

**GLOBAL  
DIMENSIONS OF  
INTELLECTUAL  
PROPERTY  
RIGHTS  
IN SCIENCE  
AND  
TECHNOLOGY**

**NATIONAL RESEARCH COUNCIL**

**GLOBAL DIMENSIONS OF  
INTELLECTUAL PROPERTY RIGHTS  
IN SCIENCE AND TECHNOLOGY**

Office of International Affairs  
National Research Council

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# Preface

Intellectual property rights (IPRs) have become an area of international interest and controversy as the rate and cost of technological progress have increased, and as national borders have become ever more transparent. Disagreements have arisen not only over the mechanics of granting such rights, but even over the validity and merits of certain fundamental concepts concerning IPRs. For example, there are those who argue that the existence of robust IPR laws catalyzes innovation, and beneficially influences the economic future of companies and nations. Others argue that such laws are economically inefficient and exploitative, and that they are detrimental to the development of emerging nations.

IPRs are not a recent invention, and the word “right” may not be particularly well chosen. As Paul David notes in Chapter 2 of this volume, patents were used as early as the 14th century by English monarchs to protect the knowledge base of foreign craftsmen imported to enhance the state of the domestic technology. In those days, patents were granted initially for 14 years, which was the time necessary to graduate two generations of apprentices. The fact that rights to exploit advances in technical capability are granted by some governing authority, and are not considered inherent to the creator, is not generally appreciated. In the United States, for example, the government grants rights primarily to promote the public interest, and such rights are formulated so as to balance in some manner the economic benefits to the inventor and to society at large. Thus, it will be appreciated that the center of gravity of this balance may shift with changes in the state of the technology, the market, or social values (U.S. Congress, Office of Technology Assessment, 1992).

Nowadays, the varying laws governing IPRs in different nations play a major role in the strategic thinking of corporations as they attempt to ensure that they receive a sufficient return on their often large and certainly risky investments in research and development. Clearly, a company will not be enthusiastic about doing business in a country unwilling to provide protection for the intellectual content of its products—a concern now facing U.S. businesses as they evaluate opportunities in the former Soviet Union. Moreover, in these times of fiscal constraint, U.S. research universities also are increasingly concerned with exploiting the fruits of their intellectual labors and are encountering problems related to differences in national laws.

Part of the problem is that the United States follows the “first-to-invent” rule and permits an inventor a grace period of one year between the announcement of a discovery in a scientific paper or at a meeting, and filing for a patent. Other nations follow a “first-to-file” rule and do not permit disclosure before filing a patent application. This difference has had unfortunate consequences, for example, in the case of Boyer and Cohen’s exploitation of their discoveries associated with rDNA. In this particular case, the recombinant DNA technique was granted patent protection in the United States but not in Europe, thereby causing a considerable loss of royalties to the inventors.

Also of increasing concern is the unauthorized use of intellectual property, which is sometimes referred to as piracy. A recent study by the U.S. International Trade Commission indicated that losses to U.S. companies from unpaid royalties on drugs, software, and electronic technologies, for example, may amount to as much as 2-3 percent of sales (i.e., many billions of dollars per year). Multinational companies thus have had to develop multinational IPR strategies, and these may include the aggressive pursuit of patent royalty income as a means of ensuring profitability.

Governments of developing countries, on the other hand, sometimes condone, either explicitly or implicitly, unauthorized use of IPRs, arguing that all knowledge should be in the public domain, or that some degree of protection from the need to pay IPR royalties is required if industry in an emerging nation is to survive the competition from more advanced and fiscally strong industries in industrialized countries. Indeed, IPR issues have now become sufficiently important that they have appeared on the agenda of recent G-7 Economic Summit meetings and are a principal subject of debate in the current Uruguay Round of the General Agreement on Tariffs and Trade (GATT) negotiations.

The issue of IPR infringement was first addressed by the Academy complex at the annual meeting of the National Academy of Engineering in 1986. Subsequently, in February 1988, a group of experts was convened to identify areas for further study. Mary Ellen Mogee, a consultant with expertise on the IPR issue, was then commissioned to develop a comprehen-

sive background paper. This work was discussed by a larger group of experts and practitioners in June 1988, and led to a recommendation that the National Research Council (NRC) should organize a conference focused on the long-term impact on IPR issues resulting from the accelerating global diffusion of technology and from changes in the nature of technology itself.

Public and private sector sponsors for such a meeting subsequently were sought by Mitchel Wallerstein, who was then the associate executive director of the NRC Office of International Affairs. In April 1991, after funding had been obtained, an oversight committee was appointed to plan and organize a conference on the "Global Dimensions of Intellectual Property Rights in Science and Technology." The principal objectives of the meeting were (1) to examine the mutual impacts of trends in science and technology and in the philosophy and practice of IPRs, and (2) to discuss and define new approaches for resolving emerging conflicts in international IPR policies. The conference was held at the National Academy of Sciences on January 8-9, 1992, and was attended by more than 400 participants. This volume is based, in part, on the proceedings of the meeting. It should provide a valuable compendium of historical facts, current opinions, and options for action for both scholars and practitioners in the field of intellectual property rights.

It is a pleasure to acknowledge the invaluable contributions of the Conference Oversight Committee (Arden L. Bement, Harvey J. Berger, Anne W. Branscomb, Jacques J. Gorlin, Zvi Griliches, Karl F. Jorda, James L. Merz, John T. Preston, Gustav Ranis, and Herbert C. Wamsley); the visionary enthusiasm and energetic persistence of Mitchel B. Wallerstein and his colleagues, Roberta A. Schoen and Mary Ellen Moguee, who served both as the primary organizers of the meeting and as editors of this volume; and the financial support of the National Academy of Engineering, the U.S. Agency for International Development, the National Science Foundation, the U.S. Commerce Department, the Ford Aerospace Corporation, the Industrial Biotechnology Association, the Pharmaceutical Manufacturers Association, and the Alfred P. Sloan Foundation, in making this meeting as timely and valuable as it turned out to be.

A.R.C. Westwood

Chairman, Conference Oversight Committee

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# Contents

## **I INTRODUCTION**

- |   |                                                                                                                                                               |    |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 1 | The Global Dimensions of Intellectual Property Rights<br>in Science and Technology                                                                            | 3  |
| 2 | Intellectual Property Institutions and the Panda's Thumb:<br>Patents, Copyrights, and Trade Secrets in Economic Theory<br>and History<br><i>Paul A. David</i> | 19 |

## **II THE CASE FOR AND AGAINST A UNIFORM WORLDWIDE INTELLECTUAL PROPERTY RIGHTS SYSTEM**

- |   |                                                                                                      |    |
|---|------------------------------------------------------------------------------------------------------|----|
|   | Introduction                                                                                         | 65 |
| 3 | Why a Uniform Intellectual Property System Makes Sense<br>for the World<br><i>Robert M. Sherwood</i> | 68 |

4	Harmonization Versus Differentiation in Intellectual Property Right Regimes <i>Claudio R. Frischtak</i>	89
5	Unauthorized Use of Intellectual Property: Effects on Investment, Technology Transfer, and Innovation <i>Edwin Mansfield</i>	107
	Discussion	146

### III

#### NATIONAL AND INTERNATIONAL APPROACHES TO INTELLECTUAL PROPERTY RIGHTS

	Introduction	151
6	Comparative National Approaches to Intellectual Property Rights: JAPAN, <i>James E. Armstrong III</i> THE EUROPEAN COMMUNITY, <i>Bryan Harris</i> INDIA, <i>Deepak Nayyar</i> THE NEWLY INDUSTRIALIZING ECONOMIES, <i>Carlos Alberto Primo Braga</i>	155 158 162 168
7	Update on International Negotiations on Intellectual Property Rights <i>Jacques J. Gorlin</i>	175
	Discussion	183

### IV

#### SCIENTIFIC AND TECHNOLOGICAL ADVANCE AND ITS IMPACT ON THE ROLE OF INTELLECTUAL PROPERTY RIGHTS

	Introduction	189
8	Trends in Global Science and Technology and What They Mean for Intellectual Property Systems <i>John A. Armstrong</i>	192

9	Sectoral Views:	
	THE RESEARCH UNIVERSITY, <i>John T. Preston</i>	208
	THE FEDERAL GOVERNMENT, <i>Bruce Merrifield</i>	214
	U.S. INDUSTRY, <i>George W. McKinney III</i>	217
10	Intellectual Property Rights and Competitive Strategy:	
	A MULTINATIONAL PHARMACEUTICAL FIRM	
	<i>Otto A. Stamm</i>	221
	A MULTINATIONAL ELECTRONICS FIRM	
	<i>Michiyuki Uenohara</i>	228
	THE MEXICAN SOFTWARE INDUSTRY	
	<i>Antonio Medina Mora Icaza</i>	232
	A MULTINATIONAL TELECOMMUNICATIONS FIRM	
	<i>William L. Keefauver</i>	236
	Discussion	241

## V

### ADAPTING INTELLECTUAL PROPERTY RIGHTS TO NEW TECHNOLOGIES

	Introduction	249
11	Adapting the Intellectual Property System to New Technologies	
	<i>John H. Barton</i>	256
12	A Case Study on Computer Programs	
	<i>Pamela Samuelson</i>	284
13	Biotechnology Case Study	
	<i>George B. Rathmann</i>	319
14	Semiconductor Chip Protection as a Case Study	
	<i>Morton David Goldberg</i>	329
15	Optoelectronics	
	<i>Eugene I. Gordon</i>	339
	Discussion	351

## VI GLOBAL INTELLECTUAL PROPERTY RIGHTS ISSUES IN PERSPECTIVE

Introduction	357
16 Global Intellectual Property Rights Issues in Perspective: A Concluding Panel Discussion	
<i>Robert E. Evenson</i>	360
<i>David C. Mowery</i>	368
<i>Michael Borrus</i>	373
<i>Robert W. Lucky</i>	377
<i>Eugene B. Skolnikoff</i>	380
Discussion	384
Moderator's Summation	388
Coda: Issues for Future Research	391

## VII APPENDIXES

A. Conference Agenda	397
B. Biographies of Contributors	401
Index	419

# I

## Introduction



# The Global Dimensions of Intellectual Property Rights in Science and Technology

We live today in a world in which the economic health of nations and the competitiveness of firms is determined largely by the ability to develop, commercialize, and most importantly, to *appropriate* (or capture) the economic benefits from scientific and technological (S&T) innovations. Intellectual property rights (IPRs), such as patents and copyrights, are an important means used by firms to help protect their investments in innovation. They are legal instruments that have been used by governments for centuries to encourage industrial development and economic growth.

IPRs protect investments in innovation by granting the innovator a temporary monopoly on the use of the innovation. This prevents rapid imitation that could cut into the innovator's returns and decrease the incentive to innovate. By restricting imitation, however, IPRs arguably raise the cost of the new technology and restrict its availability. This may, in turn, retard further progress in the technology by preventing other firms from developing new innovations or improvements that build on the original innovation in a cumulative way. If the new technology has productivity-enhancing effects when used in economic activity, these too may be retarded by the protection of the original innovation.

Thus, IPRs inherently embody a policy conflict between the objective of providing an incentive to technological innovation and the objective of encouraging the rapid diffusion of new technology and the accumulation of technological knowledge. These competing objectives also represent powerful, competing economic interests—from R&D-intensive and non-R&D-in-



tensive firms at one level, to the industrialized, newly industrialized, and developing countries at another.

Governments have generally recognized, at least implicitly, the trade-offs that are involved in IPR laws, and each nation has established national IPR systems that attempt to strike a balance between competing objectives that is deemed appropriate for its national economic, political, and social context. It is important to note in this regard that IPRs are primarily a matter of *national* jurisdiction (i.e., the protection offered to an innovation is governed by the laws of the nation in which the innovation is made, used, or sold). Thus, for example, a patent obtained from the U.S. Patent and Trademark Office provides protection only within the territory of the United States. If a company is doing business in another country, it must file for and obtain IPR protection in that country. Moreover, the protection offered by that country's laws in many cases is not as strong as U.S. IPR protection. Although international IPR conventions exist, they do not establish specific rights. Instead, the extant international agreements attempt merely to ensure that, in any given country, foreign inventors receive the same rights as those granted to local inventors.

The protection offered by IPRs has never been complete, and for that reason many observers have criticized the idea that they grant even a temporary monopoly. Moreover, there has always been a tendency for some countries to seek to use IPR laws to favor domestic firms over foreign ones. (The major international IPR conventions are aimed at controlling this behavior in the interest of encouraging international trade.) Recent changes in global science, technology, trade, and economic development have, however, strained even further the effectiveness of IPRs in protecting S&T innovations.

This volume focuses on the nature of these changes, the challenges they present for national and international IPR systems, and their implications for science and technology. The Office of International Affairs of the National Research Council undertook an examination of the global dimensions of intellectual property rights in science and technology in response to increasing concern expressed by important segments of U.S. industry—and, to a lesser extent, the U.S. university research community—about the lack of uniform international treatment of IPRs and the difficulty of protecting their innovations from imitation. This examination took the form of a major conference, the proceedings of which are published in this volume.

A report of the U.S. International Trade Commission (1988:viii) estimated that the aggregate losses to U.S. industry from inadequate intellectual property protection in other countries in 1986 were \$23.8 billion, or 2.7 percent of total sales. Much of the recent concern has focused on the developing world, particularly on the so-called newly industrializing countries (NICs), where patent and copyright laws have been weak or, in some cases, nonexistent. Unauthorized expropriation of intellectual property in