

**INTERIM REPORT OF THE
SECRETARY OF TECHNOLOGY**

**AN ASSESSMENT OF THE
INTELLECTUAL PROPERTY
POLICIES AND PRACTICES IN
VIRGINIA'S PUBLIC UNIVERSITIES
AND FEDERAL LABORATORIES**

**TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA**



SENATE DOCUMENT NO. 25

**COMMONWEALTH OF VIRGINIA
RICHMOND
2000**



COMMONWEALTH of VIRGINIA

Office of the Governor

James S. Gilmore, III
Governor

Donald W. Upson
Secretary of Technology

December 15, 1999

The Honorable James S. Gilmore, III
Governor of Virginia
State Capitol
Richmond, Virginia 23219

Members of the Virginia General Assembly
General Assembly Building
Richmond, Virginia 23219

Dear Governor Gilmore and Members of the General Assembly:

On behalf of the multi-agency study group that conducted this effort, I am pleased to submit to you *An Assessment of the Intellectual Property Policies and Practices in Virginia's Public Universities and Federal Laboratories*. This study fulfills, in part, the directives of Senate Joint Resolution 502 of the 1999 General Assembly.

Virginia can be proud of the many accomplishments of its institutions of higher education, including the commercialization of intellectual property developed as a result of their research efforts. As a result of this study, however, I believe there are significant opportunities for improvements in the relationships among research faculty, university technology transfer offices, and the business community that would benefit all of these parties as well as the general public. With the increasing importance of rapid commercialization of innovative new ideas to the continued economic growth of the Commonwealth, further consideration of how to best pursue these opportunities appears in the best interest of all Virginians.

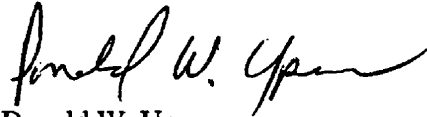
This report provides a fairly detailed assessment of current practices in the Commonwealth for addressing the transfer of intellectual property to the private sector and provides a sense of the direction that we might profitably take in changing some of the groundrules and guidance that are currently in place. It is important to note, however, that final recommendations to the Governor and the General Assembly will be developed as part of a collegial process that involves representatives of the universities, the business community and the Commonwealth. Therefore, in order to complete these initiatives and accomplish the objectives of SJR 502 in total, I request that the 2000 General Assembly extend the timeframe for the completion of all SJR 502 assignments until November 1, 2000.

December 15, 1999

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We trust that you will find the enclosed study report responsive and informative. With the publication of this document (Senate Document No. 25, 2000) and a companion study, *An Industrial Cluster Analysis of the Virginia Economy* (Senate Document No. 26, 2000), a number of the baseline requirements of SJR 502 have now been fulfilled. However, accomplishing the ultimate goal of that resolution—the development of a coordinated research and technology policy for the Commonwealth—is a complex assignment requiring several additional efforts that are already underway or will be initiated over the next several months. The overall framework for a Statewide Research and Technology Strategy for the Commonwealth, within which all SJR 502-related efforts will fit, is outlined in Section II of the enclosed report. Our plan for establishing a stakeholder-driven process for defining and then supporting a coordinated R&D policy, involving senior research and technology managers from our universities, federal laboratories located in the state, and Virginia's technology-intensive companies, is also described in Section II.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Donald W. Upson". The signature is fluid and cursive, with a long horizontal stroke at the end.

Donald W. Upson

Enclosure

c: The Honorable Wilbert Bryant
The Honorable Barry E. DuVal

AN ASSESSMENT OF THE INTELLECTUAL PROPERTY POLICIES AND PRACTICES IN VIRGINIA'S PUBLIC UNIVERSITIES AND FEDERAL LABORATORIES

PREFACE

Authority Directing the Study

Senate Joint Resolution 502 requests that the Secretary of Technology with the assistance of Virginia's Center for Innovative Technology and in consultation with institutions of higher education, federal laboratories, and the private sector, conduct a review of the intellectual property policies and procedures of the institutions of higher education and federal laboratories, incentives to participate in joint ventures, and best practices by which intellectual resources can be linked to commercialization to benefit the economy of Virginia. Finally, the study is to suggest ways that an increased awareness of these assets and mechanisms might result in greater collaborations.

Given the broad scope of the requirements, the organizations assigned responsibility for the study have initiated several research and analysis efforts. This document represents one component of those efforts – the assessment of intellectual property policies and practices. A companion document, *An Industrial Cluster Analysis of the Virginia Economy*, has also been produced in response to SJR 502. As indicated below, follow-on documents, addressing additional components of the SJR 502 requirements, will be produced during the coming year.

Towards a Comprehensive Research and Technology (R&T) Strategy for Virginia

In broad outline, the Secretary of Technology has identified three major strategic research and technology policy goals for the Commonwealth. These are:

- Improve linkages between Virginia's research universities and the private sector, inside and outside Virginia, in order to increase private sector investment in R&D performed in the Commonwealth;
- Increase Federal and state R&D investment in Virginia and in research programs important to Virginia's industries; and,
- Improve the environment and opportunities in our universities for creating innovative start-up companies that will drive new growth.

In order to achieve these goals, the Secretary has initially defined a comprehensive, stakeholder-driven R&T strategy for Virginia, of which this cluster analysis document is a significant component. An overview of this strategy is provided in Section II.

The study of the IP practices of Virginia's universities directed by SJR 502 is extremely timely because of the increasing importance of rapid commercialization of innovative ideas to the continued economic growth of the Commonwealth. The Council on Competitiveness, a private sector organization with members from industry, education and labor, has identified the ability to innovate as the basis for the United States' competitive advantage in the global economy of the

21st century. The rapid commercialization of a continuous stream of innovative new products, processes, materials, and systems will be the basis for real growth in an economy where competition turns leading edge ideas into commodities in just a few years.

Virginia's research universities are conducting significant research in technical fields including communications, biotechnology, medicine, software and systems integration, agriculture, aeronautics and aerospace, advanced materials, manufacturing processes and a host of others of importance to existing and emerging industries. Strong linkages and effective cooperation between this research base and the industries that can convert research results into products, jobs and revenues are essential to the Commonwealth fully benefiting from our outstanding universities.

During 2000, the Secretary of Technology will empanel a research and technology advisory body composed of leading research managers from industry, academia and the federal labs (see Section II). This group will advise the Secretary on a number of important issues, including developing specific recommendations for the Governor and General Assembly to consider relative to improving IP management.

Accordingly, in order to understand the current situation relative to licensing and assigning intellectual property generated by university faculty, this study was commissioned. It examines current practices at Virginia's universities, identifies concerns raised by Virginia's business community, assesses best practices from well known universities that generate significant IP, and factors in relevant federal laws and regulations. This study document provides an excellent primer on the subject and will serve as a baseline for developing the detailed recommendations mentioned above.

Study Group Membership

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Acknowledgments

The study group wishes to acknowledge the work of **Applied Research Analysts and Jagtiani and Associates** in producing the study included as Section III of this report, as well as the Executive Summary included in Section I. We also wish to recognize the time and effort of the research vice presidents/provosts and technology transfer staffs of Virginia's research universities in providing insight into current IP practices and possible improvements.

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**NOTE: Due to their magnitude (some 800 pages), Volumes 2-4 are not published as part of this legislative document. They are available for viewing at the Center for Innovative Technology in Herndon and the Department of Technology Planning in Richmond.*

SECTION I

EXECUTIVE SUMMARY

AN ASSESSMENT OF THE INTELLECTUAL PROPERTY POLICIES AND PRACTICES IN VIRGINIA'S PUBLIC UNIVERSITIES AND FEDERAL LABORATORIES

In February 1999, the Virginia legislature mandated a study to review the intellectual policies and procedures of the institutions of higher education and federal laboratories in the Commonwealth. A research team from Applied Research Analysts (a survey and research firm) and Jagtiani & Associates (an intellectual property law firm) conducted the independent study during June and July. To understand the policies, they spoke with 18 officials at eight universities and five officials associated with one federal laboratory, and reviewed their written policies. To gain insight into actual practices, they spoke with 12 officials from Virginia-based companies who had tried, successfully or not, to license intellectual property from the universities and laboratories. Finally, to identify policies and practices that could benefit the public universities, the team spoke with consultants and university officials at institutions nationwide that are widely perceived as having best practices in place.

Nine key issues were identified through an analysis of the information gathered. The issues include:

1. The apparent conflict of interest between the role of the university and the commercialization of intellectual property.
2. The communication of technical expertise and intellectual property available.
3. Streamlining the sponsored research and licensing processes.
4. Ownership of intellectual property generated by Virginia's public universities.
5. Enhancing the relationship of faculty and students with the university's licensing entity.
6. Enhancing the relationship between the university and corporations.
7. Financial arrangements regarding commercialization of intellectual property.
8. The strong state versus strong university paradigms.
9. Strengths and weaknesses of the university intellectual property office paradigm and the dedicated non-profit paradigm.

The report presents the perceptions, experiences, and concerns expressed by the university and business interviewees. It also presents the research team's analysis of their input and the written materials reviewed.

The study included a comparative analysis of Fiscal Year 1997 figures on the number of disclosures, licenses executed, licensing income received, and sponsored research expenditures for three of the Commonwealth's research universities (University of Virginia, Virginia Tech, and Virginia Commonwealth University) and 16 other institutions well regarded for their research faculty. The Virginia schools ranked quite well; if their performance could reach the median level on some measures, however, the gross licensing income realized would increase by nearly one million dollars. The research team also collected trend data from the three Virginia schools on the same four measures over the period of FY93 to FY99.

The research team concluded that on balance, the IP commercialization process is generally working well in the Commonwealth. There are, however, significant opportunities for improvement in the relationships among faculty, university technology transfer offices, and the business community that would benefit all parties as well as the general public. To make sure that these opportunities were widely perceived, the draft version of this report was reviewed by officials at the six public research universities in Virginia, and their comments are reflected in this final version.

The report is accompanied by three additional volumes of IP policies, guidelines, and related materials collected from Virginia's public universities, other public and private institutions in the United States, and related documents from associations and non-profit organizations.*

**NOTE: Due to their magnitude (some 800 pages), Volumes 2-4 are not published as part of this legislative document. They are available for viewing at the Center for Innovative Technology in Herndon and the Department of Technology Planning in Richmond.*

SECTION II

TOWARD A STRATEGIC VIEW OF RESEARCH AND TECHNOLOGY IN THE COMMONWEALTH

Elements of a Statewide R&T Strategy for the Commonwealth of Virginia

The Office of the Secretary of Technology believes that developing a statewide research and technology (R&T) strategy for the Commonwealth should be a stakeholder-driven process that results in a comprehensive, coordinated and mutually reinforcing view of research and development goals for industry, academia and government in the Commonwealth. The purpose of such a strategy is to focus coordinating, developmental, and funding efforts on those technologies (including process technologies) which offer the greatest likelihood of generating additional technology-based economic growth for the Commonwealth in the Information Age.

Among the steps necessary to develop such a strategy are the following:

- Appoint a panel of distinguished research leaders to oversee the development, implementation and updating of the Commonwealth R&T strategy and to advise the Governor, the Virginia Congressional delegation and the Secretary of Technology on technology matters.
- Establish a baseline cluster analysis that identifies and provides a clear understanding of existing relationships among technology industries, their research base, suppliers, vendors and supporting organizations (as directed by Sec. 2.1-51.44B7, *Code of Virginia*, and SJR 502).
- Identify the major research strengths of Virginia's universities, private R&D facilities and federal laboratories within the Commonwealth.
- Identify, prioritize and advocate for key federal programs that support significant Commonwealth university or industrial research efforts or major national missions.
- Identify and establish policies to strengthen those elements of Virginia's technology base (i.e., the Commonwealth's major technology industry clusters) that are important in providing global competitive advantage.
- Use the strategic direction and focus resulting from the strategy to direct public investments and attract private investments in order to fund additional research to: (a) generate new discoveries in existing and emerging technologies; and, (b) foster and improve commercialization of advanced stage technologies (as directed by SJR 502).
- Develop policies and programs that leverage the competitive advantage afforded by Virginia's exceptional public and private high-speed data networks to encourage and support collaborative research among Virginia's universities.

The long-term goals for this strategic approach include the following:

- Two Virginia universities ranked in the top 50 of US research institutions by 2010.
- 20% increase in federal R&D spending in Virginia (adjusted for inflation) by 2004 and 50% increase by 2008.
- 7.5% compound annual growth rate in federal Small Business Innovation and Research funding of Virginia firms (adjusted for inflation).
- At least one major, world-renowned research facility (public, private or federal) in Virginia for each of our major technology industry clusters by 2010.

Virginia Research and Technology Advisory Commission

The Virginia Research and Technology Advisory Commission (ViRTAC) will be chartered by the Secretary of Technology under the authority granted him in Section 2.1-51.50 of the *Code of Virginia*. The Commission will be composed of not more than 30 senior research and technology managers drawn from Virginia's universities, federal laboratories located in Virginia and, predominantly, from Virginia's technology-intensive companies.

The mission of the Commission will be to work with the Secretary of Technology, as well as the Secretary of Education and the Secretary of Commerce and Trade, as appropriate, on all matters related to the development and implementation of the statewide research and technology strategy.

Specific goals of ViRTAC include:

- Creating closer linkages between Virginia's research universities and the private sector (both inside and outside of Virginia) with an eye to increasing private sector support to research in the Commonwealth;
- Advising the Governor and the Virginia Congressional delegation, as appropriate, on priorities for state and Federal research programs; and,
- Helping to create an environment in the Commonwealth that results in a dramatic growth in the number of innovative, high-tech start-up companies commercializing research discoveries.

Specific tasks will include: evaluating proposals for the competitive award of state R&D funds, preparing and helping to present an annual presentation to members of the Virginia Congressional delegation on priorities for federal R&D programs, and hosting events designed to bring together private sector and federal research managers with Virginia's university research community.

The chair and members of the Commission will be appointed by the Secretary and will serve for a renewable two-year term. Meetings will be held at the call of the Chair and may include working groups or other subsets of the Commission established to address specific issues and tasks. The Assistant Secretary of Technology will serve as Executive Director of the Commission. Staff support will be provided by the Special Assistant to the Secretary for Media

and Events, the Center for Innovative Technology and the Department of Technology Planning. Members will not receive compensation for their service but will be reimbursed for travel and other direct expenses.

SECTION III

**CONSULTANT'S REPORT ON INTELLECTUAL PROPERTY
POLICIES AND PRACTICES**

INTRODUCTION

Innovative, technology-based products or services related to computers, communications, health, the environment, and agriculture are frequently invented at the public universities and federal laboratories located in the Commonwealth of Virginia. Virginia-based companies, as well as national and international companies, are encouraged or mandated to take the discoveries, develop them further, and move the most viable ones into the commercial marketplace for the public benefit. The universities and federal laboratories have crafted policies and procedures to guide the transfer of intellectual property (IP) to companies. Although developed under broad guidelines established by the State Council of Higher Education for Virginia and approved by the Commonwealth's Attorney General, the policies and procedures are not consistent across the universities. Nor is there consistent policy across the federal laboratories. To complicate the commercialization of IP even further, the actual practices of universities and labs sometimes differ from their formally stated policies.

The Commonwealth of Virginia is seriously committed to enhancing its stature as a world leader in high technology. Gov. James Gilmore created the Governor's Commission on Information Technology one year ago (May 21, 1998) and created the nation's first state cabinet-level post on technology by naming Donald Upson as Secretary of Technology. In February 1999, both the Virginia Senate and the House of Delegates agreed to Senate Joint Resolution No. 502 which requests that the Secretary of Technology conduct a study (with the assistance of Virginia's Center for Innovative Technology) to review:

the intellectual property policies and procedures of the institutions of higher education and federal laboratories, incentives to participate in joint ventures, and best practices by which intellectual resources can be linked to commercialization to benefit the economy of Virginia. In addition, the study findings and recommendations shall suggest ways that an increased awareness of these assets and mechanisms might result in greater collaborations.

(<http://leg1/state.va.us/cgi-bin/legp504>)

In May, the Center for Innovative Technology (CIT) awarded the contract for the independent study to Applied Research Analysts (ARA, a survey and research firm) and Jagtiani & Associates (an intellectual property law firm). This report presents the results of the study. The study had three objectives:

- To review the IP policies, procedures and incentives regarding universities' licensing of technology to private corporations.
- To identify best practices nation-wide by which such intellectual resources are commercialized.
- To serve as a baseline for recommendations on changes that would strengthen technology transfer mechanisms, broaden industry's awareness of the universities' assets, increase the value of IP under license, and thereby benefit the economy of Virginia.

METHODOLOGY

ARA and Jagtiani & Associates staff interviewed 18 university officials (7 in person, 11 by telephone) in the Office of Technology Transfer, Office of Sponsored Research, and Office of General Counsel at most of the public research universities. Before interviews were conducted with the university officials, the researchers reviewed the institutions' written IP policies provided on their Web site. The questionnaire used for the interviews (included in Appendix A) was semi-structured in format so the interview would collect some similar information from all respondents but not limit the topics covered. The questionnaire for university officials included several questions about the strengths and weaknesses the respondent perceived in how the institution structured its technology transfer activities.

The staff also attempted to interview several persons at the two main federal laboratories in the Commonwealth. Unfortunately, personnel at one of the labs declined interviews because they had no knowledge about the study's topic, and four persons interviewed at the other said very little that was germane to the study. The fifth person was formerly associated with the NASA/Langley lab and was quite informative. Unfortunately, this report cannot draw conclusions or generalizations about the federal labs in the Commonwealth based upon so little data.

To better understand the practices of the technology transfer offices at the universities, the research staff interviewed 12 officials of nine different Virginia-based companies which have tried, successfully or not, to license IP emanating from the universities and federal laboratories. The names of potential interviewees were obtained from CIT regional directors who could identify Virginia businesses relevant to this study. Approximately 20 names were obtained, but only 12 were interviewed within the tight schedule of this project. It is important to note that the business officials interviewed were never intended to constitute a random sample of Virginia-based companies which had IP-related dealings with the research universities. It is also worth noting that the perceptions and experiences of all the business officials were strikingly similar.

The questionnaire for business officials was very similar to that used with the university officials, and it asked about the institutional policies and practices that worked well or caused frustration. The responses from both groups served to highlight for the research staff the important policies at each institution, rather than relying upon a formal document analysis.

Finally, the research staff utilized two technology transfer experts with a national perspective to help identify best practices across the U.S. that deserve consideration by the Secretary of Technology and the Commonwealth's universities. The consultants recommended people at schools where they thought the nine key issues (see Chapter A below) had been dealt with wisely, and research team members contacted those individuals to learn more about their activities.

STRUCTURE OF THE REPORT

The study yielded materials that fill four volumes; this report is contained in Volume 1. The interviews, policy analyses, and best practice discussions yielded nine key issues. The issues are discussed in turn in Chapter A of the report, with each discussion having four sections following a brief explanation of the issue: a summary of the relevant comments made by officials at the universities, a summary of the relevant comments made by officials at Virginia-based companies, relevant findings from the search for best practices, and a brief discussion of the problem(s) raised by that issue.

The nine issues are as follows:

1. The apparent conflict of interest between the role of the university and the commercialization of intellectual property.
2. The communication of technical expertise and intellectual property available.
3. Streamlining the sponsored research and licensing processes.
4. Ownership of intellectual property generated by Virginia's public universities.
5. Enhancing the relationship of faculty and students with the university's licensing entity.
6. Enhancing the relationship between the university and corporations.
7. Financial arrangements regarding commercialization of intellectual property.
8. The strong state versus strong university paradigms.
9. Strengths and weaknesses of the university intellectual property office paradigm and the dedicated non-profit paradigm.

Chapter B of this report presents an analysis (required in the study contract) of university IP data from Fiscal Year 1997 in an effort to estimate the magnitude and value of lost opportunities for university-business collaboration, and the income which would have resulted from realization of those opportunities. Chapter C presents six models of intellectual property funding and ownership that reflect current Commonwealth policy and federal government policy regarding IP. Volume 1 ends with a conclusions section. Two appendices are included. Appendix A presents the list of persons interviewed and the questionnaires used in the study; Appendix B presents a legal primer with the official language from relevant sections of the Commonwealth Code and a reference to the binding federal law. The Code sections and reference to the federal law are presented in the body of the report, but are reiterated in Appendix B for ease of reference.

Volume 2 contains Appendix C which is a compilation of policies and procedures from Virginia's public universities obtained during the interviews and from Internet searches. Volume 3 contains Appendix D which is a similar compilation of policies and procedures from universities outside the Commonwealth (including Georgia Tech, the Massachusetts Institute of Technology, Stanford and Princeton Universities, and the Universities of Michigan, North Carolina, and Wisconsin). The final volume, Volume 4, contains Appendix E which presents the technology transfer guidelines and other materials gathered by Internet searches from non-university sources, such as the Association of University Technology Managers and the Licensing Executives Society.

CHAPTER A. THE NINE KEY ISSUES

The nine issues are discussed in order. Many of the issues are closely interrelated, and references are frequently made from one issue to another.

Issue 1. The Apparent Conflict of Interest between the Educational Role of the University and the Commercialization of Intellectual Property

There is a tension that exists between and among the various roles that the universities fulfill, as well as among the faculty's roles as teachers, as researchers, and as inventors with marketable products, devices, or ideas to sell. This tension is manifested in various ways, some overt and some more subtle, and sometimes within the university, but more often between the university and business communities. On the one hand, the university exists to fulfill the dual missions of education and research (and outreach, for land-grant institutions). These traditional roles carry with them a presumption that the faculty member is for the most part autonomous in the classroom and research setting, and this autonomy has historically been vigorously protected. The professor is the central ingredient in the higher education process, and within certain limits, the professor is in control of course content and what goes on in the classroom. For the most part, professors are free to research, investigate, and write about whatever they please. The assumption has also traditionally been that this autonomy and control applies not only to the professor's classroom, but also extends to his or her laboratory as well. This view of the university has the faculty member as the primary arbiter of what he or she does, teaches, and investigates. On the other hand, the very concept of technology transfer implies that to some degree, what the professor does is for sale. For this report the central question is, then, whether the educational role of the university necessarily and inherently conflicts with its ancillary role as a licensor of IP.

In some sense, this tension lies at the heart of many of the difficulties which are encountered during the process of commercializing ideas (especially the negotiation of agreements that may lead to commercialization) that stem from a professor's research, and it has ties to virtually all of the issues and concerns that follow in this report. As such, this section serves primarily to introduce all of the others, and a reading of the numbered issues below will show how many of them can be traced back to this primary, underlying issue. For example, this tension clearly is reflected in the disagreement concerning who should own IP, the professor who generated it, the

university which employs the professor, or in the case of industry-sponsored research, the company that paid for it (Issue 4). It also underlies any discussion of the relationship between the faculty and students with the university licensing entity (Issue 5), discussions about the degree to which the Commonwealth could or should strive to attain more uniformity in the policies and procedures that must be followed during the commercialization process (Issue 8), as well as details of the financial arrangements between universities and corporations (Issue 7).

A. University Input

One university respondent showed an awareness of this tension when he said, “The universities aren’t businesses, although the private sector think we should act like it.” He went on to say that in his view, the businesses seem to think that the only focus in negotiations between the schools and businesses should be the desire to make money. Interviews with business leaders, summarized below, contained many mentions of financial matters. Several of the business owners are former faculty members, however, and they voiced an appreciation of the two roles and how they sometimes come into conflict within academe.

This tension also manifests itself in discussions with respondents where the particulars of the financial aspects of commercialization deals are concerned (see Issue 7). For example, one university official said that since the commercialization of IP is not the primary mission of the university, it should not be supported by tuition revenue. The belief that commercialization is ancillary and should be funded separately is contrary to the belief of many business people, as discussed below.

The issue of the proper use and valuation of graduate students arose as well during interviews with both university officials and business representatives. The university officials who spoke to this issue indicated a concern that any work done in private labs by graduate students should “contribute genuinely and meaningfully to the student’s education. The graduate students that get sent out to businesses shouldn’t be water carriers.” Recognizing that both sides in the commercialization process have legitimate points of view, one university technology transfer officer worker put it this way: “We have to maintain our relationships with business, while at the same time keeping the faculty’s sense of autonomy.”

B. Business Input

One of the major complaints of business people who have had experiences trying to negotiate sponsored research agreements or to license or own IP generated at universities in the Commonwealth is that the up-front costs, including overhead rates on sponsored research, are frequently too high. They see much of the demand for this money stemming from the need of technology transfer office officials to pay staff and other costs of running the office itself. Business representatives view this as unfair, and certainly not a burden for which they should be made responsible. Several business owners said that they should not have to pay to maintain the university technology transfer office, nor the university facilities such as a professor’s lab that give rise to the IP, because their corporate, personal, and employees’ tax dollars already support these things.

The university's role conflict, as perceived by the majority of business officials interviewed, is more about its financing than its mission. One business owner focused on the role conflict sensed by the university staff but he saw nothing irreconcilable. He argued that universities should be more willing than they currently are to function as contract research organizations, accept industry funding, and give ownership of any inventions discovered to the industry sponsor. This funding would support faculty, help train graduate students, and enable both groups to carry out their other academic functions.

Another business respondent said it was his experience that the professors often want things both ways. That is, they want to maintain autonomy and control over their own IP, or want the university to control it, and want the money to roll in as well. Businesses see this as unrealistic, given the uncertainty whether a specific invention will be profitable in the marketplace years in the future.

C. Best Practices

A critical requirement for a university, or university system, is to have a mission statement that helps resolve the apparent conflict of roles (or interest). The mission statement should clearly state where the goal of the licensing entity lies along a continuum ranging from the generation of revenue for the institution/system to the expeditious movement of inventions into the commercial marketplace for benefit of the public good. A best practices interviewee at the University of Washington framed the issue in terms of her office's daily activities and the choices the staff make. "We're fortunate we know what we're about. We may not get every dollar out of a license, but we process the IP quickly and get it out to society."

D. Issue-related Problems

The Commonwealth should explore ways to reduce the apparent role conflict for faculty members at its public universities. The lack of clarity about the proper role of a faculty member exists in part because of the different set of assumptions brought to the commercialization of IP by the faculty members themselves, by businesses hoping to market the IP, and by IP office staff. As long as the proper role of the faculty regarding the control of IP development remains unclear, each of the actors in the IP commercialization arena will continue to define it differently.

A number of interviewees, especially those in the business world, suggested solutions to this dilemma. Several of them thought that the solution lies in the standardization of policies across the universities so that the tension is played out identically regardless of campus. University officials, however, were strongly against such an approach, as it would ignore important differences in IP demands that exist across the public schools in the Commonwealth. For example, a university with a medical school produces a large amount of biomedical IP, while another, perhaps smaller university might primarily face issues dealing with Web-based course instruction materials. Some clarification of the degree of autonomy to be expected by professors in their role as producers of IP would move the universities toward a resolution of this dilemma.

Issue 2. The Communication of Technical Expertise and Intellectual Property Available

Virtually all interviewees, regardless of whether they were a business or a university contact, said that there is a general lack of communication regarding technology transfer and IP, and that this lack of communication is a serious problem which hampers the commercialization of ideas within the Commonwealth. While on the surface this apparent uniformity of concern might suggest a single problem, additional discussion with respondents showed that it has several different aspects. Specifically, there is communication that occurs, or should occur, within and among the various universities in the Commonwealth. Additionally, there is communication between the schools and the businesses or federal labs. Furthermore, it is assumed that any communication link should be a "two-way street," and the flow of information needs to move from and to both parties. With this in mind, it should be noted that the concerns reported below, address (a) both kinds of communications listed above and (b) both sides of the communications link.

From the university perspective, the communication problems lie in the institution's ability to communicate effectively with other universities in the Commonwealth, and to let potential business partners know about the technology that is currently available at the school (as well as the specialties, strengths, and expertise of its faculty members). Better communication would also support better understanding in the business community about the capabilities of the technology transfer entity and its policies and procedures.

From the business perspective, the communication problems stem from universities not understanding the research they need conducted, the size of their potential investment in the research, and the likelihood that the IP may never translate into a valuable commercial product. There are a number of both formal and informal mechanisms that are either currently in place in the Commonwealth or that could be put in place to aid in this two-way communication process, but the feeling in both groups is that much more could and should be done.

A. University Input

University technology transfer officers almost uniformly agree that there is room for improvement in the area of communication. They indicate that this is certainly true regarding communication between the schools and the business sector, but they also say that communication among the schools is woefully lacking. The university officials pointed out a number of specific areas where such communication was inadequate, and offered some recommendations.

There is a feeling among the school representatives, especially the ones from the smaller institutions or the ones with less technology transfer experience, that there should be more communication among schools, including communication across the higher levels of the administrations. Small schools feel at a disadvantage because they tend to have little in the way of an organized technology transfer office that engages in out-reach and pro-active communication with businesses. If the saying, "build it and they will come" has any application here, then the corollary that "if it isn't built, they won't come" would also seem to apply. Given

the geographical spread of the public institutions in the Commonwealth, face-to-face communications to discuss issues related to technology transfer would have to be periodic at best, and the use of other forms of easily accessible communications such as the Internet would seem to offer an alternative.

University respondents stressed the need to have mechanisms in place to let businesses know what types of expertise are held by their faculty, graduate students, and departments. Some avenues that were previously available to facilitate such communication between universities and businesses have been closed, such as technology transfer conferences at a national level. In any event, while national conferences might attract new business to the Commonwealth, they would do little to foster and maintain relationships with businesses already here. If such conferences were to take place regularly in the Commonwealth, they would serve the purpose of letting Virginia companies know what each school has to offer, and let the schools know what types of research is being sought by businesses.

A second avenue of communication--electronic communication via the Internet--is currently underutilized. Given the tremendous access to the Internet that currently exists, efforts to use this mode of communication should be encouraged and expanded. Some universities outside of the Commonwealth have made creative use of the Internet to communicate their research expertise and the IP available, including search engines and searchable databases resident on-line. Efforts to create and maintain similar databases should be strongly encouraged, both at a Commonwealth level and at the individual public universities.

B. Business Input

From the business side as well, there is a strong sense that communication with the universities in the Commonwealth could be vastly improved. The issues that surfaced in the interviews included the inability of some businesses to discover easily what kind of technical expertise exists in the Commonwealth, and where it specifically resides. From the other side of the communication link, some business respondents were frustrated in their inability to communicate their need for particular research to the schools. There is also a sense among some of the business contacts that the Commonwealth has lost revenue because companies went outside the state to find technology that was, in fact, available in Virginia.

C. Best Practices

The Wisconsin Alumni Research Foundation (WARF) is one of the oldest organizations in the country that has the goal of actively fostering technology transfer and the commercialization of IP on behalf of one university. Their Internet Web pages include an extensive database of technology currently available at the University of Wisconsin, as well as information on disclosures, patents, licenses, and policies and procedures. The database can be searched in a variety of useful ways. For example, a visitor to their Web site can search by type of technical area, individual investigators, and date of patent. Furthermore, the WARF database serves a proactive communication role because technologies that are being offered at a discount for a limited time are emphasized. While this "fire sale" approach to the transfer of selected technologies

might yield few licenses, it serves the purpose of encouraging business owners, venture capitalists, and technology holding companies to visit the site frequently.

D. Issue-related Problems

There is a perceived lack of communication in the IP commercialization process both within and between the universities, and between the universities and their potential business partners. Since interviewees in both groups agreed that more communication would be beneficial to the IP commercialization process in the Commonwealth, any solutions put in place would be welcome. Suggestions made by interviewees include more structured opportunities for face-to-face contact, greater support for Internet use such as can be found at the WARF Web-site, and shared databases within the Commonwealth public college and university setting. Another less technically oriented suggestion was the designation of a dedicated staff member within the various university technology transfer offices who would be charged with representing the interests of the business community.

Issue 3. Streamlining the Sponsored Research and Licensing Processes

A critical factor in successful technology transfer between Virginia universities and private industry is the need to have a well-established and efficient method for allowing private industry to provide funding for research at the public universities. In addition to allowing for corporate sponsorship of research, it is essential to also provide an efficient vehicle to allow the corporate sponsor to receive the benefit from the IP developed under this sponsorship. Generally, this benefit is in the form of a license to the IP. Therefore, the need to have an efficient licensing system is intrinsically associated with the need for an efficient corporate sponsored research program.

There is identifiable tension now between the universities and the current or potential corporate sponsors. This tension is due largely to the very different realities in the two environments.

A. University Input

It was universally agreed by technology transfer officers and the persons in the offices of sponsored research that the perception among Virginia corporations is that these offices provide roadblocks to the successful relationships with principal investigators and the transfer of technology to the corporations from the principal investigators. This perception stems from the conflicting role in which these offices are placed.

This perception is perpetuated by the belief among many of the business owners that the main role of a university should include its functioning as an independent contract research laboratory. From the university perspective, the primary focus of the university should be on undergraduate and graduate education. Research is one of the essential missions of good academic institutions. At the graduate level, good training of students requires the research funds necessary to help support them. Therefore, if the goal is to teach graduate students, then it is necessary to acquire research funding for these students. Thus, the need for funding is a necessary part of the

educational mission of Virginia's universities. Generally, the Office of Sponsored Research and Graduate Studies maintains the responsibility for contract submission and compliance. The role of this entity will be discussed in detail later.

Another function of Virginia's universities is the dissemination of research information. This role has traditionally been accomplished by principal investigators publishing their findings. If the findings are the subject of IP, the licensing office may be involved in negotiating an agreement with a company about the release of information

Finally, the universities often have a fiduciary obligation to provide financial returns to the inventors of IP as well as the Commonwealth, which supports their institutions. Through successful technology transfer to corporations, this dissemination role results in revenue for the university as well as economic or strategic benefit to the corporation. The role of the licensing office will be discussed below.

Clearly, since these are distinct and different goals, some universities have created several entities for accomplishing them for legal reasons. These entities include the Office of Sponsored Research and the Licensing Office. It should be appreciated that while these entities are described as separate, they may in fact be part of the same office. At Virginia Tech, the University of Virginia, and Virginia Commonwealth University, these two entities are distinct legal entities that cooperate with each other. In contrast, George Mason University combines the two in one office. For a detailed discussion of this, see Issue 9.

Now that the roles and objectives of the Sponsored Research and Licensing Offices have been established, we may discuss some of the inefficiencies and problems created by the conflicting roles as seen by Virginia business officials.

B. Business Input

Company officials interviewed identified several problems stemming from the sponsored research and licensing entities. These problems include not knowing the correct process for each university; having to renegotiate the transaction several times with different entities within one university; being unable to own the IP that they have paid for; and not being able to structure the transaction in a timely manner.

A typical example of a sponsored research contract and license procedure would be as follows. Company A has a relationship with a principal investigator. The company and the principal investigator discuss funding of the research and ownership of any resulting IP. If the company has never dealt with a university before, they may think that they have a deal and may proceed with their business.

Next, the company is informed that they must have a contract that complies with the university's IP Policy. Therefore, the company must now renegotiate with the office of Sponsored Research to establish a sponsored research contract. More often than not, this process requires significant time since several key terms must be renegotiated. Examples of such terms include overhead costs, milestones and payment schedules. In several universities, these sponsored research

contacts must be reviewed by the university's General Counsel who may or may not be part of the Office of Sponsored Research.

Company officials may think that they are now finished with the process and return attention to running their business. But during negotiation of the sponsored research contract, a company often finds that it must have a separate contract for any IP which may be generated by the sponsored research. Now the company starts to negotiate a license agreement for ownership of the IP that they are "paying" to develop. (The ownership issues are discussed in detail under Issue 4.) To the company's frustration, they find that they cannot formally secure the rights to the IP and in fact may have to renegotiate the sponsored research contract.

From the company's perspective, a simple contract has turned into prolonged negotiations with at least three different entities with varying and conflicting interests and policies, which is both frustrating and time consuming. Company representatives said this structure is very inefficient and would never exist in a private corporate environment. Therefore, it is very difficult for them to understand the need for the layers of bureaucracy that are involved.

What corporations would appreciate is one technology transfer process that is implemented identically at every Virginia public university. This is not feasible, given the tradition of institutional autonomy within the Commonwealth and the need to develop policies and procedures that are efficient in a specific campus context. An alternative solution would be the identification of one contact person at each university whose role is to communicate with a company during the licensing process so frustrations do not build up and negotiations break down.

C. Best Practices

Several universities have taken the approach of horizontal integration of the roles of the Sponsored Research and Licensing Offices. This approach recognizes the different goals of the two departments while facilitating interaction between them. Virginia Tech and the University of Virginia utilize this approach albeit in different manners; Virginia Commonwealth University is moving toward this model as well. This approach recognizes that the traditional activities of the Office of Sponsored Research must be different for corporate funding as compared with research dollars received from the federal or state governments. This approach significantly reduces the amount of renegotiation of contracts necessary and speeds the completion time of licensing agreements.

D. Issue-related Problems

The key problem related to this issue is the lack of information held by key players in this process. First, principal investigators have not been well educated on the IP management process in place at their own university, and thus they sometimes create expectations for a company that have no possibility of fulfillment. Second, even if aware of the IP process, principal investigators often do not inform the company about it and whom they should contact. Additional information on this subject may be found in the discussions of Issues 2 and 5.

The companies would like one point of contact with authority and responsibility to negotiate on behalf of the various relevant departments within the university. Currently there is no centralized university point of contact whose role it is to facilitate the transaction and assist the company in this process. The role of coordinator has traditionally fallen on the legal counsel of the corporation or the President/CEO of the corporation, not a university affiliated person. Commonwealth funding of such a role would facilitate the successful technology transfer between universities and private corporations. This is also consistent with the current concept of Commonwealth ownership of IP.

The lack of harmonization between the goals of the university and the corporations is seen as hampering the successful technology transfer from Virginia universities. The viewpoint that corporate money and directed research subvert the educational goals of Virginia universities is inconsistent with the preferred concept of some business owners that the university serve as a contract research laboratory. This issue is one that requires education of both sides. One interviewee suggested that a state-wide conference be held every year for the education and interaction between these parties, based on the successful model provided by the SBIR/STTR/ATP conference held by the Commonwealth of Virginia in conjunction with the federal government.

Issue 4. Ownership of Intellectual Property Generated by Virginia's Public Universities

A critical issue associated with sponsored research and licensing of technology developed through privately funded research is the ownership of the IP generated by it.¹ There is significant confusion between industry and the institutions of higher education on the issue of ownership (assignment) of IP by the industrial sponsor. Several key terms must be defined before a discussion on this topic can proceed.

First, the term "assignment" means the legal transfer of rights from the creator, i.e. the principal investigator and/or their staff, to the owner, i.e., the particular university that employs the principal investigator and/or he or her staff. In this situation, the principal investigator and/or their staff is the assignor, i.e., the entity giving up the legal title to the invention, and the university is the assignee, i.e., the entity receiving the legal title to the invention. The legal basis for this transfer is §2.1-20.1:1 of the Virginia Code that states:

Patents, copyrights or materials which were potentially patentable or copyrightable developed by a state employee during working hours or within the scope of his employment or when using state-owned or state-controlled facilities shall be the property of the Commonwealth of Virginia.

§2.1-20.1:1 does not apply to employees of state-supported institutions of higher education who are subject to the patent and copyright policies of the institution employing them. Since all of the institutions of higher education surveyed in this study have a patent and copyright policy, §2.1-20.1:1 does not apply to these institutions of higher education.

These institutions with established patent and copyright policies are subject to §23-4.4 of the Virginia Code that states:

The Board of Visitors, the State Board of Community Colleges, or their designees may transfer any interest they possess in patents and copyrights or in material in which the institution claims an interest under its patent or copyright policy. However, the Governor's prior written approval shall be required for transfers of such property developed wholly or significantly through the use of state general fund and either (i) such property was developed by an employee of the institution acting within the scope of his assigned duties, or (ii) such property is to be transferred to an entity other than the Innovative Technology Authority, an entity whose purpose is to manage intellectual properties on behalf of nonprofit organizations, colleges and universities, or an entity whose purpose is to benefit the respective institutions. The Governor may attach conditions to these transfers as he deems necessary. In the event the Governor does not approve such transfer, the materials shall remain the property of the respective institutions and may be used and developed in any manner permitted by law. (emphasis added)

The first question to be determined is if “significant” state general funds have been used to develop the IP. Turning to §23-4.4 of the Virginia Code, the term “significant use of general funds” is discussed:

The State Council of Higher Education working in cooperation with the state-supported institutions of higher education and in accordance with §23-9.10:4 shall adopt a uniform statement defining (i) the conditions under which a significant use of general funds occurs and (ii) the circumstances constituting an assigned duty.

Unfortunately, the State Council of Higher Education has never provided the definition for the term “significant use of general funds.” In fact, the term “significant use of general funds” is never defined anywhere in the Virginia Code. Several institutions of higher education have taken the view that the Conflicts of Interest Act, § 2.1-639.2 et seq. provides guidance as to what would qualify as a significant use of general funds. These institutions of higher education have utilized the \$10,000 limit per year as provided in the Conflicts of Interest Act, § 2.1-639.2 et seq. to establish any amount above \$10,000 as “being significant.” If a principal investigator's salary is used in this analysis, for all practical purposes the ownership of IP will always reside with the institution of higher education and may not be transferred to the industrial sponsor without the Governor's written approval.² Thus, either the industrial sponsor must seek the written approval of the Governor to receive ownership or it must be content to license the IP.

The term “license” refers to the bundle of rights that an entity may acquire from the assignee. For example, an industrial sponsor who wishes to utilize the technology developed at a university may license the technology from the university. In this case, the industrial sponsor or company would be the licensee, i.e., the entity receiving the license and the university would be the licensor, i.e., the entity giving the license. In this example, the university is both the assignee and the licensor.

An analogy for this transfer is that of leasing a car. The individual who leases the car has a “bundle of rights and responsibilities” such as driving the car, maintaining the car, paying taxes on the car, but the “ownership” of the car belongs to someone else. Similarly, the industrial sponsor may acquire a “bundle of rights” such as, but not limited to: exclusive use of the technology, the right to publish, the right to enforce the IP, etc. These rights may resemble ownership, but are not ownership. Now that the background has been established, the issues of ownership shall be discussed from the university and company perspectives below.

A. University Input

Several universities have taken the position that they cannot assign IP to any third party other than the 501(c)(3) foundations that manage the IP.³ This view seems to be generated by the lack of clarity of §23-4.4 of the Virginia Code that fails to define the term “significant use of general funds.” In addition, by taking the viewpoint that they legally cannot assign IP, one issue in the negotiation process with companies is eliminated. Several licensing departments representatives stated this is not an important issue and does not affect their ability to successfully transfer IP to companies, but several others defined it as the most contentious issue with businesses. Several of these notions are in direct contradiction to the corporate sentiment on the issue of ownership of IP.

B. Business Input

The perception in the corporate community is that the universities do not understand the law and are not willing to work with corporations to address their need for ownership. The corporate community is quite familiar with the ATP program sponsored by the federal government, which mandates that ownership of IP reside with the company; SBIR/STTR programs allow IP ownership to reside with the university. In addition, if the corporation were to hire a non-state employee, such as a private research laboratory, the company would have the freedom to negotiate for ownership of the IP.⁴ Therefore, numerous corporations find it frustrating to be told that their research money is appreciated but that the corporation will not be allowed to own the fruits of the work that they have sponsored.

IP is the sole asset of many high tech start-ups and spin-offs. These companies rely on ownership of IP as means to leverage financing for their existence. Many of these companies are formed on the basis of IP garnered from university technology and/or sponsored research at Virginia universities. It is essential for these companies to show ownership of proprietary IP to achieve their funding objectives. The perception in the corporate marketplace is that universities do not understand that ownership issues may have nothing to do with control, but revolve around positioning a company for financing.

Another issue regarding ownership of IP is the enforcement of the ownership. It is a concern of the corporations that if they do not own the IP, they will not be able to use this fact of ownership as a barrier against their competition. Further, their fear is that the universities, the actual owners, will not be able to afford the litigation that may ensue. Additionally, even if the universities can afford such litigation, the universities may not have the same goals as the private company that sponsored the research and paid for the license of the IP.

C. Best Practices

The only Virginia university that has allowed for the assignment of IP to third parties is the College of William & Mary. Officials there believe that the term “significant use of general funds” does not include salaries of the principal investigator. Therefore, they believe that they are free to negotiate assignments with corporations.⁵ The respondents also indicated that while they have the freedom to negotiate assignments, they would do so only if there is a strong business or other reason for doing so. It is their belief that the ability to negotiate ownership provides them with an advantage in the marketplace. In addition, they believe that having the flexibility to consider assignment of ownership strengthens their negotiations and relationships with business.

Several people at other institutions outside the state which were regarded as having best practices argued strongly that the state should never give up ownership and that business owners should be better educated about the bundle of rights they can appropriately negotiate (such as an exclusive license) that give them “95% of the rights of ownership.”

D. Issue-related Problems

It is important to understand that the issue of ownership is one of education of both corporations and universities. First, corporations don’t seem aware that they can accomplish most of their business goals without an assignment of the IP to them. This may be achieved by negotiating for the rights that are of concern in the license agreement. Second, most of the Commonwealth’s public universities do not seem aware that there is a legal process for granting assignments to corporations. Therefore, education of both sides is necessary.

In addition, there is serious disagreement between the majority of universities and business owners about the appropriateness of business ownership of university-developed IP. Currently, there is the presumption that the Commonwealth should retain ownership of IP if “significant use of general funds” is utilized in the development of the IP. One basis for the disagreement (between universities as well as between the majority of institutions and businesses) is the lack of clarity of the term “significant use of general funds.” §23-4.4 of the Virginia Code states:

The State Council of Higher Education working in cooperation with the state-supported institutions of higher education and in accordance with §23-9.10:4 shall adopt a uniform statement defining (i) the conditions under which a significant use of general funds occurs and (ii) the circumstances constituting an assigned duty.

The State Council of Higher Education or legislation could determine the appropriate level (i.e., whether the current \$10,000 level is reasonable given the millions of dollars spent by corporation on sponsored research) and what costs are included (e.g., salaries, overhead).

There is also disagreement over whether the Commonwealth is and should be interested in every piece of IP developed with general funds. Businesses maintain that if the goal of

commercialization offices is to assure a return for the investment of general funds in the universities, then the paradigm must shift from a control paradigm to an enablement paradigm. This means that the Commonwealth must utilize its resources to foster a competitive free market in IP. This could be accomplished in part by creating a system where the presumption is that IP may be assigned to corporations so long as there is no strong public policy reason for not assigning this IP. This would, in effect, flip the presumptions in §23-4.4 of the Virginia Code to say that the IP may be assigned unless the Commonwealth (acting at a centralized, state level or acting at the university level) takes specific action to prevent such assignment. Chapter C presents six models of different contexts of intellectual property funding and possible resolutions of the ownership issue.

Issue 5. Enhancing the Relationship of Faculty and Students with the University's Licensing Entity

Part of the problem in streamlining the licensing process is that some faculty (and students, to a lesser extent) do not understand what constitutes IP, their responsibilities in disclosing inventions to their university, the capabilities of the licensing entity, and the general technology transfer process. This creates frustration among the principal investigators (and their lab assistants or research team members) who proceed into negotiations with companies without regard for the IP policies and procedures in place. It also creates frustrations among officials in the technology transfer office because their insistence upon following procedures is often perceived by faculty as intrusion into an area where they should not be involved.

A. University Input

Several IP office officials commented that improved communication with faculty was badly needed but that their attendance at faculty meetings and sending of memos did not appear to achieve much. Some faculty members continue to talk directly with companies and enter into arrangements regarding IP that are incompatible with the university's (i.e., Commonwealth's) rights of ownership. The officials believe that if their services were more widely understood, faculty would see them as supportive rather than hindering, and the office's presence might serve as a recruitment and retention device for talented and/or entrepreneurial faculty.

The Commonwealth's universities and other organizations offer some programs to address this need. There is a one-day IP workshop offered that focuses on legal issues of commercialization and provides continuing legal education credit. Virginia Tech Intellectual Properties hosts a Patent Recipients reception to improve communication.

B. Business Input

Similarly, most of the business officials interviewed believe that better communication between faculty and a university's technology transfer office would be beneficial, although it is often a hindrance in the short run. If the faculty better understood the legal basis for the office's involvement in IP matters and if the faculty experienced benefits stemming from disclosures,

they would be more likely to follow procedures. Instances of companies having to renegotiate contracts multiple times with multiple university offices would decline.

C. Best Practices

A consultant recommended the University of Minnesota as having implemented effective means of communication with faculty, and a research team member spoke with the head of their technology transfer office. The office head attributed most problems in communication and cooperation to the small number of licensing associates in a typical office. The workload is already very heavy, and with increased disclosures, “spending much time to educate faculty slides down the priority list.” His solution involves three approaches in addition to the standard reliance on a Web page with documents and forms. First, he gives new staff a three-month initial assignment to meet faculty one-on-one and conduct seminars about the policies, procedures, and capabilities of his office. Second, he divides his staff into two groups: one supports the Academic Health Center and the other supports the rest of the university. Third, he provides flexibility so that researchers not wanting to document their inventions on the standard disclosure form don’t need to in order to obtain his office’s support.

His latest approach to solving the communications problems with faculty is to create new positions, termed “technology transfer liaisons,” whose responsibilities will be to coordinate with the units of the university generating the majority of IP. The liaisons will be physically located in those units and be constantly visible. Through their frequent interaction with researchers, they will encourage disclosures when they seem warranted and discourage disclosures that are inappropriate. A key feature of the positions is that they will be jointly funded by his office and by the unit served (“we wanted them to literally buy into the idea”), both groups that will benefit from any royalty income realized.

D. Issue-related Problems

The fact that many researchers, faculty and students do not know of or understand the IP policies and procedures that govern the marketing of their ideas creates significant problems throughout the IP commercialization process. For one thing the knowledge void forces technology transfer office personnel to spend time resolving misunderstandings as well as heated arguments. For another, it creates a situation where inflated expectations are easily dashed for the faculty member. Finally, for the investor it adds to the frustration of dealing with university IP offices and often slows down the licensing process to the point where the IP is no longer marketable.

Issue 6. Enhancing the Relationship between the University and Corporations

As mentioned previously, the generic relationship between a university and a corporation in Virginia is not positive. Each group sees the other as overdemanding (if not greedy) and inflexible. Clearly, better communication between them (which could be partially achieved through technology transfer conferences, as one interviewee suggested) is necessary for speeding the commercialization of IP and generating royalty revenues. The improved communication

would include education of the bench scientists within companies about the IP policies and processes at the institutions with which they are collaborating.

A. University Input

The university officials interviewed largely attribute their poor relationship with companies to the inherent conflict between the two organizations: “We have something they want, and they want us to give it to them for free.” No one described sustained efforts to strengthen corporate relationships or unusual ways to foster mutual understanding and respect.

B. Business Input

Most of the company officials echoed the sentiments and perceptions of their academic counterparts. Interestingly, the most creative thinking on this issue came from a former academic who left his medical school position to start several companies. He laid out the intelligence gathering activities of good business people: attending professional or association events where faculty doing research of interest are likely to appear; serving on boards, and striking up personal relationships that would allow insights into the thinking and professional activities of the individual. Why, he wondered, didn’t representatives from technology transfer offices do the same thing? They should attend conferences and meetings where owners of businesses in industries closely related to a university’s academic strength can be expected to attend. They should serve on a company’s board of directors so they would better understand what new research is needed to take that company to its next technological, and competitive, level.

C. Best Practices

No university was nominated for having best practices in this issue area.

D. Issue-related Problems

The problems associated with strained relationships between business and public universities stem from misinformation, misunderstanding, and suspicion. The operating paradigms held by the two parties of how IP commercialization should proceed are very different. Better communication was recommended by interviewees in both groups, but the idea that staff in IP offices should behave more proactively and strategically like business people (which in a sense they are) is an interesting one that may help resolve the strain.

Issue 7. Financial Arrangements regarding Commercialization of Intellectual Property

The structuring of the financial arrangement between a company and the university is a critical component of the technology transfer process. These financial arrangements may include sponsored research, equipment and raw materials, licenses and assignments, or any combination of the above. There is always contention between companies and universities on these issues.

This discussion focuses on conflicts in the following areas: (1) importance of knowing what one is negotiating for before talking finances; (2) up-front payments for licenses and/or assignments; and (3) payment of overhead rates.

A. University Input

The larger universities have policies on their acceptable financial arrangements that are posted on their web pages. These policies and boilerplate licenses are provided as examples to companies who wish to fund research at the universities. The universities believe that the terms of their standard arrangements are equitable and that publicizing the materials will reduce future conflict with business owners. (For further discussion on conflicting roles, please see Issue 1.)

University officials perceive that corporations have resources not available to themselves which constitute significant advantages to the companies. The officials also perceive that corporations always attempt to structure one-sided deals and that caution must be taken when negotiating terms. They are very reluctant to negotiate a license up front in conjunction with a sponsored research contract because it is impossible to determine what IP may result from the research effort. University officials also presume that up-front payments are desirable because they provide immediate financial compensation to the technology transfer office. This preference is reinforced by the belief that unless a university receives up-front payments on all licenses, it appears that they are favoring or benefiting one company over others in the marketplace.

Finally, there is the strong belief that overhead rates should be paid by the corporate sponsor.. The term overhead rate or indirect cost includes heat, light, electricity, janitorial services, building and grounds maintenance, library services; and administrative services such as accounting, secretarial, and other support. Indirect costs rates are determined by the federal government on an annual basis; the current rate is 48%. Universities are accustomed to the federal government paying overhead rates on sponsored research contracts and have attempted to utilize the same overhead rate structure with businesses, sometimes regardless of company size or capability to pay.

B. Business Input

From the corporations' viewpoint, it is very difficult to negotiate first for a sponsored research contract and then, several years later, negotiate for a license or assignment to the IP generated by it. They perceive that both negotiations are part of one transaction, and should be dealt with simultaneously. In addition, corporations find it difficult to determine the value of payoffs from investments in corporate research sponsorship of research if they do not have a structured basis to measure results.

Business officials also believe that universities do not have a good idea of how to value technology. In addition, they believe that universities do not appreciate the valuable role the corporation plays by taking IP and refining it into a marketable product or service. Simply stated, the belief in the corporate environment is that universities do not understand the level of investment necessary for commercialization of products.

There is significant resistance to up-front license payments among business owners for two reasons. First, the corporations believe that up-front payments are used to subsidize the licensing departments that should be funded subsidized by the Commonwealth from corporate tax revenues, among other sources. Second and more importantly, the corporations believe that their money spent on up-front payments would be better used to commercialize the product so that long-term return may be realized for both the corporation and the university.

Finally, it is very frustrating for corporations to find out after negotiating all of the terms that they are expected to pay overhead rates on top of their sponsored research grant. This, combined with the reality that they have no hope of ever owning the IP, leaves them bitterly disappointed and upset. (For a detailed discussion of ownership of IP, see Issue 4 in this report.)

C. Best Practices

Several of the universities indicated that they provide different financial terms for companies located within the state Virginia as well as small start-ups, a practice carried out by other institutions across the nation. In addition, universities are being more creative with regard to taking equity positions in start-ups, which allows these companies to invest their limited capital in product development instead of IP acquisition.

D. Issue-related Problems

The difficulties in this area stem once again from problems of communication, with the added issue of some mutual mistrust. There have been several workshops conducted within Virginia, under CIT sponsorship which respondents said greatly facilitated the education of both the technology transfer officers and corporate officers. In one workshop held in January 1998, the participants were put into roles opposite those they normally play, and were asked to negotiate the IP stemming from a hypothetical biomedical invention. The exercise gave the participants greater familiarity with the constraints and trade-offs experienced by the individuals who are normally across from them at the negotiation table.

A closely related problem is the cost of maintaining a licensing department within the university. The directors of the offices need to pay for the maintenance of their own offices, including staff salaries, and they necessarily view the deals they make with business as a way of covering these costs. There are other models in place, however, and several business interviewees suggested that the funding for the offices should come from the Commonwealth. They argue that this would relieve some of the pressure on the universities to demand high up-front pricing guarantees, and further enhance the relationship between the technology transfer offices and businesses.

The burden of having to pay an overhead rate is especially troublesome for small businesses. If a university charges the current federal overhead rate of 48%, this means that a small company's investment of one million dollars in sponsored research is buying them only \$675,000 worth of effort. This constitutes a large disincentive for small or start-up companies to support sponsored research at a university.

The problems relating to the financial aspects of deal-making lie at the core of the relationship between businesses and the universities in the Commonwealth. Any solutions that are put in place need to either take advantage of some of the win-win opportunities, or provide visible trade-offs so that both sides can see the mutual benefits of working in non-antagonistic modes.

Issue 8. The Strong State versus Strong University Paradigms

When thinking about ways to harmonize relationships between universities in the Commonwealth and businesses around the issue of technology transfer, the question arises of how much standardization and uniformity of policies and procedures would be beneficial. There is a tendency to focus on what changes would benefit the Commonwealth or which would benefit the schools, and the solutions and recommendations one supports depends largely on one's point of focus on this question. That is, does one focus on what would be in the best interest of the Commonwealth, or on the best interest of the universities? This question is closely tied to Issue 1 above (the conflicting roles of the university), especially as it is linked to the question of autonomy for professors and institutions. The assumptions that one makes about who does or should have power to resolve disputes and to be the ultimate arbitrator of the establishment of policies and procedures plays heavily into the answers that one proposes

A. University Input

University officials stated their concern that this study will generate a groundswell among those outside of academe to standardize the policies and procedures whereby IP is commercialized. This is an understandable reaction, given the fact that the various universities tend to have different sets of guidelines whereby technology generated by their professors is marketed, and that this can make life difficult for businesses.

Additionally, schools feel that the best way for them to serve their various constituencies is to remain strong and implement policies and procedures they believe work for them. Part of the desire to develop institution-specific policies stems from the recognition that the public universities in the Commonwealth tend to specialize in terms of their departments and degree programs, do have different strengths among their faculties, and range significantly in size. These factors influence the type, quantity, and potential financial return of the IP generated, so it makes sense that one structure will not fit all institutions well.

Universities that have relatively few disclosures or patents per year have only periodic need for staff to deal with the commercialization of IP. Mandating the existence of positions such as permanent legal staff to deal with the myriad intricacies of patent law would not be a useful solution for the smaller schools.

Furthermore, there are significant differences across the schools in the types of IP they generate and thus the types of IP issues they face. For instance, schools whose main thrust in the area of IP is distance learning are mainly interested in copyright law in order to determine who owns a course that is taught over the Internet, and if the professor leaves the institution, whether the course goes with him or her or whether it can be taught again at the originating institution. The

kinds of solutions to the IP issues these schools face are very different from those faced by schools specializing in biomedical research.

B. Business Input

Business officials would like to see more standardization of policies and procedures across the schools of the Commonwealth. Some also asked for an independent party to either run or oversee the negotiation process, removing some autonomy and reducing some inconsistencies across school.

C. Best Practices

Discussions with consultants about best practices in this issue area usually evolved to a focus on state versus corporate ownership of IP generated at public universities. There was no mention of states where the balance between the state's role and the universities' role seemed right. One consultant mentioned that the experiment in centralization recently conducted by the University of California System appeared to have failed.

D. Issue-related Problems

Traditionally, the public universities in the Commonwealth have acted autonomously. The academic freedom that protects the content of courses and the direction of research chosen by individual faculty members is seen to also protect the universities from outside forces. The reality is, however, that their public funding makes them an extension of the state government, so any forced coordination or centralization of functions could be seen as perfectly appropriate (and something that other Commonwealth agencies experience frequently). No interviewee recommended a balance point where the rights of the state and the rights of the university could meet, but the rights may not be perceived by observers as inherently contradictory.

Issue 9. Strengths and Weaknesses of the University Intellectual Property Office Paradigm and the Dedicated Non-profit Paradigm

This section will address the physical structure of the licensing branch of the university. There are two prevalent models utilized in most universities across the United States. The first model is where there is a Patent Administrative Office (PAO) which is part of the university. In the typical configuration, the PAO reports to the Office of Sponsored Research and to the General Counsel. The second model is one in which a private 501(c)(3) entity is established for the specific task of commercializing the IP of the university. This structure provides a separate legal entity that communicates with the corporate environment on behalf of the university. Other models tend to be combinations of these two.⁶

One issue that is raised by the particular formation strategy is its impact on streamlining the process for technology transfer. (The reader is referred to Issue 2 for a detailed discussion on the

streamlining issue.) Another issue that is raised by the formation process is how the interaction between university personnel and this entity is enhanced by a particular model.

A. University Input

Each university has its own particular IP management structure (see Issue 3). University officials unanimously expressed a sense of accomplishment in developing their technology transfer office to the point where it was at the time of the study, and in the extent to which the structure suited the institution. A common concern voiced by all interviewees was the need for greater interdepartmental cooperation, whether the licensing branch is part of the university or not.

B. Business Input

There was no discussion about the preferred model for the licensing branch. The comments most relevant to this issue focused on the needs for communication between individuals than the organizational structure per se. The most common comment was the need for there to be only one point of contact between the corporation and the university.

C. Best Practices

An example of a university that has begun with one structure and has migrated to another over time is the University of New Mexico. They originally started the licensing department by creating a Patent Administration Office (PAO) as part of the university. As the level of activity increased, they then created a 501(c)(3) corporation called the Science & Technology Corporation (STC). They are currently in an interim period where responsibility for licensing and patent procurement is being transferred from the PAO to STC. The New Mexico system is of great interest because it illustrates a migration path for the successful development of a strong IP program where there was not one large license that created the need for development of a formal program. This university should be watched to see what obstacles they encounter as they navigate this migration path.

D. Issue-related Problems

There is an important opportunity for universities far along in the development of IP offices to provide information and "lessons learned" to the institutions which are in the process of doing so. Interviewees at George Mason University and the College of William and Mary said they welcomed input from their peers on how to develop a program that is correct for them. The Academic Licensing Community of Virginia (ALCOV) formed by many of the Commonwealth's public universities might provide the support. There may be an important support role to be played by the Office of the Secretary of Technology, too. The combined experience and resources available from ALCOV and the Secretary would enable a university to efficiently develop its own department over time without necessarily having to experience the hard lessons learned at the other schools.

A second common theme from the smaller universities was the concern that a half measure may be instituted by the Commonwealth. By this, these universities indicated that their greatest fear was establishing an expectation among their principal investigators that the university was open for business without there being infrastructure to support the demand for their services

Another pattern emerged from the study. As a university's experience with IP grew, it was likely to have created a private 501(c)(3) or entity to accept IP ownership from the university and carry out all of the licensing activities. Universities that were provided funding to establish an independent licensing branch seem to have surpassed universities that were not. However, even the better established licensing operations within the Commonwealth, such as the Patent Foundation at the University of Virginia and Virginia Tech Intellectual Properties, Inc., also have on-going needs that could be met by support from the Commonwealth. To deal with the increased demand for their services, they will need funding to hire a full staff of qualified licensing associates. Both universities indicated that there is the potential for further expansion of the IP department based on the disclosure submissions that they currently receive. Both of these licensing entities generate more revenue than they need to operate; as nonprofit legal entities, they are required to turn over any excess revenues to their respective universities. Being allowed to retain a portion of their profits would greatly assist the growth of IP in the Commonwealth, the research team was told.

CHAPTER B. ESTIMATION OF THE MAGNITUDE AND VALUE OF LOST OPPORTUNITIES

A supplemental approach to this assessment of the policies and procedures is to examine the outcomes of the technology commercialization efforts at the Commonwealth's major research universities. To that end, the research staff attempted to collect and compile information from the Virginia public universities and from the universities frequently mentioned as having best practices in the technology transfer area for Fiscal Year 1998. Because the year had recently ended at many of the institutions, the decision was made to rely on the Fiscal Year 1997 data published by the Association of University Technology Managers, Inc. (AUTM). The document (AUTM Licensing Survey: FY1997 Survey Summary, 1998) presents data using a methodology refined over the six prior annual surveys, so the reliability and comparability of the numbers across institutions has increased with time.

Nineteen universities were included in the analysis. The three Virginia schools were the University of Virginia, Virginia Tech, and Virginia Commonwealth University. Three schools (the University of Maryland, the University of North Carolina, and North Carolina State University) were included because they are close geographical competitors. Thirteen other schools were included on the basis of mention by two or more interviewees as being institutions where best practices on technology transfer could be found. The schools are named in the tables that follow. Data were collected on three measures:

- Number of invention disclosures received
- Number of licenses and options executed
- Total sponsored research expenditures

The analysis consisted of three simple calculations. The first calculation was the number of disclosures received per \$1M in sponsored research, and the results are shown in Table 1. The second calculation was the number of licenses and options executed divided by the number of disclosures received; the results are displayed in Table 2. The third analysis calculated the rate of licenses and options executed divided by gross licensing income received, and the results are presented in Table 3. The logic behind the sequence of tables is to show how the three Virginia public universities compare with well-regarded public and private U.S. schools on several different IP measures. The goal is to show how increased performance by two schools, up to the median level on a particular ratio, would in principle generate more than a million dollars in additional gross licensing income for the Commonwealth.

Table 1 shows that two Virginia schools, the University of Virginia and Virginia Tech, rank above the median on the rate of disclosures per one million dollars of sponsored research which is a widely accepted goal; they achieved .60 and .56, respectively. As stated earlier, several interviewees mentioned that the “standard” for technology transfer offices was one disclosure per million dollars in sponsored research. Perhaps the interviewers misinterpreted this comment, or the respondents had other measures in mind, because none of the schools achieve a rate above

Table 1.
Rate of Disclosures Per One Million Dollars in Sponsored Research Expenditures

Institution	Number of Disclosures Received	Sponsored Research Expenditures (in thousands)	Rate	Rank among the 19 Schools
U. of Maryland	92	131,114	.70	1
Stanford U.	248	391,141	.63	2
U. of Virginia	81	135,366	.60	3
Cornell	188	331,776	.57	4
Virginia Tech	88	156,057	.56	5
U. of Washington	280	528,602	.53	6
U. of Wisconsin	199	379,600	.52	7
MIT	360	713,600	.50	8
U. of Pennsylvania	173	364,000	.48	9
U. of So. California	113	238,399	.47 M	10
U. of Florida	103	221,854	.46	11
Duke U.	146	360,977	.40	12
U. of Michigan	168	458,500	.37	13
Texas A&M	134	366,798	.37	14
U. of North Carolina	94	263,517	.36	15
Harvard U.	119	366,710	.32	16
Johns Hopkins	229	942,440	.31	17
North Carolina State U.	105	334,394	.24	18
Virginia Commonwealth U.	22	95,000	.23	19

.70. The median rate was .47 which was achieved by the University of Southern California (and is indicated by the "M" in that column). Virginia Commonwealth University was ranked at the bottom of the list with a rate of .23.

In contrast to the first table, Table 2 shows that only Virginia Tech (with .38) is above the median value in terms of the ratio of licenses and options executed to disclosures received. The median ratio of .27 was achieved by the University of Wisconsin. Virginia Commonwealth University was ranked 14th (with a ratio of .23), and the University of Virginia was ranked 17th (with a ratio of .20).

To improve its ranking in Table 2, a school could either increase the number of licenses executed or decrease the number of disclosures received, or increase or decrease both. The preferred objective would be to increase the number of licenses executed from the same number of disclosures received. For Virginia Commonwealth University to achieve the median ratio of .27, given its number of disclosures, the number of licenses and options executed would have to increase from 5 to 6. Similarly, for the University of Virginia to attain the media ratio, the number of licenses and options executed would have to increase by nearly half to 22.

Table 2.
Ratio of Licenses and Options Executed to Disclosures Received

Institution	Number of Licenses Executed	Number of Disclosures Received	Ratio	Rank among the 19 Schools
Harvard U.	67	119	.56	1
U. of Maryland	50	92	.54	2
U. of North Carolina	50	94	.53	3
North Carolina State U.	54	105	.51	4
Stanford U.	122	248	.49	5
Cornell U.	76	188	.40	6
Virginia Tech	33	88	.38	7
U. of So. California	36	113	.32	8
U. of Michigan	47	168	.28	9
U. of Wisconsin	53	199	.27 M	10
Texas A&M	35	134	.26	11
Duke U.	38	146	.26	12
U. of Pennsylvania	40	173	.23	13
Virginia Commonwealth U.	5	22	.23	14
MIT	75	360	.21	15
Johns Hopkins	46	229	.20	16
U. of Virginia	16	81	.20	17
U. of Washington	54	280	.19	18
U. of Florida	8	103	.08	19

Table 3 displays the number of licenses and options executed, the gross licensing income received (in thousands of dollars) and the ratio between the two. The schools ranked at the top have low ratios, meaning that they realized significantly more income in FY97 and yet executed significantly fewer licenses. It is evident from the raw numbers and ratios that there is substantial variation across the 19 schools in the number of licenses they executed in and the gross income they received. Part of the reason is due to the fact that there may be a lag of five or more years between the time that a license is executed and the license starts generating income for the university. Also, it is not unheard of for one or two licenses in a university's portfolio to account for the majority of its licensing income.

Table 3
Rate of Licenses Executed Per Thousand Dollars in Gross Licensing Income Received

Institution	Number of Licenses Executed	Gross Licensing Income Received (in thousands)	Ratio	Rank among the 19 Schools
U. of Florida	8	18,156	.0004	1
Stanford U.	122	51,762	.0024	2
U. of Wisconsin	53	17,173	.0031	3
MIT	75	21,211	.0035	4
Harvard U.	67	16,490	.0041	5
U. of Virginia	16	3,465	.0046	6
U. of Washington	54	11,510	.0047	7
Texas A&M	35	4,081	.0086	8
Johns Hopkins	46	4,687	.0098	9
North Carolina State	54	3,165	.0171 M	10
U. of Pennsylvania	40	2,136	.0187	11
Cornell U.	76	3,759	.0202	12
Duke U.	38	1,520	.0250	13
U. of Michigan	47	1,780	.0264	14
Virginia Tech	33	1,159	.0285	15
U. of North Carolina	50	1,684	.0297	16
Virginia Commonwealth U.	5	156	.0321	17
U. of Maryland	50	1,372	.0364	18
U. of So. California	36	687	.0524	19

The median ratio of licenses executed per thousand dollars of licensing income received was .0171 achieved by North Carolina State University. If Virginia Tech were able to increase the amount of revenue for each license executed to the same rate, the university would realize \$776,000 in additional licensing income. If Virginia Commonwealth University were to achieve the ratio obtained by the median institution, its gross licensing income would increase \$137,000. The total to the state would be \$913,000 or nearly one million dollars. This figure is a rough

estimate of the gross income lost due to a variety of possible factors including the research specialties at the universities, the value of the inventions disclosed, and the payment terms negotiated.

This analysis has utilized a small number of variables from a wide range of universities. A more refined analysis would look at a larger set of variables (available from the AUTM survey) and compare each one of the Virginia schools, in turn, to its peer institutions as defined by the State Council of Higher Education for Virginia. This would produce a less gross estimate of income loss from a more valid analysis.

Finally, historical data were collected directly from IP officials at three Virginia universities to ascertain trends on four measures: the number of disclosures made, the number of licenses executed, gross license income received, and sponsored research expenditures. The data were from FY93 through FY99, and are shown in Table 4. All three universities increased their sponsored research expenditures and the number of licenses executed over the time period. Only Virginia Tech Intellectual Properties also increased the gross license income received, and only Virginia Commonwealth University and the Patent Foundation at the University of Virginia increased the number of disclosures received. There are important differences across the three institutions in terms of the size of their IP offices, the research expertise of their faculty, and the types of inventions made that affect the figures reported in the table.

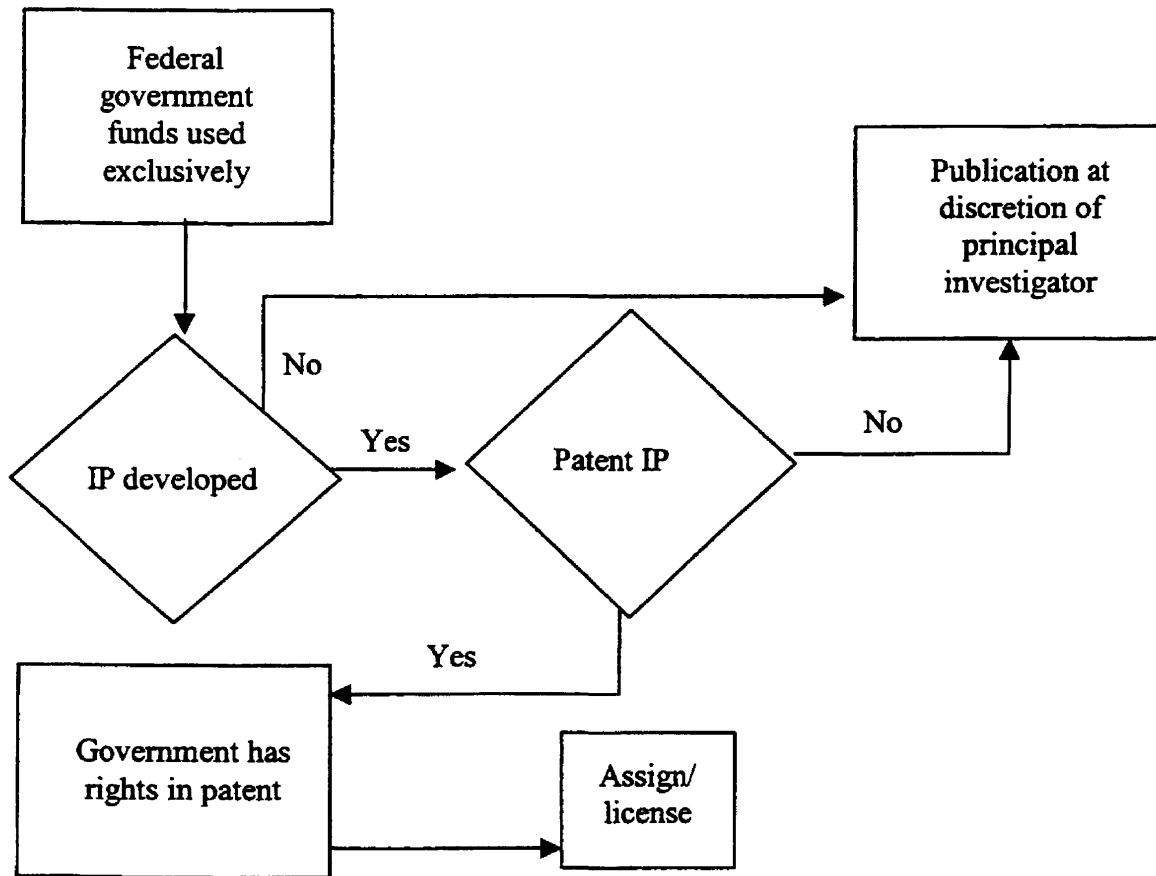
Table 4
Intellectual Property-related Activities at Three Virginia Universities

Measure:	FY94	FY95	FY96	FY97	FY98	FY99
Patent Foundation at the University of Virginia						
No. of Disclosures Received	43	49	63	81	117	154
No. of Licenses Executed	6	12	8	16	6	20
Gross License Income Received	\$4,635,032	\$5,590,424	\$3,320,351	\$3,465,682	\$3,751,868	\$4,185,446
Sponsored Research Expenditures	\$135,418,467	\$136,470,557	\$141,207,194	\$135,366,000	\$163,701,079	\$197,046,500
Virginia Commonwealth University						
No. of Disclosures Received	29	15	12	16	85	91
No. of Licenses Executed	4	4	5	7	18	14
Gross License Income Received	\$154,485	\$54,695	\$118,511	\$201,830	\$105,000	\$112,000
Sponsored Research Expenditures	\$81,920,959	\$87,358,549	\$95,709,003	Not Available	Not Available	\$105,000,000
Virginia Tech Intellectual Properties, Inc.						
No. of Disclosures Received	80	51	89	91	68	74
No. of Licenses Executed	17	18	28	18	32	41
Gross License Income Received	\$626,838	\$872,329	\$1,057,034	\$1,159,175	\$1,095,962	\$1,328,343
Sponsored Research Expenditures	\$148,313,000	\$148,501,000	\$143,815,000	\$169,800,000	\$167,100,000	Not Available

CHAPTER C. MODELS OF INTELLECTUAL PROPERTY FUNDING AND OWNERSHIP

There are six different funding contexts in which intellectual property may be generated in a Virginia public university environment. The flowcharts below outline the most common contexts. Flowchart 1 presents the situation in which federal government funds are used exclusively.

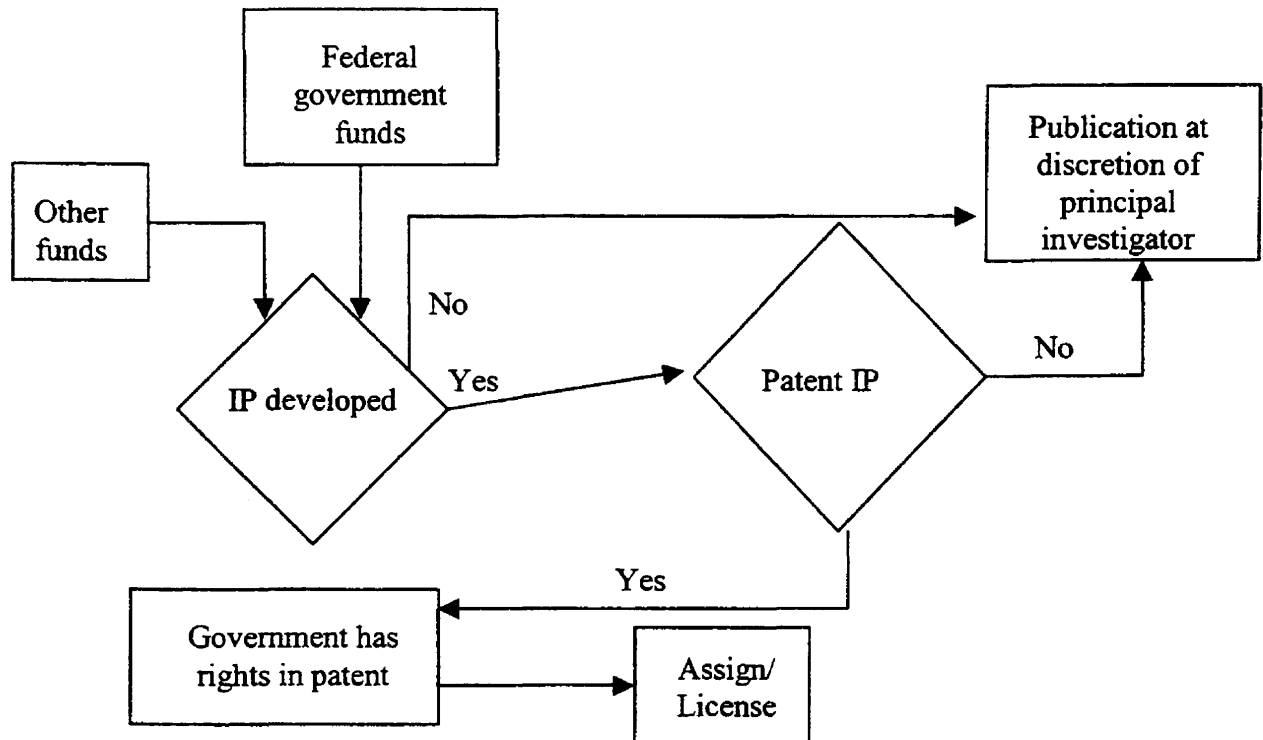
**Flowchart 1
Federal Government Funding Exclusively**



In this case, the federal government has rights in the patent application if one is filed. These rights are controlled by the Bayh-Dole Act Public Law 96-517 and 98-620 at the federal level, and they supersede any other rights in the intellectual property. (For clarification of ownership rights, see the Legal Primer in Appendix B and the discussion of SBIR, STTR, and ATP-funded research under Issue 4.

Flowchart 2 shows the IP context when federal government funds support the research along with funds from some other source.

Flowchart 2
Federal Government Funding with Any Other Funds

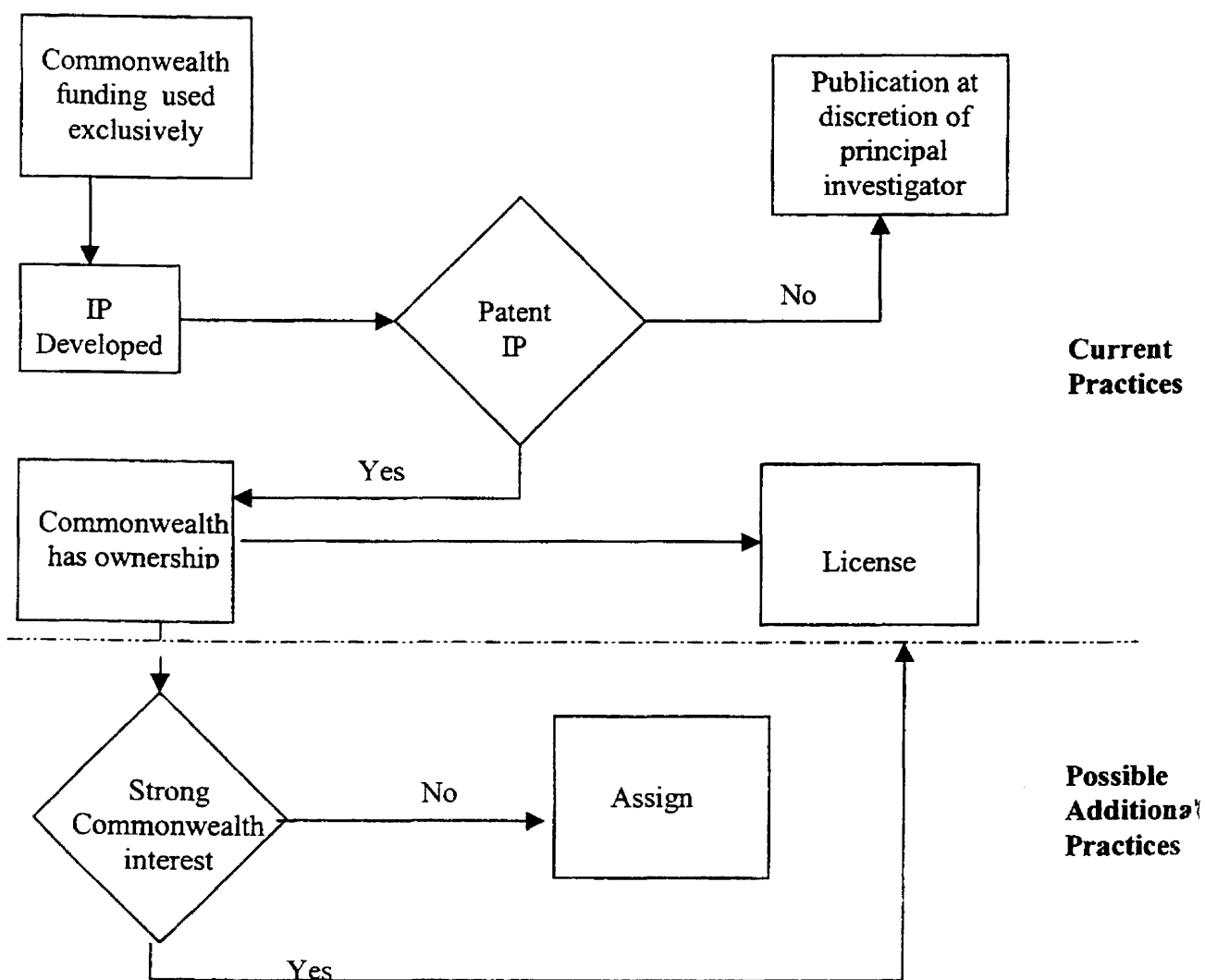


Since federal funds are used, the Bayh-Dole Act Public Law 96-517 and 98-620 supersedes any other rights in the intellectual property.

Flowchart 3 shows the context when only Commonwealth funds are utilized in the development of the IP.

In this situation under current practices, the Commonwealth has ownership of the IP and licenses it. It has been suggested that an additional possible practice to this would be as illustrated below the dashed line. The solid line from “Commonwealth has ownership” to “License” would be replaced by the line down to “Strong Commonwealth interest” and the remaining consequences implemented. In other words, if there were a strong Commonwealth interest such as health safety and welfare, then the Commonwealth may maintain the current position of licensing the IP. Otherwise, the IP may be assigned to a purchaser.

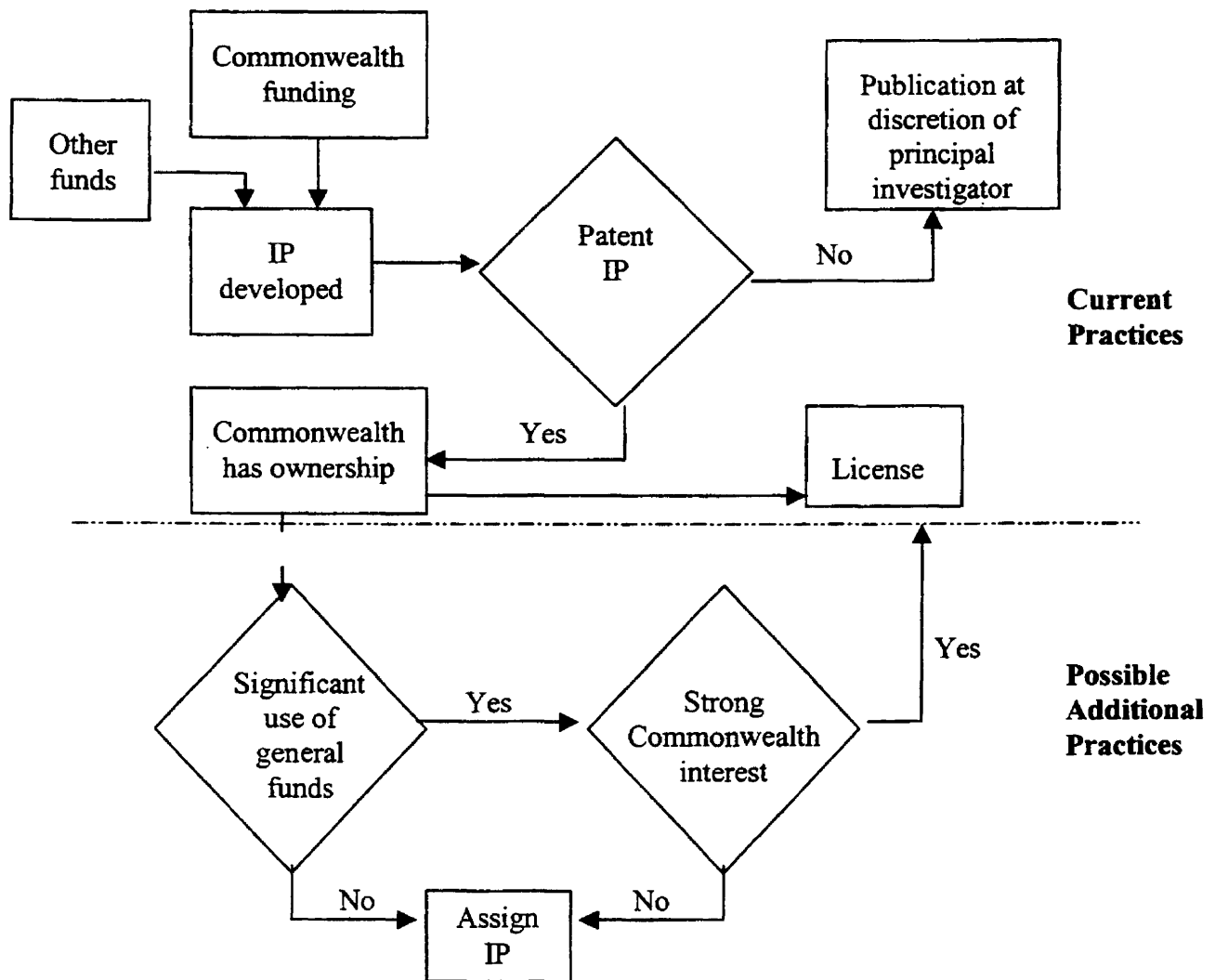
**Flowchart 3
Commonwealth Funding Exclusively**



If Commonwealth and other non-federal funds are utilized in the development of the IP, the context is as laid out in Flowchart 4. Again, the current practices are shown above the dashed line and possible additional practices below it.

The solid line from “Commonwealth has ownership” to “license” would be replaced by the line down to a new decision point, “Significant use of general funds.” If the answer is no, the IP could be assigned to a third party; if yes, the decision needs to be made whether there is a strong Commonwealth interest in the IP. If this is true, the IP would be licensed; if not, the IP may be assigned to a purchaser.

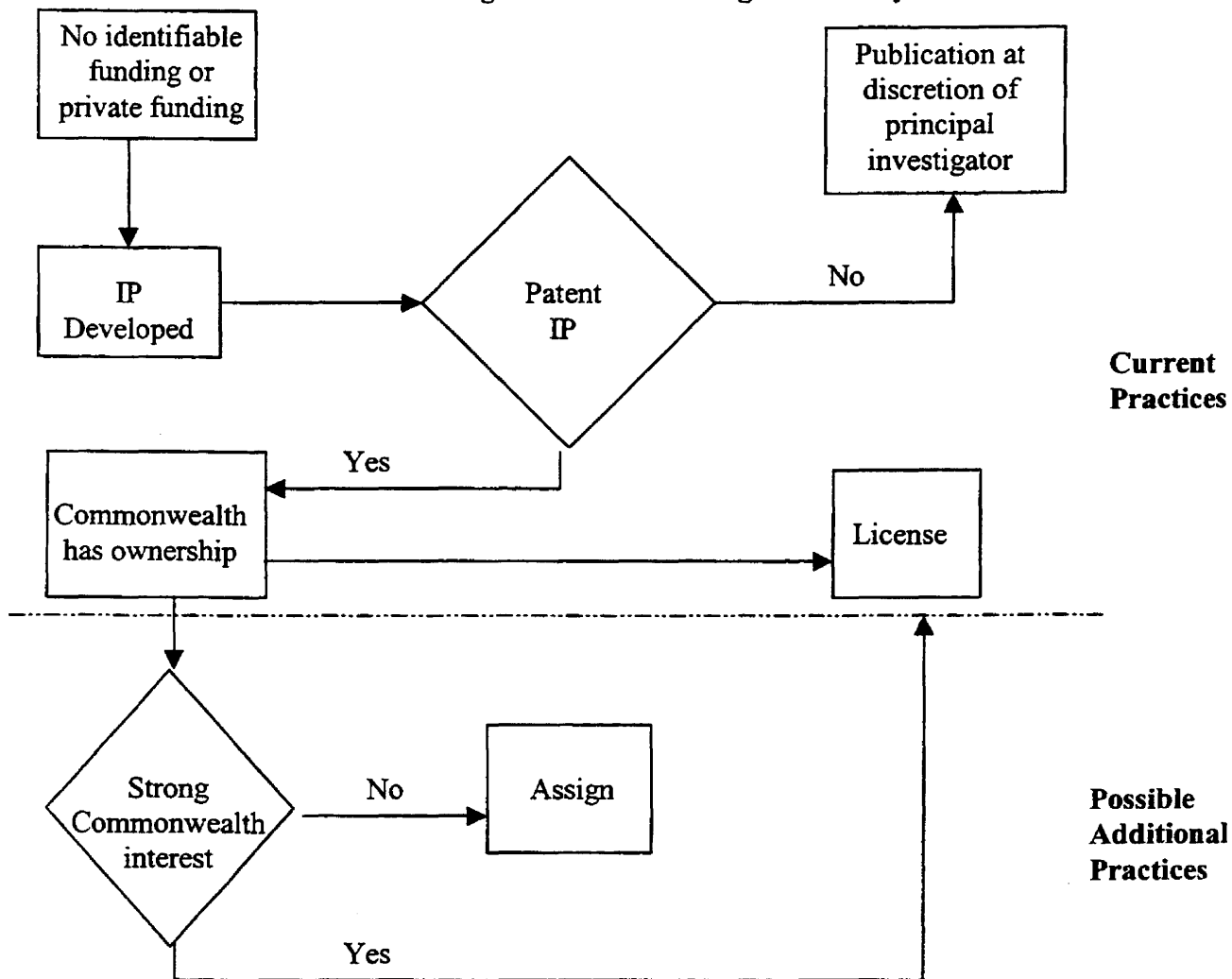
**Flowchart 4
Commonwealth Funding with Other Funds**



Flowchart 5 presents the situation in which no identifiable funds are utilized, or private funding exclusively.

When no identifiable funds are used, the Commonwealth owns the IP and licenses it. If only private funds are used, the majority of Virginia public universities believe that the Commonwealth has ownership because university facilities, faculty, and students are involved. The possible practice includes a decision point of whether there is a strong Commonwealth interest in the IP such as health or safety and welfare of the citizenry. If so, the state may maintain the current position of licensing the IP; otherwise, it may be assigned to a purchaser.

Flowchart 5
No Funding or Private Funding Exclusively



CONCLUSIONS

This study, mandated by Senate Joint Resolution 502, was conducted at an opportune time in the life of Virginia's public universities. The growth of high tech companies in various industries across the Commonwealth has brought to the fore the critical contribution of university researchers to the growth of such companies. University faculty are making increasing numbers of inventions and disclosures; business owners want to spend increasing dollars at the universities on research that will give them a technical edge over their competitors. At a time of shrinking or steady-state federal research budgets, industry-sponsored research may become a more important source of short-term income.

The current policies and procedures implemented at the universities have been the focus of this research study, as they are perceived by both university officials and Virginia business owners. The consensus is that there are opportunities for improvements in the processes underlying the commercialization of intellectual property in the Commonwealth. Commercialization is not as easily accomplished nor as profitable as most of the interviewees would like. What changes, if any, should be made in the processes will be determined by others.

APPENDIX A

LIST OF PERSONS INTERVIEWED AND THE TWO QUESTIONNAIRES USED

1. Public Universities in Virginia

Christopher Newport University

Paula Dominguez, Director, Sponsored Programs

College of William and Mary

Dr. Gary Kreps, Associate Provost for Research and Graduate Education

Jane Lopez, Manager, Sponsored Programs

Anne Womack, Director of Sponsored Programs

George Mason University

Jeff Brandwine, University Legal Affairs Advisor

Dr. Christopher Hill, Vice Provost for Research

Jennifer Murphy, Director of Office of Sponsored Programs

James Madison University

Robert Kolvoord, Associate Dean of Educational Technology

John Noftinger, Associate Vice President for Academic Affairs, Research,
and Program Innovation

Susan Wheeler, Policy and Legal Affairs Advisor

Old Dominion University

Robert Wolfson, Executive Director, Old Dominion University Research Foundation

Bruce Harper, Intellectual Property Manager, Office of Research, Economic
Development and Graduate Studies

University of Virginia

Dr. Robert MacWright, Executive Director, University of Virginia Patent Foundation

Norma Miller, Director, Office of Contract Support, School of Medicine

Dr. David Hudson, Associate Vice President for Research

Virginia Commonwealth University

Dr. Richard Franson, Director, Office of Technology Transfer and President, Intellectual
Property Foundation

Virginia Tech

Michael Martin, Executive Vice President, Virginia Tech Intellectual Properties, Inc.

Tom Hurd, Office of Sponsored Research

2. Other Universities

Stanford University

Kathryn Koo

University of Minnesota

Tony Strauss, Patents and Technology Marketing

University of Washington

Karen Deyerle, Office of Technology Transfer

3. Federal Laboratories

NASA/Langley

Preston Carraway

Gary Farley, Ph.D.

Kurt Hammerley

Sam Morello

Charles Blankenship (formerly head of TTO)

4. Virginia Businesses

Robert Klosterman, Newport News Shipbuilding

Jerry Deerman, Newport News Shipbuilding

Dr. David Martin, Mosaic Technologies

Bud Oakey, Mosaic Technologies

Dr. Brandon Price, Croptech Development Corp.

Dr. Don McAfee, Discovery Therapeutics

Dr. James Peck, Discovery Therapeutics

Dr. Tracy Wilkins, Tech Labs

Dr. Richard Freer, Commonwealth Biotechnical,

Todd Hylton ,CVC, Inc.

Rick Lally, Oceana Sensor Technologies

Dr. Jim Erler, Duality Semiconductor

5. Other Organizations

Dr. Fletcher Magnum, State Council of Higher Education for Virginia

Questionnaire for Interviews with University Officials

Name	University:		
Title:	<input type="checkbox"/> VP for Res	<input type="checkbox"/> SponRes	<input type="checkbox"/> Counsel <input type="checkbox"/> IP Official
Date:	<input type="checkbox"/> In-person	<input type="checkbox"/> By phone	Interviewer:

1. Let's begin with some historical background. Would you please tell me when your university began to deal with intellectual property generated by faculty, and what offices or committees were involved in the early days?
2. How is IP handled today by the university? What offices or organizations are involved? What are the responsibilities of each?
3. As you know, there are many different organizational models for how a university can identify IP and move it to commercialization. What do you see as the strengths of the model implemented at your school?
4. What are the weaknesses of the model as implemented at your school?
5. We have visited your university's website and searched for documents pertaining to your IP policies and procedures. We have downloaded ____ (insert number) documents. They are titled _____ (list titles). Are there other documents available either in hardcopy or electronic format that we might have in order to fully understand how IP is handled at your school?
6. I have read the documents we currently have. What changes or improvements do you think are necessary to make the IP/technology transfer process as good as possible?
7. How do you define or measure "as good as possible?" What kind of performance indicators do you think are useful in measuring technology transfer success, and what numeric levels should those indicators achieve for you to consider an IP program as successful?
8. As part of our project, we will be interviewing officials from Virginia-based companies which have tried, successfully or unsuccessfully, to license technology from the state's public universities. What will they tell us about their experiences in dealing with your university?
9. We will also be looking at public and private universities around the country for best practices in dealing with IP commercialization. What schools would you recommend we look at? What aspect of the policies and procedures of each institution constitute best practices in your mind?
10. That is the end of my questions. Do you have any additional comments you would like to make?

[Interviewer: Firm up details on how to obtain the missing documents before concluding the interview.]

Thank you for your time in speaking with me today.

Questionnaire for Interviews with Business Officials

Name:	Title:		
Company:	Location:		
Date:	<input type="checkbox"/> In-person	<input type="checkbox"/> By phone	Interviewer:

1. Would you please describe for me the kind of work your company does?
2. What are the generic issues you see in the process of acquiring, managing, and protecting IP, independent of your company's experiences in Virginia.
3. I understand that your company has sought to license intellectual property generated at one or more public universities in the state of Virginia. Is that true? Would you please tell me about your experiences? [Interviewer: For each experience, find out the university involved, the offices and/or people involved, the technology sought, and the outcome.]
4. Based on your experiences, what three words best describe your dealings with the universities?
5. What aspects of the universities' IP policies and procedures do you think work well, based on your experience?
6. What aspects of their policies and procedures create frustration?
7. I want to ask you about changes you'd recommend that would make technology transfer in Virginia more beneficial for the schools and for the companies seeking to commercialize their IP. First, is it possible to define changes that would be mutually beneficial? Second, what changes would you suggest?
8. I'd like you for a moment to play the role of an IP official at a Virginia public university. What kind of performance indicators do you think are useful in measuring whether a technology transfer process is successful? What numeric levels should those indicators achieve for you to consider your an IP program a success?
9. As part of our project, we will be interviewing Virginia university officials about their experiences with Virginia-based companies which have tried, successfully or not, to license their technology. What do you think they will tell us about their experiences in dealing with companies like yours?
10. We will also be looking at public and private universities around the country for best practices in dealing with IP commercialization. What schools would you recommend we look at? What aspect of the policies and procedures of each institution constitute best practices in your mind?

11. I'd like to know more about your company, please. What is its size, how much research does it conduct, what are your major sources of funding for research, what are your major product's life cycles, what is your patent portfolio, who are your competitors, and what is the size of your legal staff?
12. That is the end of my questions. Do you have any additional comments you would like to make?

Thank you for your time in speaking with me today.

APPENDIX B

LEGAL PRIMER

It is important to understand the four pieces of law that govern technology transfer at the public universities in Virginia. They include:

§2.1-20.1:1 of the Virginia Code that states:

Patents, copyrights or materials which were potentially patentable or copyrightable developed by a state employee during working hours or within the scope of his employment or when using state-owned or state-controlled facilities shall be the property of the Commonwealth of Virginia.

§23-4.4 of the Virginia Code that states:

The Board of Visitors, the State Board of Community Colleges, or their designees may transfer any interest they possess in patents and copyrights or in material in which the institution claims an interest under its patent or copyright policy. However, the Governor's prior written approval shall be required for transfers of such property developed wholly or significantly through the use of state general fund and either (i) such property was developed by an employee of the institution acting within the scope of his assigned duties, or (ii) such property is to be transferred to an entity other than the Innovative Technology Authority, an entity whose purpose is to manage intellectual properties on behalf of nonprofit organizations, colleges and universities, or an entity whose purpose is to benefit the respective institutions. The Governor may attach conditions to these transfers as he deems necessary. In the event the Governor does not approve such transfer, the materials shall remain the property of the respective institutions and may be used and developed in any manner permitted by law. (emphasis added)

§23-4.4 of the Virginia Code that states:

The State Council of Higher Education working in cooperation with the state-supported institutions of higher education and in accordance with §23-9.10:4 shall adopt a uniform statement defining (I) the conditions under which a significant use of general funds occurs and (ii) the circumstances constituting an assigned duty.

Federal Legislation includes:

Bayh-Dole Act Public Law 96-517 and 98-620. The text for this legislation may be found at the Internet site: <http://thomas.loc.gov/cgi-bin/bdquery/z?d099:HR03773:@@@D|TOM:/bss/d099query.html>.

APPENDIX B.1

SENATE JOINT RESOLUTION NO. 502

Requesting the Secretary of Technology to conduct a study that results in a coordinated research and development (R&D) policy for the Commonwealth.

Agreed to by the Senate, February 8, 1999

Agreed to by the House of Delegates, February 16, 1999

WHEREAS, the Commonwealth of Virginia has extensive assets in its institutions of higher education and federal laboratories which can significantly impact economic, social, and educational opportunities of the 21st century; and

WHEREAS, within the confines of Virginia's institutions of higher education and federal laboratories, a wealth of knowledge, information, and experience has accumulated; and

WHEREAS, efforts have been made to establish and maintain intradepartmental and interdepartmental and intrainstitutional and interinstitutional sharing and collaboration across departments and institutions and organizations, including the private sector; and

WHEREAS, the Secretary of Technology is a newly created cabinet position, which is the first such cabinet-level position for technology in the nation and which is charged with monitoring trends and advances in fundamental technologies of interest and importance to the economy of the Commonwealth and directing and approving a stakeholder-driven technology strategy development process that results in a comprehensive and coordinated view of research and development goals for industry, academia, and government in the Commonwealth; and

WHEREAS, there is currently no comprehensive plan for the collaborative utilization of these valuable research and development assets; and

WHEREAS, a statewide effort to integrate the valuable wealth of knowledge, information, and experience, especially as they relate to the research and development of science and technology assets housed within the confines of the institutions of higher education, federal laboratories, and the private sector, would result in greater collaborations; and

WHEREAS, such an effort would enhance the facilitation of resources, capture the opportunities, and optimize the use of resources to benefit the economic prosperity of the Commonwealth; now, therefore, be it

RESOLVED by the Senate, the House of Delegates concurring, That the Secretary of Technology, in consultation with institutions of higher education, federal laboratories, and the private sector, and with the assistance of Virginia's Center for Innovative Technology, be requested to study and develop a coordinated research and development (R&D) policy for the Commonwealth. Included among the Secretary's findings and recommendations shall be the identification of assets and opportunities for collaboration and coordinated efforts, the identification of mechanisms already in place that facilitate such goals, and the identification of any barriers and obstacles for greater collaboration; and, be it

RESOLVED FURTHER, That the Secretary's study shall include a review of the intellectual property policies and procedures of the institutions of higher education and federal laboratories, incentives to participate in joint ventures, and best practices by which intellectual resources can be linked to commercialization to benefit the economy of Virginia. In addition, the study findings and recommendations shall suggest ways that an increased awareness of these assets and mechanisms might result in greater collaborations.

All agencies of the Commonwealth shall provide assistance to the Secretary for this study, upon request. The Secretary shall complete his work in time to submit his findings and recommendations to the Joint Commission on Technology and Science, the Governor, and the 2000 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

END NOTES

¹ Ownership of IP where federal funds are utilized in the development of the IP is governed under the specific program that provides these funds. Generally, these programs fall under the Bayh-Dole Act (35 USC 200 *et seq.*). This act addresses the ownership of IP by allowing the university which conducts the research to retain ownership. Additionally, Bayh-Dole mandates the university to commercialize such IP. It should be appreciated that the Bayh-Dole Act only applies if federal funds are utilized in the development of IP (see charts 1 and 2 in Section C). While the vast majority of sponsored research is conducted with federal funding, a growing proportion (currently 10%) is being conducted with private company or industry funds. If the research is not commingled with federally funded research, any resulting IP does not fall under Bayh-Dole and thus should be freely transferable, subject to Virginia Law and University Policy. In addition, specific federal programs such as the Advanced Technology Program (ATP) require the corporate sponsor to own the any IP developed under its funding. While Bayh-Dole is an important regulation to be aware of, its significance depends on the source of the research funding. Thus, the funding source must be identified before an analysis of potential ownership issues may be undertaken. All of the university interviewees were aware of this issue and have policies in place to make this determination. It should also be appreciated that Issue 4 addresses “privately funded research” and does not address the commingling of private funds with federal funds subject to Bayh-Dole, since any legislation passed in the Commonwealth would be subject to Bayh-Dole.

² It is unclear at this time if the salary provided to a principal investigator comes from the general fund or another source of funding.

³ In addition to Bayh-Dole, one can not ignore the impact of federal tax legislation such as the Federal Tax Free Bond Act of 1986 (Title 26, IRC, Subtitle A, Chapter I, Subchapter B, part 4, subpart A, § 140 *et seq.*). The gist of this act is to provide preferential tax status for bonds where no more than 10% of funds are used for “private use.” This generally comes into play when the facility where the research is being conducted was built by using tax-free bonds. One viewpoint is that private companies who sponsor research, and receive the benefits of the research (such as IP) without paying fair market value for these benefits, would count against this 10% cap. This would be true if the sponsoring company was not paying any amount for the IP. In fact, it has been a long-standing tradition that these sponsors may receive an option to license IP at a royalty amount or rate that is negotiated with the TTO. A full study of the effects of modifying this tradition to allow for the assignment of IP generated at the public universities in Virginia should be conducted by the Attorney General with an eye toward this tax legislation.

It should be appreciated that there are numerous other existing tax laws and pending legislation relevant to the assignment issue. These include the following: HR 1039 Amend IRS code for tax credit for clinical testing; HR 1328 Public Benefit Collab. Research Tax Credit Act of 1999; HR 1682 Private Sector Research & Development Investment Act of 1999; HR 1795 National Institute of Biomedical Imaging & Engineering Establishment Act; HR 1798 Clinical Research Enhancement Act of 1999; HR 2086 Networking and Information Technology Research and Development Act; HR 2392 Small Business Innovation Research Program Reauthorization Act of 1999; S 951 Private Sector Research & Development Investment Act of 1999; S 1110 National Institute of Biomedical Imaging & Engineering Establishment Act; S 1268 Twenty-First Century Research Laboratories Act; and S 1504 National Fund for Health Research Act. Since tax law is a highly specialized legal area, it is suggested that the Attorney General’s Office be consulted for compliance with existing and pending legislation.

⁴ Section §59.1-208 of the Virginia Code mandates that intellectual property developed by contract development services belongs to the sponsor.

⁵ As discussed in the endnote above, this report does not address the issue of what funds are to be included in the term “significant use of general funds.”

⁶This discussion does not claim to offer a full legal treatment of the issues surrounding 501 (c)(3) entities.

