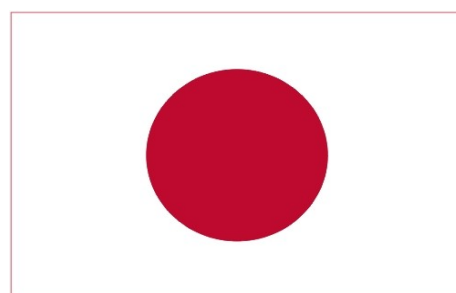
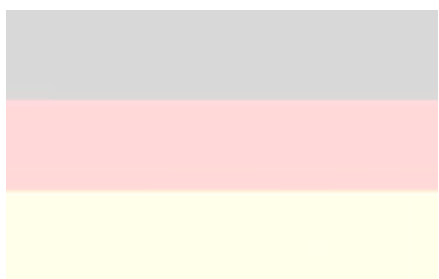
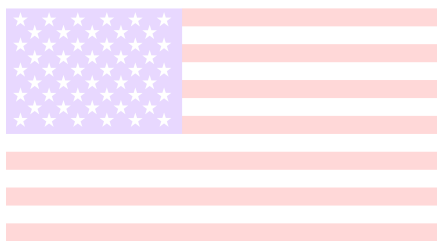


# International Intellectual Property Experiences: A Report of Four Countries

Project on Science and Intellectual  
Property in the Public Interest



## 2 International Intellectual Property Experiences

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# **International Intellectual Property Experiences: A Report of Four Countries**

Project on Science and Intellectual  
Property in the Public Interest

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## Purpose and Scope of the Report

This report is the culmination of a 2006 survey of scientists and other professionals in the United States, United Kingdom, Germany, and Japan to assess their experiences in acquiring, using, or creating intellectual property (IP).<sup>1</sup> Conducted by the American Association for the Advancement of Science (AAAS), this study arose out of concerns over the effects of IP protections on the conduct of scientific research and how those effects might differ between national IP regimes.

The findings and conclusions presented in this report address, as well as raise, several important questions about the acquisition and creation of IP in the scientific community and, in what ways—if any—they are affecting the conduct of scientific research. Who in the scientific research community, for example, is acquiring patented technologies covered by some form of IP protection(s), and by what means are those individuals acquiring such technologies? Who is making discoveries or developing technologies eligible for IP protection(s)—and what means are they using to protect their IP? Who is experiencing difficulties in acquiring or using IP for research purposes? Of those who have reported difficulties in acquiring or using IP, what types of difficulties have they encountered and how (if at all) has their research been affected? Ultimately, such questions of whether and how the conduct of scientific research is being affected by IP protections—adversely, beneficially, or both—underscore the timeliness of this report.

## Summary and Basic Methodology

The *AAAS-SIPPI 2006 Effects of Intellectual Property Protections Survey* was a multinational project focusing on four country-specific groups of potential respondents who were administered a Web-based survey. Those were:

- In the United States, 8,000 randomly-sampled members of the American Association for the Advancement of Science (AAAS) were invited to take the survey.
- In the United Kingdom, seven scientific professional societies invited approximately 5,000 scientists from their membership to participate.
- In Germany, the approximately 1,600 members of Union of the German Academies of Sciences and Humanities, the staff of the Max Planck Society for the Advancement of Science, and the 1,272 AAAS members who reside in Germany were invited to participate.
- In Japan, the Institute for Future Technology invited a random sample of 5,000 predominantly academic scientists to participate.

Details of the sample selection process are provided below.

The timing for each respondent group differed slightly. For the United States and United Kingdom samples, the same survey instrument was used and was administered to both groups

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<sup>1</sup> In this survey, questions on IP covered patents, copyright, and publicly funded data and databases.

between March and April of 2006. The survey instrument was modified slightly for the German respondents, and was administered to them in English between May and July of 2006. The questionnaire subsequently was translated into Japanese, and Japanese respondents were surveyed between December 2006 and January 2007. For all surveys, the invitations to potential respondents were disseminated by electronic mail.

## **Sampling Frames**

For the United States sample, the list of scientists chosen was drawn from the AAAS membership database. The sample frame was extracted from the database on November 17, 2005, and included 96,082 records. Of those, 15,397 were discarded due to member residency outside of the United States, and an additional 6,205 were discarded due to restrictions on solicitations via phone, postal mail, or both. The remaining 74,480 records were stratified by discipline and employment sector, and a simple random sample was drawn within each stratum.

For the Japanese sample, a list of public sector researchers constituted the sampling frame, with a sample size of 6,700 researchers stratified by professional field. A total of 1,267 responses was received, representing a 19 percent response rate. If the approximately 600 cases in which the invitational e-mail was returned as undelivered are excluded, the adjusted response rate is 21 percent. To improve interpretability for multiple comparisons, the analysis was limited to respondents from three aggregated fields: life sciences;<sup>2</sup> chemistry and physics and astronomy; and engineering and math and computer sciences. The sample also was restricted to include only those individuals from universities and government laboratories, and to researchers with doctoral or masters degrees. Although the sample consisted of a significant number of researchers from the life sciences (62 percent of the sample), those from the fields of chemistry and physics and astronomy (14 percent)—and engineering and math and computer sciences (24 percent)—also were well represented. The sample consisted mostly of university researchers (59 percent), but included a substantial number of government laboratory researchers as well (41 percent).

The sample frame for the Germany survey was comprised of members of the following professional associations: the Union of the German Academies of Sciences and Humanities, the Max Planck Society for the Advancement of Science, and AAAS members with valid e-mail addresses residing in Germany as of November 17, 2005. All such members were invited to participate in the survey.

The precise response rate for the Germany survey sample is not calculable, as the exact number of German scientists invited to take the survey is not known. The statistics reported for the Germany survey are based on a non-random sample of scientists with German addresses who were members of one of the participating professional societies as of May 2006. Of the 967 respondents from Germany, the highest percentages were from academia and the combined government, nonprofit organization, healthcare organization, or self-employed/consulting firm (GNHC) sectors, and a very small percentage represented industry. Of 800 responses from the 967 respondents, 32 percent (253) worked in academia, 2 percent (17) in industry, 64 percent (509) in the GNHC sector, and 3 percent (21) in other sectors; 21 percent (167) did not designate

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<sup>2</sup> Including the biological sciences, medical/health sciences, agricultural sciences, and other life sciences.

an employment sector. Therefore, the results of the study do not represent German scientists in general. Additionally, the statistics and percentages presented in this report do not represent the membership of the participating German professional societies due to the low response rate to the survey.

The sample frame for the U.K. survey was comprised of members of the following professional associations: Association for University Research and Industry Links, British Academy, Chemical Industries Association, Research and Development Society, the Royal Society, Royal Society of Chemistry, and United Kingdom Science Park Association. For the majority of associations, all members were invited to participate in the survey. For the Royal Society of Chemistry, a simple random sample of 3,000 members was drawn.

The exact response rate for the U.K. survey sample is not calculable, as the exact number of scientists invited to take the survey is not known. However, an estimated response rate for the survey is 16 percent—or 804 responses overall out of approximately 5,000 invitations. Of the 804 respondents, 32 percent (258) worked in academia, 28 percent (224) in industry, 15 percent (117) in the GNHC sector, and 5 percent (41) in another sector; 20 percent (164) did not specify an employment sector. As with the Germany survey, the results of the study do not represent U.K. scientists in general. Nor do the statistics and percentages presented in this report represent the membership of the participating U.K. professional societies, due to the low response rate to the survey.

Due to weighting of the U.S. and Japanese data, it is possible to make several direct comparisons of those two datasets only. It is not possible to compare either the U.K. or the Germany results to either each other or to the United States and Japan results. When results for either the United Kingdom or Germany are discussed in this report, they should be considered separately and *within the context of their own sample frames*, as discussed above.

### **Acquiring Intellectual Property**

The survey questioned participants as to whether, since January 1, 2002, they had acquired protected intellectual property (IP) for use in their work.<sup>3</sup> Twelve percent of Japanese respondents reported acquiring protected IP in the past five years. That was significantly lower than the results from the U.S. survey, where 32 percent reported that they had acquired patented technologies since 2002 (see Table 1).

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<sup>3</sup> The survey defined an IP-protected technology as a patented technology, material, or methods under some form of intellectual property protection.

**Table 1.** Acquiring Intellectual Property: United States and Japan.

Measure		Random Sample		Field	(Japan)	Sector (Japan)			All N
		JP	US	Chem, Phys & Astro	Life sci	Eng, Math & Comp Sci	Uni	Pub	
Acquired PT	% yes	11.69	25.67	10.71	14.03	6.30	9.55	14.71	984
Research tool	% yes	91.67	67.06	86.67	94.94	78.57	93.88	89.83	108
Exclusive license	% yes	5.88	10.45	0.00	5.26	16.67	8.51	3.64	102
Nonexclusive license	% yes	11.76	10.27	35.71	7.89	8.33	8.51	14.55	102
M T A	% yes	29.41	30.81	0.00	39.47	0.00	34.04	25.45	102
Less licensing	% yes	1.58	9.61	2.50	2.02	0.00	1.28	1.95	568
Same licensing	% yes	50.70	60.64	57.50	51.30	45.39	52.56	48.44	568
More Licensing	% yes	47.71	29.76	40.00	46.69	54.61	46.15	49.61	568

**Source:** AAAS-SIPPI 2006 *Effects of Intellectual Property Protections Survey Database*.

PT: Patented technology

For the United Kingdom, 27 percent of respondents (205 out of 761)<sup>4</sup> reported that they had acquired IP. Fifty-nine out of 181 respondents (33 percent) whose field fell within the life sciences category acquired IP. Within that category—in the medical/health sciences field—37 percent (34 out of 91) of scientists reported acquisition of IP, of which 49 percent (19 out of 39) of respondents were from industry, 25 percent (5 out of 20) were from academia, and 18 percent (three out of 17) were from the GNHC sector.

Of the German respondents, 20 percent (182 out of 931) reported that they had acquired a patented or otherwise protected technology for use in their work. Twenty-eight percent (12 out of 43) of respondents working in the field of engineering, 19 percent (19 out of 65) in chemistry, and 29 percent (50 out of 172) in the biological sciences represented the fields that obtained the most protected technology.

## Research Tools

Of the Japanese respondents who acquired a technology in the past five years, 92 percent reported that the technology primarily was a “research tool” (i.e., the primary use of the technology was to facilitate research—not the object of study), whereas 68 percent of U.S. respondents claimed that their last acquisition was a research tool. For Japan, those working in the life sciences were most likely to report that they had acquired the technology as a research tool (95 percent), whereas engineering researchers were least likely (79 percent). Almost half of the Japanese respondents reported that the need to license outside technology had increased over the past five years. Engineering researchers were most likely to report an increase in licensing (53 percent), whereas those in chemistry and physics and astronomy were the least likely—

<sup>4</sup> Wherever possible, the numerator and denominator associated with a reported percent will be included.

although 40 percent reported an increase in licensing. That was substantially higher than the 16 percent of American researchers who reported that licensing had increased over the past five years (see Table 1).

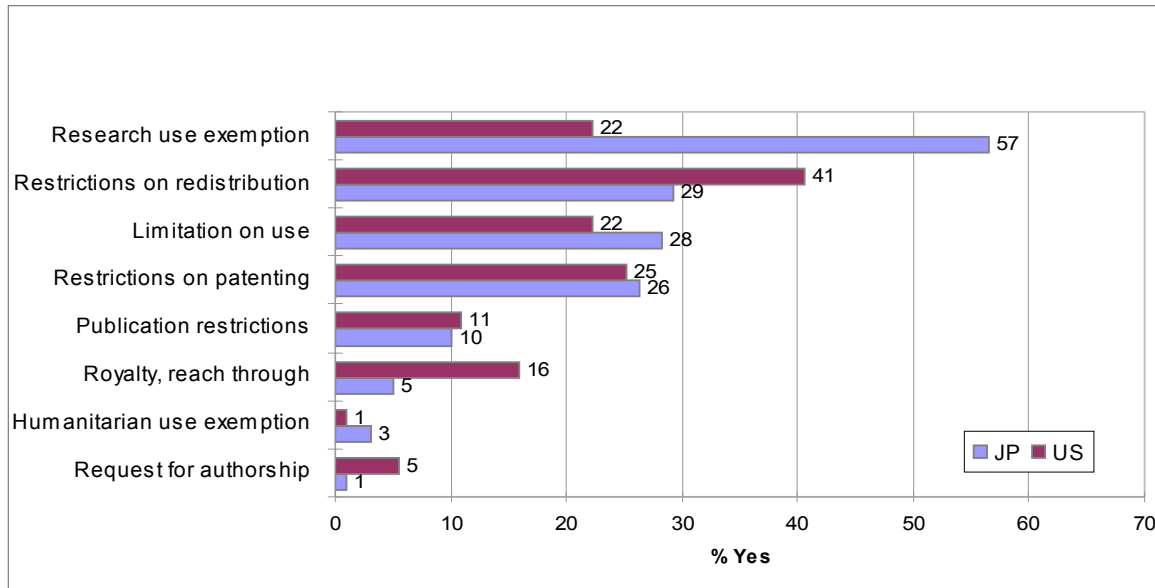
Forty percent (75 out of 188) of U.K. respondents classified their last IP acquisition as a research tool. Of the 56 respondents working in the life sciences category, 48 percent (27 out of 56) classified their last IP acquisition as a research tool; 33 percent (30 out of 92) in the combined fields of chemistry, earth sciences, and physics and astronomy; and 35 percent (six out of 17) in the combined fields of engineering and math and computer sciences. The majority of research tools was acquired within one month, and those technologies that were not reported as research tools took an average of six months or more to acquire.

In Germany, in some fields (life sciences other than medicine/health sciences, earth sciences, humanities), the majority of respondents (78 percent) reported that the acquired technology was used strictly as a research tool (131 out of 167). The scientific fields with the lowest level of research tool acquisition (57 percent) were math and computer sciences (eight out of 14) and engineering (three out of 10; only 30 percent). Here again, the majority of research tools were acquired within one month, and those technologies that were not reported as research tools took on average six months or more to acquire.

### **Terms of Access**

The survey questioned respondents as to what rights were reserved by the licensor in their last IP acquisition. Results indicate that the use of a research exemption—or continued use of the technology by the licensor for research—was very common in Japan (57 percent). The use of research exemptions was much less common in the United States (22 percent). Those results suggest that there might be more of a “free-space” for academic research in Japan than in the United States.

Humanitarian use clauses—rights withheld by licensors to license the technology to a third party for humanitarian purposes—were not common in Japan (3 percent), and less common in the United States (1 percent). Restrictions on publication were about the same for both Japan and the United States (10 percent). Royalties and reach through claims were somewhat more common in the United States (16 percent) than in Japan (5 percent; see Figure 1).



**Figure 1.** Terms of Access: Japan and the United States.

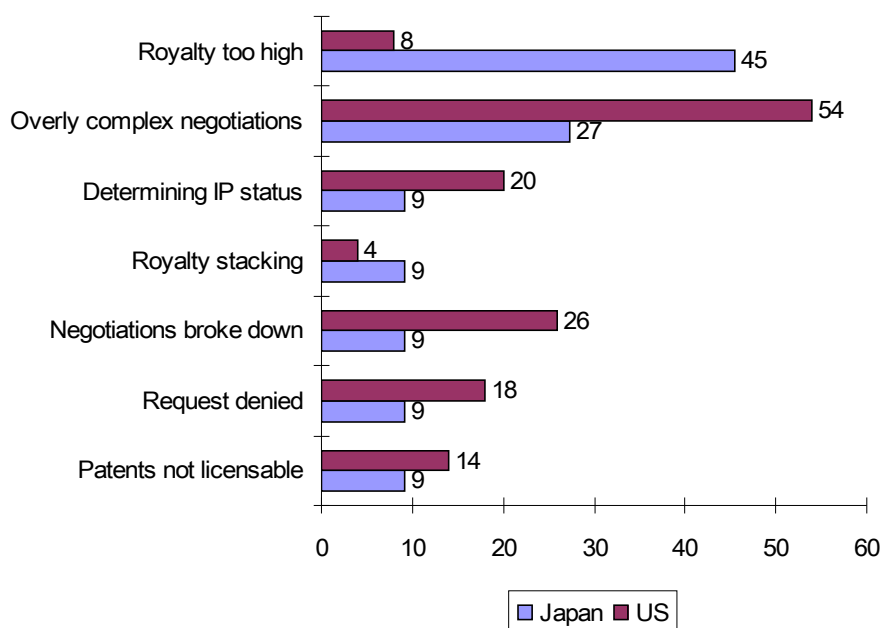
**Source:** AAAS-SIPPI 2006 *Effects of Intellectual Property Protections Survey Database*.

In the United Kingdom, 13 percent (22 out of 173) of respondents reported that a research exemption was reserved by the licensor, and 1 percent (one out of 173) of transfers included a humanitarian use exemption. Restrictions on publication and dissemination of research results were reported in 12 percent (20 out of 172) of IP acquisitions, and royalties and other reach through rights in 20 percent of the acquisitions (35 out of 173).

In Germany, 26 percent (39 out of 149) of respondents reported the inclusion of a research exemption, and only 1 percent (two out of 149) included a humanitarian use exemption. Eleven percent (16 out of 149) reported restrictions on publication and dissemination of research results, and that same percentage of respondents (11 percent; 16 out of 149) reported royalties and other reach through rights.

### Difficulties Acquiring Intellectual Property

Eleven percent of Japanese respondents reported some difficulty with acquiring a patented technology in the past five years, as opposed to 26 percent of U.S. respondents. Of the Japanese respondents reporting some difficulty, almost half (45 percent) indicated that individual royalties were too high, whereas that was reported by only 8 percent of U.S. respondents. Less than 10 percent of those Japanese respondents who had some difficulty (or less than 1 percent of those who acquired a technology—or less than 0.1 percent of all respondents) reported that necessary patents were not licensable, they were denied a license, negotiations broke down, or that multiple royalties were required. The U.S. respondents reported the highest level of problems due to overly complex licensing negotiations (see Figure 2).



**Figure 2.** Causes of Difficulties in Acquiring Intellectual Property: Japan and the United States. **Source:** AAAS-SIPPI 2006 *Effects of Intellectual Property Protections Survey Database*.

For both the U.S. and Japan samples, those results offer very little evidence of an “anticommons problem”—the possibility that, if accrued in significant numbers, IP protections (e.g., patents or copyrighted materials) in a particular discipline or field of study might impede the advancement of scientific research and prevent beneficial innovations from arising—contrary to the traditional reasons for seeking IP protections. Of those 107 respondents to the question about difficulties with technology acquisition, 2 percent reported that their research was delayed, 6 percent reported that they had to change a research project, and one respondent (1 percent of those who acquired technology—or 0.1 percent of the whole sample) reported abandoning a research project. Thus, although there is some concern that the cost of patented technologies might be too high, the vast majority of researchers largely have been unaffected by others’ patented technologies. Those results are consistent with prior research from the United States.<sup>5</sup> That is especially remarkable because the survey included both pure IP acquisition (a license to use a patented technology) and research materials that are patented (e.g., a cell line or genetically engineered mouse), which should produce somewhat higher rates of adverse effects than pure IP alone.<sup>6</sup>

In the United Kingdom, respondents who reported acquiring IP were most likely to report that they did not experience any problems during that process as well. Twenty-five percent (40 out of 158) of respondents who answered the question regarding difficulties reported having encountered difficulties in accessing technologies since January 1, 2002. Twenty-one percent (15 out of 73) of industry respondents and 24 percent (four out of 17) of GNHC respondents reported fewer problems than did academic respondents (32 percent; 15 out of 47).

<sup>5</sup> Walsh, J.P., C. Cho, and W.M. Cohen. 2007. Where excludability matters. (In press)

<sup>6</sup> Walsh et al., 2007.

Of the 40 U.K. respondents who reported having had problems acquiring IP, 23 (61 percent) indicated that licensing negotiations were overly complex, nine (26 percent) reported that licensing negotiations had broken down, and eight (21 percent) indicated that royalties were too high. The most common effects problems acquiring IP had on research projects were that projects were delayed (37 percent; 14 out of 37) or had to be changed (16 percent; six out of 27). Twenty-nine percent (10 out of 37) reported that the effects on a project were as yet unknown, and 11 percent (four out of 37) of respondents reported that problems in acquiring IP had no effect on their research projects. For academic, industry, and GNHC respondents, the most common effect reported as a result of problems with licensing was that projects were delayed. Overall, only three projects were reported abandoned.

Among German respondents, 23 percent (33 out of 111) reported experiencing difficulties in acquiring IP since January 1, 2002. Overly complex licensing negotiations accounted for 50 percent (16 out of 111) of those difficulties. Thirty-four percent (11 out of 111) reported that individual royalties were too high; 34 percent also were unable to determine the IP status of the technology they wished to acquire. Those constituted the second-ranking reasons for difficulties. The denial of a request for a license (9 percent; three out of 111), and royalties required for multiple patents (6 percent; 11 out of 111) accounted for most of the remainder of the difficulties reported.

## **Patenting and Licensing of Research Results**

The survey questioned respondents about their creation and distribution of patented technologies. In Japan, 30 percent reported that they had submitted one or more patent applications in the past five years. Japanese engineers were the most likely (50 percent), with chemistry/physics in the middle (31 percent), and life scientists least likely (22 percent); those at public research organizations (36 percent) were more likely to have filed a patent application than university researchers (25 percent). Twenty percent of Japanese respondents had been issued a patent. These numbers are somewhat lower than in the United States, where 60 percent of university respondents and 47 percent of public researchers had filed a patent application.

In the United Kingdom, 50 percent (348 out of 698) of respondents reported that since January 1, 2002 they created (or contributed significantly to) a technology that they considered eligible for IP protection(s). More specifically, 63 percent (140 out of 223) of industry respondents, 46 percent (115 out of 250) of academic respondents, and 30 percent (34 of 115) of GNHC respondents reported creating or contributing significantly to a technology that they considered eligible for IP protections. The rates of creation of IP were similar across scientific fields. For the life sciences field, 83 out of 169 respondents (49 percent) reported creating IP; that rate was 51 percent (36 out of 70 respondents) for the combined fields of engineering and math and computer sciences and 53 percent (192 out of 359 respondents) for the combined fields of chemistry, earth sciences, and physics and astronomy.

For Germany, 33 percent (286 out of 870) of respondents stated that since January 1, 2002 they or their institution created IP; the highest percentage (72 percent; 28 out of 39) originated within the combined fields of engineering and math and computer sciences. Patents (36 percent; 98 out of 276) and copyrights (29 percent; 80 out of 276) were the most utilized IP protection. Seven

percent (19 out of 276) reported withholding data, 14 percent (38 out of 276) delayed publishing, and 12 percent (33 out of 276) did not publish their findings, in order to protect their IP. Survey respondents were then questioned about how they disseminated their patented technologies. For Japanese respondents, 40 percent reported transferring the technology under an exclusive license and 21 percent under a nonexclusive license. Exclusive licenses were most common in the life sciences (50 percent). They also were much more common for academic respondents (52 percent) compared to those from public research organizations (27 percent). In contrast, 41 percent of respondents from public research organizations issued nonexclusive licenses, compared to only 4 percent from universities. Thus, of the university inventions that were licensed, 93 percent (52 out of 56) were exclusively licensed.

Exclusive licensing seems to be much more common in Japan than in the United States. For example, according licensing data from the Association of University Technology Managers, only 54 percent of U.S. university licenses were exclusive.<sup>7</sup> For both industry and academia, the most common recipient was industry (about 80 percent for both employment sectors). Thirty-two percent of those licenses included a research exemption clause, with those retained rights clauses being much more common for university licenses (38 percent) than for public research organizations (17 percent). There were no humanitarian use clauses included in any licenses.

In the United Kingdom, 62 percent (56 out of 90) respondents who reported obtaining patents also reported distributing their latest patented technology. In the life sciences category, 67 percent (14 out of 21) reported distributing their latest patented technology, compared to 71 percent (five out of seven) in the combined fields of engineering and math and computer sciences, and 58 percent (30 out of 52) in the combined fields of chemistry, earth sciences, and physics and astronomy. The percentage of technologies distributed varied between employment sectors: 86 percent (32 out of 37) of academic respondents in the United Kingdom reported distributing their latest patented technology, compared to only 38 percent (15 out of 40) of industry respondents. Across sectors, the most common distribution method given was publication (61 percent) in a scientific journal or presentation at a scientific conference (34 out of 76).

### **Observations on the Acquisition and Dissemination of Intellectual Property**

For the Japan survey results indicated that despite the increasingly pro-IP environment for Japanese university and public sector researchers, there is little evidence that patents are interfering with research. Over a five-year period, approximately 1 percent 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 percent of our total sample of researchers abandoned a project due to the inability to access a patented technology. Similarly, over a five-year period, less than 1 percent of research projects from our total sample were delayed or had to be modified because of the inability to access others' patented technology.

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<sup>7</sup> Association of University Technology Managers (AUTM) *AUTM U.S. Licensing Survey: FY 2004* and *AUTM Canadian Licensing Survey: FY 2004* (Northbrook, IL: Association of University Technology Managers, 2005).

For the United States, United Kingdom, and Germany, survey results also suggest that IP-protected technologies remain relatively accessible to the broad scientific community, and not as constrained by IP protections as many have cautioned.<sup>8</sup> In the case of research tools, the majority were transferred rather quickly, taking less than a month to obtain. Most research tools were licensed nonexclusively in all employment sectors, allowing them to remain accessible to multiple parties. Yet, in the United States, academia led industry in patenting the highest percentage of research tools and in out-licensing those tools exclusively, with the majority of those licenses going to industry itself. Although that might provide some support to earlier concerns that academic scientists—whose work often is more “upstream”—might seek financial gain from that work<sup>9</sup>—it also might suggest that when acquiring licenses from academia, industry could be requesting exclusivity to protect its interests in more “downstream” and marketable products.

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<sup>8</sup> Heller, M.A. and R.S. Eisenberg. 1998. Can patents deter innovation? The anticommons in biomedical research. *Science* 280(5364):698-70.

<sup>9</sup> See for example, A.K. Rai and R.S. Eisenberg. Bayh-Dole reform and the progress of biomedicine: Allowing universities to patent the results of government-sponsored research sometimes works against the public interest. *American Scientist* 91(1):52.

## Scientific Publishing and Access to Scientific Literature

### Basis for Publishing

Survey respondents were questioned as to the reason(s) for deciding to publish the results of their scientific work. Ninety-one percent of Japanese respondents indicated that they had decided to publish to inform others about their work; 95 percent of U.S. respondents reported having decided to publish for that purpose as well. The second-most cited reason among those from Japan (67 percent of respondents) was to document their work in an archival setting/environment, and the third-most cited reason (65 percent) was to gain or justify funding for research projects. Among U.S.-based respondents, the second-most cited reasons were to gain or justify research funding, and to document their work in an archival setting/environment (both of which were cited by 54 percent of respondents).

Among U.K.-based respondents, 91 percent indicated that they decided to publish their research to inform others about their work. Fifty-one percent also published to gain or justify funding for research projects, and 46 percent reported having published to obtain credits for academic advancement.<sup>10</sup>

Among Germany-based respondents, 95 percent reported having decided to publish their research to inform others about their work. Fifty-four percent indicated that they decided to publish to increase their prospects for promotion/professional advancement. That same percentage also published to obtain feedback from peer reviewers and other readers. Forty-nine percent of respondents also published to gain or justify funding for research projects.

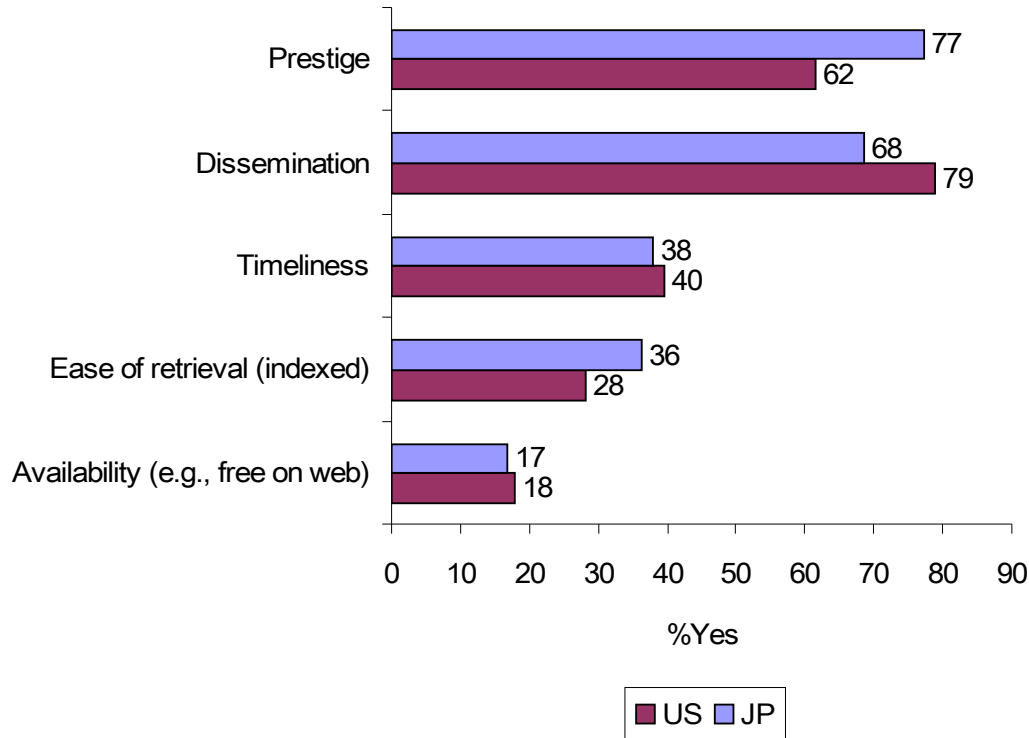
### Criteria in Publishing Scientific Work

Respondents also were questioned as to the criteria upon which they based their decision regarding how or where to publish their most recent scientific work (see Figure 3). Those criteria included the dissemination of research results; “prestige”—meaning that publication of their work in select journals, highly relevant to their field of study could lead to academic promotion or to greater prospects for obtaining funding for future research; timeliness; “ease of retrieval”—meaning that the journal in which their work was published would be indexed in a commercial or open access database; and availability of their publication (for free) on the Internet.<sup>11</sup>

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<sup>10</sup> For example, through the United Kingdom’s Research Assessment Exercise. See [www.rae.ac.uk](http://www.rae.ac.uk).

<sup>11</sup> Respondents also were allowed to select “other” to indicate that their particular criterion was not included in the survey questionnaire.



**Figure 3.** Criteria in Deciding How to Publish One's Scientific Work: Japan and the United States.

**Source:** 2006 AAAS-SIPPI *Effects of Intellectual Property Protections Survey* Database.

Seventy-nine percent of U.S. and 68 percent of Japanese respondents published on the basis of dissemination. Seventy-seven percent of Japanese respondents cited prestige, whereas for U.S. respondents, that figure was 62 percent. Compared with those criteria, timeliness, ease of retrieval, and availability online were cited by noticeably fewer respondents from the United States and Japan: 40 percent and 38 percent of U.S. and Japanese respondents (respectively) selected timeliness; 28 percent and 36 percent (respectively) chose ease of retrieval; and 18 percent and 17 percent (respectively) cited availability online.

Among the U.K. respondents, 71 percent (349 out of 490) cited dissemination as the leading criterion; prestige ranked second among criteria, by 58 percent (283 of 490 respondents). Finally, timeliness ranked third, by 29 percent (142 of 490 respondents). Those top-three criteria ranked in the same order for the survey of U.S. scientists.

For the survey of Germany-based scientists, those criteria ranked in the same order as they did for the U.S.- and U.K.-based surveys: 70 percent (502 out of 714) of respondents cited dissemination; 66 percent (470 out of 714 respondents) cited prestige; and 28 percent (198 out of 714) cited timeliness. As with the U.K.- and U.S.-based surveys, dissemination, prestige, and timeliness ranked in the same order for the survey of German scientists.

## Means of Publishing Scientific Work

For each country survey, respondents were asked to identify the publisher of their most recent work or the means by which it was published. Seventy percent of Japanese respondents and 13 percent of U.S. respondents reported that they or their institutional department were responsible for publishing their most recent work (e.g., through a personal, academic, or government agency Web site—although those examples are by no means exhaustive). Twenty-five percent of Japanese respondents published through peer-reviewed journals or publishers of conference proceedings; 68 percent of U.S. respondents indicated having used such means. For respondents from each of those countries, publishing through a freely-accessible archive occurred only in 1 percent of instances.

With respect to the means by which their most recent work was published, 62 percent of respondents (306 out of 495) from the United Kingdom indicated that their work was published in a peer-reviewed journal or publisher of conference proceedings. Individual scientists<sup>12</sup> or their respective institutional departments were second to peer-reviewed journals as a reported means of publishing (69 respondents out of 495; 14 percent of respondents). In contrast, only 2 percent (eight respondents) reported using freely-accessible archives to publish their work.

Among Germany-based respondents, 65 percent (481 out of 737) indicated that their most recent work had been published in a peer-reviewed journal or by a publisher of conference proceedings. Twenty-two percent of German respondents reported that they or their institutional department were responsible for publishing their work. Only 2 percent (16 out of 737) published by placing their work in a freely-accessible archive.

## Protecting Scientific Work

With respect to how scientific work is being protected in relation to publishing, three means in particular—as demonstrated by the results of each survey—drew particular attention during the analysis of each report. Those included delaying publication of one's scientific work, not publishing it, or publishing it incompletely. In each country survey, respondents were allowed to select one or more of those means.

For the Japan-based survey, 25 percent of respondents (particularly those from the life sciences field) indicated that they had delayed publication of their work as a protective measure. That is somewhat higher than the 17 percent of U.S. respondents (particularly those from the life sciences field as well) who delayed publication. Among Japanese respondents, the prevailing measure for protecting their scientific work was publishing it incompletely (43 percent); 6 percent of U.S. survey respondents indicated that that had published incompletely. Finally, 7 percent of Japanese respondents did not publish their work, whereas 9 percent of U.S. respondents reported not having published.

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<sup>12</sup> For example, some scientists or researchers will publish their work through a personal Web site or through their institutional department's Web page containing their academic profile and biographical information.

For the U.K.-based survey, a key measure for assessing the protection of one's scientific work was the degree to which respondents deliberately published their research to prevent others from acquiring intellectual property (IP) protections on such work. Eleven percent (57 out of 499) of those respondents reported publishing to protect their work. For the survey of Germany-based scientists, just less than 5 percent (35 out of 737) of respondents reported having published to prevent others from obtaining IP protections.

## **Copyright and Access to Scientific Literature**

Nineteen percent of Japanese respondents reported that they encountered difficulties in accessing or disseminating copyrighted materials over the past five years. Additionally, 21 percent indicated that they had difficulties in disseminating their own publication as a result of copyright restrictions. For U.S. respondents, 31 percent reported having experienced difficulties in accessing or disseminating copyrighted materials; 6 percent encountered difficulties in disseminating their own publication due to copyright restrictions. Among Japanese respondents who had difficulties in accessing copyrighted materials, 16 percent reported that such difficulties caused their research to be delayed by more than one month. Of U.S. respondents who encountered such difficulties, 21 percent reported that their research was delayed by more than one month.

Among U.K.-based respondents, 22 percent reported that they encountered difficulties in accessing or disseminating copyrighted materials over the past five years; 5 percent indicated that they had difficulties in disseminating their own publication as a result of copyright restrictions. For Germany-based respondents, 32 percent encountered difficulties in accessing or disseminating copyrighted materials; 9 percent reported having experienced difficulties in disseminating their own publication due to copyright restrictions. Forty-four percent of U.K. respondents who encountered difficulties in accessing copyrighted materials reported that, as a result, their research was delayed by less than one month. Among German respondents who experienced difficulties concerning access, 57 percent reported that their research was delayed by less than one month as a result of those difficulties.

## **Open Access Licensing Models**

We questioned respondents to each survey whether—in the context of the past three years—they had used alternative, open access (OA) publications for reference purposes in their research. Three percent of Japanese respondents reported having done so, in contrast to 11 percent of U.S.-based respondents.

Among U.K. respondents, 61 percent (398 out of 657) reported having used OA publications during the past three years. Seventy-seven percent (639 out of 831) of respondents from Germany also indicated having referenced such publications during that period.

## **Ease of Access to Scientific Literature**

Finally, we asked survey respondents' to assess the ease of access to the general body of scientific literature over the past three years. Among Japanese respondents, 72 percent indicated that they felt that their access to the literature had become easier over that period; 58 percent of those from the United States indicated that they felt that such access had become easier. Only 4 percent of Japanese respondents felt that access had become more difficult over the past three years; 2 percent of U.S. respondents felt that that access had become more difficult.

Among U.K. respondents, 51 percent (337 out of 657) reported they felt that access to the general body of scientific literature had become easier over the past three years; 9 percent (60 out of 657) felt that access had become more difficult. For Germany-based respondents, 58 percent<sup>13</sup> (481 out of 832) felt that access to scientific literature had become easier over the past three years; and 7 percent (61 out of 832) that it had become more difficult.

## **Observations on Scientific Publishing and Access to Scientific Literature**

Upon examining the means by which respondents from each of the four countries attempted to protect their scientific work in relation to publishing, some cautious observations can be made. For example, delaying the publishing of one's work was slightly more common among Japanese respondents than those from the United States. Moreover, publishing incompletely was far more common among respondents from Japan than U.S.-based respondents. For both countries, a similar percentage of respondents (7 percent for Japan and 9 percent for the United States) did not publish their scientific work in order to protect it.

For each country surveyed, most respondents—if not all—indicated having experienced some degree of difficulty and adverse effects associated with accessing or disseminating copyrighted materials. Of those effects, delays in conducting one's research—typically lasting less than one month or more than one month—were among those that were cited by enough respondents to warrant further inquiry into the relationship between access to scholarly literature and the ability to conduct research in a timely manner.

Although each set of results from the four country surveys are not of pure statistical equivalence or comparability, it is curious that a substantially higher percentage (72 percent) of respondents from Japan reported that their access to the general body of scientific literature had become easier over the past three years. In contrast, although the majority of respondents from the United States, United Kingdom, and Germany also indicated that such access had become easier, the percentages that did so were lower for each country: percentages from the U.S.-based survey and the Germany-based survey were the same (58 percent, albeit not valid for pure statistical equivalence), and results from the U.K.-based survey indicated that 51 percent of respondents believed access had become easier over the past three years. For each individual country survey,

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<sup>13</sup> That percentage is equivalent to the percentage of U.S. respondents who indicated that access to scientific literature had become easier over the past three years. However, it is important to remember that the sample size for each country survey differed. Thus, for the United States, 1,077 respondents out of 1,862—or 58 percent—indicated that access had become easier.

the percentage of respondents having reported greater difficulty (at the time of taking the survey compared to the previous three years) in accessing scientific literature was less than 10 percent, with 9 percent of respondents from the United Kingdom indicating that access had become more difficult.

## **Access to Scientific Data from Publicly Funded Sources**

Survey respondents were questioned about their experiences with accessing and using data derived from publicly funded sources. The survey instrument defined “data” as “numeric or factual” information/output that are part of a larger collection of such information. The term “publicly funded sources” of such information was defined as “data produced by a government entity or entirely with government funding in an academic or nonprofit institution.” In the United States, for example, sources of public funding would include institutions such as national or state government agencies (e.g., the National Institutes of Health, the National Science Foundation). However, it should be noted that because some differences in meaning (e.g., regarding what qualifies as a public entity) exist between the United States and the other countries surveyed, appropriate responses were added to any survey questions that required a means to account for those differences.

### **Difficulties with Accessing Publicly Funded Data**

Fourteen percent of respondents from the Japan-based survey indicated that, since January 1, 2002, they had experienced some form of difficulty with accessing data from a publicly funded source. A higher percentage of U.S. respondents—23 percent—reported experiencing difficulties. For Japanese respondents who experienced problems, the two most highly-cited difficulties were that the associated legal terms and conditions were problematic (40 percent of respondents) and that costs associated with access (independent of legal terms and conditions) were high (32 percent of respondents). In contrast, for U.S. respondents, the two most highly-cited problems were a substantial delay in the transfer of data sought (44 percent of respondents) and that access to data was denied (39 percent).

For the U.K. respondents, 20 percent (61 out of 318) reported that they had experienced some form of difficulty or difficulties with accessing data from a publicly funded source. Among German respondents, 19 percent (87 out of 465) also indicated having experienced difficulties. For those U.K. respondents who encountered problems, a substantial delay in the transfer of data sought (34 percent) and technical difficulties in gaining access to data (27 percent) ranked the highest. For those German respondents who experienced problems, a substantial delay in the transfer of data sought and the denial of access to data ranked the highest—both at 37 percent of respondents (multiple selections were allowed for this survey question).

### **Effects of Difficulties on Scientific Research**

Survey respondents who experienced difficulties in accessing data from publicly funded sources were asked what effects those difficulties had upon their research. Sixty-four percent of Japanese respondents reported having experienced “some negative effect(s),” whereas 70 percent (175 out of 249) of U.S. respondents encountered such effects. Twelve percent of Japanese

respondents reported that they experienced “serious negative effect(s);” for U.S. respondents, that figure was 10 percent (25 out of 249).

Among U.S. respondents, 67 percent (42 out of 63) reported having experienced “some negative effect(s)” upon their research. For German respondents, 67 percent (56 out of 83) indicated experiencing those effects as well. Moreover, 6 percent (four out of 63) of U.K. respondents reported having experienced “serious negative effect(s);” for German respondents, that figure was 13 percent (11 out of 83).

### **Observations on Access to Scientific Data from Publicly Funded Sources**

It is interesting to note some cautious observations between the U.S. survey results and those of the Japan-based survey. For example, similar but not exact *ratios* between each country existed for the following, with affirmative responses from the U.S. survey being higher in each instance:

- Regarding difficulties with accessing patented technologies (discussed earlier in this report), 11 percent of Japanese respondents reported such difficulties, whereas for U.S. respondents, that figure was 26 percent.
- Regarding difficulties with accessing data from publicly funded sources, 14 percent of Japanese respondents experienced such difficulties, whereas for U.S. respondents, that figure was 23 percent.

Nevertheless, for each country survey, when asked how, since January 1, 2002, the situation has changed in terms of accessing data from publicly funded sources, well over 50 percent of respondents indicated that the situation either has become easier, or, at the least, has remained the same. However, that is not to ignore the smaller—albeit not miniscule—percentages of respondents who reported that the situation has become more difficult since January 1, 2002. Such findings open the possibility for robust future analyses.