TECHNOLOGY TRANSFER AT MIT:
AN ANALYSIS OF THE TECHNOLOGY LICENSING OFFICE
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ABSTRACT

This thesis examines the role of the Technology Licensing Office in the overall process of transferring the basic scientific research performed at MIT. A theoretical framework is first established by reviewing the literature on research and development, technology transfer and university-industry interactions. Using this framework, the thesis then examines the development of the Technology Licensing Office, its current mission and strategies, and the new MIT Policies and Procedures governing intellectual property and its transfer. The interactions of the Technology Licensing Office with two other MIT transfer agents, the Industrial Liaison Program and the Office of Sponsored Programs, is also considered. Finally, the licensing process used at MIT is broken down into sequential phases and analyzed.

This general analysis is supplemented by interviews with five Technology Licensing Officers and by fifteen case studies of three kinds: licenses to existing companies, licenses to start-up companies and licenses which have posed problems. The developed theoretical framework is then applied to analyze the data from these interviews and case studies. The current practices of the Technology Licensing Office are found to be generally consistent with optimal strategies suggested by the framework. Finally, suggestions for improvement of the transfer process and recommendations for additional research and data collection are made.

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1.0 INTRODUCTION

1.1 Statement of the Topic

The Technology Licensing Office (TLO) is a key agent in the technology transfer process at MIT. The Industrial Liaison Program, the Office of Sponsored Research and the TLO all play important roles in linking industry with the Institute. The TLO is responsible for the protection of patent, copyright and other intellectual property rights arising from MIT inventions. As importantly, the licensing of those rights to industry is controlled by the TLO. By 1993, the TLO expects the volume of disclosures, patent applications and licenses to grow by 50% to 70%\(^1\). The effectiveness of the TLO in scaling up its present operations depends on an understanding of what makes it successful today. This thesis will attempt to sketch out some of the factors that contribute to that success, and think in a critical way about the technology transfer process at the TLO.

The thesis will first establish a theoretical framework based on the R & D literature, studies of technology transfer and the links between universities and industry. Next, it will seek to identify the evolution of the role of the TLO within the overall technology transfer process at MIT and will examine the stated policy of MIT on the ownership, distribution and

\(^1\) Kelley, 1988.
commercial development of technology. Using this framework, the operations of the TLO will be analyzed to determine the successes and shortcomings of the mechanisms used for effecting technology transfer. This thesis is a starting point for further analysis and will also identify areas of possible improvement in the TLO's effectiveness and suggest data gathering which might be undertaken to facilitate future research efforts.

1.2 Methods of Research

A framework for analyzing the TLO is developed in Part 2.0 from a review of the literature on research development theory, technology transfer mechanisms and university-industry interactions. The overview of the TLO presented in Part 3.0 relies on written policy documents of MIT and papers prepared for the TLO about its goals and operations. Interviews with TLO Director John Preston and Associate Director Lita Nelsen supplement the written materials.

The general conceptualization of the TLO developed in Part 3.0 is supported in Part 4.0 by interviews with five TLO Officers: John Preston, Lita Nelsen, Ronald Scharlack, Christina Jansen and Karen Kramaric. The backgrounds, approaches and TLO experiences of the Officers are presented. Each Officer tends to specialize in a certain field of
technology and their experiences reflect to some degree the
differences between these fields. Finally, an analysis of TLO
files and interviews with the responsible TLO Officers are the
basis for a review of fifteen TLO cases of three different
types: licenses to existing companies, licenses to start-up
companies and problem licenses.

The analytical framework from Part 2.0 and the information
from Parts 3.0 and 4.0 are combined in Part 5.0 to analyze the
TLO. Part 6.0 raises certain issues of interest about the TLO
and technology transfer at MIT, and makes suggestions for data
gathering and possible future research.
2.0 FRAMEWORK

2.1 R & D and Technological Innovation

2.11 Current R & D Expenditures

The total planned expenditures on R & D in the United States for 1989 are estimated to be $130 Billion. This research will be performed primarily by industry (71.7%) and the university and nonprofit sectors (17.0%). Government laboratories will account for only 11.3% of the total. By contrast, funding for this research will be provided by: industry (49.0%), the federal government (46.7%) and university/nonprofit sources (4.3%). Although in past years overall research expenditures have fallen in real terms, the share of research performed by universities and nonprofit organizations has increased to 17% of the total from a level of 15% in 1988, thus confirming the trend which began in 1987.1

2.12 R & D Literature and Theory

Given the enormous annual expenditures on research and development, it is not surprising that the academic literature in the field is well developed. An overview of this literature is necessary to properly frame the analysis of the TLO and the

---

1 Cassidy, 1989.
transfer of university-based research at MIT. We must consider both the role of university laboratories in the development cycle and the factors within industry which make the transformation of new science into innovation possible. A number of research areas are of interest in this respect: the distinction between basic research and applied research/development; the factors behind successful innovations; the kind of personnel required for successful innovation; the differences between large and small firms; and how profits from innovation are captured.

2.13 Basic and Applied Research

At leading research universities in the United States most of the research can be characterized as basic (i.e. concerned with understanding cause-and-effect relationships or natural phenomena). Fusfeld\(^1\) distinguishes between undirected basic research (conducted as a result of the intellectual curiosity of the scientist) and directed basic research (contributing to a broader mission-oriented objective). He notes, however, that the distinction is difficult to make in practice. Therefore, while the university scientist whose research is sponsored by industry or government may consider it to be undirected, the sponsor may consider it to be directed. A common feature of both types of basic research is that the commercialization of

\(^1\) Fusfeld, 1986, p. 22.
the technology which results is uncertain, and may occur, if at all, many years in the future. The R & D conducted by industry is weighted more heavily towards the development of existing science. Breakdowns of expenditures for research by industry have been stable over time and reflect approximately 3% for basic research, 21% for applied research and 76% for development.

2.14 Factors Behind Successful Innovation

Marquis proposes a model of innovation in which the genesis of a successful innovation combines the recognition of market demand and technical feasibility within a single idea. In the next stage, the idea must be capable of being fused into a design concept. What follows is a problem solving stage which may be successfully resolved in one of two ways. First, the solution may lie in a new invention susceptible of patent or other intellectual property protection. Alternatively, the solution may be adopted from an existing invention. Although a solution then exists, Marquis argues that innovation requires a further developmental stage to prove the feasibility of production and the certainty of the market. If this hurdle is overcome, the solution (in the form of a product or process)

1 Fusfeld, 1986, p. 64.
2 Marquis, 1969, in Tushman & Moore, 1988, p. 79 et seq.
must be finally utilized and diffused to customers. Uncertainty is present at each stage in the model.

Using his model to analyze over 500 innovations, Marquis draws four lessons from his research:\(^1\):

1. Small, incremental innovations contribute significantly to commercial success.

2. Recognition of demand is a more frequent factor in successful innovation than recognition of technical potential.

3. The training and experience of the people in your own firm are the principal sources of information for successful innovation.

4. Adopted innovations should not be overlooked; they, as well as those originated within the firm, contribute significantly to commercial success.

2.15 Necessary Roles in the Organization

The concept of the technological gatekeeper was developed by Professor Thomas Allen\(^2\) of MIT. He posed the question of how does an R & D laboratory keep its personnel aware of scientific and technological progress elsewhere. He

---

\(^1\) Marquis, 1969, in Tushman & Moore, 1988, p. 84.

\(^2\) Allen, 1977, p. 141 et seq.
hypothesized that a number of stars within the lab might exist who differed from their colleagues by their degree of outside communication. This hypothesis was confirmed in empirical studies of various firms in which gatekeepers (or networks of gatekeepers in larger firms) acted as a conduit for the flow of outside information to the firm. Gatekeepers read the refereed journals in their field of expertise and maintained a broad circle of informal contacts.

Roberts and Fusfeld expanded on Allen's concept of the gatekeeper to identify five critical work functions¹:

*Idea Generating*: Analyzing or synthesizing information about markets, technologies, approaches, or procedures, from which is generated an idea for a new or improved product or service, a new technical approach or procedure, or a solution to a challenging technical problem. The analysis or synthesis may be implicit or explicit; this information may be formal or informal.

*Entrepreneuring or Championing*: Recognizing, proposing, pushing, and demonstrating a new technical idea, approach, or procedure for formal management approval.

*Project Leading*: Planning and coordinating the diverse set of activities and people involved in moving a demonstrated idea into practice.

---

Gatekeeping: Collecting and channeling information about important changes in the internal and external environments. Information gatekeeping can be focused on developments in the market, in manufacturing, or in the world of technology.

Sponsoring or Coaching: Guiding and developing less experienced personnel in their critical roles; behind-the-scenes support, protection, advocacy, and sometimes "bootlegging" of funds.

The authors emphasize that these functions are not mapped one-for one with individuals, but that the roles must be played for successful innovation to occur.

2.16 Large and Small Firms

The effect of firm size on the ability of the firm to innovate has also received much attention in the literature. Some authors contend that radical innovation is most suited to the small firm and is stifled in a larger corporation. Dumbleton\(^1\) reviews the literature and argues there is no clear evidence to establish the locus of innovative activity within the small firm. He does, however, present a good summary of the advantages of small and large firms in the process of innovation:

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\(^1\) Dumbleton, 1986, p. 374 et seq.
### Table 1: Innovation in Small and Large Firms

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing</td>
<td>Ability to act quickly</td>
<td>Comprehensive market power</td>
</tr>
<tr>
<td>Organization</td>
<td>Lack of bureaucracy</td>
<td>Can be bureaucratic Risk-averse</td>
</tr>
<tr>
<td>Process</td>
<td>Efficient communication</td>
<td>Often have political overtones</td>
</tr>
<tr>
<td>Personnel</td>
<td>Often shortage of people</td>
<td>Amply qualified people available</td>
</tr>
<tr>
<td>External communication</td>
<td>Often do not have time or resources</td>
<td>Resources for library, literature searches external contacts</td>
</tr>
<tr>
<td>Finance</td>
<td>May have problem in attracting capital</td>
<td>Ability to borrow Often publicly held</td>
</tr>
<tr>
<td>Growth</td>
<td>Cash flow problems due to growth</td>
<td>Problem is to identify and act on opportunities</td>
</tr>
<tr>
<td>Economy of scale</td>
<td>Can cause problems unless product benefits outweigh costs</td>
<td>Capacity to reduce price</td>
</tr>
<tr>
<td>Regulatory</td>
<td>Must cope with patent law, government and other regulations</td>
<td>Resources to handle regulatory area</td>
</tr>
</tbody>
</table>

Source: Dumbleton, 1986
2.17 Reaping the Profits of Innovation

Who bears the costs and reaps the profits of innovation? Product and process innovators who bear the upfront costs of innovation have been overtaken by imitators who are followers. Yet some innovators have successfully captured the profits of their work and their imitators have failed or been less successful. The reasons for these successes and failures have important implications for companies deciding to license technology from MIT. Teece\(^1\) has proposed three building blocks to explain the distribution of outcomes: regimes of appropriability, the dominant design paradigm, and complementary assets.

First, an appropriability regime depends on the efficacy of legal protections (patents, copyrights or trade secrets) and the nature of the technology (product or process; tacit or codified). Certain technology is more amenable to particular types of legal protection. As well, the legal regime of protections may evolve over time. For example, patent protection is now being sought for software in addition to the traditional copyright protection. It has also become more common to \textit{patent around} an invention to forestall attempts to \textit{invent around} the patent granted.

\(^{1}\) Teece, 1987, in Tushman and Moore, 1988, p. 621 et seq.
As a second building block, Teece identifies two stages in the evolution of a branch of science: the preparadigmatic and the paradigmatic. In the former, competition among innovators is based on different designs for the product. In the latter, a dominant paradigm for the product has been established and the nature of competition changes. Innovation, in this later stage, will focus more on the process than the product itself as economies of scale become increasingly important.

The final building block Teece uses is the complementary assets available to the innovating firm. Capabilities in marketing, distribution, manufacturing, service and support may be necessary for the successful commercialization of the innovation. He further refines the analysis to classify these assets as generic (general purpose support of the innovation), specialized (unilateral dependance on the asset by the innovation) or cospecialized (interdependence between the asset and the innovation).

The relevant lessons of Teece's model for our analysis of the TLQ can be summarized as follows:

- Successful innovations in technology will come where legal protections are effective, or where the innovating firm possesses cospecialized assets.
• The availability of complementary assets becomes an important determinant of success for innovative small firms which lack the requisite specialized or co-specialized assets.

• Effective legal protection in an industry reduces the need to integrate into cospecialized assets.

• New entry into technologically mature industries requiring cospecialized assets will be best accomplished through strategic partnering.

Teece argues his model has important implications for government policy in encouraging innovation. Equally important, from the perspective of MIT, are the choices made in matching technologies to the appropriate licensees.

2.2 Technology Transfer

2.21 Technology Transfer Defined

Brooks offer the following definition:\(^1\):

Technology transfer is the process by which science and technology are diffused throughout human activity. Wherever systematic rational knowledge developed by one group or institution is embodied in

a way of doing things by other institutions or groups we have technology transfer. This can be either transfer from more basic scientific knowledge into technology, or adaptation of an existing technology to a new use. Technology transfer differs from ordinary scientific information transfer in the fact that to be really transferred it must be embodied in an actual operation of some kind.

We can see from this definition that the operations of the TLO are only one link in the overall process by which knowledge developed at MIT is ultimately embodied in the products or processes of licensees.

2.22 Key Factors in Technology Transfer

Much of the literature in the technology transfer field focuses on the trans-national transfer of technology which has already been embodied in a product or process. By contrast, the transfer process from MIT and other research universities deals with more basic technology and research. However, many of the factors useful in the analysis of university technology transfer are the same. Robinson\(^1\) has identified a number of dimensions which he uses to describe the character of technology subject to transfer. The most important of these are:

\(^1\) Robinson, 1988, p. 11 et seq.
- **Maturity**: The newness of the technology.

- **Dynamism**: The expected rate of change.

- **Relative Importance**: Basic, major improvement, incremental, or branching?

- **Environmental Specificity**: Scope of the application.

Robinson argues that the form or mode of technology transfer depends heavily on the character of the technology. These characteristics should logically influence the choices made by TLO Officers in choosing appropriate licensees.

The rate at which technology is transferred will depend on a number of factors. Doctors' review of the literature disclosed five primary factors:

1. The ease with which economic advantages relative to existing technology may be perceived.

2. The transfer time's being directly proportional to complexity.

3. The ease of communication between the inventor and/or transfer agent and the innovator.

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1 Doctors, 1971, p. 58.
4. The divisibility of the new technology permitting its trial on a limited scale.

5. The compatibility of the innovation with the existing technology and with existing ideas and values.

2.23 Legal Protection for Technology

The appropriability regime and legal protection of most importance to the operations of the TLO are the existing patent and copyright laws in the United States and abroad. The protection afforded by trade secrets is important to industry, but the use of trade secrets to protect MIT's inventions conflicts with the Institute policy on dissemination of information. Trade and service marks are dealt with occasionally by the TLO, but are of much lesser importance.

Patents are government sanctioned monopolies on inventions which expire 17 years after issue in the United States. The U.S. patent application process requires the disclosure of the invention to the United States Patent and Trademark Office. The disclosure is not revealed by the Office until the patent issues. The general rule is that to be patentable an invention must be novel, nonobvious and have demonstrable commercial value. The time from filing of the application to issuance of the patent may vary greatly depending on the scope of
protection claimed. Often the initial claim is rejected and the prosecution of the patent application may involve a number of appeals and iterations in the scope of protection.

In essence, the process is a negotiation between the inventors and the government to settle the rights granted to the inventor which are spelled out in a series of claims at the end of the patent. When granted, the patent gives the inventor rights of exclusion and not rights of use. These are rights to exclude others from: making the claimed invention, selling the claimed invention or using the claimed invention in the country that grants the patent.

Whereas patents give protection to the useful arts, copyright protects the expression of literary and artistic ideas. Although the idea itself may not be copyrighted, the expression must still be original. In the United States, the 1976 Copyright Act has codified the law governing copyright and specifically protects, as works of art, software programs and databases. Formal registration with the United States Copyright Office is not required to obtain copyright in one's work. However, registration is useful in bringing a legal action to protect against infringement. The right granted under the Copyright Act is the exclusive right to reproduce the work, prepare derivative works, distribute by sale or otherwise, and display or perform the work publicly. The U.S.
Copyright Office also registers mask works (i.e. three-dimensional patterns for semiconductor chips) under the 1984 Semiconductor Chip Act. Protection (the exclusive right to exploit) for qualifying mask works is granted for a period of ten years.

Trade secrets are often the best legal protection for know-how or formulas where other protection is not available, or where the enforcement of the protection would be difficult or unenforceable. The following definition¹ is common:

A trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business and which gives an opportunity to obtain an advantage over competitors who do not know or use it. It may be a formula for a chemical compound, a process of manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers...Generally it relates to the production of goods, as for example, a machine or formula for the production of an article. It may, however, relate to the sale of goods or to their operations in the business such as a code for determining discounts, rebates or other concessions in a price list or catalogue, or a list of specialized customers or a method of bookkeeping or other office management.

¹ Restatement (First) of Torts S.757, comment b, 1939, ref. in Arnold, White and Durkee, 1988, p. 29.
The most commonly noted example of a trade secret is the formula for Coca-Cola, which is not patented, but has never been disclosed or discovered through reverse-engineering.

2.24 Technology Transfer Mechanisms

Robinson lists some sixteen different mechanisms by which technology is commonly transferred\(^1\). However, the nature of the basic research performed at MIT limits the relevance of most of these methods. One mechanism by which technology transfer from MIT occurs is through research sponsorship and consortia agreements administered by the Office of Sponsored Programs. Consulting agreements to industry providing for the services of MIT professors and researchers are also important mechanisms for transfer. Ultimately, the most important mechanism for technology transfer from MIT is the license agreement (and the option to license agreement). These agreements, and those provisions of research, consortia and consulting agreements which affect licensing of MIT technology, are the responsibility of the TLO.

Eckstrom's treatise on licensing offers the following definition of license\(^2\):

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\(^1\) Robinson, 1988, p. 5.
\(^2\) Eckstrom, 1972 and 1988, p. 4-2.
"License" is a term which has wide applicability in a number of areas. The common denominator of all licenses is that the licensee receives from the licensor, for an agreed consideration, the right to enjoy something the licensor has the right to grant, without interference by the licensor...The term "license" is used in commercial transactions to denote the transfer of rights needed for the establishment of commercial operations, or for the expansion of existing commercial operations. The transfer can range from a conveyance of substantially all rights to the property to a conveyance of severely restricted rights to the use of the property.

One of the key features of a license is that there is a continuing business relationship but not a fiduciary relationship between the licensor and the licensee. The continuing business relationship feature distinguishes a license from an outright sale where the transaction is completed at closing. The lack of fiduciary relationship distinguishes licenses from partnerships, joint ventures or franchise relationships where the parties often owe fiduciary duties to each other.

Licenses may arise through express agreement, may be implied by a course of conduct or arise through the legal mechanisms of estoppel and acquiescence. Only the express written license agreement, negotiated at arm's length between the licensor and licensee, is relevant in the context of the
TLO. An exclusive license grants the subject rights only to the licensee. Licensees under such a grant have the right to exclude third parties and may take direct legal action against them (in the name of the licensor) to enforce this exclusivity. The exclusive grant may be subject to rights retained by the licensor to continue to improve the technology (i.e. shop rights) or to existing or future non-exclusive licenses (e.g. to the federal government sponsor). By contrast, a non-exclusive licensee may be only one of many such licensees and generally has recourse only against the licensor to enforce its rights under the license agreement.

License agreements may contain any number of permutations of terms and conditions which govern the relationship between the parties. The more important common provisions are the following:

Restrictions on Exclusivity-Duration: The exclusive grant of license may be restricted in time, and become non-exclusive thereafter.

1 Any subsequent references to a license herein are to an express written license agreement.
2 A matter of some confusion concerns the right to license a patent application. Since the rights which will issue to the patent holder are rights of exclusion, which do not exist until the patent is actually granted, the license is actually a grant to the licensee of the use of a trade secret or of a contingent right of exclusion which vests when the patent is issued. See Arnold, White and Durkee, 1988, p. 32 and Eckstrom, 1972 and 1988, p. 4-8.
Restrictions on Exclusivity-Use: The exclusive grant may be restricted to a particular field of use, and may be non-exclusive for other fields. Alternatively, the licensor may grant a number of exclusive licenses to different licensees, each covering a separate field of use.

Restrictions on Exclusivity-Geography: The grant may be exclusive only for a particular geographic area and a number of exclusive licenses may be granted in different territories.

Right to Sublicense: The licensee may have the right to grant further licenses of the licensed subject matter by contracting directly with third parties who become sublicensees. The required form of sublicense agreement may create certain obligations between the sublicensee and the original licensor to protect its property interests.

Right to Assign: The licensee may have the right to have another party take its place under the license agreement (assuming the benefits and obligations). Commonly, the right exists only if the entire business of the licensee is sold to the assignee.

Grant Backs: The licensee may be obligated to assign title or grant an exclusive or non-exclusive license to the licensor for improvements to and new discoveries related to the licensed technology.

Due Diligence: An exclusive or non-exclusive license may be subject to termination by the licensor if certain milestones have not been met. Common milestones are the required investment of
research money, preparation of a business plan, completion of a working model or achievement of minimum sales or production amounts.

Warranties/Indemnification: A license may provide that the licensor warrants a right to use or the efficacy of the subject matter. One or both of the parties may be required to indemnify the other from claims for losses suffered by third parties.

Fees and Royalties: The licensor may receive compensation for the use of the subject matter in any number of ways. The most common are lump sum fees payable at fixed dates or on the occurrence of certain events and percentage royalties calculated on a royalty base (e.g. net sales).

2.25 Valuing Transferred Technology

Contractor has written extensively on the pricing of technology transfers through licensing and has developed with Root a normative model of licensing negotiations\(^\dagger\). The model describes the ceiling and floor transfer prices of a hypothetical licensor for its technology. The licensor's ceiling is the minimum of:

1. present value of the licensee's incremental profits from the use of technology (as estimated by the licensor); and

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\(^\dagger\) Contractor and Root, 1981, p. 25.
(2) Present value of cost to licensee to obtain same technology elsewhere (as estimated by licensor).

The licensor's floor is the present value of transfer costs and opportunity costs (as estimated by licensor). The licensee's ceiling is the minimum of:

(1) Present value of incremental profits from use of technology (as estimated by licensee); or

(2) Present value of payments asked by best alternative technology supplier; or

(3) Present value of licensee's cost to develop similar technology; or

(4) Present value of costs of patent infringement or other illegal acquisition of the technology.

The licensee's floor is the present value of licensor's transfer costs (as estimated by licensee).

Under the model, a bargaining range exists where the ceiling of the licensee is greater than the floor of the licensor. Contractor and Root tested this model in a sample of 102 license agreements negotiated by 41 U.S. companies and found two divergences from the model in practice. First, the licensors did not attempt to capture all the economic rents by seeking to maximize the license revenues, but instead exhibited
satisficing behavior. Three rationales were given: the entrepreneurial risk borne by the licensee, the desire to preserve a good relationship between the parties and the licensee's ability to cheat on an agreement if dissatisfied. Second, the licensors did not explicitly consider the opportunity costs of granting the license. This, the authors argued, could not be rationalized unless a license to this licensee was the only alternative for exploiting the technology.

A different approach to the negotiation of a reasonable license price is suggested by Finnegan and Mintz\(^1\). The parties can establish an initial range of values in which an agreement may be reached (i.e. the difference between the licensor's floor and the licensee's ceiling in Contractor and Roots' model). The agreed upon consideration within this range is not a function of maximizing or satisficing behavior, but a result of good faith negotiation between the parties. The level of compensation is not a single dollar amount but a structured package consisting of the following elements:

1. initial down payment fees;

2. minimum or maximum annual fees;

3. running royalty payments;

\(^1\) Finnegan and Mintz, 1978, in Goldscheider and Arnold, 1981, p. 3D-3 et seq.
4. ascending or descending royalties;

5. lump sum royalties;

6. percentage of sales royalties;

7. cross-licensing of technologies;

8. grant-back of rights to newly discovered technology; and

9. an equity interest in the licensee's business.

By combining these elements in appropriate measures, skilled negotiators can reach a fair allocation of risk and return that provides incentives for both parties to maximize the joint return from the licensed product. Factors that will affect the determination of a fair structure are: the nature and scope of the proposed license; the likelihood of the licensee's success; the duration of the license and the ancillary effects of the license on both licensor and licensee.

2.3 University-Industry Interactions

2.3.1 Role of the University

The proper role of academic institutions in the United States is a matter of some debate. Lynton and Elman\(^1\) argue

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\(^1\) Lynton and Elman, 1987, p. 1 et seq.
that the concept of an extended university has its roots in the unique American blend of the tradition of the German university and the British college. They contend the image of the university as a self contained entity dedicated to the pursuit of knowledge for its own sake and the education of students is an idealization. Instead, the American tradition has been a utilitarian one:

Decades before the Land-Grant Act of 1862, universities in this country took on more inclusive tasks than did their counterparts in other countries. Particularly in agriculture but in other fields as well, public and private universities in America were for a time not only the principal source of new knowledge by means of basic research, but also the major mechanism for the application and dissemination of such knowledge through applied research, technical assistance, and extension services. By insisting on a broad education, they went beyond teaching new generations the emerging skills needed in an industrializing economy. Their responsibility included, as well, the task of providing farmers and others with continuing education and a steady stream of information so as to ensure up-to-date skills and a rapid diffusion and absorption of new ideas. Research, extension, and instruction were seen as inextricably interrelated\(^1\).

\(^1\) Lynton and Elman, 1987, p. 4.
They argue that today a basic need exists to recapture the role of the land-grant institution in an era of rapid technological change. To play this role adequately, three functions are required for extension of the university to industry and the community:

1. The information and communication function, which gives potential clients information about pertinent resources of the university, informs faculty of external demands and opportunities, and effects the proper match between external needs and internal expertise.

2. The brokering and negotiating function, necessary for all except short and perfunctory contact, through which appropriate administrative details and contractual arrangements are worked out.

3. The delivery function, which actually provides the desired professional and scholarly activity\(^1\).

These functions are framed broadly by the authors, but represent the basic elements that are necessary in technology transfer from the university to industry.

\(^1\) Lynton and Elman, 1987, p. 33.
2.32 Traditional University Licensing

The idealized vision of the university attacked by Lynton and Elman has been, however, a great influence on the licensing practices of universities. Businesses seek to license patents to make profits: universities seek to disseminate information. Patents are an effective method of disseminating knowledge while simultaneously protecting the property in that knowledge. However, prosecuting a patent claim can be an expensive process. Prior to recent changes in patent law, the granting of an exclusive license to a patent was difficult where the research had been sponsored by the federal government. Industry, quite rationally, shows less interest in licensing from a university on a non-exclusive basis. Therefore, patents were often not obtained because the cost of the applications could not be readily recouped. Reimers\(^1\) wrote in 1979 that the economics of university licensing offices were then dictated by the presence or absence of a big-hit invention. Without such an invention, the costs of patent filings and overhead could not easily be offset by royalty revenue. Exceptions existed where there was a combination of the following factors:

1. A substantial base of research where the university controls title to the inventions;

\(^1\) Reimers, 1979, in Goldscheider and Arnold, 1981, p. 3G-3 et seq.
2. An entrepreneurially focused licensing program; and

3. Appropriate incentives for inventors and their laboratories.

Of these three, title was key. One of the major drawbacks to federal government funding of research was the uncertainty surrounding title and the restrictions on the ability of universities to grant exclusive licenses.

2.33 Government Sponsored Research

Today federal research funding is very important to MIT and now accounts for over 90% of the research sponsorship ($230 Million at MIT and $400 Million at the Lincoln Laboratories)\(^1\). By the late 1970s, institutional patent agreements were in existence between some universities and particular federal government agencies. These set out the rules for granting exclusive licenses from university research, but were quite restrictive in the terms that licensees could obtain. Senate hearings were held in 1978 on the subject of adopting a uniform institutional patent agreement\(^2\). In 1980, Public Law 96-517\(^3\) was enacted which allowed non-profit business organizations

\(^1\) Nelsen, 1988.
\(^3\) Chapter 38-Patent Rights in Inventions made with Federal Assistance.
(including universities) to retain title to inventions resulting from sponsored federal government research. In return, the government would receive a non-exclusive license to the invention. Limitations to the duration of exclusive licenses were liberalized and a requirement was enacted that the inventor be permitted to share in the royalties with the licensing organization. The law was extended further by the enactment of Public Law 98-620 in 1984 and in 1988 an executive order rescinded limitations on the duration of the permitted exclusivity period. The restrictions today are:

(1) an irrevocable, non-royalty-bearing, non-exclusive license is to be granted to the U.S. government for government purposes;

(2) a requirement is imposed that exclusive licensees must manufacture products for the U.S. market substantially in the United States;

(3) additional licenses are required for export of certain products; and

(4) march-in rights are reserved that may be exercised by the government if an exclusive licensee is not exploiting the technology.

Together, these statutes, and the regulations made under their authority, govern the transfer of university technology based on federally funded research.
2.24 The New University-Industry Alliances

The current interest in alliances has its roots in the competitive malaise of the 1970s. A study commissioned by the American Association of Universities and published in 1982 identified 1980 as a turning point for American competitiveness and the attitude toward university-industry collaboration. Concerns about declining U.S. productivity and lagging innovation prompted a re-evaluation of the role of the university in maintaining competitiveness. The report quotes a late 1970's study that identified the problem as follows:

Although hard evidence is lacking, there are reasons to believe that the links between universities and industry weakened in the two decades following World War II and approached their nadir in the early 1970s. The principal factors behind the decline appear to have been: (1) the separation of academic research from perceived industry needs; (2) the decreased interest among Ph.D.s and other graduates in industrial research; and (3) the relative decline of basic research in industry.

At the same time, the 1982 study identified an erosion in the research base due to decreased federal funding of research and high costs of equipment and maintenance.

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1 Rosenzweig, 1982, p. 42 et seq.
Fusfeld identifies another factor in the rise of alliances: realization among companies that self-sufficiency in R & D and technological innovation is no longer possible. The result is much greater spending in the 1980s on cooperative ventures to conduct basic long term research, especially in emerging areas such as robotics, biotechnology and artificial intelligence\(^1\). He contends that the university acts as an amplifier for basic research within that greater government-industry-university linkage that he terms the *technical enterprise*\(^2\):

Above a certain threshold, it seems, the concentration of effort may be great enough to create new technical opportunities and attract additional funds. This feedback provides opportunities to derive added benefits from the system through planning and selectivity, a process that is underway in current funding of research in micro electronics. Considerable flexibility within academic research derives from the variety of funding sources involved. The very nature of basic research is such that the results can have application in areas other than the funded one, whether through theory or through new instrumentation.

In 1984, Fowler reported that many impediments to university-industry relationships were dissolving, while others

\(^1\) Fusfeld, 1986, p.79.
\(^2\) Fusfeld, 1986, p.223.
remained. Of the remaining impediments to closer ties, his survey identified as the greatest (from the university's viewpoint) the conflict between a university's need to protect the right to publish and industry's need to protect proprietary information. For industry, the greatest impediment was a company's tendency to use its own in-house research capabilities. Both industry and the universities reported the same secondary impediment: industry's primary orientation toward short-term profits and product improvement. Questions about the implications of the new relationships for academic freedom have also been raised. Reporting on university industry research relationships in the field of bio-technology, Blumenthal noted conflicts between the right to publish on one hand, and industry's desire for protection of trade secrets and the rise of commercially driven research projects, on the other. However, the growth of the new alliances continues. By 1987, Colton had identified thirty-nine operating cooperative research centers in the United States funded through the National Science Foundation.

The role of industry in funding basic research and the links in the technical enterprise of Fusfeld appear to be strengthening over time. The links between commercially sponsored research at MIT and the policies adopted by the TLO

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1 Fowler, 1984, p. 35 et seq.
2 Blumenthal et al., 1986, p. 1361 et seq.
3 Colton, 1987, p. 34 et seq.
will be of critical importance in the 1990s. Funding by industry may be necessary, and often desirable, but if the ties to the sponsor of the research interfere with the dissemination of new technologies, then the mechanism of sponsorship will need to be reevaluated.
3.0 MIT AND THE TECHNOLOGY LICENSING OFFICE

3.1 Origins of the TLO

3.11 Origins of MIT Patent Policy

The MIT Faculty and Executive Committee first adopted a formal statement of patent policy in 1932:

Inventions or other developments, whether or not subject to patent, resulting directly from a program of research financed entirely by the Massachusetts Institute of Technology, shall be the exclusive property of the Institute, and the Institute shall be entitled to all benefits and rights accruing from such inventions or developments, and may acquire the title to any patents based thereon. It shall hold and administer these rights for the ultimate benefit of the public. In cases where, after a reasonable period, the Institute does not choose to acquire rights to inventions or developments arising in this manner, provision shall be made whereby said rights or a part of them shall revert to the individuals who made the inventions or developments.

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1 Sources for material in this Part 3.0 are from interviews conducted with TLO officers, except as otherwise referenced.
Exceptions to this general rule, that title to the invention belonged to MIT, were made where there was no MIT sponsorship or there was joint sponsorship with industry (through the Division of Industrial Cooperation). A Patent Committee handled the patent applications and the relationships with industry. The policy of the Institute was to recognize contributions by faculty and staff (in the form of patentable inventions) in the same way that traditional academic contributions were recognized: increases in rank and salary. The Patent Committee's primary objectives were to make inventions available to industry and the public on a reasonable basis, to avoid situations likely to lead to litigation, and to maintain the cordial relationship existing between the Institute and the public.¹

3.12 Advent of Research Corporation

In 1937 the Committee announced it had entered into an arrangement with the Research Corporation of New York (a non-profit patent management firm) to handle the legal and commercial aspects of MIT inventions. The goal of the new arrangement was to ensure:

A smoothly operating, equitable system [that] will facilitate the development and utilization of these inventions and thus implement a decidedly potent

aspect of the activity of the Institute staff by bringing the results of its scientific and technical research to the furtherance of industry, and thus increasing the standard of living of the people of the country.\(^1\)

In 1942, the Patent Committee was reorganized and its mission redefined\(^2\):

1. To unify a policy on the business management of all patents in which the Institute has equities.

2. To advise on patent provisions of contractual arrangements to which the Institute is a party.

3. To advise on patents arrangements which involve expenditures of funds of, or on account of, the Institute, and to make recommendation in this regard to the President.

4. To review matters of broad policy in patent matters affecting Institute relations with the public.

5. To represent the Institute in receiving and disposing of patent rights.

Research Corporation continued to retain control of the legal and commercial aspects of MIT patents. During the 1950s,

however, the Division of Sponsored Research (formerly the Division of Industrial Cooperation) established a separate Patent Section which would evolve into the MIT Patent Office.

3.13 Development of the Patent Office

The role of Research Corporation was reevaluated by MIT in the mid-1960s. In 1965, the Patent Administration License Report noted that the patents which had previously been managed by Research Corporation had been transferred back to MIT. The most important of these was the magnetic core memory, invented by Dr. Jay Forrester in the 1950s. The commercial value of this patent had become apparent to MIT with the growth of the computer industry in the 1960s. To realize the monetary value from the Forrester Patent, however, MIT was forced to litigate to protect its patent claims. Successful resolution of these lawsuits would ultimately result in the realization of millions of dollars of royalty revenues to MIT.

As a result of these events, the focus of MIT's patent policy was shifting to the strict legal protection of inventions. In 1966, the MIT Policies and Procedures noted an ongoing review and update of the Institute's Patent Policies. Students and faculty were advised to check with the Patent Section, Division of Sponsored Research, for up-to-date information on the evolving policy. In 1967, The Patent
Administration License Report noted that:

Despite a financially successful year, it is increasingly apparent that not only is MIT control of the patent program desirable from both MIT's and the Government's point of view, but also that vigilance must be exercised so that problems may be resolved at the earliest possible moment. We believe that we have demonstrated that the job can be done; we must now exert greater effort to be sure that it is done.

The Patent Section of DSR became the Office of Sponsored Programs' Patent Office in 1973, and was set up independently as the MIT Patent Office in 1976. The Patent Office was staffed primarily by attorneys and its raison d'être was not the active commercialization of inventions, but rather the assurance of effective legal protection for MIT's patent claims. Given the success of the legal approach in capitalizing on the Forrester patent, this emphasis was not unfounded. However, by the 1980s, the factors noted in Part 2.0 (e.g. federal patent policy changes, international competitive pressures, etc.) would call the legally centered strategy of the Patent Office into question. A sea change in the philosophy of MIT's Patent Policy began in 1985, as the legal orientation of the Patent Office gave way to a marketing-driven operation staffed by non-legal professionals.
3.14 Founding of the TLO

In late 1985, Niels Reimers, Director of the Stanford University Office of Technology Licensing, accepted a six month appointment at MIT to reorganize the Patent Office. Jean Weidemier, now the TLO's sole internal legal counsel, is the only remaining professional staff member from the old Patent Office. In early 1986, Dr. Reimers hired two non-lawyers John Preston and Lita Nelsen (respectively, the current Director and Associate Director of the TLO). Karen Kramaric, who has since been promoted to a Technology Licensing Officer position, was also hired by Dr. Reimers. The other current Technology Licensing Officers (Christina Jansen, Ronald Scharlack and Donna Baranski-Walker) have been hired by John Preston.

3.2 TLO Mission

3.21 Goals of the TLO

John Preston and Lita Nelsen describe the mission of the TLO as fourfold. First and foremost, the goal is the effective transfer of technology from MIT. University inventions should be funded and developed for the public good. This primary goal is consistent with the overall public policy goals of diffusion of technology and the improvement of America's competitive position. Second, the TLO should seek to generate revenues for
MIT and its inventors, within the confines of the Institute's goal of free dissemination of information. Third, the TLO should seek to amicably resolve conflicts of interest among inventors, the Institute, potential licensees and the public. For example, a conflict might arise where one company wishes to pay a large sum of money to have the exclusive rights to an invention, but will detrimentally limit access to the research. Fourth, the TLO should seek to foster goodwill with the faculty, students and staff at the Institute and with industry in general. Adversarial positions to protect property rights and overzealous negotiating tactics should be avoided.

3.22 TLO Strategies

To implement these goals, the TLO has adopted four strategies which mark a departure from the practices of the old Patent Office. First, the TLO is staffed by Technology Licensing Officers with business/technical backgrounds rather than legal ones. The emphasis is placed on what can be done, rather than on what might go wrong. Second, the TLO has decided to share the risk with the licensee in the success or failure of a business based on licensed technology. In

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1 Normally the grant of an exclusive license based on a patent will allow the dissemination of the research through the publication of the patent upon issuance. It is possible, however, that experiments may not be replicable without certain tangible property (i.e. materials) which will not be available through the patent publication process.
practical terms this has meant a shift from fixed up-front license fees to percentage based running royalties. Third, greater attention is being paid to embryonic technologies which are not proven commercially and therefore require the support of risk capital. This often takes the form of venture capital funding of a start-up company based on the licensed technology. Fourth, the TLO seeks to increase the probability of success of its licensees. This involves matching the right company with the right technology and structuring a deal which allocates risk and return optimally. In 1986, when these strategies were first implemented, the TLO negotiated 17 license agreements and received revenues from licensing of approximately $2 Million. By 1988, the number of licenses granted had increased to 92 and the revenues had risen to $6.2 Million.

3.3 MIT Policies and Procedures 1989

3.31 General Policy

A new policy on intellectual property was introduced at MIT in April, 1989. The policy institutionalizes many of the initiatives undertaken by the TLO since 1985 and clarifies the rights and responsibilities of faculty, students and staff. The operations of the TLO are overseen by a standing

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1 Information in this Section 3.3 is drawn from Massachusetts Institute of Technology, 1989.
Presidential Committee which may recommend future policy regarding the exploitation of a particular technology. The Vice-President for Research is the arbiter of disputes arising from the policy and may authorize exceptions to it in unusual circumstances. The general policy statement is:

The prompt and open dissemination of the results of MIT research and the free exchange of information among scholars are essential to the fulfillment of MIT's obligations as an institution committed to excellence in education and research. Matters of ownership, distribution, and commercial development, nonetheless, arise in the context of technology transfer, which is an important aspect of MIT's commitment to public service. Technology transfer is, however, subordinate to education and research; and the dissemination of information must, therefore, not be delayed beyond the minimal period necessary to define and protect the rights of the parties.

3.32 Ownership Guidelines

Ownership of intellectual property is now governed by the following general rules. Inventors and authors own inventions and materials which are:

(a) Not developed in the course of or pursuant to a sponsored research or other agreement; and
(b) Not created as a "work-for-hire" by operation of copyright law and not created pursuant to a written agreement with MIT providing for a transfer of copyright or ownership to MIT; and

(c) Not developed with the significant use of funds or facilities administered by MIT.

The ownership of all other Intellectual Property is to be determined as follows:

(a) Ownership of Intellectual Property developed in the course of or pursuant to a sponsored research or other agreement will be determined according to the terms of such agreement; and

(b) Ownership of Intellectual Property created as a "work-for-hire" by operation of the copyright law, or created pursuant to a written agreement with MIT providing for transfer of copyright or ownership to MIT will vest with MIT; and

(c) Ownership of Intellectual Property developed by faculty, students, staff and others participating in MIT programs, including visitors, with the significant use of funds or facilities administered by MIT, will vest with MIT.
3.33 Conflict of Interest

Specific provisions govern potential conflict of interest situations which may arise due to:

(1) an adverse impact on MIT's educational responsibility to its students;

(2) an undue influence on the employment commitment of the inventor/author to MIT in terms of time or direction or effort;

(3) a detrimental effect on MIT's obligation to serve the needs of the general public;

(4) potential conflict of interest as defined in MIT's Policies and Procedures.

The most controversial area centers on licensee companies in which MIT or its faculty/staff take an equity position. In order to avoid a conflict of interest between the commercial interests of the company and the academic and research interests of MIT, detailed rules govern when such companies may fund further research at MIT.

3.34 Patents and Royalties

The new policy guidelines also make provision for the disclosure of new technology to the TLO on a prescribed form.
Patents will normally be sought on inventions only when the claims are judged to be of potential commercial value, although sponsored research agreements may require filing in other circumstances. The TLO is responsible for pursuing the licensing of technology disclosed to it by inventors and will research the market and seek to identify potential licensees. When licenses have been granted and royalty revenue is received by MIT, 15% of the Gross Royalty Income is deducted to cover the expenses of the TLO, and, in addition, out-of-pocket TLO expenses (e.g. patent filing and attorney's fees) and a reserve for future expenses are deducted. The authors/inventors of the subject matter of the license receive one-third of this amount. After certain other adjustments and write-offs, the balance of the Adjusted Royalty Income is split evenly between the MIT General Fund and the Laboratory/Department where the invention originated.

3.4 Other Transfer Agents at MIT

3.4.1 Industrial Liaison Program

There are important organs of MIT's technology transfer policy other than the TLO. The Industrial Liaison program was founded in 1948 and offers its members a window on technology at MIT. Its annual directory of research at MIT\(^1\) describes the

\(^1\) Massachusetts Institute of Technology, 1988.
ILP's ability to help member organizations in making strategic business decisions and identifying new business opportunities by:

- Augmenting industrial research and technical efforts with information, perspective and background;

- Facilitating access to the expertise of MIT's faculty and research staff;

- Providing information on the latest developments in almost any area of science, engineering, and management;

- Establishing links to MIT resources, including libraries, laboratories, and the MIT Press;

- Informing members of the latest patent licensing opportunities at MIT;

- Notifying clients of special lectures, events, and educational opportunities at MIT relevant to the business community;

- Introducing member organizations to the Institute's pool of talented undergraduate and graduate students.

The Industrial Liaison Program does not write formal agreements for performance of research or the transfer of technology with its members.
3.42 Office of Sponsored Programs

The Office of Sponsored Programs has responsibility for negotiating and administering research agreements with corporate sponsors. As noted in Sub-section 3.12, the Patent Office evolved from the OSP, and the orientation of the OSP today is still legal in nature. The OSP does not undertake active marketing efforts to attract research funds and most sponsorship are initiated through the contact of a company with an MIT professor. The various research consortia at MIT (e.g. the Materials Processing Center) are set up under agreements negotiated and administered by the OSP. The OSP officers are responsible for ensuring that the sponsor's rights under research and consortium agreements are protected. The link between the OSP and the TLO is still important because of the impact of research agreements on intellectual property rights to inventions resulting from sponsored research.

Unless the TLO approves an alternative arrangement consistent with overall MIT policy, the sponsor under an OSP research agreement may elect one of four alternatives within six months of the filing of a patent application by MIT:

1. Accept a non-exclusive, non-commercial, non-transferable, royalty-free license for internal research purposes of the sponsor; or
2. Accept a non-exclusive, non-transferable, royalty-free license for commercial use (without the right of sub-license) provided sponsor agrees to: demonstrate reasonable efforts to commercialize and transfer the technology in the public interest; pay a $3,000 annual fee; and substantially manufacture in the United States the products to be sold in the U.S.; or

3. Negotiate (within three months after election of this alternative) a royalty-bearing, limited-term exclusive license and right of sublicense through the TLO for commercial use, subject to U.S. manufacturing requirements; or

4. Waive all rights to inventions, patent applications and resulting patents in exchange for 25% of Adjusted Royalty Income (see Subsection 3.13) resulting from the license of the invention to other parties.

3.43 Other Agents

A number of other technology transfer agents exist at MIT. Among these, the Media Lab has a unique arrangement under which corporate sponsors, in effect, bargain gifts of money for non-exclusive rights to anything that is developed by the Media Lab. The arrangement is neither an outright gift of money nor sponsored research. This set-up has been particularly successful at funding the operations of the Media
Lab and at transferring technology among its members and users. Because of the royalty-free non-exclusive licenses granted to members, no royalty revenue in the traditional sense is earned.

The MIT Enterprise Forum is another agent for transfer of technology. By allowing budding entrepreneurs to present their ideas before a panel of seasoned professionals, the emerging technologies at MIT are exposed to a wider audience. Other organizations and campus clubs (e.g. the Entrepreneurs Club) also foster discussion and dissemination of new business ideas among the MIT community.

3.5 The Licensing Process

3.51 Technology Disclosure

The first formal interaction between a Technology Licensing Officer and an inventor is the submission of an MIT Technology Disclosure Form. In addition to describing the technology, the form provides information about research grants, the sponsors of the research, and about the use of MIT funds or facilities. Next, information critical to the protection of the technology disclosed is provided: the date

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1 Material in this Section 3.5 is drawn from interviews with TLO Officers and from Kelley, 1988.
of the first publication and oral disclosure of the technology. Once submitted, the Disclosure Form will initiate action by the TLO Officer to investigate patent or other protection. Alternatively, the party filing the disclosure may request other actions (e.g. a waiver of the rights of MIT in the invention). The filing of the disclosure begins a case for the TLO, which is given a case number, logged into the file system and assigned to a TLO Officer. Disclosures may come directly to a TLO Officer who has dealt with an inventor in the past or may come in over the transom. Cases are assigned by John Preston based on the subject matter and the area of speciality of the TLO Officer, or may be announced at the weekly TLO staff meeting and allocated immediately.

3.52 Evaluation of Technology

Following the disclosure, the assigned TLO Officer must make an assessment of the commercial viability of the technology. Although the Officers specialize in certain areas, a complete understanding of how the technology functions is not required for the viability evaluation. The practice is largely to rely on the inventor for an assessment of the technical efficacy of the invention. John Preston describes this as a leap of faith. Of course, if the claims are so abnormal as to be dubious, an outside evaluation of the workings of the technology might be undertaken with
appropriate non-disclosure agreements. The more important job of the TLO Officer is to assess the invention's commercial potential, assuming the technology can do what is claimed. This requires what John Preston calls horse sense, or the ability to accurately gauge the marketability of the invention based on very little hard data. If the inventor's disclosure has been prompted by a potential licensee expressing interest in the technology, this is strong evidence of viability. In many cases, the inventor has simply come up with something considered really interesting which is believed to have commercial potential.

3.53 Patent Application

Presuming the invention is believed to have commercial potential, the case is submitted to an outside patent attorney for review\(^1\). As described in Sub-section 2.23, the patent attorney may file broad claims which are often rejected by the U.S. Patent Office. Prosecution of the claim and negotiation of the scope of the protection may take several years. The involvement of outside attorneys at this stage is generally the only active participation in a case by a lawyer. After the patent filing (or copyright registration), the TLO Officer

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\(^1\) Inventions which are copyrightable material, such as software, are registered directly by the TLO officer.
acts independently to market and negotiate a license for the technology.

3.54 Marketing Efforts

TLO Officers employ a wide variety of marketing techniques that will be discussed in greater detail in Part 4.0. The general process is described by John Preston as matchmaking between the technology and the appropriate licensee. This phase of the licensing process is critical to the success of the TLO. If a potential licensee can be identified, who is excited about the prospects of the technology, then the Officer can usually structure a deal which will make the transfer viable. The art of marketing the technology is not well understood analytically even by those who practice it successfully. A recurring phrase heard from TLO Officers is that "each case is different."

However, the implementation of the LOIS database\(^1\) in the TLO during 1989 will provide a more readily accessible source of information to TLO officers. A directory of people and companies will be indexed by keywords and interaction summaries will document contact with potential licensees in a centralized system. LOIS does not, however, purport to be an expert system which can duplicate successful existing

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\(^1\) Kelley, 1988.
marketing efforts of TLO Officers. The effect of the capabilities of LOIS may simply be to increase the effectiveness of those already skilled at the art of technology marketing.

3.55 Licensing

Once a potential licensee has expressed interest in the technology, the TLO and the company may negotiate directly for a license to the invention. The current standard TLO License Agreement is annexed as Exhibit B. The grant of license includes the right to make, have made, use, lease and sell the licensed products and the practice the licensed processes. Both of these terms depend on the scope of the patent claims referenced in the license. Unlike many company-to-company transfers of technology, the license will not include improvements to the products or processes which may be later developed at MIT unless the licensed patent dominates such improvements. The license grant also does not include know-how, which might be considered a trade secret (see Sub-section 2.23), as MIT policy requires promoting the dissemination of technology. Effective transfer of technology requires the continuing interaction of the inventor with the licensee, however, and this is often accomplished through further

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1 A separate agreement for the licensing of software exists and somewhat different standard terms and conditions are used.
sponsored research or a separate consulting contract\textsuperscript{1}. Another important consideration for the TLO is protecting the Institute from costly lawsuits which conceivably might offset all the licensing revenues earned by the TLO. Accordingly, the TLO license will not provide warranties of fitness of use for the technology and will require an indemnification of MIT by the licensee for claims arising under product liability law\textsuperscript{2}.

Within the boilerplate of the standard contract\textsuperscript{3}, TLO Officers are given considerable latitude in negotiating the payment terms and the due diligence clauses with licensees. The specific terms are not required to be reviewed by John Preston (although he signs the contracts on behalf of the TLO), which allows the Officer to respond rapidly and with authority during a negotiation. The risk, of course, is that mistakes can be made which will not be caught prior to execution of the license. The decision by the TLO \textit{not to negotiate by committee} reflects the trade-off between responsiveness and conservativeness chosen in the current structure.

\begin{footnotesize}
\textsuperscript{1} The TLO does not negotiate consulting contracts with licensees on behalf of inventors.  \\
\textsuperscript{2} Nielsen, 1988.  \\
\textsuperscript{3} Material changes to the standard legal protections in the TLO contract are reviewed by internal or external legal counsel.
\end{footnotesize}
An alternative to proceeding directly to license negotiations is to execute an option. The option granted is the right to elect to enter into negotiations with the TLO for a royalty-bearing, limited-term, exclusive license to the technology. In effect, the option allows a company to tie-up the technology for a limited period of time (usually not more than six months) during which the company has a license permitting and requiring research on the commercial feasibility of the invention. Although in some cases the TLO Officer and the company may negotiate the main points of the contemplated license agreement, the option is, in some sense, merely a gentlemen's agreement to bargain in good faith in the future.

3.56 Contract Administration

Once a license agreement is negotiated and signed, the administration of the contract becomes important to ensure adherence to the agreed-upon royalties and the achievement of due diligence milestones. Royalty payments to the inventors and MIT must be calculated and disbursed. The administrative details will be handled more effectively and routinely after the full implementation of LOIS. Of greater interest, from the perspective of technology transfer, is the termination of contracts for failure to achieve the due diligence milestones.
4.0 TLO INTERVIEWS AND CASE STUDIES

4.1 Description of Research

The research for this Part 4.0 was conducted by interviewing five of the six current TLO Officers\(^1\). Each interview lasted from two to three hours and was divided into two parts. In the first part, the TLO Officer was asked a series of open-ended questions regarding their background, the nature of their work and their opinions on the technology transfer process. The results of the first part of each of the five interviews are summarized in Section 4.2 which follows.

The second part of each interview was devoted to a discussion of three cases which the TLO Officer had worked on. TLO Officers were asked to select one case which fell into each of the following categories: a license to an existing company; a license to a start-up company; and a problem license. The case interviews focused on the nature of the technology, its origins, the involvement of the TLO and the negotiation process. A discussion of these cases follows in Section 4.3. Abstracts of the fifteen cases are provided in Appendix A. The names of the companies have not been revealed for reasons of confidentiality. In addition to the interviews, the relevant

\(^1\) Donna Baranski-Walker was not interviewed because of her short tenure with the TLO.
case files were provided to the author and these files have been used in preparing the abstracts.

The sample of cases selected is not intended to be representative of the population of TLO cases. No statistically valid conclusions about the nature of start-ups versus existing companies or about successful versus unsuccessful companies are intended to be drawn from this data. Rather, by asking the Officers to select cases that they wished to talk about, it was hoped that the general discussion of casework in the first part of the interview could be grounded in specific examples. As well, by looking at three types of cases in different fields, handled by different TLO Officers, it was hoped that suggestions for future research could be generated.

4.2 TLO Officer Interviews

4.2.1 John Preston

John Preston, Director of the TLO, has headed up the TLO for a little more than three years. He holds an undergraduate degree in physics and a Master's of Business Administration. His technical specialties are analytical chemistry, instruments, electrical engineering and software. He has wide experience with small businesses, having worked in a family run
scientific instrument firm and founded his own successful software company. In between, he served as the Associate Director of the Industrial Liaison Program at MIT. These work experiences have given him broad exposure to negotiation in a variety of contexts: from loan documentation to software license and distribution agreements.

Preston's network of contacts at MIT is well developed from his years at the ILP: he estimates he knows 60% of the faculty. His tenure at the ILP also generated extensive contacts in industry. Preston also has well developed connections in the venture capital community. His marketing efforts at the TLO (for his own cases) are largely reactive: following up on the leads of inventors. His efforts at technology scanning are limited to the trade press and general scientific publications. He does not actively read the heavily refereed technical journals.

He sees the motivated inventor as the key agent in the technology transfer process. Also, an important synergy exists between professors and graduate students in generating inventions. Next, an outside investor (or an internal sponsor) who has access to financial and other resources and shares the vision of the inventors is critical. Entrepreneurs play less of a role because of the embryonic nature of much of the technology licensed. Lawyers are a necessary evil in the
process, and act as a brake on the enthusiasm of the other agents. The TLO officer plays the role of matchmaker in linking inventors and investors.

Preston describes his negotiation style as integrative, but believes it is important to set up the framework of expectations (e.g. % equity or % running royalties) early on in a negotiation. This acts as a filter mechanism to weed out the less serious investors and licensees. This problem solving style of negotiation must be matched with enough chutzpah to move the negotiations along when the prospective licensee is delaying. This requires signalling the clear intention of the TLO to license to another party if closure on the deal cannot be reached. He describes his work as 60% to 70% reactive and finds it difficult to get to the bottom of his guilt pile. Preston notes that the perceived level of importance of a proactive project needs to be much greater than that of the current emergency to be able to switch from the responsive mode. More than half of the licensees he is dealing with would prefer to have the negotiation concluded immediately.

4.22 Lita Nelsen

Lita Nelsen, the Associate Director of the TLO, joined the TLO with John Preston in 1986. She holds a Bachelor's and a Master's degree in Chemical Engineering from MIT and is a Sloan
Fellow. Her technical specialty is now almost exclusively biotechnology, which she has learned by osmosis. She also deals with some medically related chemistry, and is sharing responsibly for licensing medical devices with a new TLO Officer. Nelsen has held a variety of managerial and marketing positions in a number of high technology companies, such as Millipore, and has consulted for Arthur D. Little. She has had experience negotiating license agreements for a start-up biotechnology firm as well as contracts for a company providing educational seminars.

Nelsen's network of contacts is very large and was developed through her twenty years' experience in a number of high visibility positions. Her ties to MIT also provide a ready-made network of contacts within the Institute. However, she has also expanded this network greatly ("filled a Rolodex") in the last three years and attributes this to being good with names and faces. Her focus has been on the venture community and existing biotechnology companies. Other than venture deals, her marketing effort is usually focused on a contact known to the inventor. In a minority of situations, she contacts someone she knows independently. Rarely is the broad brush approach of a mass mailing or advertising used. Her approach to reading the scientific literature is almost identical with John Preston's.
Nelsen sees the principal investigator (i.e. a faculty member) as the key technology transfer agent. The graduate students and the research associates may have done a lot of the work in making the discovery, but are less important later in the process. The faculty member needs to be enthusiastic and gives the project its visibility and credibility by articulating the long range importance of the discovery. Venture capitalists are very important players in what she calls the minus-two stage start-up company. They wear a temporary CEO's hat, build the management team and will ultimately attract a real CEO to run the business. In existing companies, you need to find the person who can do three things well: understand the science; understand the long-term strategic direction of the company; and wield sufficient power in the company to get the technology seriously evaluated (i.e. overcome the not-invented-here syndrome).

Nelsen describes her negotiation style as integrative, but says she uses the leverage of MIT as a worthy institution to her advantage. She likens negotiation to a marriage agreement, not a one-time sale. A license agreement needs to be flexible enough to accommodate the needs of the parties, but rigid enough to be enforceable in the future if things go badly. She finds that the transition from the collaborative problem-solving mode of negotiation to the end game distributive bargaining can be a difficult one. Her work at the TLO is
described as generally reactive, but necessarily so because of the TLO's need to be perceived as a service organization. Proactive follow-up is required to turn a mere clue into a real opportunity. The result is a fragmented work day that is ideal for action junkies and is likened to juggling a hundred balls at once. Projects requiring a few hours of concentration or more need to be completed in the evening or on weekends.

4.23 Ronald Scharlack

Ron Scharlack has worked as a Technology Licensing Officer for approximately two and one-half years. He holds a Bachelor's and a Master's Degree in Mechanical Engineering, from MIT and Stanford respectively. His technical specialties are electrical engineering, optics, photo-voltaics and semiconductors, but he notes that his cases come from a wide variety of areas. He describes himself as an inventor who is fascinated by technology and has a broad background with eclectic interests. He has experience in the battery business and the automotive industry. Scharlack's negotiating experience is both professional (negotiating with utilities) and personal (he buys and sells antique rugs).

Scharlack's network of contacts at MIT and other universities is being built from the ground up. His contacts in industry are most useful and are used in a call and bounce
direct marketing technique. He also uses the MIT Report and industry newsletters to bring technology to the attention of industry and relies on the self-selection of companies who respond rather than on directed mailings. He does not favor the latter because he believes that many important candidates for licensing cannot be logically or rationally connected to the technology. The observed process of self-selection could become more important, he argues, if an effort were directed to the Fortune 1000 companies to invite them to come to MIT and look at the laboratories here as a source of new technology. Scharlack reads mainstream scientific publications and refereed technical journals extensively.

For Scharlack, the most important agent in the transfer process for conventional technology is the inventor. In the absence of a new hot button invention, the inventor must have thought about the commercial aspects of the technology and be willing to promote it effectively by communicating its potential. It is also important to find a champion within the prospective licensee. The inventor is often the key to finding and motivating this individual. Scharlack believes most of the disclosures in his practice are driven by a few active professors and their links to outside contacts.

Scharlack's starting point in negotiations is to look at what he is selling and what the licensee wants to buy. Then,
he seeks to expand the range of possibilities by information gathering and tailoring the license to meet the needs of the licensee. He believes the size of the upfront payment is largely arbitrary, but seeks to be flexible on most of the numbers in the contract. He places importance on due diligence provisions to ensure that a licensee does not sit on the technology. Scharlack's work at the TLO is a mixture of reactive and proactive. Those matters which are time-sensitive demand his attention, but he tries to give more time to the important cases (those with expected commercial impact, where the inventor is also willing to invest significant time). However, he sees some serendipity in picking the important cases, as the initial developments may not be interesting, but unforeseen changes may take place which add immensely to the value of the technology. He does set aside time to make calls and write letters, but wishes he were able to set aside more time to do internal prospecting for inventions at MIT.

4.24 Christina Jansen

Chris Jansen has been a Technology Licensing Officer for almost two years. She holds Bachelor's, Master's and Doctoral Degrees in Materials Science and presently specializes in this field. Her other areas of specialization are in manufacturing processes, test instrumentation and sensors. She works extensively with the various industry consortia set up at MIT.
through the OSP, and these generate a very large proportion of her patent applications. She has extensive experience as a manager in a number of high technology companies, including Polaroid and Digital Equipment. Her negotiation experience is not based on specific corporate positions as a negotiator, but rather on years of experience as a manager negotiating with other managers in a corporate environment.

The network of contacts from Jansen's industry experience is broadly based and valuable in her work. She considers her contacts at MIT to be of lesser importance. Her marketing strategy is to attempt a match of the technology to the right licensee with only one or two phone calls. She relies on publicity in the MIT Report or industry newsletters as a last resort if she is unable to find other leads. Jansen does not try to keep up with all the new advances in technology, but believes she can come up to speed in short order if necessary. She reads general scientific publications, but not specialized journals. The basic science in her area of speciality is not changing rapidly and consists mainly of improvements to existing technology.

Jansen sees inventors and consortia members as the key agents in the transfer process. She estimates that about 80% of the inventors suggest the ultimate licensees for their inventions. Many of these are consortia members and, of
course, the ground rules for licensing members are spelled out in the consortia agreements. Therefore, moving these deals along quickly is an important success factor in getting the technology to industry. She deals with senior people in companies who have the authority to make the deal, or can move it up a single level to get a definitive answer. These people (presidents, vice-presidents and corporate counsel) are key agents in the transfer process.

Jansen's approach to negotiation is to work together with the licensee. If you have a company that is interested and aggressive, then you go with that licensee and make the deal work. She is interested in getting high running royalties and insists on specific due diligence provisions, but the priority is to get the technology out of the TLO and into industry. Her work is reactive, but she emphasizes immediate turnaround so that she is always in the position of waiting for a reply from the licensee. She compiles a list of the deals she is actively working on, and then makes a conscious effort to proactively contact at least two potential licensees per week on a rotating basis. She notes that her disclosure rate and case load varies widely and drops off significantly in the summer.
4.25 Karen Kramaric

Karen Kramaric has worked for the TLO for approximately three and one-half years and now works as a Technology Licensing Officer specializing in software, book agreements and other materials subject to copyright. She is the only Officer holding an undergraduate degree in liberal arts and has work experience in technical writing and as a paralegal with Union Carbide. There, she was responsible for the design of a litigation data base. Although she is very familiar with software, she has not written code extensively. Prior to joining the TLO she had no specific negotiating experience in a business environment.

Kramaric's network of contacts in industry has been built up with each license agreement that she completes. Her MIT network is being developed through proactive efforts to target different departments (e.g. Ocean Engineering) and hold informal sessions with their graduate students to explain how the TLO can help with commercialization of new ideas. She is also developing a network with other universities active in software development (e.g. Stanford, Harvard and Princeton). Kramaric actively solicits new software disclosures within MIT and then conducts wide-ranging marketing campaigns. To do so, she develops mailing lists of potential licensees and advertises in industry newsletters. Her technology scanning is
Kramaric sees department heads as playing an important role in the transfer of software, by acting as overseers and establishing department policy. This is important, as much of the software licensed out of MIT comes not from the computer science departments, but from other labs as a by-product of their research efforts. Faculty in these departments often want to get the software out in the field quickly and are less concerned with monetary issues. Graduate students are important for their enthusiasm and its effect in interesting the TLO, but often suffer from tunnel vision. In licensees, project managers who have both the economic and human resources and an appreciation of the software are key to a successful transfer. She is working more extensively with outside attorneys as more software becomes susceptible to patent protection.

Kramaric describes her negotiating style as friendly, but firm. She adopts a supportive approach and carefully explains the rationale for the MIT boilerplate in the contract. Much of the process is information gathering which will permit a fair deal to be structured. She likes to be juggling multiple cases and believes that deadlines are largely governed by external events, especially the interest of potential licensees and the
effect of this interest on inventors. Kramaric believes the responsiveness of the TLO is a top priority in planning her work, and that this provides the TLO with leverage in dealing with licensees and credibility in dealing with inventors.

4.3 TLO Case Studies

4.3.1 Existing Companies

The choice between licensing to an existing or a start-up company is the decision of the individual TLO Officer. A recurring comment in all of the interviews is that the nature of the technology drives the decision whether to choose an existing company. Is the technology thick enough to base a start-up around it? Is it hot and unique? Does it need the dedication of a team to bring the technology to market? A second common comment was that the inventor needed to be interested in making a start-up work. Without the enthusiasm of the inventor, the transfer process to a start-up was given less chance of succeeding. The large firm/small firm typology of Dumbleton\(^1\) may also be of help in explaining the choice between existing firms and start-ups.

Case A-1 was the license of technology for controlled linear release of a drug. The technology was original and had

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\(^1\) See Sub-section 2.16.
potentially high value and, therefore, might suggest a likely start-up candidate. However, the original research had been funded by the licensee through the OSP and the licensee had the option rights. FDA tests were required before the product could be brought to market. Under Dumbleton's typology a large firm would possess the resources to handle the regulatory approvals, but might be bureaucratic, risk-averse and have problems identifying and acting on opportunities. The key factor for the TLO Officer here was the willingness of the company to bet on the technology: it was large enough to successfully exploit the product, but not so large as to be risk-averse. The President of the licensee was the driving force in the negotiations, and there was clear support for the project in the licensee.

Case B-1 was a license for technology which improved a known industrial product. In Teece's model\(^1\), the science here was in the paradigmatic stage of evolution and competition among processes would depend on economies of scale. Dumbleton's typology would suggest a large firm as the most appropriate to this type of innovation because the licensed technology could yield high cost savings over traditional processes only if used in large volumes. It is interesting to note that the licensee in this case practiced self-selection by

\(^1\) See Sub-section 2.17.
responding to the publicity generated by the notice in the MIT Report.

Case C-1 was the license of embryonic (but only medium-quality) technology for the fabrication of diamond devices. The licensee was an existing company, but was relatively small and had only been in business a short time. MIT took a small equity stake in the company as part of the deal. Again, the President of the licensee was driving the negotiations. However, this case is really a hybrid between a start-up and an existing company. The technology itself was not the basis for the company, but was closely associated with the existing core of the business. The TLO Officer expects to negotiate additional licenses of similar technology to the same licensee.

Case D-1 was the license of an original process for making traditional materials. Although similar to the type of innovation in Case B-1, here the technological advantage of the process was the production of a stronger product with better properties. The logical choice of a licensee for the TLO Officer was one of the four major existing companies in the field. All four were contacted, but only one responded with enthusiasm. The company did hedge its bet on the technology by agreeing initially to obtain only an option and to fund further research before committing to a license.
Case E-1 was the license of software with industry-specific application to the drilling and pumping of off-shore oil. The research had been sponsored by the company through the OSP, however, the license granted was non-exclusive. This case of licensed software is somewhat different than the licensing of patented technology on an exclusive basis. First, the non-exclusivity meant that there were no due diligence requirements. Second, the licensee was obtaining the software largely for its own use, and not to promote further dissemination.

4.32 Start-up Companies

As noted in Sub-section 4.31, the choice between a license to an existing company and to a start-up often depends on the technology and the inventor. Another key factor in the success of start-ups based on licensed MIT technology is the presence of quality venture capitalists. The problems with the small firm noted by Dumbleton (shortage of people, finance, cash flow and regulatory issues) can often be minimized when the venture capitalist takes an active interest in running the company and making it a success. The VC also acts as a screen: weeding out technologies which may be great science but have little chance for commercial success. As the active involvement of the venture capital community with the TLO is less than three years old, the effect of VCs on the long-run success of licensed
start-ups is not yet clear. Even the best venture capitalist does not have a perfect track record with start-ups.

Case A-2 was the license of state-of-the-art high technology materials. This is a classic case of the identified hot and unique technology which is thick enough to form the base for a start-up. The research which generated the technology was unfunded and the inventors had quickly reduced the idea to practice. The TLO Officer contacted a number of firms in the venture capital community about the technology and one moved quickly to commit to funding of $1 Million within a week. In this case, the VC acts as a proxy for the small firm with all the advantages noted by Dumbleton (ability to act quickly, lack of bureaucracy) but with access to significant resources. The second round of financing was completed quickly based on the contacts of the lead VC.

Case B-2 was the license of world class science in biotechnology at the "minus two" stage. Sponsorship of the research was federally funded. This was the first case where MIT took an equity position and was the genesis of the MIT policy on equity investments in licensees. The VC sponsoring the start-up agreed to major infusions of capital in the first four years, although a return on the investment in the technology was not expected for many years. In this case, the
first approach was made by the VC community and not by the TLO. The potential payoff here is great, but the risk is very high.

Case C-2 was an option to license potentially revolutionary metallurgical technology, but a license has not yet been granted. In this case, the approach of the TLO Officer to existing companies was unsuccessful because of the not-invented-here syndrome. The solution was to approach a VC to fund additional research on the technology in exchange for the option to license the technology and the right to assign the license to a start-up to be formed by the VC. The terms of the option were favorable to the VC, but the basic license terms favor MIT. However, the final terms of the license are subject to negotiation if the option is exercised.

Case D-2 was a pending license of a new application of super-conductivity at a very embryonic stage of development. The research was unfunded and there was no initial interest shown in the VC community. Negotiations with the principals of an existing small company to establish a start-up and obtain risk capital funding are continuing. Here, the inventor had been in favor of licensing to a start-up and had been promised equity. Under the MIT rules, research on the project at MIT would have then been ineligible for further funding. This has delayed the negotiations and as a result the inventor became less enthusiastic about the promoters of the start-up. The
delay has been fortuitous for MIT because the technology has now developed to the point where interest in the venture community may be rekindled.

Case E-2 was a license of graphics enhancement software for LISP hardware granted to a start-up company founded by the inventors. No venture funding was involved. The hardware supplier was interested in the success of the start-up. Here, the driving force was the inventors who wanted the technology licensed to their own company. They have faced the problems of small firms identified by Dumbleton (e.g. shortage of people, problems in attracting capital) but the nature of software development permits them to continue with limited resources if they have a customer (i.e. the hardware supplier) readily available. It is interesting to note that MIT has the right to terminate the exclusive license if the inventors are not effectively disseminating the software.

4.33 Problem Companies

The five problem companies studied present a variety of difficulties which may occur in licensing technology. All but one of the problem cases originated outside of the TLO: three with the old Patent Office and one with the OSP. As the choice of the cases was left up to the TLO Officer, one might argue that the choices were biased and sought to demonstrate the
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superiority of the new licensing philosophy at the TLO. However, a simpler explanation may be that problem cases are not really observed to be problems until they have continued for five years or more without success. Indeed, most of the cases are of an older vintage. It will be interesting to see what constitute the problem cases for the TLO in 1995.

Case A-3 was a license of technology for casting aluminum originally granted in 1982 and negotiated by the old Patent Office. The structure of compensation is high upfront fees with negligible running royalties. In fact, a prior license of the same technology had been terminated because of this structure. The key problem today is the effective perpetual license which has been granted and the extension of the grant to improvement patents. Effectively, the licensee gets rights to anything new in the same field which MIT patents, and this has restricted the ability of MIT to perform and fund other research in this area. The licensee has no interest in giving up its dominant position and dissemination of new technology is being frustrated. Currently, new licenses are carefully drawn to exclude rights to improvement patents (unless the original patent's claims dominate the improvements).

Case B-3 was a biotechnology license for a new molecule granted in 1983. The agreement was tied to an OSP research contract and joint research with other universities. Due
diligence provisions required FDA approval within seven years, and specific steps to commercialization thereafter. However, the licensee suffered financial reversals prior to the end of the seven years (due to real estate investments). MIT and the other licensors were unsecured creditors when the licensee filed for protection from its creditors under Chapter 11 of the Bankruptcy Code. Plans for assignment of the license to another company as part of an approved workout have fallen through. No revenues are being realized and the technology is not being disseminated.

Case C-3 was the license of technology for producing molecule-based microelectronic devices in 1985. The license was negotiated by the old Patent Office. The licensee had bargained for escalating fees and percentages to lighten the front-end of the agreement. Then, they apparently did nothing with the technology and resisted sublicensing the technology to other companies, saying it was against their company policy. The exclusive license gave them the opportunity to keep the technology out of the hands of competitors while they worked on their own alternative proprietary technology that would accomplish the same result. Their license was terminated, but the licensee has effectively stalled the dissemination of the technology and in the process generated little revenue for MIT.
Case D-3 was the license of a novel coating technology originally granted in 1977 and negotiated by the old Patent Office. Although there were no specific due diligence provisions, the company did actively develop the technology into a product. Technically, the product was a success, but it was a marketing flop. To prevent it from cannibalizing the existing product line, the company priced the product out of the market. The announcement of the breakthrough, however, sent the stock price soaring. To meet the stated production rate in the SEC disclosure, the company produced an oversupply of the product and warehoused it. Subsequently, the stock price fell and the company was taken over. The vast inventories of the product and the location of the production facility led the new owners to sell the property for its value as real estate. The license was terminated.

Case E-3 was the license of software to a former MIT researcher who had developed it while at MIT. The license was negotiated by the TLO as a last resort because the technology had been around for a number of years and there had been no real interest shown by a commercial licensee. The inventor would not agree to any significant due diligence milestones. However, the TLO conceded this point because there was no other potential licensee. The expectations for the technology were low and the license was terminated for failure to file an
annual report of activity. The license is now being renegotiated on a non-exclusive basis.
5.0 CONCLUSIONS AND IMPLICATIONS

5.1 General Comments

The Technology Licensing Office has returned to its historical roots under the direction of John Preston. The focus of the Officers is directed toward the effective and rapid transfer of technology and away from an overly cautious legal approach. Although the Officers may not be completely familiar with the academic literature in the fields of innovation and technology transfer, their intuitive approaches and rules of thumb are consistent with that literature.

The importance of the first stage of innovation identified by Marquis¹ (a combination of market demand and technical feasibility in a single idea) is implicitly accepted as essential to the transfer process by all TLO Officers. The importance of an inventor who can see the commercial aspects of an invention is also a consistent theme in the interviews. The second stage in the Marquis model (the choice between a new invention and adoption of an existing invention) arises for the TLO Officer when the technology is evaluated. The Officer must make an implicit calculation of the trade-off between the value of the disclosed invention and that of substitute technologies. An explicit tradeoff calculation by potential licensees under

¹ See Sub-section 2.14.
Contractor's model\(^1\) will be made later in the marketing and negotiation phases, so a culling of inventions at this stage is desirable. The next stage in the Marquis model (developmental) may take place under an option agreement or through additional sponsored research. Alternatively, all or part of this stage takes place after the technology has been formally transferred through the license agreement. The final stages are the responsibility of the licensee, but MIT shares the risk through its reliance on running royalties in the license agreement.

The Teece model\(^2\) has implications as well. First, the issue of the appropriability of the technology developed at MIT is important for the TLO. Preservation of the know-how as a trade secret might be the preferred method of protection, for many MIT inventions, if they had instead originated in laboratories within industry. However, because MIT's policy on dissemination of information precludes reliance on trade secret protection, patent or copyright protection must be sought instead. As a result, from the narrow viewpoint of commercialization, some inventions will receive sub-optimal protection. Others may go undeveloped because patent or copyright protection is inappropriate. If Teece is correct, then successful innovation and commercialization of MIT inventions will occur where there is either sufficient patent

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1 See Sub-section 2.25.
2 See Sub-section 2.17.
or copyright protection, or the existence of cospecialized assets in the licensee. Where there is sufficient protection of intellectual property rights, the success of a start-up firm may depend on its access to complementary assets such as marketing, distribution, manufacturing, service and support. The presence of a quality venture capitalist may make the acquisition of these assets possible.

Second, Teece's distinction between the preparadigmatic and paradigmatic stages of technological evolution is important. In technologically mature industries, such as materials, the basic science is not changing rapidly. Competition among industry participants will be based on incremental advantages in process technology\(^1\). When the technology disclosed to the TLO is most suitable for an industry in the paradigmatic stage of evolution, the best candidates for licensees are existing companies possessing cospecialized assets, or new entrants who will enter into strategic partnerships with established companies possessing those assets. Finally, the start-up firm funded by a venture capitalist may have the necessary access to complementary assets.

As noted, the interviews with the Officers reflect an appreciation for the operation of the academic theories in

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\(^1\) See Case B-1.
practice. The implications of applying these models to the operations of the TLO are not radical. To examine the link between theory and practice in greater detail, the TLO will be analyzed at the macro level. Then, the licensing process will be examined at the micro level to identify key decision and leverage points in the licensing process.

5.2 Overview and Analysis

5.21 Key Functions within the University

Lynton and Elman's argument\(^1\), that the role of the modern research university should encompass the functions of the land grant institution, is implicitly accepted in MIT's current policy\(^2\). The three necessary functions identified by the authors are performed at MIT by the faculty, staff and students, and by the three principal transfer agents: the ILP, the OSP and the TLO. The TLO is primarily involved in the *brokering and negotiation* function and shares this responsibility with the OSP. Whereas the old Patent Office may have been limited to this function, the TLO has gone beyond this narrow role to become an important participant with the ILP in the *information and communication* function. By effecting the proper match between external needs and MIT expertise, the TLO has enhanced its ability to perform its

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\(^1\) See Sub-section 2.31.  
\(^2\) See Section 3.3.
primary brokering and negotiation function and the faculty's ability to perform the essential delivery function.

5.22 Historical Perspective

The mission of the TLO today is a return to the primary objectives of the MIT Patent Committee articulated in 1937\(^1\). The goals of reasonable access to technology, avoidance of litigation and maintenance of cordial relationships with the public are as valid today as they were fifty years ago. Arguably, the loss of America's position as the world's leading industrial power makes this mission even more critical today. The recent study, *Made in America*\(^2\), notes that capital investment and technological innovation that can quickly reach the factory floor are critical factors for future American industrial success. To assist industry in meeting this challenge requires responsiveness and cooperation on the part of the university and its technology transfer agents. The report recognizes the need for industry to take a longer-term view to remain competitive. Similarly, the TLO has decided to take the long-term view with respect to cooperative negotiation and return on its licenses. The legal protection of property rights is still important, but has been relegated to its proper role as a support function for technology transfer.

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1 See Sub-section 3.11.
5.23 Industry Funding of Research

The role of industry in the sponsorship of university research is growing in importance. As noted, there is increasing concern in the literature about the loss of academic freedom when industry is directing the basic research. In the past, MIT has learned some difficult lessons\(^1\) about the conflicts of interest between industrial sponsors of funded research and the freedom of the university to perform and protect future research. New policies adopted by the TLO and the OSP seek to avoid the overt conflicts between industry and the university. But the general growth of industry funding, and the growth in importance of joint consortia both raise some difficult issues.

The TLO is allocating significant resources to encouraging start-ups funded by venture capital firms. With few exceptions\(^2\), venture capital firms are unwilling to sponsor university research, and start-ups by definition are unable to fund research. The technology available for transfer to start-ups will therefore be limited to that resulting from research with no industrial sponsors\(^3\). The relative success of venture funded start-up compared to licenses granted to existing

\(1\) See Case A-3.

\(2\) See Case C-2.

\(3\) It should be noted, however, that occasionally start-ups have funded research licensed to them on a non-exclusive basis.
companies will become more certain in the future. The TLO strategy of focusing on these ventures is evidence of the belief held by its Officers that this arrangement is preferable for certain embryonic technologies.

However, the continued availability of new ideas for these ventures is a matter of concern. One would hope that a steady supply of federally funded and unfunded research can generate new inventions not already spoken for by existing corporate sponsors. However, if the Institute relies more and more on industrial sponsors, the freedom to structure deals may be endangered. It is true that the rights given to sponsors under research contracts do not guarantee them a license. However, a strong presumption exists that they are entitled to license the technology on reasonable terms. The concern expressed is not directed to the terms of the license. A start-up and an established firm could strike essentially the same deal with the TLO. Rather, the problem may be that a start-up is the best vehicle for exploiting and disseminating the technology and the TLO is precluded from using it because of an existing research agreement.
5.3 Process Analysis

5.3.1 From Lab to TLO

The process by which technology makes its way from the lab to the TLO is determined largely by the institutional structure of MIT's technology transfer agents. The changes in the TLO organization and mission since 1985, and the recently adopted changes in the overall MIT policy on intellectual property, are welcome ones. The new institutional structure should be conducive to more effective technology transfer in the future. Further evolution in this structure and the relationship between the TLO and other transfer agents (e.g. the OSP and the ILP) will no doubt take place. However, this Sub-section will assume the continuance of the current structure, and examine the most important points in the process where the TLO has the greatest leverage.

The path from the laboratory to the TLO is not certain. The research and development work at MIT is, of course, more basic than that performed in industry. The research may be directed or undirected in Fusfeld's terminology, but in either case the embryonic stage of the science may make it difficult to link the new idea with a viable innovation. The key agent in the linkage identified in the TLO interviews was the inventor. Indeed, it was noted that a relatively small number
of professors generated a disproportionately large number of disclosures. After the reorganization of the TLO, the first step in reaching these inventors was through the existing MIT networks of John Preston and Lita Nelsen. The next step was ensuring that the TLO was responsive to these inventors. All Officers noted a high level of reactive activity, and placed great emphasis on the speed and quality of service to the inventors. This high level of service has and will continue to generate repeat business from the most prolific inventors.

The favorable word of mouth generated by the high level of service and the increasing licensing revenues of the TLO should generate more general interest in technology licensing and should build up the networks of the newer TLO Officers. The TLO's five year plan anticipates a rapid growth in the number of disclosures\(^1\). The successful inventors will continue to make the linkage between ideas and innovation. However, as the success of these inventors and the TLO becomes apparent, it is inevitable that more marginal disclosures will be made to the TLO. These disclosures will strain the resources of the TLO and make the evaluation phase of the licensing process critical.

The evidence from the TLO interviews suggests a key assumption made in this phase is that the technology works.

\(^1\) Kelley, 1988.
The rationale for this practice is clear: if emerging technologies are disclosed to the TLO, the inventor and not the Officer is in the best position to make a technical assessment of the research. But, not all inventors will possess the vision to go with that technical ability. For the Officer, some background in the discipline is useful in communicating and assisting the inventor. However, effective evaluation in this phase depends less on knowledge of science, than on being an effective catalyst. First, if the TLO Officer has a well developed network of contacts within the Institute (or within a department) the first cut at the problem is assessing the reputation of the inventor for making the necessary linkage. Second, if the Officer has a well developed outside network, a quick reading of the commercial viability of the technology can be obtained. Finally, if the Officer can make the same kinds of linkages that distinguish the better inventors, without the complete technical knowledge possessed by an inventor, then potential value can be realized where it might otherwise be overlooked.

The issue of the promotion of the TLO within MIT is important to consider in this context. Several Officers reported efforts at proactive measures to prospect for new inventions. At the same time, all Officers noted that the enthusiasm of the inventor was critical to the transfer process. However, a campaign within a department may turn up
marginal disclosures. Therefore, any prospecting efforts that are too specific may be counterproductive by increasing the workload. Also, the responsiveness of the TLO to disclosures that are self-selected by the inventors (or prompted by inquiries of potential licensees) may suffer. This could be offset by increasing the number of professional staff, and, either reducing the individual case load or specializing along functional lines. Both of these alternatives have drawbacks.

5.32 From TLO to Licensee

The *marketing* phase of the licensing process is not clearly delineated from the *evaluation* phase. The interviews suggest that many disclosures are prompted by outside interest and that the inventor is often responsible for locating the licensee. As the number of disclosures increase the marketing effort may become increasingly important in matching technologies on the margin. As well, any linkages identified by Officers, in fields of use not envisioned by the inventor, create value at little additional cost. Finally, Reimers offers the rule of thumb\(^1\) that except in clearly significant new technologies, the marketability of the invention is inversely proportional to the time from its initial disclosure. Although this may be untrue where development of the technology

in the university laboratory is ongoing, it suggests that rapid throughput of inventions would be desirable in most cases.

The key role of the TLO Officer in marketing is to act as a gatekeeper. Unlike Allen's gatekeeper\(^1\), the TLO does not act as a conduit for technical information into MIT. Rather, it acts as the conduit of commercial and market realities to the MIT laboratories. As such, it is less important that the TLO gatekeeper is current with all the latest developments in basic science. Of greater importance, is the ability to stay current with innovations in industry and products in the marketplace. The Officer's network of contacts in industry is critical to acting as an effective gatekeeper for MIT.

The rapidity of technology transfer depends on a number of factors cited by Doctors\(^2\). The divisibility of the technology and its compatibility with existing technology are positively correlated with the rate of transfer, but both are largely inherent in the science itself. The complexity of technology slows its transfer, but again this is outside of the control of the TLO Officer. Two factors which can be influenced are the ease of perceiving economic advantages from the new technology and the ease of communication between the inventor, the transfer agent and the innovator. First, if the TLO Officer

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1 See Sub-section 2.15.
2 See Sub-section 2.22.
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1 See Sub-section 2.15.
2 See Sub-section 2.22.
can effectively make (or assist the inventor in making) the economic case for the technology to potential licensees, then the transfer process should be accelerated. Again, the leverage results less from knowing the science than from understanding the business of the prospective licensee. Second, if the TLO Officer can open up the communication channels between the parties, the transfer can be expedited.

If Reimers is generally right in his rule of thumb, then finding any licensee quickly may be preferable to finding the right licensee eventually. But aside from the eventual negotiation of due diligence provisions, the TLO Officer must adopt some screening mechanisms to protect against problem licenses. One method, noted previously, is allowing the companies to self-select the technolgy. Another used is setting the range of values in the negotiation high (especially with start-ups and VCs) to identify the serious parties. The five critical work functions in the innovative firm identified by Roberts and Fusfeld¹ may also be used. If those functions are not present in the key individuals the Officer is dealing with, then questions should be raised. Lita Nelsen explicitly recognizes this in looking for one person in an existing company who does three critical things well². Again, the

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¹ See Sub-section 2.15.
² See Sub-section 4.22.
Officer's network of contacts is as important in the screening of licensees as it was in screening disclosures.

5.33 Negotiation Process

The pace and dynamics of the negotiation with an identified licensee determines another critical leverage point for the TLO. The TLO interviews showed a general reluctance to shop a deal around the venture community. Instead deals of interest are generally offered to only a few VCs selectively matched by the TLO Officer. In non-venture deals the Officers stated that having competing potential licensees was a rarity. Even in the case of technology advertised in the MIT Report, it was unusual to have more than one bidder on a case. Yet, the lack of a ready alternative licensee is not an impediment to negotiating from a position of strength.

The sources of leverage for the TLO are primarily the reputation of MIT and the ongoing nature of technology transfer. First, MIT is (in Lita Nelsen's words) a worthy educational non-profit institution. Although licensees are hardly altruistic in their motives, there is a respect for the motives and mission of a research university such as MIT. As well, licensees may wish to deal with MIT or other research universities on other deals in the future. Second, in the context of a single deal, the successful transfer of the
technology will require the cooperation of the professors and staff at MIT. There may also be ongoing research in related areas to which the licensee needs access. Conversely, the TLO recognizes its dependence on the good will of the licensee to make the transfer work.

The range of values for university based technology is difficult to estimate because of its embryonic nature. In Contractor's model\(^1\), the TLO and the licensee probably both share the same ceiling: the present incremental value from the licensee's use of the technology. But, each may place a different value on this use, and the TLO may have no ready method for making this estimate. The floor for the licensee is its estimate of the TLO's present value of transfer costs. The TLO's floor exceeds the licensee's floor by the present value of the opportunity costs of choosing this licensee instead of an alternative. The difficulty in estimating the ceiling for the TLO is obviated by the new emphasis placed on running royalties.

The floor presents greater difficulties as the opportunity cost is highly speculative. In case D-2, we saw a situation where the technology had matured sufficiently during negotiations to raise the opportunity cost of dealing with the first company. The initial indifference of the venture capital

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\(^1\) See Sub-section 2.25.
community had changed to active interest. But normally, if the licensee believes the opportunity cost of the TLO is zero, and has doubts about the value of the technology, it can improve its position by delaying. In effect, by entering into negotiations which drag on, it obtains the value of an option on the technology without paying for it. Presumably, informational asymmetry about the incremental value of the technology works to the advantage of the licensee in these cases. What is important, is that the Officer be able to judge when a licensee is stalling. The choice of effective negotiating tactics to call the licensee's bluff will increase the leverage of the TLO.

The TLO can make effective use of the leverage it has gained from its association with MIT. Questions of timing and tactics are important, but a full discussion in the context of negotiation theory is beyond the scope of this thesis. The questions of how the TLO effectively screens inventions, selects licensees and negotiates have yet to be answered in full. These issues provide fertile ground for future research.
6.0 ISSUES AND SUGGESTIONS FOR FUTURE RESEARCH

6.1 Outstanding Issues

This thesis has attempted to frame its analysis of the TLO within the larger context of the innovation process, the university-industry environment and the technology transfer process at MIT. Many issues remain unexplored and are fruitful areas for further research. This Section 6.1 will identify some of these issues. Suggestions for gathering data to assist further research efforts will be made in Section 6.2.

The first issue of interest is a comparison of MIT's practices with those of other research universities. On a macro level, the TLO works with the OSP and the ILP to effect the transfer process. Are the functions separated at other universities, or, is a single agent performing the functions of all three? Are these differences a function of the size of the research budgets (i.e. is critical mass important?), or, is the type of research more important? On a micro level, are the offices staffed by legal counsel, by researchers/scientists or by business professionals? Are the offices proactive or reactive? Are the licensing officers specialized, and if so, specialized by area of research within the university or by the industry they support?
Second, within MIT, are the functions of the TLO and the other agents allocated for maximum effectiveness? The funding of research is separated in large part from the licensing of the technology, although research and consortia agreements do have standard terms for licensing. Should the function of the agents be separated? Is a centralized or decentralized structure more effective? A parallel issue concerns the effectiveness of directed and undirected basic research at MIT. Do the most important discoveries result from one or the other, and what criteria should be used to measure a discovery's importance? What weight should be given to intangible variables (e.g. academic freedom) in this evaluation? As well, what is the most effective vehicle (e.g. start-ups or existing companies) for exploiting these discoveries? When is one more appropriate than the other, and has the method of funding limited the options of MIT in choosing that vehicle?

Third, within the TLO, what are the optimum staffing criteria? By increasing the number of Officers you can, perforce, increase the Officer time available per case, given a constant case load. But, does increasing the number of officers dilute their effectiveness with their contacts in MIT and outside? Is there a critical mass of cumulative case experience and ongoing workload which allows the Officer to effect the matchmaking process? As well, how important is case throughput to the viability of technology? Is it more
important to get technology licensed than to find the perfect licensee and what are the trade-offs? In one case\textsuperscript{1}, we saw the fortuitous effect of unexpected delay when the technology developed sufficiently to interest the venture community. Are there circumstances in which the TLO should allow the technology to age in-house? Can we classify the stages of development of received disclosures in a meaningful way, which will allow the TLO to decide on the velocity of the licensing process for an invention? Or, are the external driving forces (e.g. enthusiasm of inventors, interests of licensees) so much more important and certain that we are will to discount completely the opportunity costs associated with foregoing later alternatives?

Finally, for a given technology and licensee, how can the TLO Officer increase the probabilities for success? Here, the first step is to define success. Is success monetary (e.g. total revenues generated for MIT), scientific/technical (e.g. feasibility and usefulness) or transfer-oriented (e.g. rate of diffusion and scope of dissemination)? Then, what structures in the license agreement can help to promote success as defined? Specifically, what payment structures and due diligence provisions are optimal for different types of technology and licensees? Rules of thumb are used today, but can these be quantified or catagorized? Is it preferable to

\textsuperscript{1} See Case D-2.
have simple self-enforcing provisions (e.g. minimum royalty rates) which force licensees to develop or terminate, or are detailed milestones preferable? Should the TLO allocate significant resources to enforcement and monitoring complex agreements?

6.2 Future Data Gathering

The introduction of the Licensing Office Information System (LOIS) provides the opportunity to gather and organize data about professors, technology and companies for future research. Individual Officers organize and integrate this information in different ways. Ideally, the creation of a relational data base would be the first step in the process. This would permit more analysis of the foundations of successful technology transfer at the TLO. Ultimately, when this process is better understood, an expert system which follows the thought processes of the most successful Officers might be developed. The primary purpose of LOIS, however, is to provide an efficient accounting and tracking function. Storage and classification of data which impairs this function must not be undertaken lightly. As well, the cost of collecting and preparing the data must be considered.

Given these caveats, the following data may be of interest:
• MIT Information: data on professors, students, and researchers regarding fields of specialty, sources of funding, past successes and failures, and their abilities to link ideas and innovation.

• Technology Information: classification of technology by characteristics and factors noted by Robinson and Doctors¹.

• Company Information: characterization of companies by size/age, financial viability, presence/absence of complementary assets, and organizational structure; identification of key players in the Roberts and Fusfeld typology².

¹ See Sub-section 2.22.
² See Sub-section 2.15.
Selected Bibliography


8.1 Appendix A

Case Study: Existing Company A-1

TLO Officer: John Preston

Nature of Technology:

- drug delivery system provides controlled linear release
- original technology
- potential high value

Summary of License Provisions:

Date of License: September 26, 1988
Exclusivity: yes
Term: to end of patent term/ 10 years for some parts
Fixed License Fees: $252,500
Running Royalties: 3.5% to 5.0% of net sales, depending on the field of use and volume of sales
Minimum Annual Royalty: $5,000 rising to $60,000 and then higher after first commercial sale
Due Diligence Milestones: fund research of approx. $2 million over five years; seek FDA approval; clinical trials after 6 months; first commercial sale after one year; annual report to MIT

Origin of Technology:

- OSP research agreement
- faculty and graduate students
Involvement of TLO:

- standard invention disclosure
- professor introduced TLO to licensee

General Description of Negotiations:

- began under old Patent Office structure; lawyers negotiating for both sides; complex agreements
- driving forces were President of licensee and professor
- professor knowledgeable; knew what technology was worth

Negotiation of Due Diligence/Money:

- complex due diligence
- TLO set bargaining range based on professor's estimate of the technology's value

Subjective Quality Evaluation:

- high quality sponsor, technology and management

Other Comments:

- large existing company, but not so large as to be risk-averse; willing to bet on the technology
- originally executed an option agreement with licensee
Case Study: Start-up Company A-2

TLO Officer: John Preston

Nature of Technology:

- state-of-the art high technology materials
- original, with very high potential value

Summary of License Provisions:

Date of License: July 6, 1987
Exclusivity: yes
Term: 8 years after first commercial sale/11 years after date of agreement
Fixed License Fees: $75,000
Running Royalties: 3.0% of net sales, but may be reduced if other royalties due; minimum of 1.5%
Minimum Annual Royalty: $10,000 after third year
Due Diligence Milestones: business plan within 6 mos.; demonstrate commercialization within three years by achieving $500,000 revenues; raise $1 Million equity within one year.

Origin of Technology:

- unfunded research by two MIT professors and researcher
- original concept quickly reduced to practice
Involvement of TLO:

- Professors approached TLO; thought technology was commercially interesting
- Filed within two weeks; TLO suggested new technology appropriate for start-up
- Marketed idea in the venture community

General Description of Negotiations:

- VC contacted; met with next day; committed to $1 Million within one week
- VC split 1st round financing with other VC
- 2nd round of $3.5 Million arranged quickly
- VC became driving force

Negotiation of Due Diligence/Money:

- TLO set bargaining range; negotiated downward by VC
- Due diligence asked for was aggressive, but easily met

Subjective Quality Evaluation:

- Very high quality VC and technology; management team to be put in place by VC

Other Comments:

- MIT issued common stock equivalent to 20% of first $1 Million of financing; anti-dilution protection
- New mode for VC funds; almost funding basic research
Case Study: Problem Company A-3

TLO Officer: John Preston

Nature of Technology:

- technique for casting aluminum
- very original process with high potential value

Summary of License Provisions:

Date of License: January 1, 1982, modified Nov. 1984
Exclusivity: yes
Term: life of patent
Fixed License Fees: $25,000 per site
Running Royalties: effectively zero
Minimum Annual Royalty: $75,000 in year one; $100,000 in year two; and nothing thereafter
Due Diligence Milestones: none

Origin of Technology:

- MIT Professor in materials science; 15 year development effort resulting in invention
- federal DOD sponsorship

Involvement of TLO:

- agreement negotiated by old Patent Office
- prior license had been terminated; new licensee spun off division using licensed technology
- TLO involved in negotiating clean-up of problems
General Description of Negotiations:

- original agreement contained onerous lump sum payments and virtually no running royalties
- Patent Office ceded a virtual perpetual license

Negotiation of Due Diligence/Money:

- Not known

Subjective Quality Evaluation:

- High quality technology

Other Comments:

- licensee has very high leverage with MIT; rights to improvement patents were granted which restrict MIT's ability to perform and fund other research in this area
Case Study: Existing Company B-1

TLO Officer: Lita Nelsen

Nature of Technology:

- improvement of a known industrial product
- small savings per pound in cost, but in large volume this yields potentially high value

Summary of License Provisions:

Date of License: pending
Exclusivity: yes
Term: 12 to 20 years depending on territory
Fixed License Fees: $100,000 on execution
Running Royalties: 3% of net sales during exclusivity; 2% thereafter
Minimum Annual Royalty: $20,000 during period of exclusivity
Due Diligence Milestones: reasonable efforts only

Origin of Technology:

- federal government sponsored research
- faculty members trying to make a specialized device, but patent attorney drew the claims widely; claims covered eventual licensed use

Involvement of TLO:

- disclosure by inventors
- advertised technology in the MIT Report
- option granted to company #1 which failed to exercise within option period
General Description of Negotiations:

- two companies negotiating for license
- competitive bids, with TLO reserving right to choose

Negotiation of Due Diligence/Money:

- price bid up by two rivals, option holder could have exercised at lower price if timely
- reliance on minimum royalties as a proxy for milestones

Subjective Quality Evaluation:

- technology is mediocre (B-), but management team is high quality

Other Comments:

- the exception to the rule; rare that advertising in MIT Report works
- picked up by R & D newsletters
Case Study: Start-up Company B-2

TLO Officer: Lita Nelsen

Nature of Technology:

- embryonic, basic science
- world class technology

Summary of License Provisions:

Date of License: April 3, 1987
Exclusivity: yes
Term: 8 years after first commercial sale plus extensions
Fixed License Fees: $250,000 staggered schedule plus
$750,000 after patent claim granted or five years after agreement date (credited against future royalties)
Running Royalties: 3% of net sales and 5% of revenues from sublicensing
Minimum Annual Royalty: none
Due Diligence Milestones: business plan in one year; spend a total of $4 Million within four years

Origin of Technology:

- Department of Biology Professors and researchers
- federal government sponsored research

Involvement of TLO:

- professor contacted TLO
- first VC approached professor after presentation of paper
General Description of Negotiations:

- first VC was applying "slice-of-salami" negotiating tactics
- attorney was positioning
- TLO dropped the first VC and offered it to second VC at the last asking price; second VC accepted

Negotiation of Due Diligence/Money:

- second VC took offer as it stood
- due diligence is simply putting in enough money to prove serious intent

Subjective Quality Evaluation:

- top quality all around: science, VC, management
- faculty member joining firm

Other Comments:

- MIT takes 10% of equity stake of first $2 Million
- licensee may pay $10 Million at any time in lieu of all future royalties
- established equity policy at MIT (first case)
- first VC eventually bought into deal led by second VC
Case Study: Problem Company B-3

TLO Officer: Lita Nelsen

Nature of Technology:

- biotechnology; new molecule
- original; apparent potential

Summary of License Provisions:

Date of License: December 2, 1983
Exclusivity: yes
Term: 10 years from FDA approval
Fixed License Fees: none
Running Royalties: 7% of net sales plus 7% of royalties paid by distributor
Minimum Annual Royalty: none
Due Diligence Milestones: FDA approval within 7 years; first commercial sale 1 year thereafter; in-plant inspection 6 mos. thereafter; business plan

Origin of Technology:

- joint government sponsored research with other universities

Involvement of TLO:

- OSP responsible for the initial negotiations of research agreement
General Description of Negotiations:

- original negotiations for the universities headed up another institution acting as agent
- TLO acting in potential workout under Chapter 11

Negotiation of Due Diligence/Money:

- no information

Subjective Quality Evaluation:

- technology was quite good but management of company was suspect

Other Comments:

- link of sponsored research with the licensing agreement was tenuous; legal questions
- company got out of control; sought protection under chapter 11 of Bankruptcy Code
- MIT and other universities unsecured creditors with respect to royalties; trustee keeps license
- workout plans fell through
**Case Study:** Existing Company C-1

**TLO Officer:** Ronald Scharlack

**Nature of Technology:**

- diamond device fabrication
- embryonic technology

**Summary of License Provisions:**

*Date of License:* June 6, 1982  
*Exclusivity:* yes  
*Term:* 8 years after commercial sale or 10 years after agreement date  
*Fixed License Fees:* $25,000 in five payments  
*Running Royalties:* 3% on first $50,000,000 of net sales; 2% thereafter  
*Minimum Annual Royalty:* $25,000 first year; $35,000 thereafter  
*Due Diligence Milestones:* business plan; working lab device and in-plant inspections; sales of $50,000 in year one; $500,000 in year two; and $1,000,000 thereafter

**Origin of Technology:**

- Lincoln Laboratory; government sponsored research

**Involvement of TLO:**

- TLO heard about technology from someone else and asked inventors to file a disclosure  
- President of licensee came in and asked for license to technology
General Description of Negotiations:

- relatively quick
- licensee's President driving the negotiations, but reluctant to put up cash

Negotiation of Due Diligence/Money:

- initial range set by TLO based on an estimate of what was reasonable
- inventors provided input
- give and take with licensee

Subjective Quality Evaluation:

- quality of technology was medium, but management team was high quality and very enthusiastic

Other Comments:

- MIT to get 1.5% equity in company (a young company)
- niche market for the technology, but high hopes
- potential for other licenses of different technology to same company
Case Study: Start-up Company C-2

TLO Officer: Ronald Scharlack

Nature of Technology:

- potentially revolutionary approach in metals
- high risk; much uncertainty

Summary of License Provisions:

Date of License: Option signed December 31, 1987
Exclusivity: yes, if exercised
Term: 10 years
Fixed License Fees: $25,000
Running Royalties: 2%/5% of net sales plus 50% of sublicensing fees
Minimum Annual Royalty: $100,000 after five years
Due Diligence Milestones: business plan; development team; working laboratory model; scale model; commercial scale within four years; in-plant inspections; commercial production within 5 years; investment of $500,000 within 30 months and $1.5 Million within 5 years

Origin of Technology:

- professor at MIT; had no research money
- option provided funding

Involvement of TLO:

- technology not marketable to existing companies; NIH syndrome
- TLO arranges funding though option agreement with VC and Office of Sponsored Programs
General Description of Negotiations:

- favorable terms to VC on option agreement
- but draft license terms drawn in favor of MIT; these must be negotiated eventually

Negotiation of Due Diligence/Money:

- TLO established a favorable range for MIT

Subjective Quality Evaluation:

- high for VC and very high for technology; management an unknown

Other Comments:

- unusual arrangement to get seed capital for research from a VC
- no license has yet been concluded
Case Study: Problem Company C-3

TLO Officer: Ronald Scharlack

Nature of Technology:

- molecule-based microelectronic devices

Summary of License Provisions:

Date of License: November 7, 1985
Exclusivity: yes
Term: 10 years
Fixed License Fees: $15,000 on signing; $15,000 on patent
Running Royalties: 1% rising to 5% of net sales, depending on sales volume
Minimum Annual Royalty: $20,000 rising to $50,000
Due Diligence Milestones: business plan within four months; target a specific product within one year; in-plant inspections; prototype within two years; first commercial sale within 54 months

Origin of Technology:

- faculty under sponsored research

Involvement of TLO:

- originally negotiated by old Patent Office
General Description of Negotiations:

- company balked at high up-front fee
- company policy not to sublicense, indicated they were not sure if they would use the technology

Negotiation of Due Diligence/Money:

- MIT setting range of values
- company attempting to lighten front-end of agreement

Subjective Quality Evaluation:

- unknown

Other Comments:

- company developed another technology to give same results
- apparently company merely wanted to tie up technology so its competitors could not have access
- terminated by notice for failure to fulfill due diligence
Case Study: Existing Company D-1

TLO Officer: Christina Jansen

Nature of Technology:

- original process for traditional material
- stronger with better properties
- potentially high valuation

Summary of License Provisions:

Date of License: October 31, 1988
Exclusivity: yes
Term: 8 years first commercial sale; 10 years from agreement date
Fixed License Fees: $25,000 in two payments; $10,000 on patent issue
Running Royalties: 7% of net sales during exclusivity; 3% thereafter
Minimum Annual Royalty: $1,000 rising to $10,000 in year 3 and thereafter
Due Diligence Milestones: sponsor research at MIT to bring product to market within 2 years; field tests and in-plant inspections; sales according to an agreed-upon schedule

Origin of Technology:

- research on base process sponsored by federal government
- student saw unique application to new area
Involvement of TLO:

- student contacted TLO with idea
- TLO marketed to four major European companies in the industry

General Description of Negotiations:

- all companies responded but only licensee followed through
- licensee eager to conclude deal; driving force

Negotiation of Due Diligence/Money:

- TLO set initial range and company asked for lower up-front payments in exchange for a higher royalty
- agreed to commit to specific targets, flexibility was key to agreement

Subjective Quality Evaluation:

- high quality technology and first rate management team

Other Comments:

- very easy negotiation, very quickly concluded
- inventor easy to work with; very professional academics
- originated as an option; agreement to sponsor $50,000 of research and pay $10,000 option fee ($7,500 to be credited against license fees)
Case Study: Start-up Company D-2

TLO Officer: Christina Jansen

Nature of Technology:

• new application of super-conductivity principles
• upper middle range of value

Summary of License Provisions:

Date of License: pending
Exclusivity: yes
Term: negotiable
Fixed License Fees: $50,000
Running Royalties: 6% of net sales during exclusivity; 3%
thereafter
Minimum Annual Royalty: $25,000 per year
Due Diligence Milestones: business plan, additional
funding of $5 Million; develop working model; in-plant
inspections; net sales targets; timetable for first
commercial sale

Origin of Technology:

• unsponsored, bootstrap research at MIT
• research associates
Involvement of TLO:

- inventors approached TLO at early stage of technology
- patent filed, no interest by VC community; too new
- potential licensee found out about technology, approached TLO, inventor to consider taking equity, but new guidelines complicate additional funding for research

General Description of Negotiations:

- license agreement not yet concluded; foot-dragging by company on money
- no problem with the due diligence proposal

Negotiation of Due Diligence/Money:

- MIT set ranges, but company has been delaying

Subjective Quality Evaluation:

- quality of technology is medium to high;
  quality of management team is suspect: may not get funding

Other Comments:

- in theory, TLO allowed to make deals against the inventor's wishes, may market the technology to other firms if deal is not concluded; inventor is souring on idea of licensing to company
Case Study: Problem Company D-3

TLO Officer: Christina Jansen

Nature of Technology:

- original coating technology with a number of potential applications
- old technology (1977)

Summary of License Provisions:

Date of License: March 1, 1977
Exclusivity: yes
Term: 10 years from first commercial sale; 12 years from agreement date
Fixed License Fees: $12,500
Running Royalties: 3% of net sales during exclusivity; 1.25% thereafter
Minimum Annual Royalty: none
Due Diligence Milestones: no specific milestones; company commits itself to a vigorous and diligent program of exploiting patent rights to produce a product

Origin of Technology:

- professors at MIT

Involvement of TLO:

- negotiated by old Patent Office
General Description of Negotiations:

- licensee was aggressively pursuing license for technology and was willing to actively develop a product

Negotiation of Due Diligence/Money:

- no information; no real due diligence terms imposed

Subjective Quality Evaluation:

- technology good; but a marketing flop; suspect management motives

Other Comments:

- company overproduced product based on technology to satisfy SEC after premature disclosure
- company taken over and production facility for product sold for value of land
- better mousetrap, but not marketable at price asked
- technology may now be licensed to another company for a different application
Case Study: Existing Company E-1

TLO Officer: Karen Kramaric

Nature of Technology:

- software: specific to applications in offshore oil rigs
- used to analyze effect of wave motions on non-movable objects

Summary of License Provisions:

Date of License: November 7, 1988
Exclusivity: no
Term: 2 years and year to year renewal unless terminated by notice
Fixed License Fees: none
Running Royalties: 25% to 50% depending on particular application and sub-licensee
Minimum Annual Royalty: none
Due Diligence Milestones: none

Origin of Technology:

- sponsored research by company through OSP
- faculty and researchers

Involvement of TLO:

- inventors approached TLO with licensee in hand
- all marketing done by inventors
General Description of Negotiations:

- inventors were driving force for very high royalties
- licensee was interested in the software and eventually conceded to high demands
- TLO in reactive mode

Negotiation of Due Diligence/Money:

- no due diligence because non-exclusive

Subjective Quality Evaluation:

- medium quality software; high quality management

Other Comments:

- involvement of inventors was unique
- complicated by Joint Industry Program which generated different versions of the software
Case Study: Start-up Company E-2

TLO Officer: Karen Kramaric

Nature of Technology:

- software: graphics enhancement for LISP machines
- add-on and small potential value

Summary of License Provisions:

Date of License: July 21, 1986
Exclusivity: yes
Term: 3 years plus year to year renewals, but MIT has the right to terminate if in its reasonable opinion the inventors are not effectively disseminating software
Fixed License Fees: none
Running Royalties: 15% of net sales in year 1; 15% in years 2 & 3; and 5% thereafter
Minimum Annual Royalty: none
Due Diligence Milestones: best efforts to develop a market

Origin of Technology:

- invented by three graduate students; two of whom formed company; controversy in the department over deal

Involvement of TLO:

- students contacted TLO
- Patent Office to TLO transition occurring then led to a licensing delay
- MIT approved new policy
General Description of Negotiations:

- easy-going, friendly
- driving force was students and the producer of LISP machines

Negotiation of Due Diligence/Money:

- range of money was established by TLO rules of thumb
- no specific due diligence, but MIT has right to terminate license
- TLO lenient on start-up; no venture funding

Subjective Quality Evaluation:

- medium to high technology and bootstrap management team

Other Comments:

- very easy; no marketing required
**Case Study:** Problem Company E-3

**TLO Officer:** Karen Kramaric

**Nature of Technology:**

- software: algorithm for signal processing
- low potential value

**Summary of License Provisions:**

*Date of License:* September 4, 1987  
*Exclusivity:* yes  
*Term:* 3 years plus year to year renewals  
*Fixed License Fees:* none  
*Running Royalties:* 15% of net sales; one-third of sublicensing revenues  
*Minimum Annual Royalty:* $500 in year one, rising to $3500 in year four  
*Due Diligence Milestones:* provide evidence of business efforts for each year; escalating unit sales target over four years

**Origin of Technology:**

- developed by researcher who left MIT to work for commercial employer, who had licensed product from MIT and later terminated  
- product kicking around MIT, no general interest

**Involvement of TLO:**

- inventor approached TLO  
- last resort; nobody else wanted the software
General Description of Negotiations:

- inventor difficult to negotiate with

Negotiation of Due Diligence/Money:

- TLO wanted stricter milestones to ensure development
- inventor would not agree
- TLO gave in on due diligence, but this was a moot point
- terminated license for failure to file annual report of development efforts

Subjective Quality Evaluation:

- low quality technology and low quality inventor/entrepreneur

Other Comments:

- now renegotiating a non-exclusive license with inventor
- old employer is interested in the technology
8.2 APPENDIX B

LICENSE AGREEMENT

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PREAMBLE

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This Agreement is made and entered into this ______ day of
, 198 , (the Effective Date) by and between MASSACHUSETTS
INSTITUTE OF TECHNOLOGY, a corporation duly organized and
existing under the laws of the Commonwealth of Massachusetts
and having its principal office at 77 Massachusetts Avenue,
Cambridge, Massachusetts 02139, U.S.A. (hereinafter referred to
as M.I.T.), and ______________________, a corporation duly
organized under the laws of _____________ and having its
principal office at ________________ ___ (hereinafter
referred to as LICENSEE).

WITNESSETH

WHEREAS, M.I.T. is the owner of certain "Patent Rights" (as
later defined herein) relating to M.I.T. Case No.
______________________________

" by

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and has the right to grant licenses under said Patent Rights, <subject only to a royalty-free, nonexclusive license heretofore granted to the United States Government>.

WHEREAS, M.I.T. desires to have the Patent Rights utilized in the public interest and is willing to grant a license thereunder;

WHEREAS, LICENSEE has represented to M.I.T., to induce M.I.T. to enter into this Agreement, that LICENSEE is experienced in the development, production, manufacture, marketing and sale of products similar to the "Licensed Product(s)" (as later defined herein) and/or the use of the "Licensed Process(es)" (as later defined herein) and that it shall commit itself to a thorough, vigorous and diligent program of exploiting the Patent Rights so that public utilization shall result therefrom; and

WHEREAS, LICENSEE desires to obtain a license under the Patent Rights upon the terms and conditions hereinafter set forth.

NOW, THEREFORE, in consideration of the premises and the mutual covenants contained heretofore the parties hereto agree as follows:

**ARTICLE I - DEFINITIONS**

For the purposes of this Agreement, the following words and phrases shall have the following meanings:

1.1 "LICENSEE" shall include a related company of LICENSEE, the voting stock of which is directly or indirectly at least fifty percent (50%) owned or controlled by LICENSEE, an organization which directly or indirectly controls more than fifty percent (50%) of the voting stock of LICENSEE and an organization, the majority ownership of which is directly or indirectly common to the ownership of LICENSEE.
1.2 "Patent Rights" shall mean all of the following M.I.T. intellectual property:

(a) the United States and foreign patents and/or patent applications listed in Appendix A;

(b) United States and foreign patents issued from the applications listed in Appendix A and from divisionals and continuations of these applications;

(c) claims of U.S. and foreign continuation-in-part applications, and of the resulting patents, which are directed to subject matter specifically described in the U.S. and foreign applications listed in Appendix A;

(d) claims of all foreign patent applications, and of the resulting patents, which are directed to subject matter specifically described in the United States patents and/or patent applications described in (a), (b), or (c) above;

(e) any reissues of United States patents described in (a), (b), (c), or (d) above.

1.3 A "Licensed Product" shall mean any product or part thereof which:

(a) is covered in whole or in part by an issued, unexpired claim or a pending claim contained in the Patent Rights in the country in which any Licensed Product is made, used or sold;

(b) is manufactured by using a process which is covered in whole or in part by an issued, unexpired claim or a pending claim contained in the Patent Rights in the country in which any Licensed Process is used or in which such product or part thereof is used or sold.
1.4 A "Licensed Process" shall mean any process which is covered in whole or in part by an issued, unexpired claim or a pending claim contained in the Patent Rights.

1.5 "Net Sales" shall mean LICENSEE's <(and its sublicensees')> billings for Licensed Products and Licensed Processes produced hereunder less the sum of the following:

(a) discounts allowed in amounts customary in the trade;

(b) sales, tariff duties and/or use taxes directly imposed and with reference to particular sales;

(c) outbound transportation prepaid or allowed; and

(d) amounts allowed or credited on returns.

No deductions shall be made for commissions paid to individuals whether they be with independent sales agencies or regularly employed by LICENSEE and on its payroll, or for cost of collections. Licensed Products shall be considered "sold" when billed out or invoiced.

<1.6 "Tangible Property" shall mean ____________.
1.7 "Territory" shall mean ________________.
1.8 "Field of Use" shall mean ________________.

ARTICLE II – GRANT

2.1 M.I.T. hereby grants to LICENSEE the right and license to make, have made, use, lease and sell the Licensed Products, and to practice the Licensed Processes <in the Territory for the Field of Use> to the end of the term for which the Patent Rights are granted unless sooner terminated according to the terms hereof.

2.2 LICENSEE agrees that Licensed Products leased or sold in the United States shall be manufactured substantially in the United States.
2.3 In order to establish a period of exclusivity for LICENSEE, M.I.T. hereby agrees that it shall not grant any other license to make, have made, use, lease and sell Licensed Products or to utilize Licensed Processes <in the Territory for the Field of Use> during the period of time commencing with the Effective Date of this Agreement and terminating with the first to occur of:

(a) the expiration of ____ ( ) years after the first commercial sale of a Licensed Product or first commercial use of a Licensed Process; or

(b) the expiration of ____ ( ) years after the Effective Date of this Agreement.

2.4 At the end of the exclusive period, the license granted hereunder shall become nonexclusive and shall extend to the end of the term or terms for which any Patent Rights are issued, unless sooner terminated as hereinafter provided.

2.5 M.I.T. reserves the right to practice under the Patent Rights <and to use and distribute to third parties the Tangible Property> for <its own> noncommercial research purposes.

2.6 LICENSEE shall have the right to enter into sublicensing agreements for the rights, privileges and licenses granted hereunder only during the exclusive period of this Agreement. Such sublicensees may extend past the expiration date of the exclusive period of this Agreement, but any exclusivity of such sublicenses will expire upon the expiration of LICENSEE's exclusivity.

2.7 LICENSEE hereby agrees that every sublicensing agreement to which it shall be a party and which shall relate to the rights, privileges and license granted hereunder shall contain a statement setting forth the date upon which LICENSEE's exclusive rights, privileges and license hereunder shall terminate.
2.8 LICENSEE agrees that any sublicenses granted by it shall provide that the obligations to M.I.T. of Articles II, V, VII, VIII, IX, X, XII, XIII, and XV of this Agreement shall be binding upon the sublicensee as if it were a party to this Agreement. LICENSEE further agrees to attach copies of these Articles to sublicense agreements.

2.9 LICENSEE agrees to forward to M.I.T. a copy of any and all fully executed sublicense agreements, and further agrees to forward to M.I.T. annually a copy of such reports received by LICENSEE from its sublicensees during the preceding twelve (12) month period under the sublicenses as shall be pertinent to a royalty accounting under said sublicense agreements.

<2.10 LICENSEE shall not receive from sublicensees anything of value in lieu of cash payments in consideration for any sublicense under this Agreement, without the express prior written permission of M.I.T.>

2.11 The license granted hereunder shall not be construed to confer any rights upon LICENSEE by implication, estoppel or otherwise as to any technology not specifically set forth in Appendix A hereof.

ARTICLE III - DUE DILIGENCE

3.1 LICENSEE shall use its best efforts to bring one or more Licensed Products or Licensed Processes to market through a thorough, vigorous and diligent program for exploitation of the Patent Rights.

3.2 In addition, LICENSEE shall adhere to the following milestones:
(a) LICENSEE shall deliver to M.I.T. on or before
________________ a business plan showing the amount of
money, number and kind of personnel and time budgeted
and planned for each phase of development of the
Licensed Products and Licensed Processes and shall
provide similar reports to M.I.T. on an annual basis on
or before the ninetieth (90th) day following the close
of LICENSEE's fiscal year.

(b) LICENSEE shall develop a working model on or
before __________ and permit an in-plant
inspection by M.I.T. on or before _________
__________________, and thereafter permit in-plant
inspections by M.I.T. at regular intervals with at
least _____ ( ) months between each such inspection.

(c) LICENSEE shall make Net Sales according to the
following schedule:

198___  __________ units;
198___  __________ units;
198___ and each year thereafter  __________ units.

<d) Other milestones depending on invention being
licensed.>

3.3 LICENSEE's failure to perform in accordance with
Paragraphs 3.1 and 3.2 above shall be grounds for M.I.T. to
terminate this Agreement pursuant to Paragraph 13.3 hereof.

ARTICLE IV - ROYALTIES

4.1 For the rights, privileges and license granted
hereunder, LICENSEE shall pay royalties to M.I.T. in the manner
hereinafter provided to the end of the term of the Patent
Rights or until this Agreement shall be terminated as
hereinafter provided:
(a) License Issue Fee of $_________ Dollars, which said License Issue Fee shall be deemed earned and due immediately upon the execution of this Agreement.

(b) License Maintenance Fees of $_________ per year payable on January 1, 19___ and on January 1 of each year thereafter during the exclusive period of this Agreement; provided, however, that the License Maintenance Fee for a given year shall be creditable against any Running Royalties subsequently due during said year under subparagraph 4.1 (c) below.

(c) Running Royalty in an amount equal to _________ percent (___ %) of the Net Sales of the Licensed Products or Licensed Processes used, leased or sold by or for LICENSEE or its sublicensees.

4.2 No multiple royalties shall be payable because any Licensed Product, its manufacture, use, lease or sale are or shall be covered by more than one Patent Rights patent application or Patent Rights patent licensed under this Agreement.

4.3 Royalty payments shall be paid in United States dollars in Cambridge, Massachusetts, or at such other place as M.I.T. may reasonably designate consistent with the laws and regulations controlling in any foreign country. If any currency conversion shall be required in connection with the payment of royalties hereunder, such conversion shall be made by using the exchange rate prevailing at the Chase Manhattan Bank (N.A.) on the last business day of the calendar quarterly reporting period to which such royalty payments relate.

**ARTICLE V - REPORTS AND RECORDS**

5.1 LICENSEE shall keep full, true and accurate books of account containing all particulars that may be necessary for the purpose of showing the amounts payable to M.I.T. hereunder. Said books of account shall be kept at LICENSEE's principal
place of business or the principal place of business of the appropriate division of LICENSEE to which this Agreement relates. Said books and the supporting data shall be open at all reasonable times for five (5) years following the end of the calendar year to which they pertain, to the inspection of M.I.T. or its agents for the purpose of verifying LICENSEE's royalty statement or compliance in other respects with this Agreement.

5.2 LICENSEE, within sixty (60) days after March 31, June 30, September 30 and December 31, of each year, shall deliver to M.I.T. true and accurate reports, giving such particulars of the business conducted by LICENSEE and its sublicensees during the preceding three-month period under this Agreement as shall be pertinent to a royalty accounting hereunder. These shall include at least the following:

(a) number of Licensed Products manufactured and sold.
(b) total billings for Licensed Products sold.
(c) accounting for all Licensed Processes used or sold.
(d) deductions applicable as provided in Paragraph 1.5.
(e) total royalties due.
(f) names and addresses of all sublicensees of LICENSEE.

5.3 With each such report submitted, LICENSEE shall pay to M.I.T. the royalties due and payable under this Agreement. If no royalties shall be due, LICENSEE shall so report.

5.4 On or before the ninetieth (90th) day following the close of LICENSEE's fiscal year, LICENSEE shall provide M.I.T. with LICENSEE's certified financial statements for the preceding fiscal year including, at a minimum, a Balance Sheet and an Operating Statement.
5.5 The royalty payments set forth in this Agreement shall, if overdue, bear interest until payment at a per annum rate four percent (4%) above the prime rate in effect at the Chase Manhattan Bank (N.A.) on the due date. The payment of such interest shall not foreclose M.I.T. from exercising any other rights it may have as a consequence of the lateness of any payment.

ARTICLE VI - PATENT PROSECUTION

6.1 M.I.T. shall apply for, seek prompt issuance of, and maintain during the term of this Agreement the Patent Rights in the United States and in the foreign countries listed in Appendix B hereto. Appendix B may be amended by verbal agreement of both parties, such agreement to be confirmed in writing within ten (10) days. The prosecution, filing and maintenance of all Patent Rights patents and applications shall be the primary responsibility of M.I.T.; provided, however, LICENSEE shall have reasonable opportunities to advise M.I.T. and shall cooperate with M.I.T. in such prosecution, filing and maintenance.

6.2 Payment of all fees and costs relating to the filing, prosecution, and maintenance of the Patent Rights shall be the responsibility of LICENSEE, whether such fees and costs were incurred before or after the date of this Agreement.

ARTICLE VII - INFRINGEMENT

7.1 LICENSEE shall inform M.I.T. promptly in writing of any alleged infringement of the Patent Rights by a third party and of any available evidence thereof.

7.2 During the term of this Agreement, M.I.T. shall have the right, but shall not be obligated, to prosecute at its own expense any such infringements of the Patent Rights and, in furtherance of such right, LICENSEE hereby agrees that M.I.T. may join LICENSEE as a party plaintiff in any such suit, without expense to LICENSEE. The total cost of any such
infringement action commenced or defended solely by M.I.T. shall be borne by M.I.T. and M.I.T. shall keep any recovery or damages for past infringement derived therefrom.

7.3 If within six (6) months after having been notified of any alleged infringement, M.I.T. shall have been unsuccessful in persuading the alleged infringer to desist and shall not have brought and shall not be diligently prosecuting an infringement action, or if M.I.T. shall notify LICENSEE at any time prior thereto of its intention not to bring suit against any alleged infringer, then, and in those events only, LICENSEE shall have the right, but shall not be obligated, to prosecute at its own expense any infringement of the Patent Rights, and LICENSEE may, for such purposes, use the name of M.I.T. as party plaintiff; provided, however, that such right to bring an infringement action shall remain in effect only for so long as the license granted herein remains exclusive. No settlement, consent judgment or other voluntary final disposition of the suit may be entered into without the consent of M.I.T., which consent shall not unreasonably be withheld. LICENSEE shall indemnify M.I.T. against any order for costs that may be made against M.I.T. in such proceedings.

7.4 In the event that LICENSEE shall undertake the enforcement and/or defense of the Patent Rights by litigation, LICENSEE may withhold up to fifty percent (50%) of the royalties otherwise thereafter due M.I.T. hereunder and apply the same toward reimbursement of its expenses, including reasonable attorneys' fees, in connection therewith. Any recovery of damages by LICENSEE for any such suit shall be applied first in satisfaction of any unreimbursed expenses and legal fees of LICENSEE relating to the suit, and next toward reimbursement of M.I.T. for any royalties past due or withheld and applied pursuant to this Article VII. The balance remaining from any such recovery shall be divided equally between LICENSEE and M.I.T.
7.5 In the event that a declaratory judgment action alleging invalidity or noninfringement of any of the Patent Rights shall be brought against LICENSEE, M.I.T., at its option, shall have the right, within thirty (30) days after commencement of such action, to intervene and take over the sole defense of the action at its own expense.

7.6 In any infringement suit as either party may institute to enforce the Patent Rights pursuant to this Agreement, the other party hereto shall, at the request and expense of the party initiating such suit, cooperate in all respects and, to the extent possible, have its employees testify when requested and make available relevant records, papers, information, samples, specimens, and the like.

7.7 LICENSEE, during the exclusive period of this Agreement, shall have the sole right in accordance with the terms and conditions herein to sublicense any alleged infringer <in the Territory for the Field of Use> for future use of the Patent Rights.

ARTICLE VIII - PRODUCT LIABILITY

8.1 LICENSEE shall at all times during the term of this Agreement and thereafter, indemnify, defend and hold M.I.T., its trustees, officers, employees and affiliates, harmless against all claims and expenses, including legal expenses and reasonable attorneys' fees, arising out of the death of or injury to any person or persons or out of any damage to property and against any other claim, proceeding, demand, expense and liability of any kind whatsoever resulting from the production, manufacture, sale, use, lease, consumption or advertisement of the Licensed Product(s) and/or Licensed Process(es) or arising from any obligation of LICENSEE hereunder.

8.2 LICENSEE shall obtain and carry in full force and effect liability insurance which shall protect LICENSEE and M.I.T. in regard to events covered by Paragraph 8.1 above.
8.3 EXCEPT AS OTHERWISE EXPRESSLY SET FORTH IN THIS AGREEMENT, M.I.T. MAKES NO REPRESENTATIONS AND EXTENDS NO WARRANTIES OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND VALIDITY OF PATENT RIGHTS CLAIMS, ISSUED OR PENDING.

ARTICLE IX - EXPORT CONTROLS

It is understood that M.I.T. is subject to United States laws and regulations controlling the export of technical data, computer software, laboratory prototypes and other commodities (including the Arms Export Control Act, as amended and the Export Administration Act of 1979), and that its obligations hereunder are contingent on compliance with applicable United States export laws and regulations. The transfer of certain technical data and commodities may require a license from the cognizant agency of the United States Government and/or written assurances by LICENSEE that LICENSEE shall not export data or commodities to certain foreign countries without prior approval of such agency. M.I.T. neither represents that a license shall not be required nor that, if required, it shall be issued.

ARTICLE X - NON-USE OF NAMES

LICENSEE shall not use the names of the Massachusetts Institute of Technology nor of any of its employees, nor any adaptation thereof, in any advertising, promotional or sales literature without prior written consent obtained from M.I.T. in each case, except that LICENSEE may state that it is licensed by M.I.T. under one or more of the patents and/or applications comprising the Patent Rights.
ARTICLE XI - ASSIGNMENT

This Agreement is not assignable and any attempt to do so shall be void.

ARTICLE XII - ARBITRATION

12.1 Any and all claims, disputes or controversies arising under, out of, or in connection with this Agreement, including any dispute relating to patent validity or infringement, which have not been resolved by good faith negotiations between the parties, shall be resolved by final and binding arbitration in Boston, Massachusetts under the rules of the American Arbitration Association, or the Patent Arbitration Rules if applicable, then obtaining. The arbitrators shall have no power to add to, subtract from or modify any of the terms or conditions of this Agreement. Any award rendered in such arbitration may be enforced by either party in either the courts of the Commonwealth of Massachusetts or in the United States District Court for the District of Massachusetts, to whose jurisdiction for such purposes M.I.T. and LICENSEE each hereby irrevocably consents and submits.

12.2 Notwithstanding the foregoing, nothing in this Article shall be construed to waive any rights or timely performance of any obligations existing under this Agreement.

ARTICLE XIII - TERMINATION

13.1 If LICENSEE shall cease to carry on its business, this Agreement shall terminate upon notice by M.I.T.

13.2 Should LICENSEE fail to pay M.I.T. royalties due and payable hereunder, M.I.T. shall have the right to terminate this Agreement on thirty (30) days' notice, unless LICENSEE shall pay M.I.T. within the thirty (30) day period, all such royalties and interest due and payable. Upon the expiration of the thirty (30) day period, if LICENSEE shall not have paid all
such royalties and interest due and payable, the rights, privileges and license granted hereunder shall terminate.

13.3 Upon any material breach or default of this Agreement by LICENSEE, other than those occurrences set out in Paragraphs 13.1 and 13.2 hereinabove, which shall always take precedence in that order over any material breach or default referred to in this Paragraph 13.3, M.I.T. shall have the right to terminate this Agreement and the rights, privileges and license granted hereunder by ninety (90) days' notice to LICENSEE. Such termination shall become effective unless LICENSEE shall have cured any such breach or default prior to the expiration of the ninety (90) day period.

13.4 LICENSEE shall have the right to terminate this Agreement at any time on six (6) months' notice to M.I.T., and upon payment of all amounts due M.I.T. through the effective date of the termination.

13.5 Upon termination of this Agreement for any reason, nothing herein shall be construed to release either party from any obligation that matured prior to the effective date of such termination. LICENSEE and any sublicensee thereof may, however, after the effective date of such termination, sell all Licensed Products, and complete Licensed Products in the process of manufacture at the time of such termination and sell the same, provided that LICENSEE shall pay to M.I.T. the royalties thereon as required by Article IV of this Agreement and shall submit the reports required by Article V hereof on the sales of Licensed Products.

13.6 Upon termination of this Agreement for any reason, any sublicensee not then in default shall have the right to seek a license from M.I.T.

ARTICLE XIV - PAYMENTS, NOTICES AND OTHER COMMUNICATIONS

Any payment, notice or other communication pursuant to this Agreement shall be sufficiently made or given on the date of mailing if sent to such party by certified first class mail,
postage prepaid, addressed to it at its address below or as it shall designate by written notice given to the other party:

In the case of M.I.T.:

Director
Technology Licensing Office
Massachusetts Institute of Technology
Room E32-300
Cambridge, Massachusetts 02139

In the case of LICENSEE:
<title>
<company>
<address>

ARTICLE XV - MISCELLANEOUS PROVISIONS

15.1 This Agreement shall be construed, governed, interpreted and applied in accordance with the laws of the Commonwealth of Massachusetts, U.S.A., except that questions affecting the construction and effect of any patent shall be determined by the law of the country in which the patent was granted.

15.2 The parties hereto acknowledge that this Agreement sets forth the entire Agreement and understanding of the parties hereto as to the subject matter hereof, and shall not be subject to any change or modification except by the execution of a written instrument subscribed to by the parties hereto.

15.3 The provisions of this Agreement are severable, and in the event that any provisions of this Agreement shall be determined to be invalid or unenforceable under any controlling body of the law, such invalidity or unenforceability shall not in any way affect the validity or enforceability of the remaining provisions hereof.

15.4 LICENSEE agrees to mark the Licensed Products sold in the United States with all applicable United States patent numbers. All Licensed Products shipped to or sold in other
countries shall be marked in such a manner as to conform with the patent laws and practice of the country of manufacture or sale.

15.5 The failure of either party to assert a right hereunder or to insist upon compliance with any term or condition of this Agreement shall not constitute a waiver of that right or excuse a similar subsequent failure to perform any such term or condition by the other party.

IN WITNESS WHEREOF, the parties have hereunto set their hands and seals and duly executed this Agreement the day and year set forth below.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
By

Name

Title

Date

<Company Name>
By

Name

Title

Date