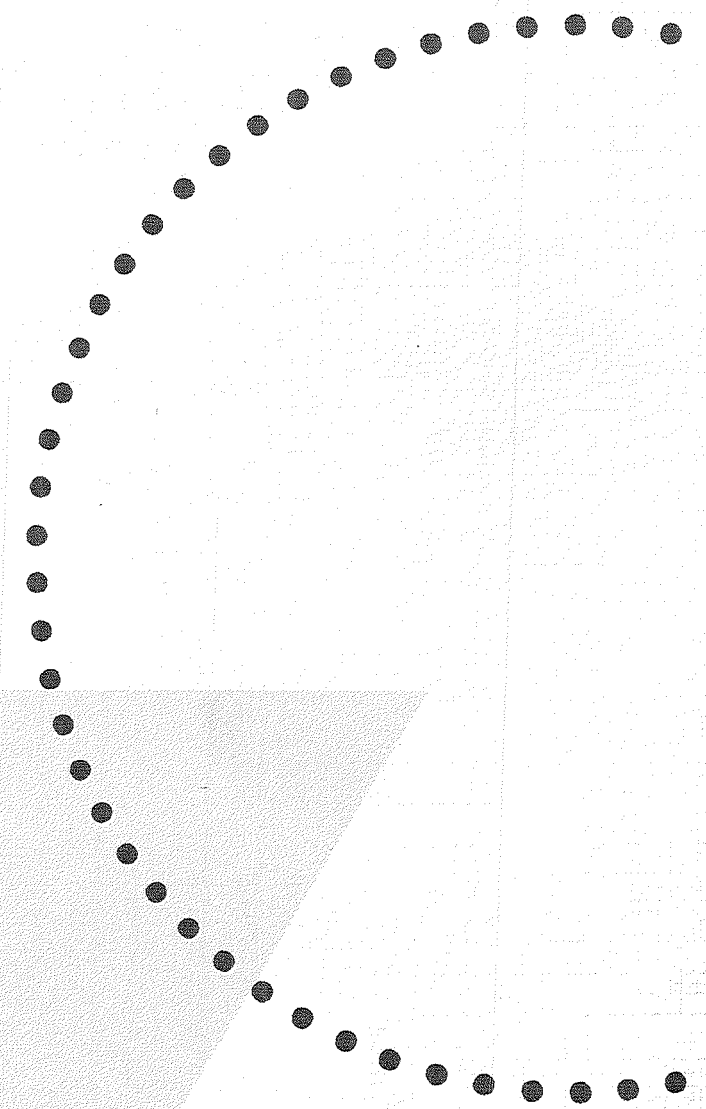
AUTM Licensing Survey: FY 1996

Survey Summary



AUTM®

Association of University Technology Managers, Inc.

A MESSAGE FROM THE AUTM PRESIDENT

Dear AUTM Members and Interested Friends:

It is with great pride that I convey to our members and Survey users AUTM's sixth annual Licensing Survey. It is gratifying that the data reflect successes in areas envisioned by Congress when it enacted the Bayh-Dole Act in 1980. From these results, it is clear that industry continues to expand its recognition of the creativity and ingenuity of faculty and other inventors at universities, teaching hospitals, and nonprofit research centers in the U.S. and Canada. More new companies are being formed, more new licenses are being signed, more private dollars are being invested to develop our early-stage federally funded technologies, and more products based on technology licensed in past years are reaching the market and benefiting the public.

It is reflective of our mission that we submit ourselves to this detailed gathering and public reporting of data about our productivity every year. Although our institutions vary widely in funding, character, and purpose, the data allow each of us to develop and use analytical tools to benchmark and continually improve our performance. Indeed, other institutions around the world are now turning to AUTM for guidance in how to commercialize university technology.

The data in the Survey reinforce our national strategy in leaving ownership of intellectual property rights with academic and other nonprofit institutions. This approach has made it easier for thousands of existing and newly created companies to obtain rights to early-stage technologies and to make the investments needed to bring them to market. Revenue from successful commercialization (after program and patent expenses) provides an ancillary source of support for our primary missions of education and research. The results of licensing programs reported here provide objective evidence for continuing the present legislative basis governing our technology transfer activities.

This edition of the Survey has been expanded to include new parameters that allow us to better understand our processes and results. The AUTM Survey, Statistics, and Metrics Committee, chaired by Daniel E. Massing and ably supported by Diane C. Hoffman, has succeeded in preserving the quality and response rate of the Survey, while at the same time permitting AUTM to expand the scope of data that is compiled.

Spotlighting significant Survey results, we can see that nearly two-thirds (64%) of all the licenses granted last year went to small companies, including start-ups, achieving our goal of creating new companies and new jobs. While no one is likely to be surprised that healthcare takes the majority of licenses, it remains significant that physical sciences contribute to as many as 33% of the total active licenses. The availability of data describing the start date of technology transfer offices enables Survey users to compare institutional data on the basis of like history and helps to highlight the long length of time the academic technology transfer process often requires to generate significant results.

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AUTM Licensing Survey: FY 1996

A Survey Summary of Technology Licensing (and Related) Performance for U.S. and Canadian Academic and Nonprofit Institutions, and Patent Management Firms

Edited By:

Daniel E. Massing, Chair
AUTM Survey, Statistics, and
Metrics Committee

The Association of University Technology Managers (AUTM) has undertaken this Survey and the reported results herein for the educational benefit of its own members and as a public service to the nonprofit technology licensing community. AUTM has assembled these data using responses obtained from its members representing educational and other nonprofit research organizations. These contributors to the data voluntarily self-reported results to AUTM using the AUTM Licensing Survey instrument. Use of institutional or entity names in the report as Survey respondents is for reference purposes in data presentation only and does not constitute an endorsement or official submission on the part of the institutions or organizations named. AUTM has made no independent verification of the data presented and cautions that the data may not be accurate in all respects.

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AUTM LICENSING SURVEY

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FOREWORD

In its sixth consecutive year, the AUTM Licensing Survey, as reflected in this report, has been revised in both format and content consistent with the interests of the licensing community of universities, hospitals, nonprofit institutions, and patent management organizations. With the completion of the AUTM *FY 1995 Five-Year Survey Summary* and *Full Report* came a realization of the importance of the Survey reports to their users and of the need to react to new interests in survey parameters that, up until about two years ago, were not known or widely used. Indeed, this same period witnessed the emergence of conferences and published literature devoted entirely to performance measurement and metrics of technology licensing. The subject matter of these meetings and resulting proceedings were invaluable in tracking the changing needs of the licensing community. In view of this external interest and the inquiries received from participating institutions and individuals, the AUTM Survey, Statistics, and Metrics Committee initiated development and review of a revised survey instrument. The adoption of this instrument, which is the basis of the data collection for this report, followed a rigorous process involving reviewers within AUTM and at selected institutions that regularly participate in the Survey.

The resulting survey process used for this year-six edition balances introduction of new parameters in such areas as equity-based licensing, distribution of licensing by discipline, licensing to start-up companies, and licensing exclusivity, with those parameters for which recurrent respondent data have been available from the last five years. The end product is a report that contains a one-year installment of new data, and consistent with previous Surveys, six consecutive years of data for selected parameters.

As with previous surveys performed by AUTM, the response rates and quality of data remain high. The committee charged with performing the Survey continues to be aware of and to monitor the effort required by our survey population in completing the Survey form. We wish to particularly recognize the group of ninety-five recurrent respondent organizations for contributing to one of the most important aspects of the Survey, which is the collection of consistent data sufficient to measure trends in the principal indicators associated with technology licensing.

Daniel E. Massing, Chair
AUTM Survey, Statistics, and
Metrics Committee

FY 1996 Survey Summary

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Attachments

Attachment A: AUTM Licensing Survey (FY 1996), Instructions and Definitions
Attachment B: Table of Contents *(Full Report)*
Attachment C: List of Tables *(Full Report)*
Attachment D: Summary of Fiscal Year (FY) 1996 Totals
Attachment E: Selected Facts & Figures for Fiscal Year (FY) 1996
Attachment F: Aggregate Totals for Respondents in Each Year for FY 1991 - FY 1996
Attachment G: Comparative Totals for Six-Year Recurrent Respondents for FY 1991 - FY 1996

EXECUTIVE SUMMARY

In 1997, the Association of University Technology Managers published a five-year report on licensing activities among academic organizations. The five-year report entitled *AUTM Licensing Survey FY 1991 - FY 1995* includes a discussion of the growth of technology transfer in the United States as well as a brief history in Canada, which the reader may find useful to the discussion of this report. This sixth edition of the AUTM Licensing Survey, combined with the five-year report, provides a historical record of licensing-related parameters from FY 1991 - FY 1996 that are intended to measure the factors that influence the licensing process. Key findings are as follows:

- 173 major U.S. and Canadian universities, teaching hospitals, research institutes, and patent commercialization companies responded to the Survey, the same number as in FY 1995.

Research Expenditures:

- Total FY 1996 sponsored research expenditures by the institutions were $21.4 billion, up 7.5% [i] from $19.9 billion in FY 1995.
- Total FY 1996 sponsored research expenditures funded by federal government sources was $13.9 billion, up 8.6% from $12.8 billion in FY 1995.
- Total FY 1996 sponsored research expenditures funded by industry was $1.9 billion, up 12% from $1.7 billion in FY 1995.

Patent-Related Activity:

- 10,178 Invention Disclosures were made in FY 1996, up 4% from the prior year.
- 3,261 New U.S. Patent Applications were filed in FY 1996, as compared to 2,872 in FY 1995.
- 2,095 U.S. Patents Issued in FY 1996, up by 14% from FY 1995.
- When comparing the same institutions across all years (six-year recurrent respondent data), the following annual average rates of increase are observed:
    - Invention Disclosures, 7% per year
    - New U.S. Patent Applications Filed, 10.6% per year
    - Licenses/Options Executed, 12.4% per year
    - U.S. Patents Issued, 8% per year

Start-Up Activity:

- 248 start-up companies were formed in FY 1996, up 11% from 223 in FY 1995.
- Academic institutions received an equity interest in 167 transactions in FY 1996, up 17.6% from 142 in FY 1995.
- 1,881 new companies have been formed since 1980 that were based on a license to an academic invention, including the 248 formed in FY 1996.
- From 1980 through FY 1995, 1,633 start-up companies were formed. In FY 1996, historical data were

---

Terms from the AUTM Survey are shown in capital letters and are defined on pages 34-40. References, i.e., ref. 1-5, and Notes, i.e., i-xxiv, appear throughout the report and may be found on pages 24 and 25-28, respectively.

1.0 INTRODUCTION AND OVERVIEW

The term "technology transfer" is used throughout this report as the descriptor of the process whereby inventions or intellectual property from academic research is licensed or conveyed through use rights to industry. This report presents survey data that measure various activities (parameters) associated with the transfer process. The stimulus for the basic process is research expenditure by the responding institutions. This research leads to an inventive result formalized by disclosure and legal processes through patents or some other form of statutory protection. With commercial interest comes the actual "transfer" process enabled through licensing by the institution as licensor to industry followed by transfer of appropriate know-how. Commercial use of the licensed technology yields royalty income or some other consideration to the institution that is shared with inventors and the campus infrastructure. Much of the data presented in this report quantify the magnitude of parameters of technology transfer. Such data describe the three basic elements of the process: 1) process stimuli—research expenditure and invention disclosure; 2) process variables—patent application and issue; and 3) process results—license income.

Users of this report may wish to review definitions of survey parameters contained in Attachment A of this document (pp. 29-40). These formal definitions form the basis for responses provided by survey participants as well as provide a means of interpretation of reported data by survey users.

The sixth year of the annual AUTM Survey departs from previous years with the addition of new survey parameters while, at the same time, preserving traditional data from previous editions. Readers of this report will, therefore, find a first-year installment of new information and six years of comparable data. In addition, a format change has been implemented in the full volume of the report. This change provides data presentation for year-six new information (i.e., FY 1996) and six years of comparable data for parameters of the recurrent respondent group. Therefore, beginning with this FY 1996 report, users will need to collect and retain individual-year reports for future reference as each new edition will contain the survey data of the respective year together with that year's addition to the recurrent respondent data set. Use of this format is intended to reduce the repetitive content that, if continued over time, would make the full volume unwieldy and difficult to use. Nevertheless, using this format does not preclude another comprehensive edition similar to the FY 1991 - FY 1995 report at some future point in time.

There are several new survey parameters that have been introduced in the survey instrument for the first time. The decision to expand the scope of the Survey comes in response to the user community and the observed increase in Survey use. From the many suggestions received, a group of parameters was selected based on the following criteria: 1) quantitative, definable criterion; 2) relevance to Survey user interest; 3) availability of data and potential responsiveness of the surveyed organizations; and 4) meaningfulness for trend measurement. Some suggestions, although very interesting from the user's perspective, could not be implemented, primarily due to the difficulty that would have been experienced by the surveyed institutions in gathering the information. Indeed, those responsible for conducting the Survey are acutely aware of the effort required for Survey completion, and thus, at this stage of its evolution, elected to seek the advice of representatives of selected institutions in addition to internal review of the survey instrument by the committee and AUTM officials. It was agreed that "bigger is not (necessarily) better," but that some changes were appropriate to the Survey mission.

As an introduction to users, the following is a list of new survey parameters in order of appearance in the survey instrument for which FY 1996 data are reported:

- Start date of technology transfer activities (program year) [ii]

Terms from the AUTM Survey are shown in capital letters and are defined on pages 34-40. References, i.e., ref. 1-5, and Notes, i.e., i-xxiv, appear throughout the report and may be found on pages 24 and 25-28, respectively.

A closing discussion item is devoted to the observed use of the AUTM Survey. It has been noted that this Survey is referenced in many publications, particularly those produced by the "external" community of investigators interested in process metrics and economic impact of technology licensing. A very significant publication is the result of a first-of-its-kind "Metrics Summit" held this past year, co-sponsored by the Technology Transfer Society and the Engineering Foundation. The proceedings of this meeting (ref. 1), some 346 pages plus appendices, contain material on a variety of topics including process metrics, models, and benchmarking. For those who work with these subject areas, and use and reference the AUTM Licensing Survey as the data source, AUTM publishes this Survey in hard copy and also makes the data available on a diskette in spreadsheet format for anyone wishing to further process the raw data. Both the sixth year (FY 1996) parameters and the previous five-year (FY 1991 - FY 1995) data are available.

As in the previous edition of the Survey, discussion and summarizing of results for FY 1996 are addressed in later sections of this report. Further presentations to enable inference from the data are covered as well.

2.0 AUTM LICENSING SURVEY: BACKGROUND AND DESCRIPTION

AUTM carries out the Licensing Survey each year, consistent with its objective to collect information on its members' programs, to assist in meeting one of its primary objectives: sharing of information with its members. This Survey provides objective information related to the field of academic technology transfer. The Survey gathers data on the technology transfer programs of both U.S. and Canadian institutions. The first AUTM Licensing Survey was conducted in 1993, capturing data for FY 1991 and FY 1992. Since that time, the Survey has been administered on an annual basis.

The data gathering process [iii] covers a wide range of topics, including information on activity in such areas as invention disclosures, patenting and licensing, and requests financial information such as license income received, payments made to other institutions, and legal fees and reimbursements. It also asks for certain organizational information, such as staffing levels and numbers of staff carrying out various kinds of work.

Each question contained in the survey instrument is intended to assure that consistent data are collected from institution to institution. In addition, every effort is made to collect comparable information each year to enable a meaningful analysis of trends within the data collection interval. A few of the questions and definitions on the Survey have been clarified over time (see Notes, pp. 25-28, and additional annotations throughout the report). [iv, v, vi, vii] One or two new questions also have been asked every year that had not been asked previously.[viii] Of special note for the FY 1996 Survey (conducted in 1997) was the expansion of the survey instrument to ask several new questions that provide objective data on important licensing processes. These questions are discussed in Section 3.3, New Licensing-Related Parameters.

2.1 Historical Data: FY 1991 - FY 1995

Data accrued under the AUTM Licensing Survey for Fiscal Years 1991 - 1995 have been summarized in two separate reports referred to as the *AUTM Licensing Survey, FY 1995 Five-Year Survey Summary* and the *AUTM Licensing Survey, FY 1991 - FY 1995 (Full Report)*. These reports present the aggregate and institutional data for all respondents to the Survey in these prior years. At times, the FY 1996 Survey reports refer to these data in aggregate, some of which are shown in aggregate in the attachments to this report.

The five-year reports are a milestone in the series of statistical surveys performed by AUTM. The FY 1995 *Full Report* is a five-year comprehensive report. Its contents form a cumulative record of technology

Terms from the AUTM Survey are shown in capital letters and are defined on pages 34-40. References, i.e., ref. 1-5, and Notes, i.e., i-xxiv, appear throughout the report and may be found on pages 24 and 25-28, respectively.

3.0 THE FY 1996 AUTM LICENSING SURVEY

3.1 Data Collection

The FY 1996 AUTM Licensing Survey instrument is included as Attachment A, pp. 29-40. The survey population for Fiscal Year 1996 consisted of 300 institutions, including: 212 U.S. Universities, 55 U.S. Hospitals and Research Institutes, 28 Canadian Institutions, and 5 Third-Party Patent Management Firms.

The institutions surveyed were asked to provide a best estimate for each question if an exact response was not known. In a few instances, best estimates were provided, and, at times, responses were rounded to the nearest thousands or millions. Not available data are noted as "N.A."

3.2 Respondents

Follow-up efforts were heavily concentrated toward the top 100 universities, identified in the National Science Foundation's (NSF) report entitled *Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions* (Fiscal Year 1994) (ref. 2). This effort resulted in an 89% response rate from these top institutions. Overall, for Fiscal Year 1996, 58% of those contacted responded, representing 173 organizations, including: 131 U.S. Universities, 26 U.S. Hospitals and Research Institutes, 14 Canadian Institutions, and 2 Third-Party Patent Management Firms.

Summaries of the number of responses to the Survey in FY 1996 and in previous years are shown in Figures 1 through 3. Figure 1 highlights the participation of the major research institutions. Figures 2 and 3 show the number of responses by sample population for the respective years. Additional survey population statistics for FY 1991 through FY 1995 are available in the published five-year report.

Figure 1:

OVERALL RESPONSE RATE TO THE SURVEY
AND PARTICIPATION OF MAJOR RESEARCH INSTITUTIONS
FY 1991 - FY 1996

	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996
Overall Response Rate [a]	50%	50%	63%	62%	62%	58%
Top 100 Research Universities (ref. 2)	66%	66%	85%	84%	87%	89%

a) Whereas the overall response rate has remained level over the years, the number of responses has increased. This is due to a rise in the total number of institutions surveyed each year. As AUTM's membership grows by institutions that join AUTM and that meet the criteria to be surveyed, the survey population expands as well.

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with the technology transfer sequence: invention disclosure, patent application, issued patents, licenses executed, and licensing result (license income). This section also reports the license-related research funding that was committed in FY 1996. Section 6.0 provides information on company start-up activity.

Throughout the report, the data are presented for all respondents in each year and/or by six-year recurrent respondents, depending on which group makes the most accurate statement. For example, trend analysis and comparison of data from one year to the next is limited to the six-year recurrent sample population to ensure that the same institutions are represented in each year. In addition, data from participating third-party patent management firms are excluded from year-to-year analyses due to the small sample size, and to avoid a possible double-count in the data (e.g., an invention disclosure received or a license executed may be counted by both a responding institution and a patent management firm, if the patent management firm manages licensing activity for that institution).

4.1 Life Science and Physical Science

Survey data presented in this section reflect the Life Science and Physical Science[xvi] classifications provided by the participants in response to new questions included for the first time in FY 1996.

Detailed data by field or discipline were provided for 84% (10,901) of the 12,951 Cumulative ACTIVE LICENSES & OPTIONS reported for all respondents. The remaining 16% were not classified. These data are shown in Figure 4. Percentages of the total reflect the portions of cumulative ACTIVE LICENSES & OPTIONS that are related to Life Science and Physical Science, respectively.

Figure 4:

CUMULATIVE ACTIVE LICENSES & OPTIONS
LIFE SCIENCE v. PHYSICAL SCIENCE
FOR INSTITUTIONS PROVIDING DETAILED DATA
(Respondents that Provided Detailed Data, N=151:
U.S. Univs., N=113; Hosps. & Res. Insts., N=24; Canadian Insts., N=12; Pat. Mng. Firms, N=2)

FY 1996	Total Cumulative Active Licenses & Options	Cumulative Active Licenses & Options: Life Science	% of Total	Cumulative Active Licenses & Options: Physical Science	% of Total
U.S. Universities	8,626	5,536	64%	3,090	36%
U.S. Hospitals & Research Institutes	1,331	1,223	92%	108	8%
Canadian Institutions	652	374	57%	278	43%
Patent Management Firms	292	208	71%	84	29%
All Respondents	10,901	7,341	67%	3,560	33%

Detailed information by field or discipline was provided for 78% ($463.0 million) of the GROSS LICENSE INCOME RECEIVED ($591.7 million) reported for all respondents. The remaining 22% of GROSS LICENSE INCOME RECEIVED was not classified according to these disciplines. Percentages of the total reflect the portions of GROSS LICENSE INCOME RECEIVED that are related to Life Science and Physical Science classifications, respectively. These data are shown in Figure 5.

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negotiated with START-UP COMPANIES. Of equal interest is that 64% of the LICENSES & OPTIONS EXECUTED were signed with START-UP or existing SMALL COMPANIES, leaving 36% with LARGE COMPANIES.

Figure 7:

LICENSES & OPTIONS EXECUTED:
LICENSED TO
START-UP, SMALL, OR LARGE COMPANIES
FOR INSTITUTIONS PROVIDING DETAILED DATA
(Respondents that Provided Detailed Data, N=162:
U.S. Univs., N=124; Hosps. & Res. Insts., N=23; Canadian Insts., N=13; Pat. Mng. Firms, N=2)

FY 1996	Total Licenses & Options Executed	Licenses & Options Executed: Start-Ups	% of Total	Licenses & Options Executed: Small Cos.	% of Total	Licenses & Options Executed: Large Cos.	% of Total
U.S. Universities	2,009	219	11%	1,099	55%	691	34%
U.S. Hospitals & Research Institutes	239	21	9%	111	46%	107	45%
Canadian Institutions	192	53	28%	74	38%	65	34%
Patent Mngmnt. Firms	47	4	8%	13	28%	30	64%
All Respondents	2,487	297	12%	1,297	52%	893	36%

5.0 INTERPRETATION OF SELECTED DATA

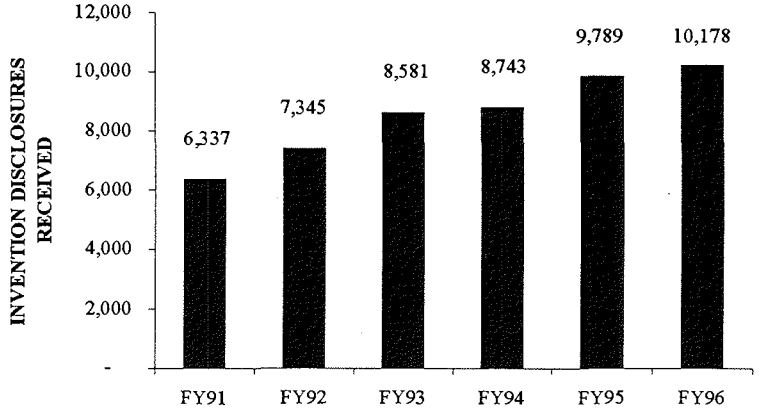
Survey results tabulated in this section are provided to reinforce the data reported in the five-year report, enhanced by the addition of FY 1996 information. The combined historical record is intended to measure the factors at work that influence the licensing process.

5.1 Invention Disclosures

Figures 8A and 8B depict INVENTION DISCLOSURES RECEIVED for all respondents and six-year recurrent respondents, respectively, over the years.

Figure 8A:

INVENTION DISCLOSURES RECEIVED
(All Respondents for Each Year:
FY91: N=130; FY92: N=130; FY93: N=158; FY94: N=159; FY95: N=173; FY96: N=173)



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Figure 9A:

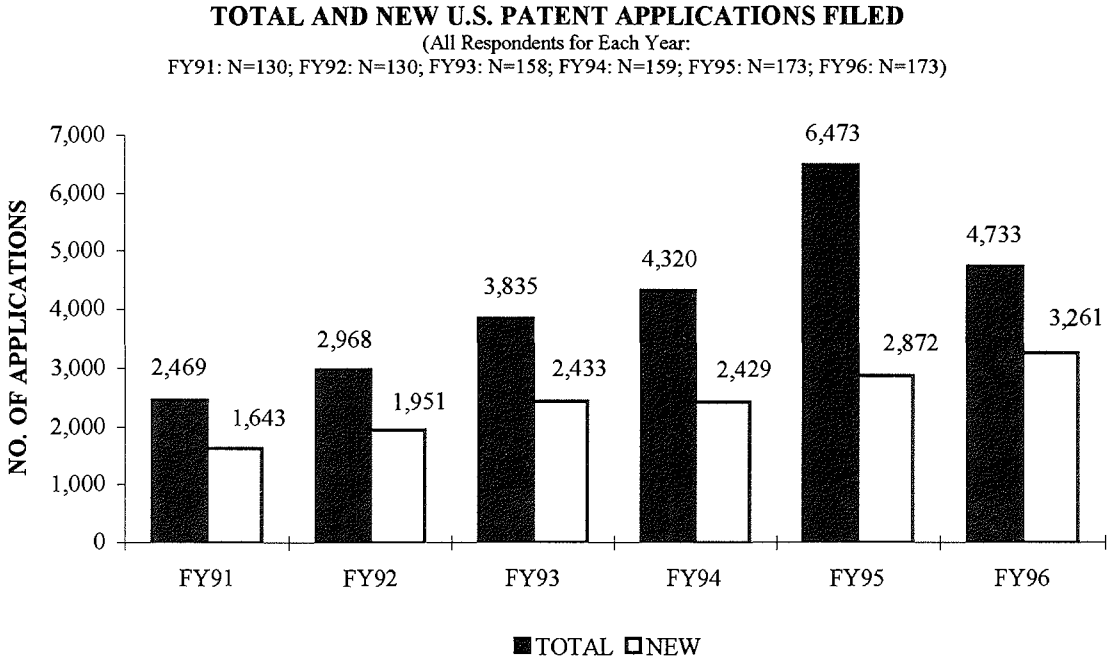
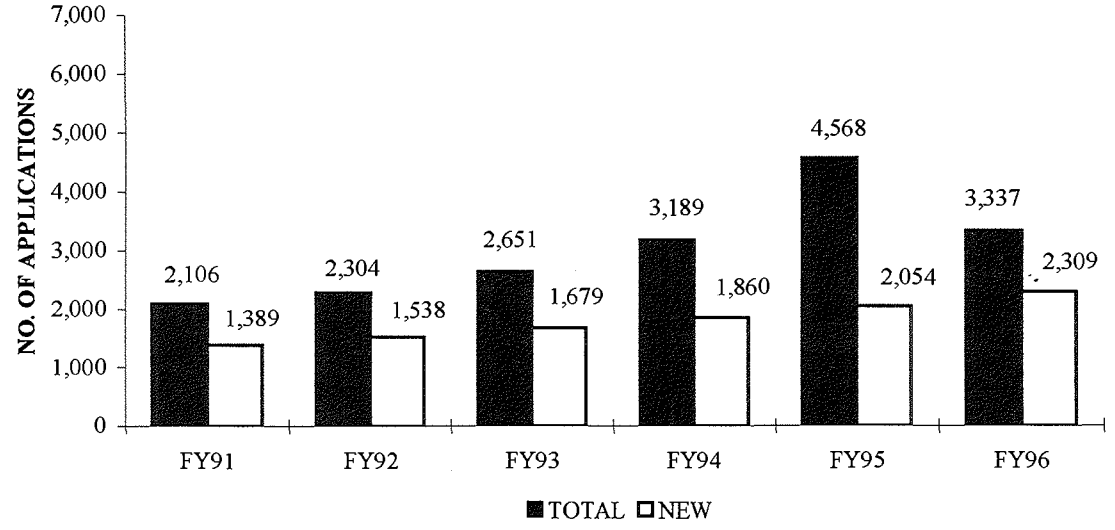


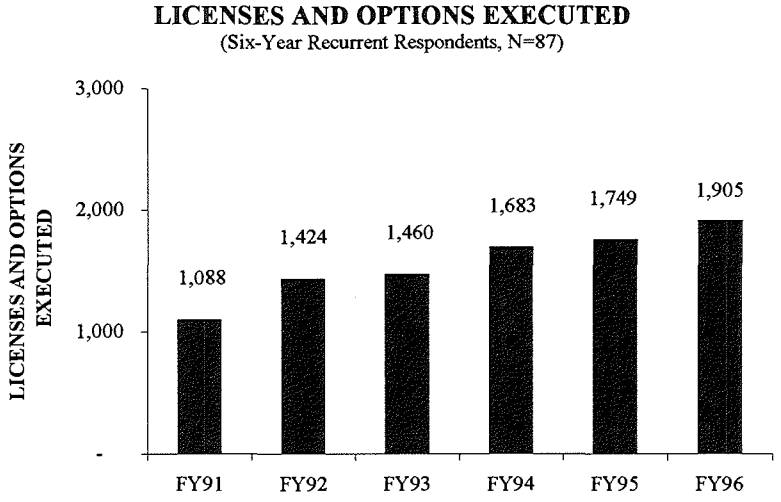
Figure 9B:



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Figure 11B depicts LICENSES & OPTIONS EXECUTED for six-year recurrent respondents, showing an increase of 9% from FY 1995, and a 75% increase from FY 1991.

Figure 11B:



5.4 License Income

Gross LICENSE INCOME RECEIVED in FY 1996 increased to $592 million, while *adjusted gross license income* (calculated by subtracting LICENSE INCOME PAID TO OTHER INSTITUTIONS from gross LICENSE INCOME RECEIVED) increased to $514 million. Cumulative gross LICENSE INCOME by participating institutions since FY 1991 topped $2.3 billion, and cumulative *adjusted gross license income* exceeded $2.0 billion.[xxi]

Table 7 in the *Full Report* lists the gross LICENSE INCOME RECEIVED by sample population and the *adjusted gross license income received* on an institution-by-institution basis, for each year. It also identifies the amount of LICENSE INCOME PAID TO OTHER INSTITUTIONS, which is used to derive the *adjusted gross license income*. When reviewing LICENSE INCOME RECEIVED for a single institution, the reader may wish to review *adjusted gross license income* for the respective institution as well.

Figure 12 graphs the aggregate data for gross LICENSE INCOME RECEIVED and *adjusted gross license income,* for all respondents for each year.

It should be noted that, by charter, the third-party patent management firms return a significant percentage of license income they receive back to the institution from which the licensed invention originated. The return of these funds is reflected in the Survey as part of LICENSE INCOME PAID TO OTHER INSTITUTIONS.

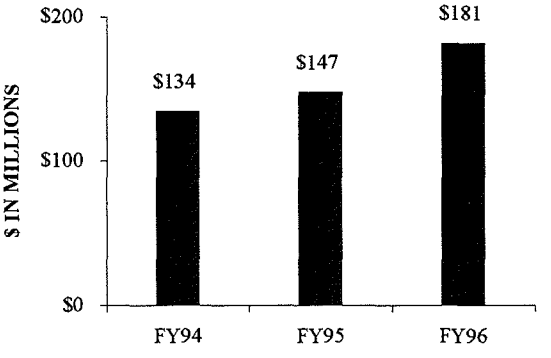
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5.5 License-Related Research Funding

Figure 14 reports the *license-related research funding* (defined as research funding committed in conjunction with the execution of license and option agreements) for Fiscal Years 1994 - 1996. A portion of the 23% increase noted in FY 1996 (approximately 30%) is attributed to two institutions that were each successful in negotiating a large research agreement in conjunction with the signing of a license. The balance of the reported research funding is spread across the remaining 144 respondents. Some institutions do not track these data (their response is noted as N.A.). Others provide data only on an annual basis, when the definition allows for the reporting of the research funding related to licenses/options to be on a multi-year award basis. These data, therefore, are believed to understate the actual funding level. [xxii]

Figure 14:

LICENSE-RELATED RESEARCH FUNDING
(Respondents Providing a Response:
FY94: N=136; FY95: N=145; FY96: N=146)



6.0 COMPANY START-UP ACTIVITY

6.1 Start-Up Information

Company start-up activity continues to be a significant result of the technology licensing process, with 248 START-UPS formed in FY 1996 by 86 institutions (an additional 82 institutions reported no start-ups formed). The initiation of these 248 start-up companies was based on technologies discovered at the respondents' institutions. Half of the respondents reported having established a policy or guidelines for governing the licensing of technology to investigator-/institution-initiated start-up companies.

Figure 15:

START-UPS FOR FY 1996

Institutions Reporting > 0 Start-ups	Start-Up Companies Formed
N=86	248

In the earlier AUTM licensing surveys, 192 institutions responded to a survey item on how many start-up companies had resulted from the licensing of their technology between 1980 and FY 1995. Of these 192

Terms from the AUTM Survey are shown in capital letters and are defined on pages 34-40. References, i.e., ref. 1-5, and Notes, i.e., i-xxiv, appear throughout the report and may be found on pages 24 and 25-28, respectively.

Figure 17:

LICENSES WITH EQUITY
(All Respondents for Each Year:
FY 1996: N=173; FY 1995: N=173; and FY 1994: N=159)

	FY 1996		FY 1995		FY 1994 and Prior Years	
	# of Insts.	Licenses with Equity	# of Insts.	Licenses with Equity	# of Insts.	*Cumulative* Licenses with Equity
Reporting Response > 0	66	167	70	142	100	592
Reporting Response = 0	104	0	100	0	53	0
Reporting No Response	3	N.A.	3	N.A.	6	N.A.
Totals	173	167	173	142	159	592

In an attempt to better describe LICENSE INCOME, in FY 1996 the Survey requested that LICENSE INCOME be distributed among RUNNING ROYALTIES, CASHED-IN EQUITY, and All Other Types of income. Detailed data were received for 92% ($545.9 million) of GROSS LICENSE INCOME ($591.7 million) reported for all respondents. The results are shown in Figure 18.

Figure 18:

GROSS LICENSE INCOME RECEIVED
BY RUNNING ROYALTIES, CASHED-IN EQUITY, AND OTHER
FOR INSTITUTIONS PROVIDING DETAILED DATA
(Respondents that Provided Detailed Data, N=163:
U.S. Univs., N=125; Hosps. & Res. Insts., N=24; Canadian Insts., N=12; Pat. Mng. Firms, N=2)

FY 1996 ($ millions)	Total Gross License Income	Gross License Income: Running Royalties	% of Total	Gross License Income: Cashed-In Equity	% of Total	Gross License Income: All Other Types	% of Total
U.S. Universities	$351.8	$282.1	80%	$20.2	6%	$49.5	14%
U.S. Hospitals & Research Institutes	$103.9	$83.7	81%	$4.7	4%	$15.5	15%
Canadian Institutions	$10.5	$7.1	67%	$0.4	4%	$3.0	29%
Patent Mngmnt. Firms	$79.7	$77.3	97%	$0	0%	$2.4	3%
All Respondents	$545.9	$450.2	82%	$25.3	5%	$70.4	13%

University involvement in starting new companies and taking equity (e.g., holding stock) in those companies has become more prevalent in recent years. In FY 1996, respondents were asked to provide the cumulative VALUE OF ALL EQUITY HOLDINGS related to licensing activity. This amount was reported at $197,985,747 by 135 responding institutions. Of the 135 institutions, 59 reported no ($0 value) equity holding in companies.

Figure 19:

	Cumulative Value of All Equity Holdings (N=135)
FY 1996	$ 197,985,747

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believed to be traceable as an aftermath to implementation of the provisional patent application where organizations may have elected not to convert the provisional applications reflected in FY 1995 data one year later, or if converted, such applications are not classified as new. One other possible explanation may be fewer divisional applications filed in FY 1996 than in the previous year.

A comparison of process input and output can be made by computing, on a year-by-year basis, the ratio of INVENTION DISCLOSURES per LICENSE/OPTION using the data in Figure 8B: INVENTION DISCLOSURES RECEIVED, and Figure 11B: LICENSES AND OPTIONS EXECUTED. This ratio, viewed as a normalized measure, provides insight to the license yield from INVENTION DISCLOSURES RECEIVED as the process input function. This relationship assumes licensing occurs within approximately two years of disclosure. This fact is not always borne out in actual practice, however. It also assumes a steady portion of licenses are negotiated on an exclusive and non-exclusive basis across the years, with a split of 53/47 theorized as a reasonable estimate. (If there are significantly more or less exclusive or non-exclusive licenses from one year to the next, this analysis becomes less meaningful.) Along with the ratio one may examine the historical pattern of LICENSE INCOME as a corresponding but necessarily time-displaced relation. Assuming that the licensing process output (LICENSE INCOME) responds over time to an input (INVENTION DISCLOSURE), the data in Figure 13 would correlate to data in Figure 8B through an input function (i.e., "the ratio"). It may be possible, therefore, to interpret the time response of the output parameter, LICENSE INCOME, to an input, INVENTION DISCLOSURE, using Figure 20 as an illustration.

Figure 20:

COMPARISON OF SELECTED INPUT AND OUTPUT MEASURES

	1991	1992	1993	1994	1995	1996
Invention Disclosures per License/Option	4.6	4.0	4.1	3.5	3.7	3.7
Gross License Income per License/Option ($000)	$145	$147	$191	$185	$205	$227
Percent Change in Gross License Income	--	32%	34%	11%	15%	21%

The first row of data suggests that fewer disclosures are needed to produce a license although from a numerical basis, for the years FY 1994 - FY 1996 the metric is essentially constant. It may be seen from the preceding table that from a near-uniform or slightly reduced input, there is an increase in the output response in the normalized LICENSE INCOME metric. (LICENSE INCOME should not be interpreted as an expected amount of income to be generated per license, as these amounts will vary greatly; rather, this metric is presented only as a tool by which to examine an output in this process.) The third row percentage figures are provided as an aid to interpreting the income per license ratio appearing in the tabulation. The third row is calculated using the gross license income amounts shown in Figure 13 for six-year recurrent respondents.

A popular belief is that the age of a technology transfer operation[xxiv] is a determining factor in the results of its licensing effort. It is probable, given the earlier discussion here regarding license portfolio mix, that the longer-running operation is more likely to have the mature licenses, particularly in the life sciences, that produce significant income. With this year's Survey there are available, for the first time, data on the age of most respondents' operations. These data are distributed across the respondent population in Figure 21.

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formed in recent years, and thus have not yet reached five years of operation. Thirty-seven percent (37%) of the start-up companies formed involved equity participation by the licensing organization. Another significant result seen from new data is the age distribution of the licensing organizations, with fifty-four percent (54%) of the group ten years or less in operation.

Given the revised format and content of this year's Survey, it is appropriate in this concluding discussion to explain rationale for future editions. First, with regard to the new parameters added this year, it is desirable, if not mandatory, to collect data for these same parameters in future years to form a historical record that would provide objective information to economic development interests and other observers who follow, for example, company formation and flow of dollars resulting from technology transfer. It is believed by the organizers of the Survey that a practical size limit for the Survey instrument was attained with this edition. This observation takes into account the experience of the Survey administrator and the responding organizations in a combined assessment of the work involved in completing the Survey. There will be future need to evaluate new survey subject matter to keep this work responsive to the needs of users. This evaluation will include an assessment of the significance of potentially new information balanced against the overall impact to the respondent organizations in completing the Survey.

Terms from the AUTM Survey are shown in capital letters and are defined on pages 34-40. References, i.e., ref. 1-5, and Notes, i.e., i-xxiv, appear throughout the report and may be found on pages 24 and 25-28, respectively.

NOTES

[i] *The rates of increase for Total Research Expenditures and Research Expenditures: Federal Government Sources will vary, depending on a review of all respondents versus six-year recurrent respondents. The rate of increase from FY 1995 to FY 1996 for these categories of expenditures approximates 3 to 6 percent, depending on the sample population under review, if the $331 million increase in Total Research Expenditures and Research Expenditures: Federal Government Sources as a result of MIT's change in reporting in FY 1996 is removed from the data. See footnote x below.*

[ii] *Program Year refers to the year in which the respondent reported that the institution had devoted 0.5 Professional FTE to technology transfer activities.*

[iii] *See Attachment A for the AUTM Licensing Survey and its Instructions and Definitions page.*

[iv] *The definitions for Total Sponsored Research Expenditures, Research Expenditures: Federal Government Sources, and Research Expenditures: Industrial Sources were modified beginning with FY 1993 to request annual expenditure amounts as opposed to annual sponsored funding levels. In addition, industrial support provided for clinical trial studies could not be excluded from industrial support expenditures due to the institutions' tracking systems. Therefore, in FY 1993 and thereafter, this exclusion was dropped from the Survey. To help managers identify if clinical trial studies might be included in the reported figure for research expenditures from industrial sources, a new question was added to the Survey in FY 1993 to determine if the participating institution includes a Medical School.*

[v] *Unlike U.S. institutions, research expenditures reported for Canadian institutions generally do not include principal investigators' salaries and benefit costs, or indirect costs.*

[vi] *The questions related to staffing levels in the technology transfer office were modified in FY 1996 to eliminate the need to arbitrarily assign a portion of FTEs (Full Time Equivalents) for Technology Transfer to FTEs for Licensing Activity. In previous years, FTEs for Licensing Activity was a subset of FTEs for Technology Transfer activities. Beginning with FY 1996, an assignment of FTEs for Licensing Activities was no longer requested. The FTE data provided in FY 1996 is comparable to the FTE for Technology Transfer activity submitted in previous years.*

[vii] *The total numbers of Professional FTEs and Support Staff FTEs for technology transfer do not include efforts of paid consultants.*

[viii] *License Income Paid to Other Institutions and the number of U.S. Patents Issued are examples of questions that were added to the Survey after the Survey's implementation the first year. These data have only been accrued beginning with FY 1993. Research funding related to a license was requested for the first time in FY 1994, and then annually thereafter.*

[ix] *Institutions surveyed are members of AUTM and include universities and colleges, teaching hospitals, not-for-profit research institutes, and third-party patent management firms that manage intellectual property for these institutions.*

[x] *Six-year recurrent respondents are those institutions, excluding third-party patent management firms (PMFs), that have participated in all six years of the AUTM Licensing Survey. Because the six-year recurrent respondents sample is used to identify trends, patent management firms were excluded from this category to avoid*

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SURVEY SHOWS SMALL COMPANIES ARE BIGGEST USERS OF ACADEMIC RESEARCH INNOVATIONS

Universities Move Science from the Laboratory to the Marketplace, Supporting 212,000 Jobs and Contributing $24.8 Billion to the Economy

Norwalk, CT—The sixth annual licensing survey released by the Association of University Technology Managers (AUTM) confirms that the transfer of research conducted at academic research institutions to companies plays a vital role in the U.S. economy. AUTM estimates that sales of products developed from inventions made in the course of academic research and licensed to industry amounted to $20.6 billion in 1996. Furthermore, licensee companies, including 248 new ones, invested an estimated $4.2 billion prior to sales to bring the early-stage inventions to market. The combination supported an estimated 212,500 primarily high-wage, high-skill jobs in 1996.

"The Survey data illustrate that the private sector is expanding its partnerships with universities and other nonprofit research institutions, as Congress hoped when it gave us control over our patents," commented Marvin C. Guthrie, president of AUTM, and vice president, patents and licensing, Massachusetts General Hospital. "I am especially gratified that small companies took nearly two-thirds (64%) of all the licenses granted last year, just as Congress intended."

The nearly 300-page Survey presents a comprehensive profile of academic technology transfer, the process by which, following the Bayh-Dole Act of 1980 (Public Law 96-517), universities and other nonprofit research institutions find private sector partners to take on the commercialization of federally funded research discoveries and innovations. It includes reports from 131 U.S. universities (including 89% of the top 100 research universities), 26 teaching hospitals and other nonprofit research institutions, 14 Canadian academic institutions and two patent management firms. The data enhance our understanding of one of the major pathways by which the nation's investment in basic academic research is translated into public benefits.

---MORE---

The Survey reports that research institutions received 10,178 disclosures of inventions from their researchers in 1996, resulting in 3,261 new patent applications. Institutions reported negotiating 2,741 new licenses or options to commercialize academic discoveries. Licenses are the agreements that define terms and conditions for the right to develop inventions into commercial products. The cumulative total of active licenses, signifying that the industry partner is pursuing commercialization, reached 12,951 in 1996.

Reports from a subset of institutions that have provided data every year since 1991, when the survey began, help shed light on trends. Technology transfer appears to be more efficient in 1996, with research expenditures in support of academic research upon which licensing depends rising at an average rate of 6% annually since 1991, not inflation-adjusted. Meanwhile, licenses executed at these institutions have increased 75% since 1991, or 12% per year, on average.

While not every innovation succeeds in the market or even in reaching the market, many of the active licenses have or will result in highly significant new products or processes, sometimes laying the foundation for new companies, or even entire industries. In particular, the biotechnology industry has depended on academic research since its beginnings in the early 1980s. Newly available data in the 1996 edition of the Survey confirm how crucial technology transfer is to meeting medical needs: 67% of the active licenses and an even larger percentage of the license income received by institutions (86%) drew upon research in the biomedical and other life sciences.

Universities reported more detail this year on their level of activity as equity investors in start-ups or small companies. Universities generally accept an equity position partially in lieu of licensing fees to permit start-ups to direct the cash conserved towards faster commercialization. The Survey shows that in 1996, 167 licenses, about six percent, included equity participation for the institutions.

The president-elect of AUTM, Karen Hersey, Intellectual Property Counsel for the Massachusetts Institute of Technology, commented, "The Survey confirms that research universities are effectively translating theory into practice to the enormous benefit of the public. The volume of technology transfer activity demonstrates that industry not only needs the creativity and innovation of academic research, but values our active participation in the process of building partnerships."

AUTM is a nonprofit, professional membership society with over 1,800 members working in 250 academic institutions and an equal number of companies. Web site: http://autm.rice.edu/autm. The Survey is available printed in summary or full report form. The data are also available in electronic format. To order, contact AUTM: 49 East Avenue, Norwalk, CT, 06851-3919, phone 203/845-9015, fax 203/847-1304, e-mail: autm@ix.netcom.com.

####

5. RESEARCH EXPENDITURES:

What was the annual amount of **RESEARCH EXPENDITURES** (include both direct and indirect costs) for your institution for the following categories?

Year	*Total Research Expenditures*	*Research Expenditures: Federal Govt. Sources*	*Research Expenditures: Industrial Sources*
Fiscal Year 1996			

Note: The sum of Research Expenditures funded by Federal Government and Industrial Sources may not equal Total Research Expenditures.

6. LICENSE/OPTION AGREEMENTS:

6.a) How many **LICENSES/OPTIONS** did your institution execute in Fiscal Year 1996? How many **LICENSES/OPTIONS** executed in Fiscal Year 1996 included **EQUITY**? How many **LICENSES/OPTIONS** were **ACTIVE** as of the last day in Fiscal Year 1996?

(# of licenses here and in question 8 should exclude software end-user licenses under $1,000)

Year	*# of Licenses/Options Executed*	*# of Licenses/Options Executed w/ Equity*	*Total # of Active Licenses/Options*
Fiscal Year 1996			

New!! **6.b)** How many of the **LICENSES/OPTIONS** executed in Fiscal Year 1996 were licensed to **START-UP COMPANIES, SMALL COMPANIES**, or **LARGE COMPANIES**?

Year	*# of Licenses/Options Executed (Same as 6.a)*	*Licenses/ Options Executed: to Start-Ups*	*Licenses/ Options Executed: to Small Cos.*	*Licenses/ Options Executed: to Large Cos.*
Fiscal Year 1996				

New!! **6.c)** How many of the **LICENSES/OPTIONS** executed in Fiscal Year 1996 were **EXCLUSIVE LICENSES/OPTIONS** and how many were **NON-EXCLUSIVE**?

Year	*# of Licenses/Options Executed (Same as 6.a)*	*# of Licenses/Options Executed: Exclusive*	*# of Licenses/Options Executed: Non-Exclusive*
Fiscal Year 1996			

a double count in the data. Attachment G includes comparative totals for major data elements for the six-year recurrent respondents by sample population, excluding PMFs. (The criteria for Attachment G differs from Attachment F, which includes all responses provided for all participating institutions, even if those institutions responded to the Survey in only one year.) The total number of maximum six-year recurrent respondents is 94: 95 minus 1 PMF (see Figure 2). When six-year recurrent respondents are studied, "N=x" where "x," representing the sample size, will never be greater than 94, but could be less depending on the number of six-year recurrent respondents that provided a response to the data element being analyzed. ("N.A." responses are also excluded from the six-year recurrent respondents.)

[xi] *Beginning with FY 1996, research expenditure and licensing data for the Massachusetts Institute of Technology (MIT) include the Lincoln Laboratory: a federal laboratory managed by MIT. Research expenditures attributed to the Lincoln Laboratory in both the total and federal research expenditure categories in FY 1996 is $331 million. Note: In the first year of the Survey, MIT requested that its licensing data exclude licensing activity from the Lincoln Laboratory. To do this, MIT requested that its licensing data, i.e., royalties received and all other variables (with the exception of start-up companies), be multiplied by 80% (attributing 20% of activity to the Lincoln Laboratory) to make its data comparable with that of other Survey respondents. This adjustment was made in each year for Fiscal Years 1991 - 1995. This adjustment has not been made in FY 1996. To adjust MIT's data to include the Lincoln Laboratory activity in prior years, Total Research Expenditures and Research Expenditures: Federal Government Sources would be increased by $389 million, $364 million, $354.3 million, $341.9 million, and $339 million for FY 1991 - FY 1995, respectively, and patent and licensing data (with the exception of start-up companies) would be increased by a factor of 1.25 for all variables for all years.*

[xii] *Respondents to the AUTM Licensing Survey that are responsible for the management of a federal laboratory and that manage the licensing activity of that lab, report research and licensing data for the lab in this Survey at the election of the manager of the Technology Transfer Office. The institutions known to include data from a federal laboratory in this Survey are listed in the following chart:*

Institution	*Federal Laboratory*	*Research Expenditure Data*	*Patent and Licensing Data*
California Institute of Technology	*Jet Propulsion Laboratory*	*Not Included*	*Included*
Iowa State University	*Ames Laboratory*	*Included*	*Included*
Massachusetts Institute of Technology	*Lincoln Laboratory*	*Included*	*Included*
Princeton University	*Plasma Physics Lab*	*Not Included*	*Included*
Stanford University	*SLAC*	*Not Included*	*Included*

[xiii] *The comparable tables included in the Full Report list the six-year recurrent respondents and their respective values reported from year to year for each of the major data elements shown in Attachment G.*

[xiv] *Follow-up efforts were heavily concentrated toward the top 50 universities for FY 1991 and FY 1992. Beginning with FY 1993, these efforts were expanded to include the top 100 universities. There is greater representation in the six-year recurrent respondents sample, therefore, of the universities that fall within the top 50 than of those that are among the top 100.*

[xv] *Tables 3, 4, 5, 8, and 9 contain detailed information about major data elements. These newly detailed data were surveyed for the first time in FY 1996. Respondents were asked to provide a response to these new questions, if possible. The data in these tables reflect the major data element in the left column, with the detailed data listed to the right. If an institution was not able to provide this information, the detailed column is noted with "N.A." for that institution. On the last page of each of these tables, where the report totals are shown, the detailed information may not add up to the total amount of the major data element because of N.A. responses.*

[xvi] *Life Science includes all works derived from such disciplines as biology, medicine, chemistry (basic), pharmacy, medical devices, and those involving human physiology and psychology, including discipline-related*

10.0 REFERENCES

1. "Technology Transfer: How Do We Know What Works?," Proceedings of the Technology Transfer Metrics Summit (June 1997), Santa Fe, NM, Technology Transfer Society, 435 North Michigan Avenue, Suite 1717, Chicago, IL 60611-4067, (312) 644-0828, Fax: (312) 644-8557.

2. National Science Foundation's (NSF) report entitled *Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions* (Fiscal Year 1994), Table B-4, "Federal Obligations for Science and Engineering to the 100 Universities and Colleges Receiving the Largest Amounts...," pp. 31-32.

3. Stevens, Ashley J., presentation entitled "Measuring Economic Impact," AUTM Advanced Licensing Course held in Arizona, December 1994. The formula used to estimate sales using the Stevens' approach was modified by AUTM in 1996 through use of data derived from AUTM's Economic Impact Survey.

4. Pressman, Lori, et al., "Pre-Production Investment and Jobs Induced by MIT Exclusive Patent Licenses: A Preliminary Model to Measure the Economic Impact of University Licensing," *Journal of the Association of University Technology Managers*, Volume VII:49-82.

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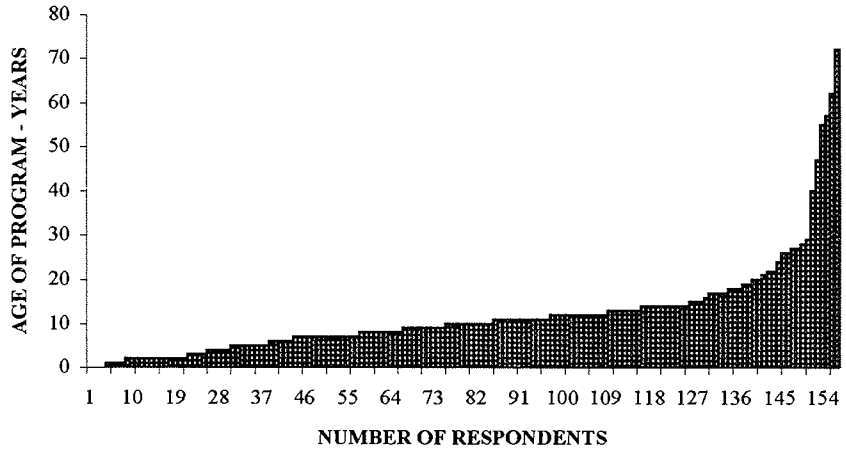
FREQUENCY DISTRIBUTION OF AGE OF PROGRAM

Number of Years in Operation	Number of Respondents	Cumulative Percent Total
0 - 5	38	24%
6 - 10	47	54%
11 - 15	44	82%
16 - 20	12	90%
> 20	16	100%
N.A.	16	
Total	173	

Figure 22 shows the same information on age of program as is reflected in Figure 21, but displayed as a histogram. Although the last number of respondents shown on the x axis is noted as 154, the data continue up through respondent number 157. It is interesting to note the variation in the age of the programs, noting that slightly more than half of the respondents report 10 or less years.

Figure 22:

HISTOGRAM OF AGE OF PROGRAM



9.0 CONCLUSION

There are several direct conclusions that may be established on the strength of six-year recurrent respondent data. First, license income, posting a twenty-one percent (21%) increase over FY 1995, surpassed the previous year's fifteen percent (15%) increase. The growth of this measure of process output occurred in response to a near constant level (over time) of invention disclosures. Second, of the new parameters surveyed, the most enlightening measures, at this time, may be the formation of start-up companies and corresponding equity participation by the licensing organization (see Figure 16B). The historical data gathered for the FY 1980 - FY 1995 period reflect a seventy-seven percent (77%) survival rate for start-up companies: not surprising when one considers that a large portion of these start-ups were

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7.0 ECONOMIC IMPACT OF LICENSING ACTIVITIES

The impact of the licensing activity at academic institutions, nonprofit organizations, and patent management firms is extensive. Based on the Stevens' approach (ref. 3), which estimates sales of products by licensees and then converts these sales to jobs, an analysis of the FY 1996 Survey data estimates that the licensing of inventions discovered by institutions participating in this Survey generated $20.6 billion in product sales. A secondary finding based on the Pressman model (ref. 4), which measures pre-production investment (investment made prior to the sales of licensed products), shows that induced, pre-production investment yielded approximately $4.2 billion in FY 1996. Adding these amounts together brings the total economic impact of technology transfer by academic institutions to $24.8 billion, supporting an estimated 212,500 jobs per year.

A recent article by Peter B. Kramer et al. (ref. 5) confirms the approach used by Pressman to estimate induced investment and supports the general concept that induced investments have value as a measure of economic impact. The Kramer article also reminds the reader that licensing to start-up ventures plays a substantial role in economic growth. In FY 1996 alone, academic licensing led to the formation of 248 new companies. Of the 1,594 licenses/options negotiated with small business in FY 1996, 19% went to start-up companies.

8.0 OTHER SELECTED FINDINGS

Licensing and technology transfer can be characterized by a process description. Using traditional process component definitions one may define the process in terms of survey parameters in the following manner:

Licensing Process	Parameters
Inputs:	Research Expenditures Invention Disclosures
Outputs:	License Income Company Start-Ups Equity
Variables:	Patent Applications Patents Licenses/Options
Resources:	Staff Count (FTE) Legal Fees Expended and Reimbursed

The foregoing is a useful construct with which to interpret Survey data and therefore, reference will be made to the relevant process function in examining selected survey parameters in this discussion. At this point in time there exists *six years of recurrent respondent data* so that trends and indeed predictors of future results may be augmented. To begin, we note from Figure 8B, INVENTION DISCLOSURES RECEIVED, a near constant but modest rate of increase over a six-year period. As the primary process input, this parameter—disclosures—given process, time, and resources yield licenses and resulting income. An examination of a process variable in Figures 9A and 9B, TOTAL AND NEW U.S. PATENT APPLICATIONS FILED, reveals a significant decrease from FY 1995 to FY 1996 applications, which is

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institutions, 152 had technology that had given rise to at least one such company. In total, these companies accounted for 1,633 start-ups (See Figure 16A). In FY 1996, respondents were asked to provide information on how many of these companies are still in existence. These results are shown in Figure 16B.

Figure 16A:

START-UPS FORMED
(N represents number of institutions providing a response, including a response of zero)

	FY 1996 (N=168)	FY 1995 (N=172)	FY 1994 (N=156)	FY 1980 to FY 1993 (N=154)
Start-Ups Formed	248	223	241	1,169

121 institutions provided operational data on start-ups, accounting for 1,516 companies. Of the 1,516 START-UPS formed, 1,166 were reported as being in operation. The OPERATIONAL START-UPS were distributed to Life Science and Physical Science, with the exception of only one institution not providing this detail. Fifty-seven percent (57%) of the start-up companies in operation were reported in Life Science, with the balance of 43% in Physical Science. Of the 1,516 START-UPS formed, 37% involved the taking of equity by the licensing institution.

Figure 16B:

HISTORICAL DATA FOR START-UPS FORMED
FY 1980 TO FY 1995
(N represents number of institutions providing a response greater than zero)

	FY 1980 to FY 1995 (N=152)	Data on Start-Ups Formed FY 1980 to FY 1995 (N=121)	Operational Start-Ups: Life Science (N=120)	Operational Start-Ups: Physical Science (N=120)	Equity in Start-Ups Formed FY 1980 to FY 1995 (N=103)
Start-Ups Formed	1,633	1,516			557
Operational Start-Ups		1,166			
Operational Start-Ups: by Science		1,143	647	496	

6.2 Equity Considerations

Also significant in FY 1996 is the license-related equity activity.[xxiii] Figure 17 notes the number of LICENSES WITH EQUITY reported under the Survey for Fiscal Years 1996 and prior years. Sixty-six institutions reported 167 licenses with equity in FY 1996, compared to 70 institutions that reported 142 licenses with equity in FY 1995.

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Figure 12:

GROSS LICENSE INCOME RECEIVED AND ADJUSTED GROSS LICENSE INCOME
(All Respondents for Each Year:
FY91: N=130; FY92: N=130; FY93: N=158; FY94: N=159; FY95: N=173; FY96: N=173)

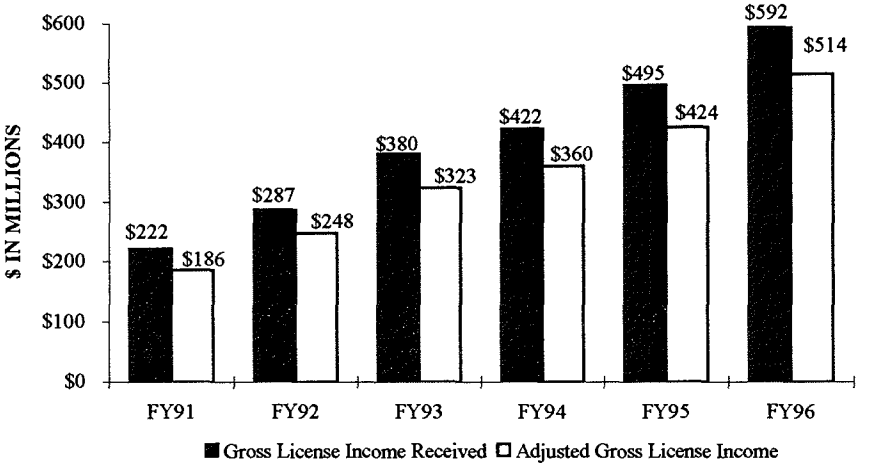
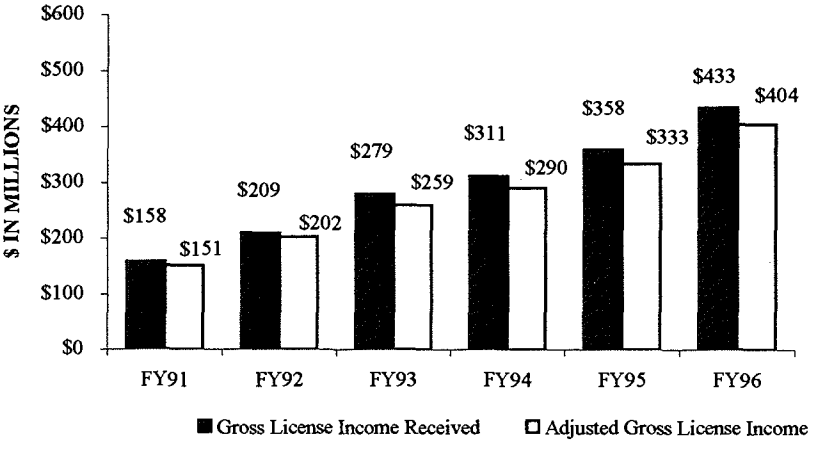


Figure 13 reflects the growth in LICENSE INCOME from FY 1991 - FY 1996 for six-year recurrent respondents that provided LICENSE INCOME information for all six years of the Survey. Recall that six-year recurrent respondent data exclude third-party patent management firms (see Note x). LICENSE INCOME for six-year recurrent respondents rose from $158 million in FY 1991 to $433 million in FY 1996 for gross LICENSE INCOME RECEIVED, representing a 174% increase over the six years surveyed.

Figure 13:

GROSS LICENSE INCOME RECEIVED AND ADJUSTED GROSS LICENSE INCOME
(Six-Year Recurrent Respondents, N=91)

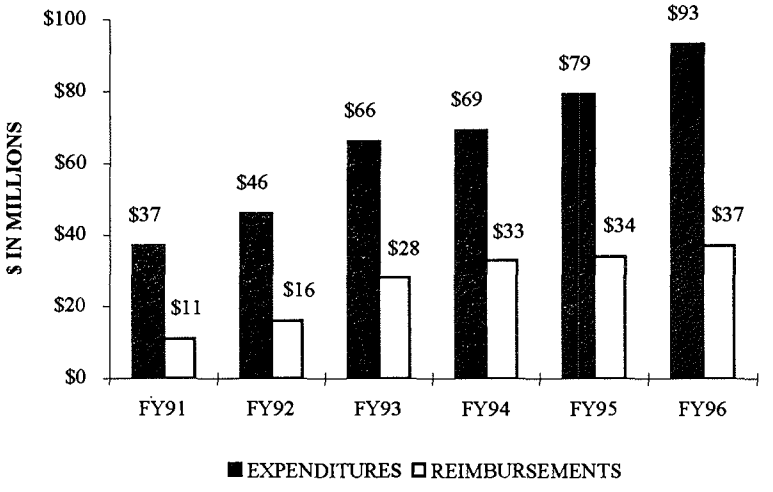


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LEGAL FEES EXPENDITURES were $93 million in FY 1996. [xx] These costs are partially offset by the recovery of these expenses from licensees through LEGAL FEES REIMBURSEMENTS. For FY 1996, reimbursements are shown at $37 million, 40% of LEGAL FEES EXPENDED.

Figure 10:

LEGAL FEES EXPENDED AND REIMBURSED
(All Respondents for Each Year:
FY91: N=130; FY92: N=130; FY93: N=158; FY94: N=159; FY95: N=173; FY96: N=173)

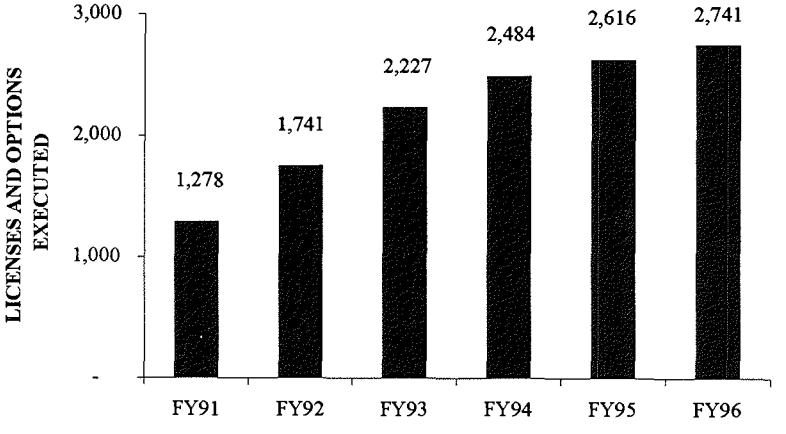


5.3 Licensing

FY 1996 also saw a continuation in the growth of licensing activity. Respondents executed 2,741 licenses and options in FY 1996, yielding a cumulative total of 13,087 LICENSES & OPTIONS EXECUTED since FY 1991.

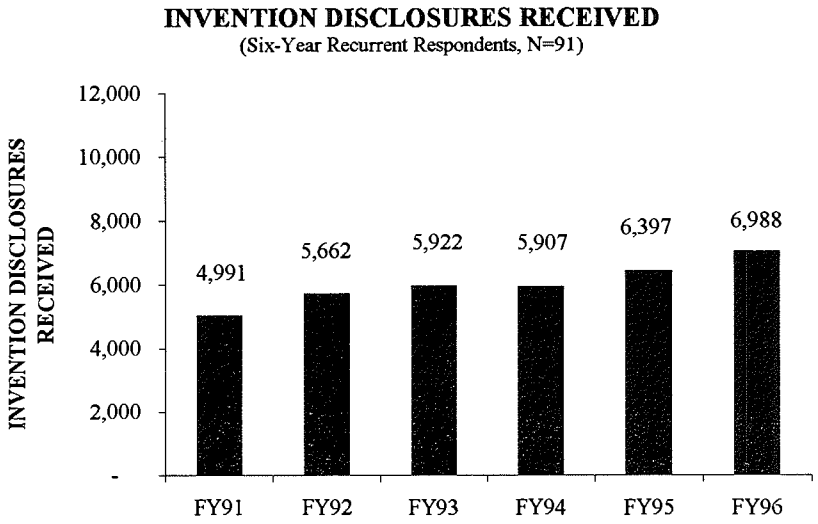
Figure 11A:

LICENSES AND OPTIONS EXECUTED
(All Respondents for Each Year:
FY91: N=130; FY92: N=130; FY93: N=158; FY94: N=159; FY95: N=173; FY96: N=173)



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Figure 8B:



5.2 Patenting

Respondents reported that they were issued 2,095 U.S. patents in FY 1996, up 14% from the prior year.[xviii] Patent application activity for TOTAL U.S. PATENT APPLICATIONS FILED shows a decline in FY 1996. One possible explanation for the spike in TOTAL U.S. PATENT APPLICATIONS FILED shown for FY 1995 is due to the filings of the divisional applications that were to be made by June 8, 1995, in order to receive the patent term of seventeen years from issuance. In addition, an increase in the filing of provisional applications, reflecting a new filing format resulting from GATT, affected the data in FY 1995 and will continue to show a presence in these data through a higher number of both TOTAL and NEW U.S. PATENT APPLICATIONS FILED. The increased filing of divisional and provisional applications resulted in a disproportionate number of TOTAL U.S. PATENT APPLICATIONS FILED to NEW U.S. PATENT APPLICATIONS FILED in FY 1995, and an overall increase in patent application activity in FY 1995. The apparent decline in the number of divisional applications filed in FY 1996 has resulted in a decrease in TOTAL U.S. PATENT APPLICATIONS FILED from FY 1995 to FY 1996. There is not, however, a related decrease in NEW U.S. PATENT APPLICATIONS FILED because divisional applications are not included in the numbers reported for new applications filed. To the contrary, NEW U.S. PATENT APPLICATIONS FILED rose in FY 1996 to 3,261, up from 2,872 in FY 1995.[xix]

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Figure 5:

GROSS LICENSE INCOME RECEIVED:
LIFE SCIENCE v. PHYSICAL SCIENCE
FOR INSTITUTIONS PROVIDING DETAILED DATA
(Respondents that Provided Detailed Data, N=156:
U.S. Univs., N=119; Hosps. & Res. Insts., N=24; Canadian Insts., N=11; Pat. Mng. Firms, N=2)

FY 1996	Total Gross License Income Received	Gross License Income Received: Life Science	% of Total	Gross License Income Received: Physical Science	% of Total
U.S. Universities	$242,057,513	$194,199,551	80%	$47,857,962	20%
U.S. Hospitals & Research Institutes	$131,741,920	$118,242,472	90%	$13,499,448	10%
Canadian Institutions	$9,589,867	$8,089,750	84%	$1,500,117	16%
Patent Management Firms	$79,643,112	$76,735,550	96%	$2,907,562	4%
All Respondents	$463,032,412	$397,267,323	86%	$65,765,089	14%

Canadian institutions report in Canadian dollars. These responses are then converted to U.S. dollars.[xvii]

4.2 Licenses & Options Executed

Ninety-eight percent (2,696) of the LICENSES & OPTIONS EXECUTED (2,741) for all respondents were identified as either exclusive or non-exclusive licenses/options by respondents. Percentages of the total reflect the portion of LICENSE & OPTIONS EXECUTED on an exclusive or non-exclusive basis, respectively. These data are shown in Figure 6.

Figure 6:

LICENSES & OPTIONS EXECUTED:
EXCLUSIVE v. NON-EXCLUSIVE
FOR INSTITUTIONS PROVIDING DETAILED DATA
(Respondents that Provided Detailed Data, N=166:
U.S. Univs., N=126; Hosps. & Res. Insts., N=25; Canadian Insts., N=14; Pat. Mng. Firms, N=1)

FY 1996	Total Licenses & Options Executed	Licenses & Options Executed: Exclusive	% of Total	Licenses & Options Executed: Non-Exclusive	% of Total
U.S. Universities	2,198	1,127	51%	1,071	49%
U.S. Hospitals & Research Institutes	276	149	54%	127	46%
Canadian Institutions	206	144	70%	62	30%
Patent Management Firms	16	10	63%	6	37%
All Respondents	2,696	1,430	53%	1,266	47%

LICENSES & OPTIONS EXECUTED by START-UP, SMALL, and LARGE COMPANY categories are shown in Figure 7. Company information was provided for 91% (2,487) of all licenses/options reported. Percentages of the total reflect the portion of licenses/options signed with the respective size companies. It is significant to note that 12% of the LICENSES & OPTIONS EXECUTED for these respondents were

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Figure 2:

SURVEY RESPONDENT INFORMATION
FY 1996

	U.S. Univs.	U.S. Hosps. and Res. Insts.	Canadian Insts.	Patent Mngmnt. Firms	Total
FY 1996					
Surveyed	212	55	28	5	300
Responded	131	26	14	2	173
Six-Year Recurrent Respondents: FY 1991 - FY 1996	73	14	7	1	95

The six-year recurrent respondents include approximately 62% of the top 100 U.S. Universities and 83% of the top 50 U.S. Universities.[xiv]

Figure 3:

SURVEY RESPONDENT INFORMATION
FY 1991 - FY 1995

	Total Surveyed	RESPONSES				
		U.S. Univs.	U.S. Hosps. and Res. Insts.	Canadian Insts.	Patent Mngmnt. Firms	Total
FY 1991 and FY 1992	260	98	20	10	2	130
FY 1993	250	117	26	12	3	158
FY 1994	255	120	24	12	3	159
FY 1995	279	127	27	16	3	173

3.3 New Licensing-Related Parameters

Fiscal Year 1996 marked the sixth year for the AUTM Licensing Survey, which offered an opportunity to build a foundation for future reports. Toward this goal, the survey instrument was expanded to ask several new questions that provide objective data on important licensing processes. These questions were developed in response to member interest in licensing-related parameters that were not surveyed formally in the past. The areas covered by the new questions included licensing activity described by company size, exclusivity, and science discipline; and information on equity and start-ups. Respondents were asked to provide complete responses to these new questions when possible.

The results of these new questions are discussed in aggregate and by sample populations in the following sections. The institution-by-institution responses are summarized in Tables 3, 4, 5, 8, and 9 in the *Full Report*.[xv]

4.0 HIGHLIGHTS OF SURVEY RESULTS

The presentations of summary data in this section highlight results for FY 1996, using the new licensing-related parameters as the basis for discussion.

In Section 5.0, Interpretation of Selected Data, the data are presented in a format and sequence consistent

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licensing data for universities, hospitals and research institutes, Canadian institutions, and patent management firms. The presentations of results in the five-year reports range from simple tabulations to complex charts, combined with discussion and interpretation.

The AUTM Licensing Survey five-year summary and full reports may be purchased from AUTM Headquarters. Data contained in the reports are also available for purchase on diskette.

2.2 The FY 1996 Survey Reports

The results of the FY 1996 AUTM Licensing Survey are reported in two documents. The first is entitled *AUTM Licensing Survey FY 1996: A Survey Summary of Technology Licensing (and Related) Performance for U.S. and Canadian Academic and Nonprofit Institutions, and Patent Management Firms,* and is referred to as the *"FY 1996 Survey Summary."* It provides FY 1996 data for all respondents[ix] divided into the following institutional categories: U.S. Universities, U.S. Hospitals and Research Institutes, Canadian Institutions, and Third-Party Patent Management Firms (see Attachments D and E, pp. 45-54). It also highlights noteworthy developments in FY 1996 and brings together summary information on all institutions that have ever responded to the AUTM Licensing Survey (see Attachment F, pp. 55-64) as well as the subset of those institutions that provided information for FY 1991-1996, the six years for which AUTM Survey data have been collected (see Attachment G, pp. 65-72). This latter group is referred to as the **"six-year recurrent respondents."** [x]

The second document is entitled *AUTM Licensing Survey: Fiscal Year 1996,* and is referred to as the *"Full Report."* The *Full Report* includes the *FY 1996 Survey Summary* as well as FY 1996 data on an institution-by-institution basis for each data element surveyed.[xi, xii] Tables in the *Full Report* are ranked by each table's major data element and are reported by institution within respective groupings of U.S. Universities, U.S. Hospitals and Research Institutes, Canadian Institutions, and Patent Management Firms. Also included are aggregate totals and subtotals for the institutions, summarized for all respondents and by the four categories of organizations noted above.

Included in the *Full Report* is a series of tables that compare the year-to-year responses on selected questions of those institutions that have provided six full years of data for the Survey.[xiii] These tables are referred to as the six-year recurrent respondent tables. The six-year recurrent respondent tables are useful in determining changes in the data from year to year. The user, however, is cautioned to review the institutional data provided in these tables to identify outliers relevant to a specific analysis.

The Table of Contents for the *Full Report* and a listing of the tables contained in each section can be found in Attachments B and C (pp. 41-44) of this report.

2.3 Use of the Survey Information

The AUTM Licensing Survey is intended to provide the members of AUTM with useful data from which they may evaluate their own programs. This information is often used for internal purposes in preparing management reports and for external purposes for other presentations. The information contained in the Survey reports is best used as a starting place or as a point of departure for more extensive analysis.

The findings presented here may also be of interest to government officials and policy makers who work in the field. The trends and highlights noted may aid in understanding the contributions academic institutions, nonprofit organizations, and patent management firms have made in the transfer of technologies for commercialization and public use.

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- Number of licenses/options by start-up, small, or large companies
- Number of licenses/options by exclusive and non-exclusive licenses
- Number of active licenses by life science and physical science
- License income received from life science and physical science licenses
- License income received as running royalty, cashed-in equity, and all other income types
- Cashed in equity and value of equity holdings by the respondent
- Number of licensed start-up companies formed in FY 1996 currently in operation
- Does the institution have a policy regarding investigator-/institution-initiated start-up companies?
- Start-up companies formed during FY 1980 - FY 1995 in operation today
- Operational start-up companies (FY 1980 - FY 1995) by life science and physical science
- Start-up companies (FY 1980 - FY 1995) involving equity participation by institution

Another important change relates to the traditional term ROYALTIES RECEIVED compared to the term LICENSE INCOME, which has been adopted to better reflect the components of the income. Survey users should take note that the definition and components did not change from the previous five years; hence, although the terms are different, the data are comparable.

The previous practice of rank ordering institutional data by LICENSE INCOME has been replaced by the format that ranks respondent data by TOTAL RESEARCH EXPENDITURES. Therefore, data presented in Attachment E of this report follows this revised format. The rationale for this change is that emphasis should reflect process dependency on research rather than license income. LICENSE INCOME, although widely recognized as one measure of success, is not to be overly emphasized so as to give it standing as the measure. Clearly, without research funding, there would be virtually little, if any, subject matter for the technology transfer process.

The information reported for this first year installment of new parameters is but a single data point in the continuum. These data are believed to be good indicators, and most likely in the hands of observers, predictors of licensing performance. It is widely held, for example, that life science licensing is the "primary institutional bread-winner" but that the risk/reward is considerable. In other words, the probability of an income-producing, biotech or drug license, for example, may be low given development and regulatory hurdles. Licensing organizations may choose the alternative physical science area where most licensing is not regulatory-driven, development is usually predictable, and early successes lead to license income, albeit less than from life science inventions.

In viewing the new data at this initialization point, there are few surprises. The generally used criteria for the life/physical science discipline split in license activity and resulting income was 67/33 and 86/14, respectively, and is reflected in the survey data reported by all respondents. Data on exclusive/non-exclusive license classification is a near even split at 53/47, and the licensee company-size distribution is heavily weighted toward the small company compared to the start-up or large company alternatives.

The importance of these new measures is that they represent a starting point that, with the addition of future year data, will form a historical record of important process variables. This is particularly important in the case of license equity and company start-up parameters as these are outcome measures of technology licensing important to the economic development community.

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provided for 93% (1,516) of these start-ups. Of the 1,516 start-ups, 75% were reported as operational and were classified as 57% life science and 43% physical science. These respondents reported taking equity in 37% of the 1,516 start-up companies formed.

- Since 1980, academic institutions have received an equity interest in 901 licensing transactions.
- In FY 1996, they received $25.3 million from equity liquidation as part of licensing transactions.

The FY 1996 AUTM Licensing Survey added several new questions, which provide data on additional licensing parameters. These new data are described in the next two sections.

Licenses and Options:

- 2,741 new licenses and options were executed in FY 1996, up from 2,616 in FY 1995.
- 64% of new licenses and options executed were with newly formed or existing small companies (fewer than 500 employees), while 36% were with large companies.
- In FY 1996, 53% of new licenses and options executed were exclusive, while 47% were non-exclusive.

License Income:

- Total gross license income received from licenses and options was $591.7 million, up 19.6% from $494.7 million in FY 1995.
- Of the FY 1996 total, $450 million (76%) came from royalties on product sales, $25 million (4%) came from equity liquidation as part of the licensing transaction, $70 million (12%) came from various fees and other pre-commercialization payments, and the remainder of $46.7 million (8%) was not classified according to these categories.
- In FY 1996, 86% of gross license income was from inventions relating to life science while 14% was received from inventions relating to physical science.
- $77.7 million of total income was paid to another reporting institution, up 9.0% from $71 million in FY 1995, so that net license income was $514 million, up 21.2% from $424 million in FY 1995.

Economic Growth:

- 12,951 licenses and options were active in FY 1996, implying that the licensee was still actively developing the invention or selling product, up 9.7% from 11,806 in FY 1995.
- An economic impact model developed by AUTM shows that, in FY 1996, $24.8 billion of U.S. economic activity can be attributed to the results of academic licensing, supporting 212,500 jobs. In FY 1995, the comparable figures were $21 billion and 180,000 jobs.

The AUTM Licensing Survey is prepared as a *Summary Report,* which discusses the data in aggregate and provides selected data from the *Full Report.* The Survey results are also published in a comprehensive report, the *Full Report,* which contains the *Summary Report* and includes tables that present data obtained from individual respondents on an institution-by-institution basis. To purchase copies of these reports, contact AUTM Headquarters at (203) 845-9015, autm@ix.netcom.com.

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Acknowledgment

On behalf of the AUTM Board of Trustees, I would like to thank the many individuals and their staff who devoted a significant amount of time and effort in preparing a response to the AUTM Licensing Survey this year. The new questions appearing on the Survey in Fiscal Year 1996 presented an unprecedented challenge. You met that challenge. Sincere appreciation is also extended to Daniel E. Massing, Chair, Survey/Statistics/Metrics Committee, under whose leadership and direction the five-year comprehensive Survey reports were developed as well as this six-year edition that promises to be of equal value and importance as we learn about our programs. Dan's guidance over these past two years has taken the Survey through a transition from the completion of a comprehensive five-year report to the building of a foundation for the development of future reports. And finally, I would like to recognize the efforts of Diane C. Hoffman who continues to strive toward maintaining the quality of the data from year to year. We are grateful to all of you for your dedication and support.

Marjorie Forster
AUTM Vice President/Planning
February, 1998.

Most of the Survey data report what can easily be measured: invention disclosures, patents applied for and granted, licenses and options executed, license income earned. These are indeed raw data. What do they mean? Some thoughtful analysis now is beginning to connect the dots. The picture that is emerging reveals that when a company signs a license for a technology, it makes a substantial investment of resources—capital, employees, and management attention—to bring a product to market. Licensing thus makes a significant contribution to the economy in terms of jobs and secondary spending in what survey analysts are calling induced, pre-production investment, estimated at $4.2 billion in FY 1996.

Once the early-stage technology leaves our laboratories, we continue to act as stewards, monitoring the progress of our licenses towards commercialization. But the final development and eventual success or failure of each invention are in the hands of our licensees and the marketplace. Nevertheless, we can begin to calculate outward from the royalties received how successful our efforts are in creating public benefit. Using standard ratios favored by economists, sales of products based on our technologies reached an estimated $20.6 billion in FY 1996, bringing the total economic impact to $24.8 billion. Accordingly, this economic impact contributed to the creation of over 212,000 high-wage, high-skill jobs.

In summary, all members of AUTM can share in the pride of our work. I personally applaud the effort, productivity, professionalism, and success of all AUTM technology transfer professionals. In addition, I salute the thousands of companies that have recognized the value in our technology and have risked investment to commercialize our research for the public benefit.

Marvin C. Guthrie
1997 AUTM President