest scientists. The e-mail invitation to participate in the *2006 Effects of Intellectual Property Protections Survey*, however, was distributed to each of the institute and research facility organizational heads, and it was their decision whether to forward that invitation to their employees. As such, the true "sample size" for the German phase of the *2006 Effects of Intellectual Property Protections Survey* can not be easily determined.

[2] That is, the 1,272 AAAS members as of November 17, 2005 with valid e-mail addresses whose primary residence is in Germany.

[3] Hansen, S., A. Brewster, J. Asher, and M. Kisielewski. 2005. *The Effects of Patenting in the AAAS Scientific Community*. (Washington, DC: American Association for the Advancement of Science).

Because the 2006 questionnaire was significantly expanded compared to the 2005 pilot survey, AAAS staff felt further testing was warranted. Therefore, as a field test for the questionnaire, it was self-administered by twelve volunteer scientists who subsequently reported on their experiences taking the survey to AAAS staff. Those experiences were compiled and further edits of the survey instrument were made. A final round of quality checking ensued before the survey was made available to respondents in February of 2006.

After the U.S./U.K. survey was implemented, preparations were made to edit the survey instrument, if required, to make it more suitable to a German audience. Even though the German survey was to be in English, SIPPI staff felt that cultural differences might affect the German respondents' understanding of the questionnaire. For that reason, a series of four cognitive interviews of expatriate German scientists in the greater Washington DC area was implemented, after which minor changes were made to the survey to enhance respondent understanding. The modified questionnaire was then tested via another series of cognitive interviews, again of expatriate German scientists in the greater Washington DC area. The second series of interviews confirmed that the edits increased respondent understanding of the survey questionnaire, and the German survey commenced shortly thereafter.

The preparation for the Japanese survey began after the German phase was completed. First a series of five cognitive interviews of expatriate Japanese scientists in the greater Washington DC area was implemented to test the Germany-specific version of the questionnaire. SIPPI staff determined that no modifications were required to the survey instrument prior to translation to Japanese. Then an initial translation and back-translation of the questionnaire was completed. Subsequent rounds of translation and back-translation were used to fine-tune the Japanese language questionnaire: those rounds of translation all occurred in electronic media format. When Japanese text was ready, it was copied and pasted into Web page format. Finally, the Web pages were carefully checked to ensure both that all questions were correctly placed and also that the database software behind the Web survey was correctly accepting Japanese input.

Further details of the cognitive interviewing process described above will appear in a separate publication.

Survey Logistics for the Japan Sample

Sampled individuals were invited to participate in the survey via an e-mail message. In order to reduce the possibility of single respondents answering the survey multiple times, or response from scientists that were not part of the sample, an individualized code was required to enter the survey. In the case of the Japanese respondents, sampled individuals were assigned a code upon their first arrival at the survey Web site. Reminder e-mails were sent a week after the survey was launched.

Appendix 2: Survey Instrument

Please note that the survey instrument for the Japanese sample of the AAAS-SIPPI 2006 Effects of Intellectual Property Protections Survey *was administered in Japanese; this is the English version of that survey*.

Underlining indicates a modification or creation of a category during the cleaning of the data in the "other" category.

Q01: In what field of science do you (or if retired/on leave, did you) primarily work?

Biological sciences
Medical/health sciences
Agricultural sciences
Other life sciences
Physical sciences
Chemistry
Engineering
Earth sciences
Physics and astronomy
Math and computer sciences
Science history, ethics, or philosophy
Science education or administration
Science publishing or media
Other social, behavioral or economic sciences
Non-scientific Field
Other

Q02: Which of these would you describe as your main job function (check all that apply)?

Academic teaching and research
Scientific research (non-academic)
Academic administration (e.g., Dean, Department Head)
Administration/Management (University/corporate/government)
Student
Development (or Finance)
Funding
Medical services
Product/process engineering (including software)
Manufacturing/processing
Quality control/assurance/regulatory/safety/analysis
Purchasing
Journalism (writing/editing/publishing)
Law/legal services/forensics
Policy/ethics
Consulting
Intellectual property management (e.g., technology transfer)
Retired/on leave
Other:
Sales/Marketing/Product support/Business Improvement

Q03: Since 1 January 2002, have you* acquired any patented technologies, materials or methods (technology) to use in your work that were covered by some form of intellectual property protection?

by "you", we mean the following:

- ***If you are self-employed, you personally.***
- ***If you are employed by a university, company, government, etc., please answer within the context of your employment since 1 January 2002 (i.e., technology acquired under the sponsorship of your employer(s) that you used in your work).***
- ***If you manage intellectual property, then technology acquired by your university, company, etc.***

Yes → Go to question 04
No → Go to question 14
Not sure/don't know → Go to question 14

Q04: Please specify the scientific field of the last patented technology* you acquired since 1 January 2002:

Note: Please specify the scientific field in which the patented technology was developed, even if it was used for research in a different field. If more than one patented technology was acquired at the same time, please select one and answer the question in relation to that technology.

Biological sciences
Medical/health sciences
Agricultural sciences
Other life sciences
Physical sciences
Chemistry
Engineering
Earth sciences
Physics and astronomy
Math and computer sciences
Science history, ethics, or philosophy
Science education or administration
Science publishing or media
Other social, behavioral or economic sciences
Non-scientific Field
Other:

Q05: Who was the source of the last patented technology you acquired?

Academe
Industry
Government/Inter-governmental organization
Nonprofit/Nongovernmental organization
Other:
Not sure/Don't know
Individual/self outside of employment

Q06: Was the last patented technology you acquired used strictly as a research tool (meaning that it was not the subject of the research)?

Yes
No

Q07: Please indicate which of the following methods was used in the acquisition of this patented technology.

Informal (no official agreement)
License: Exclusive
License: Non-exclusive
Material Transfer Agreement (MTA)
Sponsored Research Agreement (SRA)
Confidentiality Agreement
Memorandum of Understanding (MOU)
Purchase
General Public License (GPL, Open Source Software)
Other:
Not sure/Don't know
Developed by organization/self
More than one of the above
Donation
Acquired through acquisition of company
Some type of collaboration/cooperative agreement

Q08: Please indicate which, if any, terms were involved in the assignment or licensing of the last patented technology you acquired (check all that apply):

Research or experimental use exemption maintained by licensor
Humanitarian use exemption
Limitation on use (field of use restriction)
Restrictions on patenting (research use only)
Restrictions on redistribution
Restrictions on publication and dissemination of research results
Claims on future products, through reach through royalties, future license rights, or similar claims
Request for authorship
None
Other
Not sure/don't know
More than one of the above

Q09: How long did it take to acquire this patented technology?

Less than one month
1 to 2 months
More than two months, but less than 6 months
Six months or more
Not sure/Don't know

Q10: Since 1 January 2002, did you experience any difficulties while attempting to acquire any patented technologies?

Yes → Go to question 11
No → Go to question 14

Q11: Thinking back to the last time since 1 January 2002 that you had difficulties acquiring a patented tec hnology, what were the reasons (check all that apply)?

Necessary patents were/are not licensable
Request for license denied
Overly complex patent licensing negotiations
Licensing negotiations broke down
Individuals royalties were too high
Royalties required for multiple patents
Unable to determine the IP status of the technology
Other:
Took too long to obtain technology
No response from IP owner to request
Problems with Patent Office
Employer rules

Q12: Thinking back to the last time since 1 January 2002 that you had difficulties acquiring a patented techno logy, ultimately, how was your research affected by these difficulties?

It was delayed → Go to question 14
It had to be changed → Go to question 13
It had to be abandoned → Go to question 14
Effect not yet known → Go to question 14
Not at all → Go to question 14
Other → Go to question 14

Q13: As a result of having to change your research, did you do any of the following (check all that apply):

Used different technologies/tools
Attempted to invent around patented technology
Changed geographic location for the work (to another country)
Changed project goals
Worked around issue in another way
Other

Q14: Does your current work involve less or more licensing of technology than it did prior to 1 Jan uary 2002?

Less
About the same
More
Not sure
Don't know, only active in my field since:
Not applicable

Q15: Since 1 January 2002, have you* created any technologies that you/your institution would consider intelle c-tual property?**

by "you", we mean the following:

- ***If you are self-employed, you personally.***
- ***If you are employed by a university, company, government, etc., please answer within the context of your em-ployment (i.e., intellectual property developed under the sponsorship of your employer(s) to which you have significantly contributed).***
- ***If you manage intellectual property, then intellectual property of yo ur university, company, etc.***

By intellectual property, we are referring to property, created through intellectual and/or discovery efforts, that is generally protectable under patent, trademark, copyright, trade secret, agre ements, or other laws.

Yes → Go to question 16
No → Go to question 24

Q16: Which of the following approaches were used in protecting your *last* technological innovation (check all that apply)?

Patent
Copyright
Trademark
Trade secret
Complex product design
Embodied in product (e.g., software in machinery)
Withheld data or information
Delayed publication
Did not publish
None
Other
Do not know
Plant Variety Protection or other government protection not listed above

Q17A: Since 1 January 2002, how many patents have been submitted (or are pending) for your technical innovations? (If you don't know, please leave blank.)

Respondents could write in their answer

Q17B: Since 1 January 2002, how many patents have been issued for your technical innovations? (If you don't know, please leave blank.)

Don't Know → Go to question 24
0 → Go to question 24
1 or more → Go to question 18

Of the patents that have been issued since 1 January 2002, we would like to ask you to please answer questions 18-23 in regards to the last patent received by you. By "received by you", we mean patents issued directly to you if you are self-employed; patents issued to your employer to which you significantly contributed if you are employed by a university, company, government, etc.; and patents issued to your organization if you manage intellectual property.

Q18: What was the primary field for your last patent (check only one)?

Biological sciences
Medical/health sciences
Agricultural sciences
Other life sciences
Physical sciences
Chemistry
Engineering
Earth sciences
Physics and astronomy
Mathematics and computer science
Social, behavioral and economic sciences
Non-scientific field
Other:

Q19: Would you consider the technology protected by your last patent a technology whose value is wholly or partially in its use for conducting research (e.g., as a research tool or to enable technology)?

Yes
No
Not sure/don't know

Q20: Please rate how important applying for and/or acquiring your last patent was to you (or, if the patent was applied for by your employer, to your employer) with respect to each of the following:

Not at all important
Slightly important
Somewhat important
Very important

A. Acquiring venture capital
B. Cooperating with other institutions
C. Mergers with other institutions
D. Acquiring public R&D funding
E. Acquiring private R&D funding
F. Generating licensing income
G. Timing of scientific publications
H. Number of scientific publications
I. Improving your or your institution's technological portfolio
J. Improving your or your institution's academic reputation
K. Improving your or your organization's negotiations (e.g., cross licensing or joint ventures)
L. Protecting own technology from imitation
M. Preventing competitors' patenting and application activities
N. Improving R&D cooperation
O. Other concerns

Q21: Was the technology protected by your last patent disseminated to others in any way?

Yes → Go to question 22
No → Go to question 23
Not sure/don't know → Go to question 24

Q22: Please indicate how the technology protected by your last patent was disseminated:

Shared informally (no official agreements) → Go to question 24
Licensed exclusively → Go to question 22A
Licensed non-exclusively → Go to question 22D
Donated/given for free → Go to question 24
Placed in patent pool or consortia → Go to question 24
Used in cross-licensing agreements → Go to question 24
Published in scientific journal/conference → Go to question 25
Sold the technology → Go to question 24
Other → Go to question 24

Q22A: Who was the recipient of the technology protected by your last patent (select only one)?

Academia
Industry
Government
Nonprofit
Other

Q22B: How easy or difficult was it to license the technology protected by your last patent?

Very easy
Easy
Neither easy nor difficult
Difficult
Very difficult
Don't know

Q22C: In setting the licensing terms for the technology protected by your last patent, did you maintain a (check all that apply):

Research or experimental use exemption that allowed you or others to continue to conduct work on or with the technology for research purposes → Go to question 24
Humanitarian use exemption that *allowed for the development of and/or the transfer of the technology to developing countries* → Go to question 24
Neither → Go to question 24
Not sure/don't know → Go to question 24

Q22D: Who were the recipients of the technology protected by your last patent (select all that apply)?

Academia
Industry
Government
Nonprofit
Other

Q22E: In setting the licensing terms for the technology protected by your last patent, did you maintain a (check all that apply):

Research or experimental use exemption that allowed you to continue to conduct work on or with the technology for research purposes → Go to question 24
Humanitarian use exemption that *allowed for the development of and/or the transfer of the technology to developing countries* → Go to question 24
Neither → Go to question 24
Not sure/don't know → Go to question 24
Does not apply → Go to question 24

Q23: Which ONE of these is the main reason that you have not disseminated the technology protected by this patent?

You (or your organization) planned/are planning to conduct future research with the technology
You (or your organization) were/are developing or commercializing the technology yourself
You (or your organization) wanted/want to block competitors
Precluded by an agreement
Other:

Q24: Has your scientific work ever been published?

Yes → Go to question 25
No → Go to question 34
Not sure/don't know → Go to question 34

We would like to ask you some questions relating to the last material you published.

Q25: Regarding your latest publication, why did you choose to publish this material (check all that apply)?

To inform others about your work and results
To increase prospects for promotion
To gain credits for academic advancement, etc. (e.g., Research Assessment Exercise, RAE)
To gain/justify research funding
To get feedback from reviewers and readers
To document the work in an archival way
To prevent others from acquiring IP protections
Other:
Gain investment capital/promote commercial product
Duty/other's choice/invitation

Q26: Regarding your latest publication, who published this material?

Myself or my department
My organization
Conference organizer
Journal or proceedings publisher
Professional association (other than your own organization)
National (government) library or other government office
Placed in a freely accessible archive
Placed in a commercial archive
Other
(Commercial Publishing Group (including Commercial University Presses))

Q27: On which criteria did you base your choice when choosing how/where to publish your latest publication (check all that apply)?

Prestige; it is on a shortlist of approved journals (promotion, funding)
Dissemination; large circulation, relevant readership
Timeliness; short time from submission to publication
Availability; article would be available for free on the Web
Ease of retrieval; journal is indexed in commercial or open access database
Other:
Not my choice/only one choice/invited/choice of others
Focus of journal/appropriateness of article for specific journal
Where article most likely/easily accepted

Q28: Did you or your coauthor(s) keep the copyrights to your latest publication?

Yes → Go to question 29
No → Go to question 30
Not sure/don't know → Go to question 32

Q29: Did you use alternative open access licensing models (e.g., Creative Commons) for your latest publication?

Yes
No
Not sure/don't know

Q30: Were you or your coauthor(s) required to transfer copyright of your latest publication to any of the following (check all that apply)?

Your organization
Publishing organization or journal
Sponsoring organization
I was not required to transfer copyright
Other:
Not sure/don't know
Federal work, not copyrightable

Q31: As a result of transferring copyrights, have you experienced difficulty using your latest published material subsequently, e.g., sharing with colleagues, posting on a Web site, etc.?

Yes
No
Not applicable
Not sure/don't know

Q32: Was your latest publication also placed in an electronic bibliographic service or index?

Yes → Go to question 32A
No → Go to question 33
Not sure/don't know → Go to question 33

Q32A: Was the full text of your latest publication placed in a:

National/governmental library (e.g., PubMed, Medline)
Freely accessible archive
Commercially accessible archive
Other:
None of the above
Don't Know

Q33: Since 1 January 2002, in order to protect your work, have you ever (check all that apply):

Not published your research
Published incompletely
Delayed publication
Maintained copyright control
Instituted various legal devices (for example, contracts or End-User License Agreements)
Used technological devices (Digital [Rights] Management tools (DRMs) or other smart software, etc.)
Other:
None of the above
Filed for patent
Not Applicable

Q34: Since 1 January 2002, have any difficulties associated with gaining access to or disseminating copyrighted works (membership fees, subscriptions, etc.) had an impact on your work?

Yes → Go to question 35
No → Go to question 36
Not sure/don't know → Go to question 36

Q35: Problems associated with accessing scientific literature had the following effect(s) on your work (check all that apply):

I have not had problems associated with accessing scientific literature
There were no effects on my research
They delayed my research less than one month
They delayed my research for one month or more
I had to change the research approach
I had to abandon my research project
There were other effects on my research. Please explain.
Loss of research funds to pay for access or to duplicate work
Less background research done
Unspecified delay of work

Q36: Over the past (3) years, have you used open access (freely accessible) publications:

Not at all
Less frequently than before three years
About the same as before three years ago
More frequently than before three years ago
Don't know, only active in research since _____ *(enter year here)*
Not sure/don't know

Q37: Has your access to the scientific literature (in general) over the past three years become:

Easier
Is about the same
More difficult
Much more difficult
Don't know, only active in research since _____(enter year here)
Not sure/don't know

The following questions concern your experiences with access to and use of data from publicly funded sources. By "data", we mean numeric or factual data that are part of a larger dataset or database. By "publicly funded sources" we mean data produced by a government entity or entirely with government funding in an academic or nonprofit institution. (Note: For some responses you are requested to provide a brief explanation. Please provide as much detail as you consider appropriate.)

Q38. Since 1 January 2002, in your work, have you used (or tried to use) data from publicly funded sources (that you yourself did not produce)?

Yes → Go to question 39
No → Go to question 48

Q39: Since 1 January 2002, have you experienced any difficulties in obtaining data from publicly funded sources?

Yes → Go to question 40
No → Go to question 44
Not sure/don't know → Go to question 44

Q40: Thinking back to the last time you had difficulty in obtaining data from publicly funded sources, which if any of the following difficulties did you experience (check all that apply)?

There was a substantial delay in the transfer of the requested data → Go to question 43
Legal terms and conditions were problematic → Go to question 43
Costs were high. If so, how much did the data cost? → Go to question 43
Other difficulties in obtaining the data. Please describe briefly: → Go to question 43
Access was denied → Go to question 41
Technical Difficulty in Access/Difficult to Locate → Go to question 43

Q41: Thinking back to the last time you had difficulty in obtaining data from publicly funded sources, the following reasons were given for denying your request for access to data from a publicly funded source (check all that apply):

No reason was given
Results based on those data were not yet published by the producer of the data
Results based on those data had been published, but the data were withheld anyway
Data were produced in support of proprietary research
Period of exclusive use under the data producer's research grant or contract had not yet expired
Data only available to researchers in a specific research program, in which you were not a participant
Your uses of the data would be proprietary
Data only available to researchers in a specific country, of which you were not a citizen
Data were classified as secret or sensitive by the government and you did not have the appropriate security clearance
Data could not be disclosed in order to protect the privacy of human subject(s)
Producer of the data stated that the rights in the data could not be adequately protected
Other reasons. Please explain:
Not applicable

Q42: Thinking back to the last time you had difficulty in obtaining data from publicly funded sources, the denial of access to the data that you were requesting had the following effect(s) on your research/work (check all that apply):

There were no effects on my research/work
It delayed my research/work less than one month
It delayed my research/work by one month or more
I had to produce similar data myself or within my research group
I had to find another source for data that was a satisfactory substitute
I had to find another source for data that was not a satisfactory substitute
I had to change the research/work approach
I had to abandon my research/work project
There were other effects on my research/work. Please explain:

Q43: Thinking back to the last time you had difficulty in obtaining data from publicly funded sources: overall, difficulties in obtaining data from a publicly funded source had:

Serious negative effect(s) on my research/work
Some negative effects(s) on my research/work
No effect(s) on my research/work
Some positive effect(s) on my research/work
Serious positive effect(s) on my research/work
Not applicable
Not sure/don't know

Q44: In your view, how has the situation changed since 1 January 2002, in terms of obtaining access to data from publicly funded sources?

It has become easier to obtain data from publicly funded sources
It has become more difficult to obtain data from publicly funded sources
The situation has remained about the same
Don't know, only active in research since:_____(enter year here)
Don't know

Q45: Since 1 January 2002, have you denied requests from others for data you have produced with funding from public sources?

I did not produce any data using public funding during this time period
No, I have not denied access to the data I produced from my publicly funded research
No, I have not denied access to the data I produced from my publicly funded research, but I placed certain conditions on access to those data. If so, please explain:
No, I have not denied access to the data I produced from my publicly funded research, but I placed certain conditions on the use of those data. If so, please explain:
Yes, I have denied access to the data I produced from my publicly funded research. If so, please explain:
Not sure/don't know

Q46: Since 1 January 2002, have you experienced difficulties in *using* data from publicly funded sources (check all that apply)?

I have not experienced difficulties in using data from publicly funded sources → Go to question 48
The data had scientific deficiencies → Go to question 47
The data had technical problems → Go to question 47
The data had legal proprietary restrictions on re-use based on national legislation (e.g., database protection legislation) → Go to question 47
The data had legal proprietary restrictions on re-use based on funding agency regulations → Go to question 47
The data had legal proprietary restrictions on re-use based on licensing terms → Go to question 47
The legal restrictions on re-use were enforced by technological means → Go to question 47
There were other difficulties in using the data. If so, please explain: → Go to question 47

Q47: Difficulties in *using* data from a publicly funded source have had:

Serious negative effect(s) on my research
Some negative effects(s) on my research
No effect(s) on my research
Some positive effect(s) on my research
Serious positive effect(s) on my research
Not applicable
Not sure/don't know

Q48A: We would like to learn about your opinion/view on technologies owned by others in your area of work. Please indicate how strongly you agree with the following statements by rating each of them on the following scale:

Haven't thought much about that
Disagree strongly
Disagree somewhat
Neither agree nor disagree
Agree somewhat
Agree strongly

A. Intellectual property rights provide incentives to invent and make discoveries.
B. Intellectual property rights impair the free and open exchange of material and/or research results.
C. Technologies owned by others are easily exchanged through licensing and material transfer agreements.
D. Obtaining access to technologies owned by others often involves contractual restrictions on publications that cause significant constraint[s] on academic freedom.
E. Access to technologies owned by others has improved over the past 5 years.
F. Overall, intellectual property protections are having a POSITIVE impact on my conduct in science.

Q49: ***Thank you for responding to this survey so far. We have just a few more questions for you about you and your place of work. Please respond to these questions, as your participation will allow us to examine differences in experiences with intellectual properties in different countries, work settings, etc.***

In what type of institution is your main employment?

School/university
Industry/corporation
Hospital/health services
Law firm/forensics
Publishing/media
Nonprofit agency or NGO
Government or IGO
Self-employed/consultant
Retired/on leave/not currently employed
Other:

Q50: In which country do you primarily conduct your research/work?

A drop-down menu listing every country was provided to the respondent.

Q51: What is your gender?

Male
Female
Other[4]

Q52: How many years of professional work experience do you have?

0-4
5-9
10
20-29
30+

[4] As a survey methodology experiment, instead of check boxes for "male" and "female," a write-in box was provided for this question. Three respondents chose to report their gender as something other than "male" or "female". This experiment will be discussed further in a future publication.

Q53: What degrees have you obtained (check *all* that apply)?

Associate degree (U.S.): AA, ABS, AS
Foundation degree (U.K.): FdA, FdEd, FdEng, FdMus, FdSc, FdTech
Bachelor's degree: BA, BComm, BE, BS, BSc, BFA, BCL, LLB, BM, BBA, BChir, BEng, MBChB
Master's degree: MA, MS, MSc, MApol, MPhil, MRes, MFA, MTh, M.T.S., M.Div, MPhys, MMath, MMus, MESci, MGeol, MTCM, BCL (Oxon)
Specialist degree: EdS, B.Acc.
Doctoral degree: PhD, EdD,* EngD, DNursSci, DBA, DD, DSc, DLitt, DA, DMA, DMus, DCL, ThD, PharmD, DPT, DPhil, DOM, OMD, PsyD
JD/LLM
None of the above
Other

Q54: Has any of your research/work been funded or paid for by (check all that apply):

National, State or local governmental grants, contracts, or employment
European Union or other IGO grants, contracts, or employment
Research councils
University sponsorship (from a university other than your own university or college)
Industry sponsorship (from a company other than your own company or institution)
Research and Development supported by your employer
Nonprofit, non-government sources (including foundations)
Other personal or private funding
Other:
Not applicable

Appendix 3: Tables

The population of scientists targeted by the survey was scientists in the natural sciences, with a graduate school education level (MA/PhD), the work in the university or public sector.

Table 1. Descriptive Statistics of Population.

		Count	Percent
Field	Chem, Phys and Astronomy	140	14.23
N=984	Life science	606	61.59
	Eng, Math and Comp Sci	238	24.19
Sector	University	576	58.54
N=984	Public research center/NPO	408	41.46
Seniority	0-4	78	7.94
N=982	5-9	122	12.42
Mean = 19.69	10-19	292	29.74
	20-29	300	30.55
	30+	190	19.35
Education	Master degree	92	9.35
N= 984	Doctoral degree	892	90.65

Table 2. Patented Technology Acquisition (by field, sector).

Measure		Random Sample	Field			Sector		All N
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Sciences	University	Public	
Q03 Acquired PT	%yes	11.69	10.71	14.03	6.30	9.55	14.71	984
Q06 Research tool	%yes	91.67	86.67	94.94	78.57	93.88	89.83	108
Q07 Licence_ex	%yes	5.88	0.00	5.26	16.67	8.51	3.64	102
Q07 Licence_nonex	%yes	11.76	35.71	7.89	8.33	8.51	14.55	102
Q07 Licence_MTA	%yes	29.41	0.00	39.47	0.00	34.04	25.45	102
Q14 [Licence Tech] less	%yes	1.58	2.50	2.02	0.00	1.28	1.95	568
Q14 [Licence Tech]same	%yes	50.70	57.50	51.30	45.39	52.56	48.44	568
Q14 [Licence Tech] more	%yes	47.71	40.00	46.69	54.61	46.15	49.61	568

Table 3-1. Access Terms (by field, sector and license type).

Q8 Were any of the following terms involved in the assignment or licensing of the last patented technology you acquired N=111		**Random Sample**	**Field**			**Sector**		**Q07**		
			Chemistry, Phys & Astro	**Life Sciences**	**Eng, Math & Comp Sciences**	**University**	**Public**	**Exclusive**	**Non-exclusive**	**MTA**
Research/ experimental use exemption retained by licensor	% yes	56.57	25.00	62.67	50.00	56.52	56.60	50.00	27.27	75.86
Humanitarian use exemption	% yes	3.03	0.00	4.00	0.00	0.00	5.66	0.00	0.00	10.34
Limitation on use (field of use restriction)	% yes	28.28	25.00	29.33	25.00	30.43	26.42	33.33	36.36	34.48
Restrictions on patenting (research use only)	% yes	26.26	25.00	28.00	16.67	23.91	28.30	33.33	36.36	31.03
Restrictions on redistribution	% yes	29.29	8.33	32.00	33.33	30.43	28.30	50.00	27.27	41.38
Restrictions on publication and dissemination of research results	% yes	10.10	16.67	9.33	8.33	6.52	13.21	0.00	18.18	13.79
Claims on future products, through reach through royalties, future license rights, or similar claims	% yes	5.05	8.33	4.00	8.33	4.35	5.66	0.00	0.00	6.90
Request for authorship	% yes	1.01	0.00	1.33	0.00	2.17	0.00	0.00	0.00	3.45
Total	**N**	**99**	**12**	**75**	**12**	**46**	**53**	**6**	**11**	**29**

Table 3-2. Access Difficulties (by field, sector).

Measure		Random Sample	Field			Sector		All N
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Sciences	University	Pubic	
Q09 acquire PT: > 1 month	%yes	43.90	37.50	44.44	45.45	39.47	47.73	82
Q10 difficulties acquiring PT	%yes	11.34	18.18	12.16	0	13.33	9.62	97
Q11 Reasons for difficulties (for those with difficulties)								
Necessary patents were/are not licensable	%yes	9.09	0.00	11.11	0	16.67	0.00	11
Request for license denied	%yes	9.09	50.00	0.00	0	0.00	20.00	11
Overly complex patent licensing negotiations	%yes	27.27	0.00	33.33	0	16.67	40.00	11
Licensing negotiations broke down	%yes	9.09	0.00	11.11	0	16.67	0.00	11
Individuals royalties were too high	%yes	45.45	50.00	44.44	0	50.00	40.00	11
Royalties required for multiple patents	%yes	9.09	0.00	11.11	0	16.67	0.00	11
Unable to determine the IP status of the technology	%yes	9.09	0.00	11.11	0	0.00	20.00	11
Q12 Effect of these difficulties (for those who acquire PT)								
Due to difficulties: delayed	%yes	2.52	0.00	3.47	0	3.33	1.92	97
Due to difficulties: modify	%yes	7.56	18.18	6.95	0	6.77	7.70	97
Due to difficulties: abandon	%yes	1.26	0.00	1.74	0	3.33	0.00	97
Q12 Effect of these difficulties (for all researchers)								
Due to difficulties: delayed	%yes	0.30	0.00	0.49	0	0.32	0.28	984
Due to difficulties: modify	%yes	0.88	1.95	0.98	0	0.64	0.01	984
Due to difficulties: abandon	%yes	0.15	0.00	0.24	0	0.32	0	984

Table 4-1. IP Produced (by field, sector).

Measure		Random Sample	Field			Sector		All N
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Sciences	University	Public	
Q15 Intellectual property	%yes	48.22	50.71	40.33	66.81	44.35	53.68	983
Q16_1 Patent	%yes	87.34	85.92	85.66	90.57	84.31	90.87	474
Q16_2 Copyright	%yes	16.46	16.90	13.52	20.75	16.08	16.89	474
Q16_3 Trademark	%yes	3.38	1.41	4.10	3.14	3.14	3.65	474
Q16_4 Trade secret	%yes	3.59	1.41	2.46	6.29	3.14	4.11	474
Q16_5 Complex product design	%yes	0.00	0.00	0.00	0.00	0.00	0.00	474
Q16_6 Embodied in product	%yes	0.21	0.00	0.41	0.00	0.39	0.00	474
Q16_7 Withhold data or information	%yes	16.24	14.08	17.62	15.09	14.51	18.26	474
Q16_8 Delayed publication	%yes	20.68	21.13	24.18	15.09	20.39	21.00	474
Q16_9 Did not publish	%yes	13.08	16.90	10.66	15.09	10.98	15.53	474
Q16_10 None	%yes	5.70	4.23	6.56	5.03	7.06	4.11	474
Q17A Submitted patent: more than 0	%yes	30.41	33.04	22.11	51.38	24.84	38.23	786
Q17B Issued patent: more than 0	%yes	20.23	24.11	14.20	34.25	16.34	25.69	786
Q19 Last PT was research tool	%yes	85.71	88.00	90.91	77.55	87.69	84.00	140

Table 4-2. IP Dissemination (by field, sector).

Measure		Random Sample	Field			Sector		All N
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Sciences	University	Public	
Q22 How was your last PT disseminated?								
Shared informally	%yes	8.51	11.11	10.00	5.56	12.00	4.55	47
Licensed exclusively	%yes	40.43	33.33	50.00	33.33	52.00	27.27	47
Licensed non-exclusively	%yes	21.28	22.22	25.00	16.67	4.00	40.91	47
Donated/given for free	%yes	10.64	11.11	15.00	5.56	16.00	4.55	47
Placed in patent pool or consortia	%yes	2.13	0.00	0.00	5.56	4.00	0.00	47
Used in cross-licensing agreement	%yes	0.00	0.00	0.00	0.00	0.00	0.00	47
Published in scientific jour-nal/conference	%yes	2.13	0.00	0.00	5.56	4.00	0.00	47
Sold the technology	%yes	4.26	11.11	5.00	.	4.00	4.55	47
Q22A recipient : Academia	%yes	15.79	33.33	10.00	16.67	23.08	.	19
Q22A recipient : Industry	%yes	78.95	66.67	80.00	83.33	76.92	83.33	19
Q22A recipient : Government	%yes	5.26	.	10.00	0.00	0.00	16.67	19
Q22C_1 License terms: Research/Exp use	%yes	31.58	33.33	30.00	33.33	38.46	16.67	19
Q22C_2 License terms: Humanitarian use	%yes	0.00	0.00	0.00	0.00	0.00	0.00	19
Q22C_3 License terms: Neither	%yes	47.37	33.33	50.00	50.00	53.85	33.33	19
Q23 Main reason PT not disseminated								
Planning to conduct future research with technology	%yes	47.00	47.06	45.45	48.72	46.34	47.46	100
Developing or commercializing the technology yourself	%yes	16.00	23.53	20.45	7.69	19.51	13.56	100
You (or your organization) wanted/want to block competitors	%yes	4.00	0.00	6.82	2.56	0.00	6.78	100
Precluded by an agreement	%yes	5.00	0.00	2.27	10.26	7.32	3.39	100
Other	%yes	28.00	29.41	25.00	30.77	26.83	28.81	100

Table 5-1. Importance to Patent.

Measure (%high)		All	Field			Sector	
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Sciences	University	Public
Q20_A Acquiring venture capital	Mean	42.42	21.43	49.33	43.55	47.37	38.20
Q20_B Cooperating with other institutions	Mean	61.45	60.71	58.67	65.08	62.34	60.67
Q20_C Mergers with other institutions	Mean	14.38	17.86	9.86	18.03	17.57	11.63
Q20_D Acquiring public R&D funding	Mean	73.17	78.57	73.97	69.84	68.00	77.53
Q20_E Acquiring private R&D funding	Mean	56.44	50.00	58.33	57.14	57.33	55.68
Q20_F Generating licensing income	Mean	39.26	32.14	42.47	38.71	35.14	42.70
Q20_G Timing of scientific publications	Mean	59.76	62.96	68.92	47.62	53.95	64.77
Q20_H Number of scientific publications	Mean	50.30	44.44	56.76	45.31	50.65	50.00
Q20_I For portfolio	Mean	23.13	14.81	23.94	25.81	27.03	19.77
Q20_J For reputation	Mean	52.73	53.57	60.27	43.75	44.74	59.55
Q20_K For negotiations	Mean	45.45	50.00	45.95	42.86	41.33	48.89
Q20_L Protecting own technology from imitation	Mean	61.73	57.69	63.51	61.29	64.00	59.77
Q20_M Preventing competitors	Mean	59.26	55.56	57.53	62.90	62.67	56.32
Q20_N Improving R&D cooperation	Mean	50.00	48.15	43.84	58.06	52.00	48.28
Q20_O Other concerns	Mean	15.38	27.27	16.67	10.53	17.07	14.00
Total	N	165	28	75	62	76	89

Table 6. Publishing (by field, sector).

Measure		Random Sample	Field			Sector		All N
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Science	University	Public	
Q24 Any publications?	%yes	97.24	98.55	96.68	97.88	97.55	96.79	977
Q25 Why publishes?								
To inform others	%yes	90.93	90.58	92.35	87.55	89.17	93.43	959
To increase prospects for promotion	%yes	47.24	47.83	48.64	43.35	54.00	37.63	959
To gain credits for academic advancement	%yes	64.23	76.81	61.73	63.09	68.74	57.83	959
To gain/Justify research funding	%yes	65.38	68.84	67.86	57.08	69.09	60.10	959
To get feedback from viewers	%yes	40.35	44.20	41.16	36.05	40.14	40.66	959
To document the work in an archival way	%yes	67.26	72.46	67.52	63.52	66.96	67.68	959
To prevent others from acquiring IP protections	%yes	9.38	7.25	7.48	15.45	7.64	11.87	959
Other	%yes	1.04	1.45	0.51	2.15	1.42	0.51	959
Q26 Who publishes?								
Myself or my department	%yes	69.28	69.57	67.06	74.68	65.48	74.68	957
My organization	%yes	1.04	0.00	1.37	0.86	1.42	0.51	957
Conference organizer	%yes	1.57	0.72	0.51	4.72	1.60	1.52	957
Journal or proceedings publisher	%yes	24.56	24.64	29.01	13.30	28.11	19.49	957
Professional association	%yes	2.51	3.62	1.54	4.29	2.85	2.03	957
National library	%yes	0.21	0.00	0.34	0.00	0.00	0.51	957
Placed in a free accessible archive	%yes	0.52	0.72	0.17	1.29	0.53	0.51	957
Other	%yes	0.31	0.72	0.00	0.86	0.00	0.76	957

Measure		Random Sample	Field			Sector		All N
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Science	University	Public	
Q27 Criteria for choosing publication outlet								
Prestige	%yes	77.25	81.02	76.37	77.25	80.54	72.59	954
Dissemination	%yes	68.45	75.18	65.75	71.24	68.93	67.77	954
Timeliness	%yes	37.95	45.99	36.82	36.05	41.43	32.99	954
Availability (e.g., free on web)	%yes	16.88	18.98	17.64	13.73	18.39	14.72	954
Ease of retrieval (indexed)	%yes	36.27	35.04	40.24	27.04	40.18	30.71	954
Other	%yes	2.52	2.19	1.88	4.29	1.61	3.81	954
Q29 Use open access licensing	%yes	3.11	12.00	0.78	4.17	3.82	2.13	225
Q31 Trouble disseminating own pub	%yes	20.70	22.35	18.07	27.36	21.57	19.42	512
Q32A Was full text version placed in?								
National/government library	%yes	19.02	13.04	18.33	26.27	17.31	22.03	652
Freely accessible archive	%yes	25.46	17.39	29.41	16.95	26.20	24.15	652
Commercially accessible archive	%yes	42.94	57.61	40.50	40.68	43.75	41.53	652
Other	%yes	7.06	10.87	5.88	8.47	7.21	6.78	652
None of the above	%yes	5.52	1.09	5.88	7.63	5.53	5.51	652

Table 7-1. Publication Secrecy (by field and sector).

Measure		Random Sample	Field			Sector		All N
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Science	University	Public	
Q33_1 Not published	%yes	7.24	4.08	8.61	5.38	6.86	7.79	760
Q33_2 Published incompletely	%yes	42.76	44.90	42.23	43.01	38.27	49.35	760
Q33_3 Delay publication	%yes	25.26	21.43	27.52	21.51	22.35	29.55	760

Table 7-2. Logistic Regression (predicting secrecy).

N=646	Q33 Secrecy					
	Not published		Published incompletely		Delay publication	
	Beta	E(p)	Beta	E(p)	Beta	E(p)
(Compare with: Life science) Chem, Phys & Astro	-0.3391	0.712	0.00657	1.007	-0.1478	0.863
Eng, Math and Co	-0.1898	0.827	-0.0814	0.922*	-0.2266	0.797
University	-0.0187	0.981	-0.3360	0.715***	-0.2884	0.749
Seniority	-0.1807	0.835	-0.2456	0.782***	0.0347	1.035
Q17A submitted patent	0.6310	1.880*	0.6145	1.849***	1.0777	2.938***
Funded by industry sponsorship	0.0773	1.080	0.0374	1.038	0.3694	1.447
R Square	0.033		0.056		0.093	

Table 8-1. Access to Public Funded Sources.

Measure		Random Sample	Field			Sector		All N
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Science	University	Public	
Q34 troubles in gaining access to or disseminating copyrighted work	%yes	19.25	20.71	19.87	16.81	18.06	20.94	982
Q35 What troubles?								
No problem	%yes	33.16	21.43	36.97	30.00	38.83	26.19	187
No effect	%yes	31.02	25.00	33.61	27.50	32.04	29.76	187
Delay my research, lt 1 month	%yes	22.46	25.00	25.21	12.50	23.30	21.43	187
Delay my research, gt 1 month	%yes	15.51	10.71	12.61	27.50	15.53	15.48	187
Change my research approach	%yes	12.30	10.71	12.61	12.50	14.56	9.52	187
Abandon my project	%yes	1.60	7.14	0.84	0.00	2.91	0.00	187
Other effect	%yes	8.56	17.86	5.88	10.00	9.71	7.14	187
Q36 Use open access more frequently, over last 3 years	%yes	41.55	38.57	48.68	25.21	41.91	41.03	982
Q37 lit. access: easier	%yes	71.71	74.64	74.96	61.76	72.52	70.54	979
Q37 lit. access: more difficult	%yes	3.78	4.34	3.32	4.62	3.13	4.70	979

Table 8-2. Difficulties of Access to Public Funded Data (by field and sector).

Measure		Random Sample	Field			Sector		All N
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Science	University	Public	
Q38 Use data from public founded source	%yes	51.48	49.29	54.55	44.96	47.65	56.86	983
Q39 Any difficulty accessing data	%yes	13.36	18.84	12.01	14.02	14.86	11.59	509
Q40 difficulty : delay in the transfer requested data	%yes	19.35	15.38	14.71	33.33	23.08	13.04	62
Q40 difficulty : Legal terms and conditions were problematic	%yes	40.32	38.46	44.12	33.33	38.46	43.48	62
Q40 difficulty : Costs were high	%yes	32.26	30.77	35.29	26.67	35.90	26.09	62
Q40 difficulty : Other difficulties	%yes	27.42	23.08	29.41	26.67	23.08	34.78	62
Q40 difficulty: access was denied	%yes	3.23	0.00	2.94	6.67	5.13	0.00	62
Q43 serious negative effect	%yes	12.12	7.69	15.79	6.67	7.50	19.23	66
Q43 some negative effect	%yes	63.64	76.92	65.79	46.67	75.00	46.15	66
Q43 no effect	%yes	15.15	15.38	10.53	26.67	12.50	19.23	66
Q44 become easier to obtain data from publicly funded sources	%yes	44.58	47.83	41.82	50.93	44.73	44.40	507
Q44 become more difficult to obtain data from publicly funded sources	%yes	1.58	1.45	2.12	0.00	1.09	2.16	507
Q44 The situation has remained about the same	%yes	43.20	46.38	44.24	37.96	44.36	41.81	507
Q45 Have you denied requested from others?								
Did not produce any data using public funding source	%yes	30.06	14.93	33.76	28.57	33.33	26.15	479
No, but placed restrictions	%yes	67.22	83.58	63.06	69.39	64.75	70.18	479
Yes, I denied	%yes	2.71	1.49	3.18	2.04	1.92	3.67	479
Q46 Difficulties in using pubs								
No difficulty	%yes	74.85	61.19	78.30	73.08	75.76	73.78	489
Scientific deficiencies	%yes	12.88	16.42	11.95	13.46	12.50	13.33	489
Technical problems	%yes	4.70	7.46	3.77	5.77	5.68	3.56	489
Legal proprietary restrictions on re-use based on national legislations	%yes	4.70	4.48	4.72	4.81	3.79	5.78	489
Legal proprietary restrictions on re-use based on funding agency regulations	%yes	3.07	5.97	2.20	3.85	3.41	2.67	489
Legal proprietary restrictions on re-use based on licensing terms	%yes	5.93	7.46	5.03	7.69	5.68	6.22	489
Legal restrictions on re-use were enforced by technological mean	%yes	1.64	0.00	0.94	4.81	1.89	1.33	489
Other difficulties	%yes	2.86	4.48	2.52	2.88	1.89	4.00	489

Measure		Random Sample	Field			Sector		All N
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Science	University	Public	
Q47 Effect on these difficulties								
Serious effect	%yes	4.07	0.00	4.35	7.14	1.56	6.78	123
Some negative effect	%yes	50.41	57.69	56.52	28.57	50.00	50.85	123
No effect	%yes	31.71	38.46	28.99	32.14	31.25	32.20	123
Some positive effect	%yes	2.44	0.00	1.45	7.14	4.69	0.00	123

Note: Q41 reasons for denying your request and Q42 effects on denial of access results are not reporting due to small responses (n=2).

Table 9. Opinions on IP

Q48 Measure (%high)		All	Field			Sector	
			Chemistry, Phys & Astro	Life Sciences	Eng, Math & Comp Sciences	University	Public
A. Intellectual property rights provide incentives to invent and make discoveries	%High	66.97	67.46	67.11	66.36	62.70	72.88
B. Intellectual property rights impair the free and open exchange of material and/or research results	%High	53.79	52.31	56.54	47.62	55.51	51.47
C. Technologies owned by others are easily exchanged through licensing and material transfer agreements	%High	37.90	33.72	42.53	28.57	37.10	38.87
D. Obtaining access to technologies owned by others often involves contractual restrictions on publications that cause significant constraint[s] on academic freedom	%High	64.12	66.07	63.55	64.53	64.89	63.07
E. Access to technologies owned by others has improved over the past 5 years	%High	44.50	47.22	37.15	58.10	40.17	50.39
F. Overall, intellectual property protections are having a POSITIVE impact on my conduct in science	%High	23.91	21.21	21.41	31.19	20.81	28.06
Total	N	869	126	529	214	504	365

Table 10. Disaggregated Demographic Information

		Count	Percent
Field N=984	Biological sciences	183	18.60%
	Medical/health sciences	243	24.70%
	Agricultural sciences	180	18.29%
	Physical sciences	29	2.95%
	Chemistry	58	5.89%
	Engineering	220	22.36%
	Earth sciences	49	4.98%
	Physics and astronomy	4	0.41%
	Math and computer sciences	18	1.83%
Sector N= 984	School/university	576	58.54%
	Public research center	391	39.74%
	Nonprofit agency or NGO	7	0.71%
	Government or IGO	10	1.02%