INSTITUTE
for ADVANCED STUDY

REPORT

FOR THE ACADEMIC YEARS

1989·90 AND 1990·91

PRINCETON · NEW JERSEY

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[-1990]

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INSTITUTE FOR ADVANCED STUDY
Princeton, New Jersey

REPORT OF THE CHAIRMAN

This report covers a period marked by significant global events. The Institute reflected this exciting time and welcomed an extraordinary number of scholars from Eastern Europe and China — thereby expanding the networks of important intellectual exchanges in the sciences and humanities throughout the worldwide academic community.

The Board of Trustees was enriched through the additions of Rand V. Araskog, Bernard Bailyn, Theodore L. Cross, and Hamish Maxwell.

Rand V. Araskog, a native of Minnesota, graduated from the U. S. Military Academy at West Point and attended the Harvard Graduate School of Arts and Sciences before joining the office of the Secretary of Defense (1954-59). He was with Honeywell, Inc. in Minneapolis until 1966, when he joined the ITT System as director of marketing for its U. S. Defense-Space Group. He has been chief executive of ITT Corporation since 1979 and chairman since 1980. He is a director of the New York Stock Exchange as well as of Dayton Hudson Corporation, Dow Jones & Company, Inc., Hartford Fire Insurance Company and Shell Oil Company and is chairman of the Economic Club of New York and a member of the Council on Foreign Relations. He is the author of *The ITT Wars* (1989) and of articles that have appeared in *The New York Times* and elsewhere.

Bernard Bailyn was born in Hartford, Connecticut and educated at Williams College and Harvard University. He has taught at Harvard since 1949, becoming Professor in 1961 and Winthrop Professor of History in 1966. He was appointed Adams University Professor in 1981, and in 1983 he was named Director of the Charles Warren Center for Studies in American History. He is a member of the American Historical Association (President, 1981), a corresponding Fellow of the British Academy and a member of the American Academy of Arts and Sciences and other scholarly societies. His books include *The Ideological Origins of the American Revolution,* for which he received the Pulitzer and Bancroft Prizes in 1968, *The Origin of American Politics, The Ordeal of Thomas Hutchinson,* which was awarded the National Book Award in History in 1975, and *Voyagers to the West,* which won the Pulitzer Prize in 1987.

Theodore L. Cross, born near Boston, went from Amherst College to the Harvard Law School, where he was Editor of the *Harvard Law Review.* He has been a consultant to the U. S. Office of Economic Opportunity and the Department of Health, Education and Welfare. His books include *Black Capitalism, The Black Power Imperative* and *Behind the Great Wall* (the last-mentioned co-authored with his wife, Mary Cross). He was co-founder, chairman and chief executive officer

of the publishing company Warren, Gorham & Lamont. Since 1985 he has been chairman of Faulkner & Gray, Inc. He is a trustee of the Folger Shakespeare Library and of Princeton University Press, a member of the Legal Defense Fund of the N.A.A.C.P. and Director of the Institute for Scientific Information.

Hamish Maxwell was born in England and educated at the University of Cambridge. His career with Philip Morris began in 1954. After 1961, he held executive positions with Philip Morris International, which he served as president and chief executive officer from 1978 to 1983. Since 1984, he has been chairman and chief executive officer of Philip Morris Companies, Inc., the parent company of Philip Morris Incorporated, Philip Morris International, Inc., Kraft General Foods and Miller Brewing Company.

In 1990, Dr. Marvin L. Goldberger announced his retirement as director, to be effective in July, 1991. This enormously capable leader leaves the Institute with the deepest regret and with the warm recognition and appreciation of both the Board of Trustees and Faculty. A noted physicist of quick wit and precise intellect, Dr. Goldberger has enhanced the remarkable work of the Institute through his gifts of extraordinary diplomacy and scholarship. Together with his wife, Mildred, he added greatly to the spirit and cohesion of the institution. We thank them and wish them both well.

The seventh director of the Institute is Dr. Phillip A. Griffiths. Dr. Griffiths joins the Institute from Duke University, where he had been Provost and James B. Duke Professor of Mathematics since 1983. He combines the strengths of a world-class mathematician and a superb administrator. The Institute will be most fortunate to benefit from his leadership.

It is an honor to work with the distinguished Board and Faculty of the Institute. In closing, I would like to share a quote from one of our Trustees, G. Daniel Mostow, who said, "Centuries from now, the contributions of the Institute will still be discernible in the fabric of science and technology of that hard-to-imagine future. I believe earnestly that the Institute and the world's leading universities are the glory of our civilization; that long after the twenty-first century, generations will continue to admire the conjunction of individual genius and private capital that underlay our enduring contributions to knowledge."

James D. Wolfensohn, *Chairman of the Board*

REPORT OF THE DIRECTOR

It was my pleasure this year to welcome Professor Oleg Grabar to the Faculty of the School of Historical Studies. Professor Grabar, formerly the Aga Khan Professor of Islamic art at Harvard University, was born in France and received his BA from Harvard University and his Ph.D. in Oriental Languages and Literatures and History of Art from Princeton University. Professor Grabar is one of the world's leading Islamicists, and his work reflects a profound and broad knowledge of all aspects of Islamic history, bringing to bear a wide range of historical perspectives: political, economic, religious, and literary. His work spans participation in field archaeology (directing the excavation of the Moayyad palace at Qasr al-Hayr al-Sharqi in Syria in 1978) to highly theoretical interpretations of Islamic aesthetics.

Professor Grabar has written on many aspects of Islamic art, including its architecture, miniatures, mural paintings and coins. Among his published works are *The Formation of Islamic Art* (1973, 1987), *The Art and Architecture of Islam* (with Richard Ettinghausen, 1987) and, most recently, *The Great Mosque of Isfahan (1989)*. Soon to be published are his Mellon lectures on ornament which were delivered at the National Gallery of Art under the title *Intermediary Demons: Toward a Theory of Ornament*.

The Institute has been saddened by the loss of several important colleagues: Felix Gilbert, Professor Emeritus, School of Historical Studies, who died on Feburary 14, 1991; James F. Gilliam, Professor Emeritus, School of Historical Studies, on March 16, 1990; and Otto E. Neugebauer, Long-Term Member, Schools of Historical Studies and Natural Sciences, on February 19, 1990. The work of these fine scholars not only commanded wide respect, but each man had a profound impact as well on the research of younger scholars.

John H. Elliott, Professor in the School of Historical Studies since 1973, became Regius Professor of Modern History at the University of Oxford in June of 1990. John W. Milnor, Professor in the School of Mathematics since 1970, became Professor and Director of the Institute for Mathematical Sciences of the State University of New York at Stony Brook.

The Institute has a tradition of having Director's Visitors which provides an opportunity for attracting distinguished people whose interests frequently do not fall into the normal school structure of the Institute. The Institute community is thereby enriched, and the visitors are stimulated by their exposure to the Faculty and Members. Another aspect of the program is that it provides an opporutnity to explore new areas which at some future time might become part of the Institute's on-going activities.

It was a pleasure to have as Director's Visitors during 1989-91 Joel E. Cohen, Professor of Populations, The Rockefeller University; Richard J. Eden, Professor of Energy Studies at the University of Cambridge; Professor Fang LiZhi, former Director, Center for Astrophysics, University of Science & Technology, People's Republic of China; Vladimir Gribov, Professor of Physics, L.D. Landau Institute for Theoretical Physics in Moscow; Arnold Newman, photographer; Lev Okun, Head of Laboratory of Elementary Particle Theory, Institute of Experimental and Theoretical Physics, Moscow; Yakov Smorodinski, Kurchatov Institute of Atomic Energy, Moscow; and Gerald Wasserburg, Division of Geological and Planetary Sciences, California Institute of Technology.

At its biennial meeting in May, 1990, the Association of Members of the Institute for Advanced Study (AMIAS) elected Robert S. Doran, president. Dr. Doran, professor of mathematics at Texas Christian University, succeeds Dr. David Pingree.

The research of the Institute is shared through a wide variety of publications, seminars and lectures. In 1989-90, the Faculty of the School of Historical Studies presented a series of lectures that were open to the public. These were followed in 1990-91 by Faculty Lectures by the Schools of Natural Sciences and Social Science. The often over-flowing audiences for these lectures spoke strongly to the Institute's need for a larger lecture hall. I am pleased to report that plans have progressed well for the construction of the mathematics building and lecture hall with ground-breaking to take place during the fall of 1991.

I am very grateful for all of the support received by the Institute from its Board of Trustees, other individuals, foundations, corporations and the government. The Friends of the Institute has flourished under the leadership of Frank E. Taplin, Jr. and an outstanding Executive Committee.

Important new foundation grants have supported the research of all four Schools. These programs include two-year support for younger scholars in the School of Historical Studies by the Sherman Fairchild Foundation; support for long-term Members in astrophysics and theoretical physics by the W. M. Keck Foundation; three years of parallel and complementary interdisciplinary programs in the Schools of Historical Studies and Social Science by The Andrew W. Mellon Foundation; important programs in both the Schools of Mathematics and Natural Sciences by The Ambrose Monell Foundation; lectures and research in theoretical biophysics by The Seaver Institute; and special programs in the School of Mathematics by the Sloan Foundation.

Government support such as that from the National Science Foundation, NASA, the National Endowment for the Humanities and the State of New Jersey is also recognized with gratitude.

It is with the greatest appreciation that I thank all who contribute to the Institute. Only with this support is the Institute able to continue to pursue independent research at its highest and most productive level.

Marvin L. Goldberger, *Director*

A speech presented by Marvin L. Goldberger, Director, on May 5, 1990.

There is nothing quite like the Institute for Advanced Study in Princeton, New Jersey. Founded in 1930 by the Bamberger family, it was the inspiration of the renowned educator Abraham Flexner and remains today essentially unchanged, a tribute to his genius. Located on an 800-acre site on the outskirts of Princeton, the Institute is totally independent of Princeton University. There is a Faculty but no students; there is no teaching yet the Institute has a vital educational role; there are no laboratories, but a great deal of research is done. There are 22 permanent Faculty and about 150 visitors (called Members) who come with their families for a year. What kind of strange place is this and how has it maintained its vitality for nearly 60 years?

The original idea of the Institute was to provide a place where a relatively small number of outstanding scholars could work free from the obligations and distractions from research that are inevitably (and properly) present at a university, even the so-called research universities. It was quickly realized, primarily by one of the original Faculty, the mathematician Oswald Veblen, that this would rapidly produce a sterile atmosphere and proposed that there should be a continuing flow of young post-doctoral students as well as a number of older scholars in addition to the Faculty. This annual renewal has been and continues to be the life blood of the Institute. Flexner, who became the first Director, chose mathematics to be the first School because it was a field of great intellectual significance and also one in which there were unarguable objective criteria of excellence. His initial appointments of Veblen, John von Neumann and Herman Weyl were selected from the faculty of Princeton and the Institute was, in fact, housed in Fine Hall on the campus until the first permanent building was erected on the present Institute campus. Flexner's greatest coup was the hiring of Albert Einstein. This gave instant credibility to the fledgling endeavor. Mathematics and physics flourished and soon world-class scholars in archaeology, art history, other branches of history, economics, and political science were added to the Faculty. Among this group was the great art historian Erwin Panofsky, as renowned in his field as Einstein was in physics, and archaeologist-classicist Homer Thompson who is still active as an emeritus professor.

Robert Oppenheimer's appearance on the scene after the War as Director was electric. The charismatic hero of the atom bomb project was a magnet for the cream of the post-war crop of theoretical physicists. Faculty appointments included Abraham Pais, Freeman Dyson, C.N. Yang and T.D. Lee (the latter two won the Nobel Prize in physics in 1957 for work done at the Institute). Later accomplishments of the Members have been noteworthy: altogether nine future Nobel Laureates are alumni, as well as winners of the Wolf Prize and MacArthur Prize. The present Faculty of the School of Natural Sciences is exceptional. Five of the six are members of the National Academy of Sciences. Someone likened the two most recent appointments (Edward Witten and Frank Wilczek) to having Roger Clemens and Orel Hershiser on the same team.

It was not only in physics that brilliant appointments were made under Oppenheimer. Mathematicians Borel, Milnor, Montgomery, Selberg, Weil and Whitney joined the School of Mathematics and George Kennan came to the School of Historical Studies, an unusual appointment not without its opposition among the Faculty. It was, of course, a brilliant one and this great man is still active although now an emeritus professor.

The youngest of what are now four Schools is the School of Social Science started during the administration of Carl Kaysen who succeeded Oppenheimer in 1966. (Mathematics and physics split amicably in 1965 when the School of Natural Sciences was established, signifying the appearance among the physicists of astrophysicists.) There are currently three Faculty in Social Science with primary interests in cultural anthropology, political philosophy, and social history; political economics is represented by emeritus professor Albert Hirschman.

The permanent Faculty today still consists of superstars. The Institute continues to be able to hire the very best in spite of the existence at major universities of research professorships offering comparable freedom. The 150 annual Members are selected from among roughly 1000 applicants and the rate of acceptance of invitations is almost 100%. It seems clear that the Institute is doing something very right and something judged by at least the academic community as being very worthwhile. But what is this thing it does? Why should it continue to exist? Why does it merit support from the outside world?

The permanent Faculty do research, learn from each other, guide and learn from the Members; some of them teach at Princeton on a voluntary basis and supervise Ph.D. theses. The Members do research and learn from each other and from the Faculty. Everyone participates in seminars at the Institute, at Princeton University and increasingly at nearby Rutgers. The only obligation the Faculty and Members have is a full-time commitment to research.

The opportunity for total immersion in research is enormously stimulating both for young post-docs trying to begin an existence as independent scholars, and

for older ones to complete work or to take up something entirely different. The Members live together in an apartment complex within walking distance of the campus and eat at a superb dining hall. The whole setup encourages interaction among people from different disciplines and different cultures since the Members come from all over the world. Although the "Two Culture" problem is far from being solved here, the chances for doing so are greater than in a university setting where size and tradition militate against too much interaction. So, what the Institute "does" is to provide a place for people to do research and teach each other under optimal conditions as nearly free from outside stress as is possible. One Member has described it as "paradise without apples or snakes."

Why should the Institute continue to exist? If it didn't exist, should it be created and, if so, how would it differ from what is here? The fact that the Institute can still attract world-class Faculty away from the most prestigious universities and the best and brightest post-docs as Members is proof of its vitality. However, the circumstances that led Flexner to invent the Institute have changed. There are now many more research and post-doctoral opportunities and federal agencies that support such endeavors and thus the Institute's post-graduate educational role is no longer almost unique as it was before World War II. But what makes the Institute different from the universities as a research environment is the way the various pieces come together.

Consider, for example, the young post-docs in mathematics, about 60 in any year. This sheer number of people, all fanatically interested in the same general field, is something no university can offer. In addition, the mathematics community consisting of Institute Faculty and the faculties of Princeton University and Rutgers is simply unmatched. There are few prominent mathematicians in the world that have not passed through the Institute at one time or another. For example, the mathematics equivalent of the Nobel Prize, the Fields Medal, has been awarded 31 times; 18 of the awardees were at the Institute before getting the Medal and many of the rest at some time later. Seven past and present Faculty members are Fields Medalists.

Very much the same can be said for the environment of the 40-odd young physicists and astrophysicists who come each year. The Physics Department at Princeton has always been outstanding and that at Rutgers has improved dramatically in recent years, making the physics environment unusually exciting and attractive. For the past seventeen years the weekly astrophysics lunch seminar has been attended by scientists from up and down the Eastern seaboard and is generally regarded as the clearing house for all hot information. The Members in the School generally tend to stay for two years, but there are a small number of five-year Members who have invariably gone on to tenured appointments at major universities or at the Institute. There are usually several senior people in residence on sabbatical leave from their home institutions.

The atmosphere and style of operation, while no less exciting, is quite different in the Schools of Historical Studies and Social Science. The Members, about 30 in Historical Studies and 20 in Social Science, tend to be mature scholars who already have tenured appointments at universities. They come here to write books, to participate in special programs and to study with the distinguished permanent Faculty. Obviously, a small institution cannot cover all of the humanities. Emphasis in history is ancient Greece and Rome, medieval and modern European history and art history. Social Science consists, at present, of cultural anthropology, political philosophy, and social history. There is an unusually close relationship with Princeton University and the Institute enjoys full privileges at Firestone Library. The presence of this vigorous scholarly activity in the humanities under the same roof with scientific research is one of the things that makes the Institute unique.

On balance, a modern day Flexner, provided he or she were smart enough, wouldn't go too far wrong to re-invent the Institute largely unchanged in overall form. There are some research areas which might well have been expected to flourish that might be encouraged in a reincarnation (and which might well appear here in the future anyway) such as history of science, philosophy, linguistics and aspects of theoretical biology.

Finally, the question of whether the Institute merits support from the outside world must be addressed. The answer from Federal funding agencies like the National Science Foundation, Department of Energy, and the National Endowment for the Humanities (all of which gave us very broad umbrella grants and allow us near total discretion in the use of their funds) is a resounding yes. Foundations likewise are sympathetic to our efforts although they largely insist on the *quid pro quo* of rather well defined projects. Contributions from corporations are much more difficult to obtain. The Institute's product — books and journal articles — is rather esoteric and only rarely has any practical applications that would excite stockholders. There are few, if any, wealthy alumni to call on. Philanthropically inclined people are often more naturally attracted to their own alma maters. We must, therefore, rely heavily on Trustees for unrestricted funds and individuals who might want to be associated with this unique institution.

A truly civilized society should be prepared to support the highest form of pure intellectual endeavor without regard for immediate practical applications. In the long run, the obscure mathematics and physics at the forefront will inevitably have profound implications philosophically and maybe even practically. In the same way, deepening our understanding and appreciation of the humanities affects how we think about and respect ourselves and will influence how future historians will evaluate our civilization.

ACKNOWLEDGMENTS

ACKNOWLEDGMENTS (continued)

BEQUEST

INDEPENDENT AUDITORS' REPORT

The Board of Trustees
  Institute for Advanced Study —
    Louis Bamberger and Mrs. Felix Fuld Foundation

We have audited the accompanying balance sheet of Institute for Advanced Study — Louis Bamberger and Mrs. Felix Fuld Foundation (the "Institute") as of June 30, 1991, and the related statements of support and revenue, expenses, capital additions and changes in fund balances and of changes in financial position for the year then ended. These financial statements are the responsibility of the Institute's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, such financial statements present fairly, in all material respects, the financial position of the Institute at June 30, 1991 and the results of its operations and the changes in its financial position for the year then ended in conformity with generally accepted accounting principles.

DELOITTE & TOUCHE
Parsippany, New Jersey
August 19, 1991

BALANCE SHEET
JUNE 30, 1991 [WITH COMPARATIVE AMOUNTS FOR 1990]

ASSETS	1991	1990
OPERATING FUNDS:		
Cash and temporary investments	$ 780,959	$ 257,921
Accounts receivable	63,389	95,188
Government grants and contracts receivable	953,203	249,668
Accrued income on investments	1,325,729	1,764,875
Prepaid and other assets	245,022	224,534
TOTAL OPERATING FUNDS	$ 3,368,302	$ 2,592,186
PLANT FUNDS:		
Debt service fund deposits	$ 458,114	$ 453,074
Unamortized debt issuance expense	62,142	65,250
Land, buildings and improvements, equipment and rare book collection — net [Note C]	17,216,399	15,294,291
TOTAL PLANT FUNDS	$ 17,736,655	$ 15,812,615
ENDOWMENT AND SIMILAR FUNDS:		
Investments, at cost [Notes B & D]	$182,886,503	$185,513,158
TOTAL ENDOWMENT AND SIMILAR FUNDS	$182,886,503	$185,513,158

See Notes to Financial Statements

LIABILITIES AND FUND BALANCES	1991	1990
OPERATING FUNDS:		
Accounts payable and accrued expenses	$ 1,653,510	$ 892,309
Deferred restricted revenue [Note F]	1,536,791	884,113
Fund balance — unrestricted	178,001	815,764
TOTAL OPERATING FUNDS	$ 3,368,302	$ 2,592,186
PLANT FUNDS:		
Interest payable [Note D]	$ 293,114	$ 298,074
Long-term debt [Note D]	7,489,435	7,640,657
Plant fund balance	9,954,106	7,873,884
TOTAL PLANT FUNDS	$ 17,736,655	$ 15,812,615
ENDOWMENT AND SIMILAR FUNDS:		
Fund balances:		
True endowment	$ 37,923,222	$ 37,761,052
Quasi-endowment:		
Restricted	16,740,382	16,091,183
Unrestricted:		
Designated	11,560,295	10,213,085
Undesignated	116,662,604	121,447,838
TOTAL ENDOWMENT AND SIMILAR FUNDS	$182,886,503	$185,513,158

STATEMENT OF SUPPORT AND REVENUE, EXPENSES, CAPITAL ADDITIONS AND CHANGES IN FUND BALANCES FOR THE YEAR ENDED JUNE 30, 1991 [WITH COMPARATIVE TOTALS FOR 1990]

	OPERATING FUNDS	
	UNRESTRICTED	RESTRICTED
SUPPORT AND REVENUE:		
Endowment income [net of management fees]	$ 6,145,280	$2,375,450
Private gifts and grants	500	1,274,604
Government grants and contracts		2,621,374
Total support and revenue	6,145,780	6,271,428
EXPENSES:		
School of Mathematics	1,038,735	2,098,153
School of Natural Sciences	1,539,086	1,892,473
School of Historical Studies	1,707,360	798,144
School of Social Science		1,325,905
Libraries and other academic expenses	1,626,501	329,321
Administration and general	2,614,286	5,240
Auxiliary activity — tenants' housing expenses, net of unrestricted revenue of $224,039 in 1991	52,335	92,360
Total expenses	8,578,303	6,541,596
EXCESS [DEFICIENCY] OF SUPPORT AND REVENUE OVER EXPENSES BEFORE CAPITAL ADDITIONS	[2,432,523]	[270,168]
CAPITAL ADDITIONS:		
Gifts and grants		
Realized gain on investments — net		
Gain on sale of plant assets		
Investment income		
Total capital additions		
EXCESS [DEFICIENCY] OF SUPPORT AND REVENUE OVER EXPENSES AFTER CAPITAL ADDITIONS	[2,432,523]	[270,168]
FUND BALANCES AT BEGINNING OF YEAR	815,764	
TRANSFERS:		
Plant acquisitions and principal debt service payments, net	[2,730,767]	
Quasi-endowment funds utilized	4,637,753	281,094
Transfers to other endowment and similar funds	[112,226]	[10,926]
FUND BALANCES AT END OF YEAR	$ 178,001	$ –0–

TOTAL	PLANT FUNDS	ENDOWMENT AND SIMILAR FUNDS	TOTAL 1991 ALL FUNDS	TOTAL 1990 ALL FUNDS
$ 8,520,730	$ 68,075		$ 8,588,805	$ 8,548,767
1,275,104			1,275,104	1,077,708
2,621,374			2,621,374	2,717,296
12,417,208	68,075		12,485,283	12,343,771
3,136,888	277,995		3,414,883	3,024,450
3,431,559	393,318		3,824,877	3,532,040
2,505,504	152,255		2,657,759	2,592,334
1,325,905	70,689		1,396,594	1,506,741
1,955,822	154,093		2,109,915	1,815,552
2,619,526	196,142		2,815,668	2,749,194
144,695	106,933		251,628	289,730
15,119,899	1,351,425		16,471,324	15,510,041
[2,702,691]	[1,283,350]		[3,986,041]	[3,166,270]
	1,030,003	$ 959,804	1,989,807	157,543
		809,236	809,236	13,598,158
				443,469
	2,802		2,802	2,917
	1,032,805	1,769,040	2,801,845	14,202,087
[2,702,691]	[250,545]	1,769,040	[1,184,196]	11,035,817
815,764	7,873,884	185,513,158	194,202,806	183,166,989
[2,730,767]	2,730,767			
4,918,847		[4,918,847]		
[123,152]	[400,000]	523,152		
$ 178,001	$ 9,954,106	$182,886,503	$193,018,610	$194,202,806

STATEMENT OF CHANGES IN FINANCIAL POSITION
FOR THE YEAR ENDED JUNE 30, 1991 [WITH COMPARATIVE TOTALS FOR 1990]

	OPERATING FUNDS	PLANT FUNDS
RESOURCES PROVIDED:		
Deficiency of support and revenue over expenses		
before capital additions	$ [2,702,691]	$ [1,283,350]
Capital additions:		
Gifts and grants		1,030,003
Realized gain on investments — net		
Gain on sale of plant assets		
Investment income		2,802
Excess [deficiency] of support and revenue over expenses		
after capital additions	[2,702,691]	[250,545]
Items not using [providing] resources:		
Depreciation		1,351,425
Amortization of debt issuance expense		3,108
Gain on sale of investments — net		
Gain on sale of plant assets		
Proceeds from sale of investments		
Proceeds from sale of plant assets		
Decrease in receivables		
Decrease in accrued income	439,146	
Increase in payables	766,194	
Increase in deferred restricted revenue	647,685	
Total resources provided [used]	[849,666]	1,103,988
RESOURCES USED:		
Purchases of investments		
Purchases of plant facilities and equipment		3,273,533
Increase in receivables	671,735	
Increase in deferred charges	20,489	
Increase in debt service fund deposits		5,040
Increase in accrued income		
Decrease in payables		4,960
Decrease in deferred restricted revenue		
Reduction of long-term debt		151,222
Total resources used	692,224	3,434,755
TRANSFERS:		
Plant acquisitions and principal debt service payments	[2,730,767]	2,730,767
Quasi-endowment funds utilized	4,918,847	
Transfers to other endowment and similar funds	[123,152]	[400,000]
Total transfers	2,064,928	2,330,767
INCREASE (DECREASE) IN CASH AND TEMPORARY INVESTMENTS	$ 523,038	$ —0—

	ENDOWMENT AND SIMILAR FUNDS	TOTAL 1991 ALL FUNDS	TOTAL 1990 ALL FUNDS
		$ [3,986,041]	$ [3,166,270]
	$ 959,804	1,989,807	157,543
	809,236	809,236	13,598,158
			443,469
		2,802	2,917
	1,769,040	[1,184,196]	11,035,817
		1,351,425	1,180,185
		3,108	3,107
	[809,236]	[809,236]	[13,598,158]
			[443,469]
	330,055,425	330,055,425	365,343,181
			1,428,988
	171,903	171,903	11,282
		439,146	
		766,194	246,607
		647,685	
	331,187,132	331,441,454	365,207,540
	326,791,437	326,791,437	362,996,206
		3,273,533	1,947,471
		671,735	16,263
		20,489	
		5,040	5,433
			68,065
		4,960	4,567
			264,991
		151,222	141,222
	326,791,437	330,918,416	365,444,218
	[4,918,847]		
	523,152		
	[4,395,695]	–0–	–0–
	$ –0–	$ 523,038	$ [236,678]

NOTES TO FINANCIAL STATEMENTS · JUNE 30, 1991

A · SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

The Institute for Advanced Study — Louis Bamberger and Mrs. Felix Fuld Foundation (the "Institute"), an independent, private institution devoted to the encouragement, support and patronage of learning, was founded in 1930 as a community of scholars where intellectual inquiry could be carried out in the most favorable circumstances.

Focused on mathematics and classical studies at the outset, the Institute today consists of the School of Historical Studies, the School of Mathematics, the School of Natural Sciences and the School of Social Science. Each School has a small permanent faculty, and some 160 fellowships are awarded annually to visiting members from other research institutions and universities throughout the world.

The objectives of the Institute were described as follows in the Founders' original letter to the first Trustees: "The primary purpose is the pursuit of advanced learning and exploration in fields of pure science and high scholarship to the utmost degree that the facilities of the institution and the ability of the faculty and students will permit."

Basis of Presentation

The accompanying financial statements are prepared on the accrual basis and are presented in accordance with recommendations contained in *Audits of Certain Nonprofit Organizations* issued by the American Institute of Certified Public Accountants. Certain prior year amounts presented for comparative purposes have been reclassified to conform to the current year presentation.

Fund Accounting

The accounts of the Institute are maintained in accordance with the principles of "fund accounting." This is the procedure by which resources for various purposes are classified for accounting and reporting purposes into funds that are in accordance with activities or objectives specified. Separate accounts are maintained for each fund; however, in the accompanying financial statements, funds that have similar characteristics have been combined into fund groups.

Fund balances restricted by outside sources are so indicated and are distinguished from unrestricted funds allocated or designated to specific purposes by action of the governing board. Externally restricted funds may only be utilized

in accordance with the purpose established by the grantor of such funds. In contrast, the governing board retains full control over unrestricted funds to use in achieving any of the Institute's objectives.

True endowment funds are subject to the restrictions of the gift instruments which require that the principal be invested in perpetuity; only income earned on such funds may be utilized. Quasi-endowment funds have been established by the governing board to function as endowment funds and any portion of these funds may be expended. Unrestricted quasi-endowment funds have no external restrictions. However, certain of these funds have been internally designated to support specific needs of the Institute.

All gains and losses arising from the sale, collection, or other disposition of investments and other non-cash assets are accounted for in the fund which owned such assets. Ordinary income earned on investments and receivables is generally accounted for in the fund owning such assets. However, unrestricted income earned on investments of endowment and similar funds is accounted for as revenue in unrestricted operating funds, and restricted income is accounted for as deferred restricted revenue until used in accordance with the terms of the restriction or transferred to endowment and similar funds.

Forward Contracts

The Institute enters into forward exchange contracts for the sale of foreign currencies as hedges of investments denominated in foreign currencies. Gains and losses resulting from such forward contracts are deferred and included in the measurement of the gain or loss of the hedged security when sold.

Plant Assets and Depreciation

Uses of operating funds for plant acquisitions and principal debt service payments are accounted for as transfers to plant funds. Proceeds from the sale of plant assets, if unrestricted, are transferred to operating funds, or, if restricted, to deferred amounts restricted for plant acquisitions. Depreciation is provided over the estimated useful lives of the respective assets on a straight-line basis (buildings and capital improvements 20-40 years, equipment 3-6 years).

B · INVESTMENTS

Investments purchased by the Institute are recorded at cost; investments received by gift are recorded at the fair market value at the date of donation.

Endowment and similar funds investments at June 30, 1991 are comprised of the following:

	CARRYING VALUE	MARKET VALUE
Pooled investments:		
Cash equivalents	$ 13,401,930	$ 13,401,930
Equity securities	111,090,089	116,652,481
Debt securities	53,885,504	54,421,298
Mortgages and notes receivable from faculty and staff	3,240,975	3,240,975
Investment accounts receivable	1,805,561	1,805,561
Investment accounts payable	[555,480]	[555,480]
Total pooled investments	182,868,579	188,966,765
Funds invested separately:		
Equity securities	17,924	34,425
Total	$182,886,503	$189,001,190

Marketable debt and equity securities are carried in the aggregate at lower of cost (amortized, in the case of debt securities) or market. Realized gains and losses are computed based on the average cost of the investment.

Equity securities include the Institute's interest in certain limited partnerships with a carrying value of approximately $17,875,528 and a market value of approximately $19,170,682 at June 30, 1991. The Institute accounts for these investments under the equity method and, accordingly, recognizes its proportionate share of ordinary income and net realized gains attributable to the investments of the partnerships. The Institute's proportionate share of ordinary income and net realized loss was $75,991 and $125,783, respectively, for the year ended June 30, 1991.

Substantially all the assets of endowment and similar funds are pooled with each individual fund subscribing to or disposing of units on the basis of the market value per unit, determined on a quarterly basis. Earnings per unit of the pooled investments for the year ended June 30, 1991, exclusive of realized gains and losses, amounted to $350 after deducting management fees.

The following table summarizes changes in carrying and market values of the pooled investments:

| | POOLED ASSETS | | | MARKET VALUE |
	MARKET VALUE	CARRYING VALUE	UNREALIZED APPRECIATION	PER UNIT
June 30, 1990	$196,302,689	$185,495,233	$10,807,456	$7,846
June 30, 1991	189,001,190	182,886,503	6,114,687	7,704
Decrease in unrealized appreciation for the year ended June 30, 1991			[4,692,769]	
Realized net gain for the year ended June 30, 1991			809,236	
Net change for the year ended June 30, 1991			$[3,883,533]	

C · PHYSICAL PLANT

Physical plant and equipment are stated at cost at date of acquisition, less accumulated depreciation. Library books, other than rare books, are not capitalized.

A summary of plant assets at June 30, 1991 follows:

Land and improvements	$ 2,411,447
Buildings and improvements	23,796,664
Equipment	7,709,413
Rare book collection	199,508
Total	30,117,032
Less accumulated depreciation	[16,900,633]
Net book value	$ 17,216,399

D · LONG-TERM DEBT

A summary of long-term debt at June 30, 1991 follows:

7.804%, 1980 — NJEFA	$7,565,000
Less unamortized bond discount	[75,565]
Total long-term debt	$7,489,435

In July, 1980, the Institute received proceeds of the New Jersey Educational Facilities Authority (NJEFA) offering of $8,775,000 Revenue Bonds, 1980 Series A, the Institute for Advanced Study Issue. The proceeds were used for the construction of the West Building, the Dining Hall and the Social Science Library, as well as other construction and major remodeling projects of Institute facilities.

The bonds are dated July 1, 1980, bear interest, payable semi-annually, at the net average annual rate of 7.804%, are subject to redemption at various prices, and require principal payments and sinking fund installments through July 1, 2011. Bond principal in the amount of $165,000 matured on July 1, 1991 and bond principal in the amount of $175,000 (1992), $185,000 (1993) and $200,000 (1994) will mature on July 1 of the designated years. The obligation to pay the Authority on a periodic basis, in the amounts sufficient to cover principal and interest due on the bonds, is a general obligation of the Institute and is collater-alized by United States Treasury Notes, 8.875%, due February 15, 1996, with an aggregate face amount of $8,625,000.

Interest expense on long-term debt for the year ended June 30, 1991 was $604,783, of which $293,114 is payable at June 30, 1991.

E · PENSION PLANS AND OTHER POSTRETIREMENT BENEFITS

Separate voluntary defined contribution retirement plans are in effect for faculty members and eligible staff personnel, both of which provide for annuities which are funded with the Teachers Insurance and Annuity Association and/or the College Retirement Equities Fund. Contributions are based on the individ-ual participants' compensation in accordance with the formula set forth in the plan documents on a non-discriminatory basis. Contributions for the year ended June 30, 1991 totalled approximately $747,000.

In addition to providing pension benefits, the Institute provides certain health care and life insurance benefits for retired employees and faculty. Substantially all of the Institute's employees may become eligible for those benefits if they reach normal retirement age while working for the Institute. The cost of retiree health care and life insurance benefits is recognized as expense as premiums are paid. For fiscal year 1991, those costs totalled approximately $128,000.

In December, 1990, the Financial Accounting Standards Board issued Statement of Financial Accounting Standards No. 106, Employers' Accounting for Postre-tirement Benefits Other Than Pensions ("SFAS 106"). SFAS 106, effective for fiscal year ending 1996, will require that the Institute change its method of accounting for postretirement health care and life insurance benefits to an accrual basis. This change in accounting will require the recognition of a transi-tion liability which represents the actuarial present value of benefits attributed to prior employee service. The Institute has not yet determined what effect the adoption of SFAS 106 will have on its financial condition.

F · CHANGES IN DEFERRED RESTRICTED REVENUE

Restricted receipts, which are recorded initially as deferred restricted revenue, are reported as revenues when expended in accordance with the terms of the restriction or transferred to quasi-endowment funds. Changes in deferred restricted revenue amounts are as follows:

	TOTAL DEFERRED RESTRICTED REVENUE
Balance at June 30, 1990	$ 884,113
Additions:	
Contributions, grants, etc.	4,747,465
Net restricted endowment income	2,375,450
Quasi-endowment funds utilized	270,168
Total additions	7,393,083
Deductions:	
Funds expended from contributions, grants, etc.	4,094,787
Funds expended from restricted endowment	2,645,618
Total deductions	6,740,405
Balance at June 30, 1991	$1,536,791

G · FUNDS HELD IN TRUST BY OTHERS

The Institute is the residuary beneficiary of a trust and, upon the death of the life tenant, will be entitled to receive the corpus thereof. The approximate market value of the trust's assets, as reported by the administrator of the trust, aggregated $1,880,000 as of June 30, 1991 and is not inlcuded in the accompanying financial statements.

H · FUNCTIONAL ALLOCATION OF EXPENSES

The costs of providing the various programs and other activities of the Institute have been summarized on a functional basis in the statement of support and revenue, expenses, capital additions and changes in fund balances. Accordingly, certain costs have been allocated among the programs and supporting services benefited. The net costs incurred by the Institute in operating both the Dining Hall [$375,000, net of $383,000 in revenues] and members' housing [$256,000, net of $962,000 in revenues] have been allocated among the programs and supporting services benefited. An overhead charge is allocated to certain schools generally based upon their ability to recover such costs under the terms of various grants and contracts. Overhead allocated from administration and general expenses to various programs totalled $1,099,000 for the year ended June 30, 1991.

THE SCHOOL OF HISTORICAL STUDIES

Faculty

GLEN W. BOWERSOCK
GILES CONSTABLE
JOHN H. ELLIOTT [-1990]
OLEG GRABAR [1990-]
CHRISTIAN HABICHT
IRVING LAVIN
PETER PARET *[Andrew W. Mellon Professor]*

Professors Emeriti

MARSHALL CLAGETT
FELIX GILBERT★
JAMES F. GILLIAM★★
GEORGE F. KENNAN
KENNETH M. SETTON
HOMER A. THOMPSON
MORTON WHITE

Member with Long-Term Appointment

OTTO E. NEUGEBAUER★★★

★Deceased February 14, 1991
★★Deceased March 16, 1990
★★★Deceased February 19, 1990

THE SCHOOL OF HISTORICAL STUDIES

The School of Historical Studies is concerned principally with the history of western civilization. Within this wide area of study, a large range of topics has been explored at one time or another both by current and emeriti Faculty and by Visiting Members, but the emphasis has been particularly strong in the fields of Greek and Roman civilization, medieval and modern European history, and the history of art, science and ideas.

The particular emphases of the School are a product of its own history. Two years after the opening of the School of Mathematics in 1933, a School of Economics and Politics and a School of Humanistic Studies were established. In Humanistic Studies, the first professor was Benjamin Dean Meritt, a specialist in Greek history and epigraphy, who was closely associated with excavations in the Athenian Agora. The second appointment to the Faculty of the School of Humanistic Studies was that of the German art historian, Erwin Panofsky. Panofsky ranged through the entire gamut of European art from the middle ages to motion pictures, but he was particularly associated with the development of the field of iconology.

Three additional appointments strengthened the field of classical studies: Elias Avery Lowe, a Latin paleographer who worked on the handwriting of pre-ninth century manuscripts; Ernst Herzfeld, a Near Eastern archaeologist and historian, whose scholarly work, by the time of his death, comprised nearly 200 titles; and Hetty Goldman, one of the pioneering American women archaeologists, whose discoveries at Tarsus in Turkey were published in six volumes. Modern history was represented at the Institute from the outset, with the appointment of the military and political historian Edward M. Earle. Earle was an original member of the School of Economics and Politics, which merged in 1949 with the School of Humanistic Studies to become the School of Historical Studies.

After World War II, classical studies were further augmented by the appointments of Homer A. Thompson in Greek archaeology, Harold F. Cherniss in Greek philosophy, and Andrew Alföldi in ancient history and numismatics. Although Alföldi published tirelessly on a wide range of subjects during his years at the Institute, he was mainly preoccupied with the history of early Rome and that of Julius Caesar, on both of which subjects he wrote several books. Medieval history came to the Institute Faculty with Ernst Kantorowicz, whose interests stretched in time from the later phases of classical antiquity to the fifteenth and sixteenth centuries, and in space embraced both western Europe and the Byzantine and Islamic East. The art historical tradition was carried on by Millard Meiss, who was able to complete at the Institute his great work on late medieval manuscript painting in Burgundy.

Additions to the Faculty in modern history came with the appointments of Sir Ernest Llewelyn Woodward in British diplomatic history; George F. Kennan, former Ambassador to Russia, in Russian history and international relations; Felix Gilbert, in Renaissance as well as modern history; and Morton White in the history of modern philosophy. Roman military history and papyrology were represented by James F. Gilliam; medieval history of the Latin East, Venice, and the relations between the Papacy and the Levant, by Kenneth M. Setton; medieval science, especially the classical heritage, by Marshall Clagett.

While these traditions have remained strong in the School of Historical Studies, they have not excluded scholars working in other fields who have come here as Visiting Members. The total number of Visiting Members who have come to the School is now more than a thousand. The articles and books resulting from their research at the Institute are witness to the quality and productivity of their scholarly activity here.

ACADEMIC ACTIVITIES 1989-1991

The School was host to 43 long-term, term, and annual Members in 1989-90 and six Visitors. During the summer of 1989, it also provided research facilities for fourteen summer visitors. Nineteen Members came from foreign countries, including Canada, Cyprus, England, Finland, France, Germany, Italy, Jordan, Poland, Spain and Switzerland.

In 1990-91 there were 43 long-term, term, and annual Members at the School. In addition, twelve summer visitors made use of the School's research facilities. Sixteen Members and Visitors came from foreign countries, including Australia, Belgium, Canada, France, Germany, Greece, New Zealand, and Spain.

All Members and Visitors in the School of Historical Studies are independent scholars and concentrate on their own subjects. The topics of their individual projects are listed in the next section. But contacts and exchanges with one another, whether organized or informal, are often fruitful and stimulating. Among the formal colloquia — lectures followed by discussions — were those in art history on a monthly basis, sponsored jointly by the School of Historical Studies and Princeton University's Department of Art and Archaeology. Some of the Members also gave papers at meetings of the Institute's School of Social Science.

FUNDING

During 1989-90, Members in the School were funded by the Sherman Fairchild Foundation, The Andrew W. Mellon Foundation, the National Endowment for the Humanities, the Helena Rubinstein Foundation, the Fritz Thyssen Stiftung,

as well as by fellowships funded by the Elizabeth and J. Richardson Dilworth, Edwin C. and Elizabeth A. Whitehead, and Hetty Goldman endowment funds. In addition, two summer visitors received funding from the Samuel H. Kress Foundation.

Members' funding for 1990-91 was received from The Sherman Fairchild Foundation, The Andrew W. Mellon Foundation, the Samuel H. Kress Foundation, and the Fritz Thyssen Stiftung. Fellowships were also funded by the Elizabeth and J. Richardson Dilworth, Edwin C. and Elizabeth A. Whitehead, and Hetty Goldman endowment funds.

FACULTY

During the academic year 1989-90, GLEN BOWERSOCK's Thomas Spencer Jerome Lectures, *Hellenism in Late Antiquity*, were published by the University of Michigan Press and the Cambridge University Press. In addition, he published ten scholarly articles and delivered five public lectures, including one in the series of Faculty Lectures sponsored by the School of Historical Studies. Another was the inaugural lecture in a series of annual presentations at the University of North Carolina (Chapel Hill) in honor of T. Robert S. Broughton. During the past academic year two volumes were published in the series *Revealing Antiquity*, for which he serves as general editor at the Harvard University Press. He joined the editorial board of the new journal, *Arabian Archaeology and Epigraphy* (Copenhagen) and became the honorary American secretary of the Society for the Promotion of Roman Studies in London.

In 1990-91, Professor Bowersock published ten scholarly articles and delivered a lecture at the annual *Historia-Augusta-Colloquium* held by the University of Geneva. Christian Habicht and he chaired the first of three year-long Institute Mellon Seminars sponsored by a joint grant to the Schools of Historical Studies and Social Science; the topic for 1990-1991, "The Methodology of Sources," concentrated upon classical antiquity. Two additional volumes were published in the series *Revealing Antiquity*. For the Harvard University Press Professor Bowersock served on an *ad hoc* committee to assess the future of the Loeb Classical Library. He continued his service as a Senior Fellow of Dumbarton Oaks Center for Byzantine Studies, as a Councilor of the American Numismatic Society, and as a member of various other editorial boards and committees. In October 1990 the University of Strasbourg conferred upon him the doctoral degree *honoris causa*. His current work has been the preparation of the Sather Lectures for the University of California at Berkeley, on "Fiction as History, from Nero to Julian."

GILES CONSTABLE gave a lecture on "Mary and Martha in the Middle Ages: Changing Views on Action and Contemplation" at the American Philosophical

Society in Philadelphia. In January 1990 he took part in the Faculty Lecture Series giving a paper on "Medieval Monasticism and Modern Society," and in April 1990 gave the Lionel Trilling Lecture at Columbia University, entitled "The Ordering of Society in the Middle Ages." He gave papers at the Penn-Paris International Colloquium at the Bellagio Study and Conference Center and at the 37th Settimane di studio at Spoleto. He organized the Delaware Valley Medieval Association meetings at the Institute and a series of sessions at the 25th International Congress on Medieval Studies at Kalamazoo. During the year several of his scholarly articles and reviews were published. He also co-authored *The Cartulary and Charters of Notre-Dame of Homblieres.*

In 1990-91 Professor Constable gave lectures at Villanova University, the University of Massachusetts, the University of Chicago, the University of California, Berkeley, and at the University of New Mexico. He served as commentator at a session in the meeting of the American Historical Association, served on a committee to visit the history department at Notre Dame University, and attended many meetings and conferences. He published a number of articles and joined the advisory boards of the *Revue Mabillon* and of *Mediterranean Studies.*

OLEG GRABAR joined the School of Historical Studies as a permanent faculty member on July 1, 1990 after completing his 36th year of teaching at Harvard University. His book, *The Great Mosque of Isfahan*, based on the Kevorkian lectures given at New York University, was published by the NYU Press, while the Journal of the Society of Architectural Historians published his paper, "From the Dome of Heaven to the Pleasure Dome," given at the 50th meeting of the society. As a member of the Master Jury of the Fourth Aga Khan Award for Architecture, he attended the Award ceremony in Cairo, lectured in Kuwait, Paris, and the Boston Museum of Fine Arts.

In 1990-91, Professor Grabar gave the inaugural lecture for the Seminar on Patronage in Islamic Art, held at the Walters Art Gallery, Baltimore, and at the Kimball Museum in Fort Worth. He also participated in a number of seminars, including a seminar in memory of Professor R. Wittkower, a seminar on Medieval Art in Palermo, a seminar on ethnicity at SUNY-Binghamton, a seminar on Europe and the Orient at the Council of Europe and UNESCO, and a seminar on Islamic Spain in Grenada. He also lectured on Persian Painting at Penn State University and at the von Grunebaum colloquium at UCLA, and on early Islamic art at the Institut du Monde Arabe in Paris. He served as member and chair of the Steering Committee for the development of an exhibition on the Islamic world at the Smithsonian Institution, as a member of the Max van Berchem Foundation in Geneva, and as a member of the Executive Committee of the Aga Kahn Program at Harvard and MIT. He supervised completion of two Ph.D. theses at Harvard, one at MIT, and served as reader for a thesis at the University of Pennsylvania. During the period he also published an article, "Europe and the Orient: An Ideologically Charged Exhibition" (*Muqarnas*, 1990),

and sections in two monographs: "Patronage in Islamic Art" in *Islamic Art and Patronage, Treasures in Islamic Architecture,* and Klaus Herdig, *Forms and Structures,* New York, 1990.

CHRISTIAN HABICHT had his book *Cicero the Politician* published by The Johns Hopkins University Press. He translated it into German and saw it published under the title *Cicero der Politiker* by C.H. Beck, Munich. Volume 8 of the new *Cambridge Ancient History* included his chapter on "The Seleucids and their Rivals". Major papers were published by *Chiron, Zeitschrift für Papyrologie und Epigraphik,* and *Phoenix.* Professor Habicht was the James S. Constantine Lecturer of the University of Virginia and University Lecturer at the University of Hamburg. He delivered the Inaugural Lecture at the new Center for Epigraphical Studies, Ohio State University, on "Athens in the Hellenistic Period, 323-30 B.C. In the series of Faculty Lectures at the Institute for Advanced Study he spoke on "Cicero and Caesar."

In 1990-91 Professor Habicht published several papers, among them "New and Old Panathenaic Victor Lists" (together with S. Tracy), an article of 50 pages on a recently found important inscription, in *Hesperia* 1991. He was engaged in preparing a session for the next International Congress of Greek and Latin Epigraphy, scheduled for Nîmes in 1992. He began work on a major general book on Athens in the Hellenistic Period (338-30 B.C.). His file of some 18,000 Athenian citizens of the Hellenistic Period, which he had collected over the last seventeen years and grouped according to their demotic (139 in number) was computerized by Julia Bernheim and is now available for use by other scholars. Professor Habicht was University Lecturer at Cornell University and lectured at the University of Würzburg. In May 1991, on the nomination of the Heidelberger Akademie der Wissenschaften, he was awarded the Reuchlin Prize in the Humanities by the city of Pforzheim; a public ceremony was held on July 6, 1991.

In 1989-90, IRVING LAVIN published several scholarly articles and lectured at a number of American universities. He also delivered lectures and participated in colloquia at Oaxaca, Mexico, and in Europe, at Florence, Rome, Naples, Strasbourg, and Hamburg, and gave a course of lectures at the Collège de France in Paris. He taught a seminar in the Department of Art and Archaeology at Princeton University, and continued to organize the series of colloquia in the history of art sponsored jointly by the School of Historical Studies and the Department. He continued his services to several organizations and institution, including the advisory boards of the J. Paul Getty Trust and the Canadian Centre for Architecture, as chairman of the US National Committee for the History of Art and as a member of the executive committee of the Comité International d'Histoire de l'Art. He also continued to sit on the advisory boards of several scholarly journals, including *Art e Dossier; The Journal of Medieval and Renaissance Studies; Palladio, rivista di storia dell'architettura e restauro;* and *Quaderni d'italianistica.* He spoke in the Institute Faculty Lecture Series on "Picasso's Lithograph(s) 'The

Bull(s)' and the History of Art in Reverse." A volume of essays by Professor Lavin's former students was published in celebration of his sixtieth birthday.

In 1990-91, Professor Lavin lectured at the Louvre, and at the American Academy in Rome, and gave a course of lectures at the Instituto di Studi Filosofici in Naples. He participated in colloquia at Santiago di Compostela, Spain, Chantilly, Graz, Tokyo, Düsseldorf, and Taxco, Mexico. His essay "High and Low Before their Time: Bernini and the Art of Social Satire," was published in *Modern Art and Popular Culture, Readings in High and Low*, (New York, 1990) in conjunction with the exhibition of the same name at the Museum of Modern Art, New York. Professor Lavin also prepared the final version of a volume of studies to be published by the University of California Press, entitled *Past-Present. Essays on Historicism in Art from Donatello to Picasso.*

PETER PARET's monograph *Art as History* was published in 1989 and translated into German the following year. *Makers of Modern Strategy* which he edited, has come out in Japanese and Italian editions. His monograph *Clausewitz and the State* also appeared in a Japanese edition. He published several articles on subjects ranging from the new historical museum in Berlin to the role of military power in the development of the modern state, the latter based on a paper originally given at a symposium on "Power" at the Shelby Cullom Davis Center at Princeton University, and gave lectures and seminars at various Universities, including Harvard, Yale, and Stanford. In March 1991 he gave the banquet address at the annual meeting of the Society of Military Historians in Durham, North Carolina. In the Faculty Lectures Series at the Institute for Advanced Study he spoke on Clausewitz as a political scientist and as a historian. With a former student, Daniel Moran, he completed work on an edition of Carl von Clausewitz's historical and political writings, which was published at the end of 1991. He co-chaired an interdisciplinary conference in Bad Homburg on the political significance of art collecting in Germany, which was followed by a second conference on this theme at the Institute for Advanced Study in October 1991, jointly sponsored by the Institute, the Fritz Thyssen Foundation, and The Andrew W. Mellon Foundation. He was elected an Honorary Fellow of the London School of Economics and Political Science, and a Fellow of the Leo Baeck Institute.

During the academic year 1991 professor Paret completed two long-term projects, both of which will be published in 1992; a collection of his essays on the relationship between war and political and social change; and a book on posters as historical documents on which he collaborated with Beth Irwin Lewis of the College of Wooster and with his son Paul.

PROFESSORS EMERITI

MARSHALL CLAGETT'S first volume of *Ancient Egyptian Science* was published by the American Philosophical Society in November, 1989, and was awarded the John Frederick Lewis Prize of the American Philosophical Society. Professor Clagett continues the preparation of Volumes II and III. He presented "Early Egyptian Annals on Stone" at a meeting of the American Philosophical Society and is nearing completion of "Additions to Computer-generated Hieroglyphs."

FELIX GILBERT died on February 14, 1991 at his home in Princeton. He was 85 years of age. In November, 1990 the Princeton University Press published Professor Gilbert's last book, *History: Politics or Culture?* To honor Professor Gilbert's memory and to express the faculty's respect and affection for its long-time colleague, the School of Historical Studies will sponsor a public lecture in his name in the spring of 1992.

GEORGE KENNAN'S publications have included articles in *Die Zeit, Diplomatic History, Foreign Affairs*, and the *Washington Post*. He has testified before the Senate Foreign Relations Committee, appeared in televised and print interviews concerning contemporary Soviet and German issues, and traveled to both Russia and Germany to meet with diplomatic officials of those countries. Professor Kennan is currently working on a book on his personal and political philosophy.

KENNETH M. SETTON, as editor-in-chief of a multi-volume *History of the Crusades*, had the satisfaction in the spring of 1990 to see the sixth and final volume in print. In 1990 Professor Setton received, for the third time, the John Frederick Lewis Prize from the American Philosophical Society for his book on *Venice, Austria, and the Turks in the Seventeenth Century*. He also received the American Historical Association's 1990 Award for Scholarly Distinction.

HOMER A. THOMPSON continued to supervise the study and publication of the results of the excavation of the Athenian Agora, of which he was field director from 1947 to 1968. He also completed a study of the Palace of the Giants, a great complex of the fifth century after Christ that overlay most of the area of the Agora in classical times.

MORTON WHITE continued his research in philosophy and intellectual history. He is completing a book in which he analyzes the concepts of free action and free choice while showing the relationship between his own ideas and those of other philosophers, especially William James, Jonathan Edwards, G. E. Moore, and some more recent thinkers. In September, 1989, he delivered a lecture entitled "Philosophy, Japan, and the Future of Advanced Study" at a conference held in Kyoto under the auspices of the International Institute for Advanced Studies.

THE SCHOOL OF HISTORICAL STUDIES

MEMBERS, VISITORS AND RESEARCH STAFF
1989 – 90

BENJAMIN C. B. ARNOLD
Medieval European history
University of Reading, United Kingdom

ELIZABETH BEATSON
Medieval art history
Princeton, New Jersey · A

RICHARD R. BEEMAN
American history
University of Pennsylvania · V

ALAN E. BERNSTEIN
Medieval history
University of Arizona

EVE BLAU
Viennese architecture
Centre Canadien d'Architecture · VS

LAWRENCE M. BRYANT
Early modern French history
California State University, Chico

GLENN RICHARD BUGH
Greek history
Virginia Polytechnic Institute and State University

CHARLES BURROUGHS
Architectural history
State University of New York, Binghamton

DWAYNE E. CARPENTER
Medieval Spanish intellectual history
Columbia University · F

PETRA TEN-DOESSCHATE CHU
19th-century French painting
Seton Hall University · S

OWEN S. CONNELLY, JR.
French history of the revolutionary and
Napoleonic eras
University of South Carolina · F

M. ELIZABETH CROPPER
History of art
The Johns Hopkins University · F

ANTHONY CUTLER
Art history
Pennsylvania State University · F

CHARLES G. DEMPSEY
Renaissance and Baroque art
The Johns Hopkins University · F

BRENDAN DOOLEY
Early modern Italian history
Venezia-Mestre, Italy

PIERRE D.L.R. DU PREY
History of architecture
Queen's University, Ontario · S

ANTONIO FEROS
Spanish history
Universidad Antónoma de Madrid · A

ROBERT S. J. GARLAND
Greek religion
Colgate University · S

MARGARET T. GIBSON
Medieval history
University of Liverpool · S

CHARLES C. GILLISPIE
History of science
Princeton University · V

GEORGE L. GORSE
Renaissance history
Pomona and Scripps Colleges

ALEXANDRE G. GROUCHEVOY
Roman and Byzantine Arabia
Academy of Sciences (Near East), Leningrad · A

HELMUT HALFMANN
Ancient history
Universität Münster · F

P. H. SIEGFRIED JAKEL
Classical philology
Universities of Turku and Helsinki, Finland · S

CHARLES KANNENGIESSER
Early Christianity
University of Notre Dame · F

VASSOS KARAGEORGHIS
Archaeology of Cyprus
Department of Antiquities, Nicosia, Cyprus

JERZY KLOCZOWSKI
History of the church
Catholic University, Lublin, Poland

LINDA A. KOCH
Italian Renaissance art
Rutgers University · A

PETER G. LAKE
Early modern English history
Royal Holloway and Bedford New College, London

JOSEPH M. LEVINE
British intellectual history
Syracuse University · V

BETH IRWIN LEWIS
Modern European history
The College of Wooster · R

ANDREW W. LINTOTT
Roman history
Worcester College, Oxford · S

R. BURR LITCHFIELD
Modern European history
Brown University · S

ERNEST LLUCH
History of Spanish economic thought
Universidad de Barcelona

JOHN P. LYNCH
Classical philology
University of California, Santa Cruz

MARGARET B. LYTTELTON
Near-Eastern Graeco-Roman archaeology
London · S

THOMAS F. MATHEWS
Early Christian-Byzantine art
Institute of Fine Arts, New York University · S

JAMES MULDOON
Early modern history
Rutgers University

JACOB NEUSNER
Judaic studies
Brown University

THOMAS NIPPERDEY
Modern German history
Universität München · F

ELAINE HIESEY PAGELS
History of religion: early Christianity
Princeton University · V

ROBERT R. PALMER
18th-century European history
Princeton, New Jersey · V

JAMES A. PARENTE, JR.
German and Dutch neo-Latin literature
The University of Illinois, Chicago

LEANDRO POLVERINI
Roman history
University of Perugia · F

JAMES M. POWELL
Medieval history
Syracuse University

ERICA REINER
Assyriology
The Oriental Institute, University of Chicago · S

JEAN-PAUL REY-COQUAIS
Greek epigraphy of the Near East
Université de Dijon

JEANNE ROBERT
Greek epigraphy
Paris, France · DF

CHRISTOPH SCHAUBLIN
Classical philology
Universität Bern

BERND SEIDENSTICKER
Greek and Roman tragedy
Freie Universität, Berlin · F

MARY LEE TOWNSEND
Modern European cultural history
The University of Tulsa

FRANÇOISE WAQUET
Modern European intellectual history
University of Paris, Sorbonne · S

v *Visitor* · A *Research Assistant* · R *Research Associate* · D *Distinguished Visitor*

KENNETH B. WOLF
Medieval European history (Spain)
Pomona College

FAWZI ZAYADINE
History and archaeology of Petra
Department of Antiquities, Amman, Jordan · F

MEMBERS, VISITORS AND RESEARCH STAFF
1990 – 91

NINA ATHANASSOGLOU-KALLMYER
Early modern European art
University of Delaware · S

MARIE-FRANÇOISE BASLEZ
Greek epigraphy and history
Ecole Normale Supérieure · S

ALFRED S. BRADFORD
Ancient history
University of Missouri-Columbia · MF/VS

HORST BREDEKAMP
Spanish romanesque sculpture; Renaissance art
Universität Hamburg · S

SARAH C. BRETT-SMITH
Art history of Africa
Rutgers University

ALAN CAMERON
Late antiquity
Columbia University

VICKI CARON
Modern western European Jewish history
Brown University

ROGER CHICKERING
German history
University of Oregon · S

PATRICIA B. CRADDOCK
18th-century British literature
University of Florida

GARTH L. FOWDEN
Late Roman history
National Research Foundation, Athens

JOHN B. FREED
Medieval German history
Illinois State University

HANNS GABELMANN
Classical archaeology
Universität Bonn · F

LEWIS H. GANN
Modern European history
Stanford University · F

PATRICK J. GEARY
Medieval history
University of Florida

JULIÁN GONZÁLEZ
Latin literature and epigraphy
University of Seville · AF

MONICA H. GREEN
History of science and medicine
Duke University

WILLIAM W. HAGEN
Early modern and modern German history
University of California, Davis

MICHELE A. HANNOOSH
19th-century literature and art criticism
University of California, Davis · S

PETER HERZ
Ancient history
Universität Mainz · I

UVO HÖLSCHER
Classical philology
Universität München · S

MICHEL HUGLO
Musical paleography; medieval musicology
Centre National de la Recherche Scientifique, Paris
(retired)

CHRISTOPHER P. JONES
Greek literature and Roman history
University of Toronto · V

LINDA A. KOCH
Italian Renaissance art
Rutgers University · A

PETER LANDAU
History of canon law
Universität München

JAMES H. MARROW
Northern European art
University of California, Berkeley

CONSTANT J. MEWS
12th-century intellectual and religious history
Monash University · F

MARGARET M. MILES
Classical archaeology

DANIEL MORAN
Late 18th- and early 19th-century German history
University of Northern Colorado · RF

ROBERT R. PALMER
18th-century European history
Princeton, New Jersey · V

DAVID R. RINGROSE
History of Spain – economic history of Europe
University of California, San Diego

PAUL A. ROBINSON
Modern European intellectual history
Stanford University

PHILIP H. ROUSSEAU
Late Roman religious history
University of Auckland · F

INGRID SEVERIN
Modern European history
Nationalgalerie, Berlin · AS

WALTER SIMONS
Medieval church history; mendicant orders
Institute for Advanced Study · A

FRITZ STERN
Modern European history
Columbia University · V

HANS TAEUBER
Ancient history
Universität Wien · A

MARY LEE TOWNSEND
Modern European cultural history
The University of Tulsa

WILLIAM L. TRONZO
Medieval art
The Johns Hopkins University · F

LUCETTE VALENSI
History of North Africa and the Middle East
École des Hautes Études en Sciences Sociales · F

HERMAN VAN DER WEE
Social and economic history
Universiteit Leuven · S

ALBERT VAN HELDEN
History of science
Rice University

ANDRÉ VAUCHEZ
Religious history of the Middle Ages
University of Paris-X · S

LAUREN S. WEINGARDEN
Art history
Florida State University · MF · VS

STEPHEN A. WHITE
Ancient philosophy
University of Texas at Austin

JAMES R. WISEMAN
Archaeology
Boston University

KENNETH B. WOLF
Medieval European history (Spain)
Pomona College

BARTOLOMÉ YUN
Spanish economic history
Universidad de Valladolid

OTTO ZWIERLEIN
Classical philology
Universität Bonn

THE SCHOOL OF MATHEMATICS

Faculty

ENRICO BOMBIERI *[IBM von Neumann Professor]*
ARMAND BOREL *[Herman Weyl Professor]*
LUIS A. CAFFARELLI
PIERRE DELIGNE
ROBERT P. LANGLANDS
JOHN W. MILNOR *[Oswald Veblen Professor]* [-1990]
THOMAS SPENCER

Professors Emeriti

DEANE MONTGOMERY
ATLE SELBERG
ANDRÉ WEIL

THE SCHOOL OF MATHEMATICS

ACADEMIC ACTIVITIES 1989-1990

As is customary, the scientific life of the School of Mathematics is centered in the interaction of its members, informally and through the many seminars (about ten per week) organized by members and faculty around the whole spectrum of mathematics.

The Members Seminar, a weekly event which is a tradition in the School, allows members to present their ideas to a vast mathematical audience. More specialized seminars were held on automorphic forms, organized by Professor Robert Langlands; the Mordell's Conjecture Seminar and the Number Theory Seminar, both organized by Professor Enrico Bombieri; the Math-Physics Seminar, organized by Professors Luis Caffarelli and Thomas Spencer; and the Topology Seminar organized by Professor Thomas Spencer.

The special seminars during 1989-90 included the opportunity to hear Professor Vladimir Platonov, Institute of Mathematics, Byelorussian Academy of Sciences, U.S.S.R., on "A new local-global principle for algebraic groups" and "Local-global principles in algebra and algebraic number theory," and Professor Ilya Piatetski-Shapiro, Tel Aviv University, who spoke on the "Converse theorem for GL(n)." David Kazhdan of Harvard, talked about "Local systems on moduli spaces"; in February Jean-Luc Brylinski of Pennsylvania State University gave a talk on "Geometry of the space of knots"; and a seminar on "The structure of the Tate-Shafarevitch Group (d'aprés Kolyvagin)" was given by Norbert Schappacher of Max Planck Institute.

The Marston Morse Lectures were delivered by Mikhael Gromov of the IHES on February 26 and 28, 1990 on the subject of the "Rigidity of Symmetric Spaces and Related Topics."

We are sad to recall the death of Emeritus Professor Hassler Whitney. Professor Whitney, who joined the Institute faculty in 1952, was a recipient of the National Medal of Science, the Wolf Prize and the Steele Prize.

In June 1990, Professor Jack Milnor left the Institute to accept the position of Director of the Institute for Mathematical Sciences at the State University at Stony Brook.

ACADEMIC ACTIVITIES 1990-91

A prominent part of the academic year 1990-91 was the special program dedicated to two aspects of number theory, namely analytic number theory and algorithmic number theory, the former studying the distribution of number

theoretic sequences by analytical means, and the latter studying the question of complexity of procedures to solve number theoretic questions. The two topics overlap to some extent, each motivating problems and borrowing techniques form the other.

Hendrik Lenstra, a leading specialist in algorithmic number theory, was Distinguished Visiting Professor for this special year. Two weekly seminars, one for each topic, each with double meetings, together with several additional seminars, were devoted to the program. In algorithmic number theory a first main topic was factorization and applications of smooth numbers to various questions, on which Carl Pomerance gave a series of lectures during the fall term. In the same term, Hendrik Lenstra presented in the seminar a course on algorithms in number theory, and he followed in the spring with a course on primality testing and algorithms in algebraic number theory. The purpose of the seminar was to present current techniques and results in these very active areas of number theory to all participants.

A second seminar devoted to analytic number theory was established in collaboration with Rutgers University, with much help of Henryk Iwaniec. Topics included distribution of prime numbers and of smooth numbers in arithmetic progressions (with seminars by Hildebrand, Granville, Friedlander), classical analytic number theory (with seminars by Murty, Goldston, Friedlander, Iwaniec, Duke, Sarnal, Ghosh, Pintz, Perelli, Hejhal, Maier, Heath-Brown, Shahidi, Balog, Viola, Hildebrand, Salerno, Kai Man Tsang, Ramare, Deshouillers), diophantine equations (Lewis, Heath-Brown, Bombieri). Trevor Wooley and Robert Vaughan gave a series of lectures on their recent work, introducing smooth numbers in the study of Weyl sums, with applications to Waring's problem. Additional lectures were given by Watt, Coppersmith, Mestre, Robbins, Lapidus, Pila and Adolphson, each of whom visited the Institute for a short period during the year.

Noteworthy achievements during the year included the construction by Lenstra and Pomerance of provably fast factorization algorithms by means of quadratic forms; the discovery by Pintz, who used probabilistic techniques from graph theory, of the best lower bound for gaps between primes; and new bounds for character sums obtained by Iwaniec and Friedlander. New results on prime multiplets were obtained by Balog, and new results on smooth numbers by Granville. Further applications of the improved method of Weyl sums were made by Vaughan and Wooley, and new progress on a long-standing problem of Erdo's was achieved by Bombieri, Granville and Pintz. In conclusion, it was a very active and successful special year.

The seminar on analysis and mathematical physics seminar continued to meet, and the seminar on geometry and topology was organized by the members.

During Term I Mladen Bestvina assumed responsibility, but he was succeeded by Joel Hass in Term II.

In the second term Professors Daniel Gorenstein and Richard Lyons, visiting from Rutgers University, conducted a seminar on finite groups. Pierre Deligne and Vadim Schechtman organized a seminar on Weiss-Zumino-Witten theories to which Edward Witten from the School of Natural Sciences also contributed.

In the seminar on arithmetic groups and related topics, directed by Professor Armand Borel, one of the principal sets of lectures was by the young German mathematician Jens Franke, who explained his recent work on the cohomology of discrete groups and automorphic forms.

Professor Clifford Taubes of Harvard University gave two Marston Morse Lectures in March on the "Interaction Energy in the Calculus of Variations" and "Some Equations on Manifolds with Ends".

ARMAND BOREL was awarded the Leroy P. Steele Prize "...in recognition of cumulative influence extending over a career, including the education of doctoral students." The citation continues in part: "...he placed the facilities of the Institute for Advanced Study at the service of mathematics and mathematicians, using them to foster talent, share his ideas, and facilitate access to recent developments through seminars and lectures. It is just simply not possible to cite a career more accomplished or fruitful or one more meaningful to the contemporary mathematical community."

THOMAS SPENCER, together with Jürg Fröhlich of the Swiss Federal Institute of Technology, was awarded the Dannie Heineman Prize in mathematical physics by the American Physical Society. The citation praised their contributions to the rigorous mathematical solutions of some outstanding problems in statistical mechanics and field theory.

LUIS CAFFARELLI was elected to membership in the National Academy of Sciences, and ROBERT LANGLANDS received an honorary doctor of science degree from McGill University in Montreal.

FUNDING

In 1989-91 major support for programs in the School of Mathematics was received from The Ambrose Monell Foundation, the Alfred P. Sloan Foundation, and the National Science Foundation. Gifts of equipment were received from Sun Microsystems, Inc. and International Business Machines, Inc.

THE SCHOOL OF MATHEMATICS

MEMBERS, VISITORS AND RESEARCH STAFF
1989-90

ALEJANDRO ADEM
Group actions/cohomology of groups
Stanford University

J. F. GILES AUCHMUTY
Variational methods for nonlinear partial
differential equations
University of Houston · F

DAVID M. AUSTIN
Geometry and topology (Gauge theory)
University of Utah

JOSÉ BARROS-NETO
Partial differential equations
Rutgers University · V

DONALD BLASIUS
Number theory
University of California, Los Angeles

CIPRIAN S. BORCEA
Torelli problems for complete intersections
algebraic geometry
*National Institute for Scientific and Technical Creation,
Bucharest*

LIA BRONSARD
Partial differential equations
Brown University

PAUL BURCHARD
D-modules
University of Chicago

JIANGUO CAO
Differential geometry and partial differential
equations
University of Pennsylvania

JENNIFER T. CHAYES
Mathematical physics
University of California, Los Angeles

LINCOLN CHAYES
Mathematical physics
University of California, Los Angeles

VICTOR A. CHULAEVSKY
Dynamical systems and quantum mechanics
U.S.S.R. Academy of Sciences, Moscow · S

PERCY A. DEIFT
Spectral and inverse spectral theory, integrable
systems
*Courant Institute of Mathematical Sciences, New York
University* · S

DENNIS M. DETURCK
Geometric analysis
University of Pennsylvania

ALEXANDRU DIMCA
Topology of algebraic varieties
Max-Planck-Institute für Mathematik, Bonn

VLADIMIR G. DRINFELD
Number theory, automorphic forms
Physical Technical Institute, Harkov, U.S.S.R. · S

JOHN D. FAY
Theta functions, automorphic forms, and the
Selberg trace formalism
Haverford College

JENS FRANKE
Arithmetical algebraic geometry
Friedrich-Schiller-Universität, Jena · F

SIDNEY I. FRANKEL
Several complex variables, differential geometry,
ergodic theory
Columbia University

GREGORY A. FREIMAN
Additive number theory
University of Tel Aviv, Israel

BENT FUGLEDE
Potential theory
Københavns Univ. Mathematiske Institut, Denmark

DAVID GABAI
3-manifolds, foliations
California Institute of Technology · F

ANDREW J. GRANVILLE
Analytic number theory
University of Toronto

THOMAS C. HALES
Representation theory
Harvard University

ZHENG-XU HE
Topology and geometry
University of California, San Diego

DENNIS A. HEJHAL
Number theory and complex analysis
University of Minnesota · s

JING-SONG HUANG
Lie theory, representation theory
Massachusetts Institute of Technology

TAMOTSU IKEDA
Theory of L-functions
Kyoto University

STEPHANE JAFFARD
Analysis
Ecole Polytechnique, France

MICHIO JIMBO
Integrable systems
Kyoto University · s

NAIHUAN JING
Quantum groups; Kac-Moody Lie algebras
Yale University

BRUCE W. JORDAN
Number theory, automorphic forms
Baruch College, The City University of New York · ʀ

JAY A. JORGENSON
Arithmetic geometry, complex algebraic
geometry
Stanford University

GABRIEL KATZ
Group actions on manifolds
Ben Gurion University, Israel · s

STEVEN PAUL KERCKHOFF
Topology, differential geometry
Stanford University

ULRICH M. KORSCHORKE
Topology (knots, links and immersions)
Universität Gesamthochschule Siegen · s

DIETER KOTSCHICK
Differential and algebraic geometry, 4-manifolds
Wolfson College, Oxford

MICHAEL LARSEN
Arithmetic algebraic geometry
Princeton University

CLAUDE R. LEBRUN, JR.
Differential geometry, complex analysis,
mathematical physics
State University of New York, Stony Brook

YANYAN LI
Partial differential equations, analysis
Princeton University

PAULO LIMA-FILHO
Geometry and topology
State University of New York, Stony Brook

LISA A. MANTINI
Representations of Lie groups
Oklahoma State University

DAVID MASSER
Transcendental number theory
The University of Michigan · s

OLIVIER MATHIEU
Infinite dimentional Lie algebras
University of Paris, C.N.R.S., France

HISAYOSI MATUMOTO
Representation theory of semisimple Lie groups,
algebraic analysis
Massachusetts Institute of Technology

GEOFFREY MESS
Low dimensional topology
Mathematical Sciences Research Institute, Berkeley · ʀ

WERNER MÜLLER
Global analysis, spectral theory
Akademie der Wissenschaften der DDR, Karl-
Weierstraße-Institut für Mathematik, Berlin

VIJAYAKUMAR MURTY
Number theory
University of Toronto · F

JÓZEF H. PRZYTYCKI
Classical knot theory and its relations to topology
of 3-manifolds, statistical mechanics and
quantum field theory
University of British Columbia · S

IGOR REIDER
Algebraic geometry
University of Oklahoma

JONATHAN D. ROGAWSKI
Automorphic forms
University of California, Los Angeles · S

JOACHIM H. RUBINSTEIN
Geometry and topology, minimal surfaces,
network design
University of Melbourne, Australia · S

ANTHONY J. SCHOLL
Arithmetic algebraic geometry
Durham University, England

ROBERTO SILVOTTI
Mathematical physics
*Institut für Theoretische Physik der Universität Zürich,
Switzerland*

MARK STERN
Differential geometry
Duke University

MARVIN D. TRETKOFF
Riemann surfaces, Abelian integrals
Stevens Institute of Technology · V

ALEJANDRO URIBE
Spectral theory of elliptic operators
Princeton University

PAUL A. VOJTA
Number theory
University of California, Berkeley

JAN WEHR
Mathematical physics of disordered systems
Rutgers University

DAVID J. WRIGHT
Algebraic groups and number theory, Kleinian
and Zeta groups
Oklahoma State University

GISBERT WÜSTHOLZ
Transcendental number theory
*Eidgenössische Techniche Hochschule, Zürich,
Switzerland* · VS

HIROFUMI YAMADA
Non-commutative analysis
Tokyo Metropolitan University

KUNRUI YU
Transcendental theory and Diophantine
approximation
Institute of Mathematics, Beijing

AKIHIKO YUKIE
Shintani zeta functions and geometric invariant
theory
Oklahoma State University

JIANG ZENG
Combinatorics, special functions, symmetric
group, Young tableaux
Université Louis-Pasteur, Strasbourg

MEMBERS, VISITORS AND RESEARCH STAFF
1990 – 91

DAVID AUSTIN
Geometry and topology (Gauge theory)
University of Utah

ANTAL BALOG
Number theory
*Mathematical Institute of the Hungarian Academy of
Sciences*

MLADEN BESTVINA
Topology
University of California, Los Angeles · F

MIKHAIL V. BOROVOI
Algebraic groups, arithmetic algebraic geometry
*Far East branch of the U.S.S.R. Academy of Sciences,
Khabarovsk*

MARK BRITTENHAM
Geometric topology
Cornell University

LIA BRONSARD
Partial differential equations
Brown University

MARC BURGER
Rigidity of locally symmetric spaces
Stanford University

LEONARD S. CHARLAP
Computational number theory
Institute for Defense Analyses

HENRI COHEN
Number theory
University of Bordeaux · S

J. BRIAN CONREY
Number theory
Oklahoma State University · V

KEVIN D. CORLETTE
Differential geometry, harmonic maps
University of Chicago · S

JOSEPH D'ATRI
Differential geometry
Rutgers University

JEAN-MARC DESHOUILLERS
Number theory
University of Bordeaux · S

MARIO EUDAVE-MUÑOZ
Low dimensional topology
University of California, Santa Barbara

JENS FRANKE
Arithmetical algebraic geometry
Friedrich-Schiller-Universität, Germany

JOHN FRIEDLANDER
Number theory
University of Toronto · V

MASAAKI FURUSAWA
Automorphic L-functions
The John Hopkins University

KRZYSZTOF GALICKI
Complex geometry and mathematical physics
Rice University · S

AMIT GHOSH
Number theory
Oklahoma State University

V. A. GINZBURG
Representation theory
Institute of Physics of the Earth, Moscow · F

HERMAN GLUCK
Differential geometry
University of Pennsylvania · F

DANIEL GOLDSTON
Analytic number theory
San Jose State University · F

DANIEL GORENSTEIN
Finite simple group T
Rutgers University · S

ANDREW GRANVILLE
Analytic number theory
University of Toronto

MICHAEL GRINFEL'D
Mathematical physics/phase transformations
Institute of the Physics of the Earth, Moscow

MICHEL GROS
Arithmetic algebraic geometry
IRMAR, University of Rennes I

MASAKI HANAMURA
Algebraic geometry
Massachusetts Institute of Technology

JOEL HASS
Topology, differential geometry
University of California, Davis

DENNIS HEJHAL
Number theory and complex analysis
University of Minnesota · F

ADOLF HILDEBRAND
Number theory
University of Illinois, Urbana-Champaign

YI-ZHI HUANG
Infinite-dimensional Lie algebras and conformal field theory
Rutgers University

TAMOTSU IKEDA
Automorphic forms, L-functions
Kyoto University, Japan

ZHIREN JIN
Partial differential equations, differential
geometry
University of Pennsylvania

ROBION C. KIRBY
Low dimensional topology
University of California, Berkeley · F

HENDRIK LENSTRA
Computational and algorithmic number theory
University of California, Berkeley · D

DONALD J. LEWIS
Diophantine equations
University of Michigan

RICHARD LYONS
Finite simple groups
Rutgers University · S

HELMUT MAIER
Number theory
University of Georgia

GRIGORII ALEKSANDROVIC MARGULIS
Discrete subgroups of Lie groups; ergodic theory
*Institute of Information Transmission Problems,
U.S.S.R.* · S

FRANK MORGAN
Geometric measure theory; minimal surfaces
Williams College

G. DANIEL MOSTOW
Discrete and continuous groups
Yale University · F

DETLEF HORST MULLER
Real analysis
University of Bielefeld

RAM MURTY
Number theory
McGill University · F

MELVYN NATHANSON
Combinatorial number theory
*Lehman College, City University of
New York* · V

NITIN NITSURE
Algebraic geometry
Tata Institute of Fundamental Research, India

FRANS OORT
Algebraic geometry and number theory
University of Utrecht · F

GEORGE PAPANICOLAOU
Fluids, random media
Courant Institute of Mathematical Sciences

ALBERTO PERELLI
Analytic number theory
University of Napoli · S

JANOS PINTZ
Analytic number theory, computational number
theory
*Mathematical Institute of the Hungarian Academy of
Sciences*

CARL POMERANCE
Number theory
University of Georgia

FRAYDOUN REZAKHANLOU
Probability — infinite particle systems,
hydrodynamics
Courant Institute of Mathematical Sciences

FERNANDO RODRIGUEZ-VILLEGAS
Number theory
Ohio State University

VADIM V. SCHECHTMAN
Mathematical physics, algebraic geometry
*Institute of Problems of Microelectronics Technology and
Superpure Materials, Moscow*

JOACHIM SCHWERMER
Automorphic forms, number theory
Katholische University, Eichstätt · F

FREYDOON SHAHIDI
Automorphic forms
Purdue Univerity

V. V. SHOKUROV
Birational algebraic geometry
Yaroslavl' Pedagogical Institute, U.S.S.R.

WEI-TONG SHU
Partial differential equations
Princeton University

F *First Term* · S *Second Term* · M *Member with Long Term Appointment*

JAN PHILIP SOLOVEJ
Mathematical physics
University of Michigan · s

FERNANDO SORIA
Classical analysis and partial differential equations
Universidad Autónoma de Madrid

PANAGIOTIS SOUGANIDIS
Partial differential equations
Brown University

HERBERT SPOHN
Mathematical physics
University of Munich · F

DOMOKOS SZASZ
Dynamical systems, nonequilibrium statistical physics
Mathematical Institute of the Hungarian Academy of Sciences · F

ROBERT TARJAN
Theoretical computer science
Princeton University · F

ABIGAIL THOMPSON
Low dimensional topology; knot theory
University of California, Davis

ALEXANDRE N. VARCHENKO
Conformal field theory, algebraic K-theory, theory of singularities
Moscow Institute of Gas and Oil

ROBERT C. VAUGHAN
Analytic number theory
Imperial College of Science and Technology

JAN WEHR
Mathematical physics, probability
Rutgers University

TREVOR WOOLEY
Number theory
Imperial College of Science and Technology

HIROYUKI YOSHIDA
Number theory, automorphic forms
Kyoto University

THALEIA ZARIPHOPOULOU-SOUGANIDIS
Stochastic control — applications to theories of finance
Worcester Polytechnic Institute · v

DONG ZHANG
Differential geometry and partial differential equations
Stanford University

SHUN-HUI ZHU
Global differential geometry
State University of New York, Stony Brook

THE SCHOOL OF NATURAL SCIENCES

Faculty

STEPHEN L. ADLER *[New Jersey Albert Einstein Professor]*
JOHN N. BAHCALL
FREEMAN J. DYSON
PIET HUT
FRANK WILCZEK
EDWARD WITTEN

Members with Long-Term Appointments

JULIAN M. BIGELOW [—1990)
OTTO E. NEUGEBAUER*

*Deceased February 19, 1990

THE SCHOOL OF NATURAL SCIENCES

ACADEMIC ACTIVITIES OF THE SCHOOL

Recent activities in the School of Natural Sciences have focused on three frontiers of physics: the very small, the very large, and the very many.

The study of the very small is known as elementary particle physics. Its aim is to understand the nature of the elementary building blocks of matter and their mutual interactions. It has long been traditional to divide the fundamental interactions into four classes — strong, electromagnetic, weak, and gravitational. In the 1970's compelling theories describing three of the four traditional interactions were constructed. The successful theories of the strong, electromagnetic and weak interactions are all very similar mathematically, and beautiful unified theories encompassing these three interactions have been constructed. A great remaining challenge, which drives much of the research of the School, is to understand how gravity fits in.

Over long distances and for macroscopic bodies, gravity is well described by Einstein's theory of general relativity, perhaps the most beautiful of all physical theories. However, the conceptual framework of general relativity is not easy to reconcile with the conceptual framework used to describe the microworld, i.e., quantum mechanics. We are attempting to address several fascinating physical questions that hinge on the proper treatment of general relativity within quantum mechanics, such as whether the topology of space-time changes due to quantum fluctuations, producing "wormhole" or "baby universes," whether small black holes can evaporate completely into ordinary particles, and many others.

The mathematical theory of relativity does not seem, superficially, to be closely related in form to the theories that successfully describe the other interactions. Starting in the mid-1980's, however, it has been widely realized that all four interactions arise inexorably together when one tries to extend the traditional theory of interacting point particles to spatially extended objects — superstrings — in a consistent way. This potential "theory of everything" remains the focus of much research at the Institute. The study of superstring theory has stimulated the development of new mathematical techniques, some of which have proved to be of great interest to pure mathematicians. Since superstring theory appears to incorporate gravity in a manner consistent with quantum mechanics, it holds tremendous promise for addressing the problems previously mentioned.

Despite the fact that there is now a reliable "standard model" for the strong, electromagnetic, and weak interactions, much remains to be done in these fields. An especially important theoretical challenge, still only partially met, is to calculate the consequences of quantum chromodynamics or QCD — the modern

theory of the strong interaction — with decent accuracy. At present, some of the world's fastest computers and novel advanced techniques of parallel processing are employed on this problem, but even so new insights will be necessary to solve it.

Another frontier in the physics of the very small is, remarkably, cosmology. The tie between elementary particle physics and cosmology is that, according to the widely accepted big bang picture, the Universe is extremely hot and dense during its earliest moments. To describe the behavior of matter under such extreme conditions, we must employ all the results and tools of elementary particle physics. An overview of the important astrophysics research being done at the Institute is to be found in Professor John Bahcall's summary below.

Another area of activity in the School of Natural Sciences for the past two years has been biophysics and computational neuroscience. The goal of efforts in this area is to uncover the principles underlying the operation, organization, and function of the nervous system and thereby explain how the brain solves its intricate perceptual and control problems.

Research done at the Institute for Advanced Study is now helping to clarify how the brain represents spatial, temporal, and color attributes of the visual world and how it uses this information to perform its recognition tasks. It also explains how differences in the visual system of different species can be traced to differences between their visual environments. The findings, while based on theoretical ideas from information theory and physics, suggest concrete predictions for psychophysical and electrophysiological experiments. They may lead to significant clinical and technological applications.

Finally, two spectacular experimental discoveries in the last decade have proved again that the behavior of many identical particles, each in itself mundane — ordinary atoms in ordinary matter — can present startling surprises. Two fascinating, qualitatively new behaviors of matter were discovered: the quantized Hall effect, and high temperature superconductivity. (Both were promptly rewarded with Nobel prizes.) Revolutionary new theoretical concepts involving fractional charge and new forms of quantum statistics have proved their worth in the Hall effect. Vigorous attempts are afoot to exploit these ideas in other contexts, including high temperature superconductivity.

FACULTY

STEPHEN ADLER worked in two main areas during 1989-90: (i) multiscale acceleration algorithms for Monte Carlo analysis, and (ii) quaternionic quantum mechanics. The Monte Carlo work had its genesis in a short paper written in 1981 which pointed out that for multiquadratic actions, one can construct a stochastic analog of the usual deterministic over-relaxation algorithm used for

solving partial differential equations. The idea is to regard the minimization of an action (solving a partial differential equation) as the zero temperature limit of a Monte Carlo process in which the action is thermalized; hence to every algorithm used to solve elliptic PDE's there is in principle a corresponding Monte Carlo algorithm. A few years ago he returned to do more work on over-relaxtion, including a detailed theoretical analysis of critical slowing down for Gaussian actions, and an explicit construction of the stochastic algorithm corresponding to the general linear iterative process for a quadratic action. In a talk he gave at the Boston University Workshop on Acceleration Algorithms he surveyed acceleration methods for differential equations with an emphasis on fast Fourier transform and multigrid. This led him to explore ways to implement analogs of the multiscaling idea for lattice gauge theories by appropriate changes of variables. Recently he has pursued this idea in collaboration with Gyan Bhanot and preliminary computations look promising.

For several years Professor Adler has been interested in quaternionic quantum mechanics, a largely unexplored extension of standard complex quantum mechanics. While in Australia in the fall of 1987 he was asked some questions by the neutron scattering people there which led him to look at scattering theory in quaternionic quantum mechanics. He found the novel and surprising result that in non-relativistic quaternionic quantum mechanics, with a general quaternionic potential, the asymptotic states are all contained in a complex subspace of quaternionic Hilbert space, and the S-matrix is complex, not quaternionic. Hence there are no quaternionic scattering phases; quaternionic quantum mechanics acts as an effective complex quantum mechanics on the asymptotic space. There is nonetheless a characteristic signature of the underlying quaternionic dynamics: the effective complex theory is T-violating. One corollary of the asymptotic state structure being complex is that one can use the standard complex tensor product to construct multiparticle scattering states, and so the folklore that quaternionic quantum mechanics is at best a single particle theory is incorrect. Professor Adler is currently writing a book on Quaternionic Quantum Mechanics in which he is working out in detail the quaternionic analogs of many of the results of standard non-relativistic quantum mechanics. He hopes this project will get others interested in further exploration of quaternionic quantum mechanics and will lead to an investigation of the relativistic case.

In 1990-91 Professor Adler continued work on his book on Quaternionic Quantum Mechanics, to be published by Oxford University Press. Material worked out and incorporated during the past academic year included an extensive discussion of relativistic single particle wave equations, their non-relativistic reduction, and the quaternionic structure of the Poincare group; also, the generalized geometric phase, the WKB approximation, and projective representations of the phase space transition group. In the fall of 1991, Professor Adler will be teaching a course based on the book at Princeton University and publication is planned for early 1992. Further work on the quaternionic project, beyond what is in the book, will involve a study of quantum field theory.

In 1990-91 Professor Adler also worked, in collaboration with Gyan Bhanot, on Monte Carlo acceleration algorithms. They explored the use of changes of variables which are specific to lattices whose dimension is a power of two. Preliminary studies on the U(1) lattice gauge theory have been promising, and further extensive computations have shown that the new algorithms reduce the critical exponent from two to close to zero. An extensive program of investigations of the new algorithms is planned. A secondary activity of Professor Adler this year has been the initiation of work on neural networks.

JOHN BAHCALL'S main activity in 1989-90 was in the area of neutrino astrophysics. Together with Roger Ulrich (UCLA), Bahcall added a number of improvements to the standard solar model which they used to predict the event rate in eleven solar neutrino experiments involving among other targets, ^{37}Cl, ^{71}Ga, ^{2}H, and free electrons. The predicted rate for the ^{37}Cl experiment is about a factor of four larger than the observed rate, which has given rise to many imaginative solutions to the "solar neutrino problem."

The standard solar model was also used to calculate the p-mode and g-mode oscillation frequencies and compared with observation. The observed and calculated oscillation frequencies are in remarkably good agreement, although there are significant discrepancies at the level of 0.1% of the basic p-mode frequencies. These discrepancies may represent an imprecise description of complicated physics near the solar surface or they signal the need for a slightly improved description near the base of the corrective zone or below. Together with Avi Loeb (IAS), Professor Bahcall has developed a convenient analytic description of heavy element diffusion in solar interiors. The slow process of gravitational settling of heavy elements is the only known physical process not yet included in the Bahcall-Ulrich solar model that might affect the calculated neutrino fluxes or helioseismological frequencies to within measurable accuracy. The Bahcall-Loeb description of heavy element diffusion can be included in future calculations of standard solar models, although there are no computer codes which can be adapted to include properly the diffusion without significant modifications.

Professor Bahcall also calculated improved neutrino absorption and scattering cross sections for all of the solar neutrino experiments that are being actively developed; the calculations for the important deuterium experiment were carried out with K. Kubodera (SUNY) and S. Nozawa (CERN). Together with A. Dar (Technion, Haifa), T. Piran (Jerusalem), W. Press (Harvard), and D. Spergel (IAS and Princeton University), Bahcall carried out analysis of the observed neutrino events from the supernova in the Large Magellanic Cloud, SN1987A. The statistical techniques that were used to combine data from different experiments were adopted by a number of groups, all of which agree that the results of the SN1987A observations are in good agreement with expectations based on standard theoretical ideals regarding supernova explosions.

More recently, Professor Bahcall collaborated on producing new solar models with M. Pinsonneault (Yale University) that include the effect of helium diffusion. Bahcall also wrote a user-friendly, exportable code for energy generation and neutrino production and Pinsonneault wrote an exportable code for solving the Bahcall-Loeb diffusion equations. Together they have calculated a series of new models that give only slightly charged neutrino fluxes but which may yield measurable differences in the solar helioseismological frequencies. Bahcall, A. Gould (IAS) and C. Flynn (Heidelberg) have carried out extensive studies of the dynamics of a new sample of K giants. The results prove a more reliable estimate of the amount of missing matter in the solar vicinity.

During 1989-90, Professor Bahcall also concentrated on developing new software that would calculate the effects of gravitational settling of heavier elements in the interiors of radioactively supported stars. This piece of physics is the last remaining standard physics that has not yet been included in the most sophisticated models of the solar interior. A crude estimate of the effect of this process is that it will raise the predicted higher energy neutrino fluxes by a few percent.

Professor Bahcall's work in 1990-91 had three main themes: investigating the solar neutrino mystery, using the Hubble Space Telescope to make observations of quasars, and chairing the National Research Council study of the highest priority initiatives in astronomy and astrophysics. In the area of solar neutrinos, Bahcall proved a general theorem showing that the shapes of individual energy spectra are independent of their solar origin to measurable accuracy, and he collaborated with Hans Bethe to put forward an explicit solution of the long standing solar neutrino problem. Bahcall and Bethe also made a general argument that the solar neutrino problem cannot be solved by modifications of astrophysical models, but instead requires new physics. With the Hubble Space Telescope, Bahcall and his collaborators found a much larger than expected number of Lyman' clouds, which may be the precursors of galaxies. In collaboration with researchers at different institutions, he is currently investigating ways of identifying these clouds locally. Bahcall is principal investigator of the Key Project for quasar absorption lines, which is currently the largest single program of the Hubble Space Telescope. He and his collaborators at IAS, CalTech, LaJolla, Pittsburgh, the Royal Greenwich Observatory, and the Institute d'Astrophysique are eagerly awaiting the first observations from this program which will be available in late October, 1991. Together with D. Maoz — the postdoctoral member in charge of this program — and D. Schneider and collaborators from Princeton University and Cambridge, England, Bahcall has studied the images of over one hundred fifty quasars to investigate the extent to which matter in the universe acts as a gravitational lens and forms multiple images of different quasars. Two other postdoctoral members, Guhathakurta and Yanny, are working with Bahcall and Schneider to study the distribution of stars in high resolution images of global clusters, the oldest and — in many ways — the most beautiful collection of stars in the galaxy.

The young members in astronomy and astrophysics have worked on an aston-ishing variety of topics including the theory and possible detection of dark mat-ter, the distribution of stars between galaxies, the physical characteristics and evolution of neutron stars, the imprint of structure formation on the cosmic microwave background radiation, and the friction developed between mass con-centrations as they pass near each other.

History will be the best guide as to which of these many works are most signifi-cant. Three specific investigations have already attracted a great amount of atten-tion. D. Schneider has continued his work with J. Gunn (Princeton University) and M. Schmidt (CalTech) in finding and analyzing the most distant objects known in the universe. Their discoveries persist in frustrating theorists by show-ing that extremely energetic objects exist at the earliest epochs at which we have detailed information about the universe. Another postdoctoral member, P. Guhathakurta, has worked with T. Tyson of Bell Telephone Laboratories and has uncovered a new class of distant blue Galaxies, another source of puzzlement to astronomical theorists. Two young postdoctoral members from Israel, A. Loeb and A. Laor, have developed a fundamental new theory describing how the mass around a bright quasar may be maintained for long periods in the form of a thick disk.

During 1989-90 FREEMAN DYSON divided his time among pure mathemat-ics, physics, astronomy, writing, and lecturing. He published "Mappings and Symmetries of Partitions," in the *Journal of Combinatorial Theory* and "Feynman's Proof of the Maxwell Equations" in the *American Journal of Physics*. Professor Dyson also contributed conference reports to the International Astronomical Union Colloquium No. 123, "Observatories in Earth Orbit and Beyond" at the Goddard Space Flight Center, Greenbelt, Maryland, in April, 1990. These were entitled "Major Observatories versus Economy-class Observatories in Space" and "Occultation Astronomy." In addition, he spent a fraction of the year prepar-ing a popular science book with the title "From Eros to Gaia," which he plans to publish in 1991. This consists mainly of public lectures he has given.

During 1990-91 Professor Dyson worked mainly on two mathematical problems in collaboration with Harold Falk of CUNY and Joel Lebowitz of Rutgers, and finished a book of popular scientific lectures based on his Danz Lectures given at the University of Washington in 1988. The Falk problem resulted in a paper with the title "Period of a Discrete Cat Mapping," accepted for publication in the *American Mathematical Monthly* in 1992. It explains the surprisingly short recurrence times observed when a standard strongly-mixing map of the plane is iterated on a finite lattice. The Lebowitz problem is to determine the statistical distribution of the number of points of a square lattice that lie within a circle with fixed center and variable radius. The Lebowitz problem requires a much deeper analysis and is still unsolved, but with the help of Pavel Bleher and Zhe Ming Cheng enough progress was made to begin writing up some partial results

for publication. Professor Dyson's book of popular essays is mainly concerned with the problem of maintaining a healthy balance between big science and small science in a variety of disciplines. The book will probably be published in 1992 with the title "From Eros to Gaia."

In October 1990 Professor Dyson gave the Radcliffe Lecture in Oxford with the title "Carbon Dioxide in the Atmosphere and the Biosphere," a talk he first gave in the Faculty Lecture Series ant the Institute. In January, 1991 he received the Oersted Medal at the annual meeting of the American Association of Physics Teachers in San Antonio, where he gave a talk with the title "To Teach or Not to Teach," published in the *American Journal of Physics*. He received honorary degrees at Bates College in Maine and at Haverford College in Pennsylvania. Two talks given at the International Astronomical Union Colloquium were published in the colloquium's proceedings, *Observatories in Earth Orbit and Beyond* (ed. Y. Kondo, Kluwer Academic Publishers, 1990).

PIET HUT spent the academic year 1989-90 on sabbatical in Japan and Holland, visiting the astronomy departments at the universities of Tokyo and Utrecht. In Tokyo he was involved in large-scale simulations of the evolution of dense star systems in collaboration with Japanese colleagues, using a supercomputer at the Institute for Supercomputing Research. One of the most important results of these simulations was a statistical description of the migration processes of primordial double stars through a star cluster. In Utrecht he taught a course on the evolution of globular star clusters. His research in Holland focused on observational aspects of star cluster evolution, especially those connected to low-mass X-ray binaries and millisecond pulsars.

In 1990-91 Professor Hut conducted research in stellar and cometary dynamics. In the first area, he studied the effects of primordial binaries on the evolution of global clusters. Working with Roger Romani and Steve McMillan, a number of observational consequences of the dynamical evolution were worked out for the recently discovered millisecond pulsars in these clusters. Another application was a study of the nucleus of the nearby galaxy M33, for which a dynamical model was constructed in analogy with global cluster dynamics, in a collaboration with Lars Hernquist and John Kormendy. A more theoretical project in stellar dynamics focused on analytical and semi-numerical investigation of the exponential growth of errors in N-body calculations, carried out with Jeremy Goodman and Douglas Heggie. In the second area, that of cometary dynamics, Professor Hut constructed models for the formation of multiple impacts during the geological period of the Cretaceous-Tertiary boundary, some 66 million years ago. Stimulated by the recent identification of a huge crater in the Yucatan peninsula, with a diameter of 180 km, for which the age was determined to be compatible with being 66 million years, Hut embarked on a collaboration with Walter Alvarez, Gene Shoemaker, and Sandro Montanari. Their collusion was that the mass extinction at that time may have been triggered by multiple cometary impacts during the northern hemisphere summer.

During 1989-90 FRANK WILCZEK investigated problems in three areas, anyon superconductivity, Aharonov-Bohm effects, and negative curvature. Several years ago he pointed out the possible existence of new forms of quantum statistics in two spatial dimensions, interpolating continuously between fermions and bosons. Particles with such statistics are called anyons. Soon after, it was discovered that anyons actually do exist in actual materials that are effectively two dimensional; specifically quasiparticles in the fractional quantized Hall effect are anyons.

There has been a new level of interest in these ideas, mainly stimulated by Laughlin's proposal that holes in the new high temperature copper oxide super-conductors behave as anyons, and that this property is directly responsible for their superconductivity. Wilczek, Edward Witten, Bert Halperin and Wilczek's student, Yi-Hong Chen, analyzed the behavior of certain kinds of anyons (Y.-H. Chen, F. Wilczek, E. Witten B. Halperin "On Anyon Superconductivity" *International Journal of Modern Physics, B3, 1001, 1989*). They demonstrated that ideal gases of such particles are indeed superconducting at zero temperature, and analyzed some of the special features of such superconducting states. One by-product of that work was a new understanding of how an old and useful, but previously rather vague, analogy between superconductivity and hydrodynamics could be made precise and be put to use.

A series of possible phenomenological consequences of anyon superconductivity were analyzed in a paper Wilczek co-authored with Halperin and J. March-Russell (*Physics Review*, B40, 726, 1989). Perhaps the most important result of that paper, however, is that every term in the effective Lagrangian for anyon superconductivity calculated in the earlier Chen, Wilczek, Witten and Halperin paper was derived directly and quantitatively from basic principles; for instance, the magnitude of the superconducting linear Hall effect was traced to the value of the angular momentum in the state. Another by-product of this work was the discovery of a new general mechanism whereby massless particles and (closely related) superconductivity may arise. This mechanism, called "spontaneous fact violation, was identified in the Chen et al paper and in a much more precise and general way in S. Giddings and F. Wilczek, "Spontaneous Fact Violation," *International Journal of Modern Physics*, A5, 635 (1990). Subsequently Wilczek combined these papers and allied subjects in a monograph, *Fractional Statistics and Anyons Superconductivity*, World Scientific (1990).

Concerning Aharonov-Bohm effects, a convenient catch-all phrase for several topics that are closely related conceptually but diverse in detail, Wilczek pointed out in an article co-authored with L. Krauss ("Discrete Gauge Symmetry in the Continuum," *Physics Review Letters*, 62, 1071, 1989) that unbroken discrete gauge symmetries make sense and have non-trivial consequences, even in the continuum. The most striking consequence, from a theoretical point of view, is that black holes may have purely quantum "hair," i.e., properties that are totally missed in classical physics. Recently the analysis has been sharpened and

extended to non-abelian discrete symmetries in a paper written with M. Alford and March-Russell (*Nuclear Physics*, B337, 695, 1990).

The most evident physical phenomena associated with discrete gauge symmetries is a special scattering process that generalizes the process of scattering of charged particles off an infinitely thin solenoid analyzed by Aharonov and Bohm in a celebrated paper. In a paper Wilczek wrote with Alford and March-Russell ("Enhanced Baryon Number Violation due to Cosmic Strings," *Nuclear Physics*, B328, 140, 1989), it was pointed out that this could dramatically enhance the probability for particles to get to the core of cosmic strings, and thus, for instance, be subject to baryon-number violating processes. In a paper written with Y.-S. Wu ("Space-Time Approach to Holonomy Scattering," *Physics Review Letters*, 65, 13, 1990), the basic mechanism is generalized, notably including the result that non-abelian flux tubes scatter strongly off one another. An important subsequent development, which may be rich in consequences, was described in Alford, K. Benson, S. Coleman , and Wilczek's paper, "Zero Modes of Non-Abelian Vortices," (*Nuclear Physics*, B349, 414, 1991) where it was found that generically loops of non-abelian flux support a new form of superconductivity such that the charge and current are not localized on the string, i.e., the loop forms a superconducting wire. The superconductivity is forced by basic symmetries and should be very robust.

In the area of negative curvature, Wilczek joined with C. Callan of Princeton University and a number of students to investigate the properties of interacting quantum fields in maximally symmetric spaces of constant negative curvature ("Infrared Behavior at Negative Curvature," *Nuclear Physics*, B340, 366. 1990). Wilczek has found that many interesting questions that are intractable in flat space become much easier to investigate on the negatively curved space. Specifically, the theory of the strong interaction — QCD — comes under much better analytic control. Semiclassical techniques that have given us much qualitative insight into the basic non-perturbative phenomena of quark confinement and chiral symmetry breakdown give quantitative results in this new context. These can certainly be compared to numerical experiments and perhaps extrapolated to the directly physical case of flat space.

In 1990-91 Professor Wilczek continued exploring the physical implications of new forms of quantum statistics, or anyons. These concepts have proved to be central to the description of recently discovered states of matter, so-called quantized Hall states, that exhibit remarkable electronic behavior. Recently he has combined these concepts with the traditional paring concept of superconductivity theory to predict the existence of other new states of matter which should form at low temperatures in strong magnetic fields.

In a quite different physical direction, but using related mathematics, he has been exploring the implications of discrete gauge symmetries. A notable result has

been to establish that black holes can have previously unsuspected structure — "hair." Encouraged by this insight, he is taking a shot at other outstanding problems in the quantum theory of black holes.

Finally, encouraged by the recent results of large-scale numerical simulations, he is elaborating his previous suggestions about the behavior of quarks and gluons at high temperature (second order phase transition) into a detailed quantitative theory.

In 1989-90 EDWARD WITTEN continued his work on topological field theories and their relation to string theory and geometry. There were two main developments during the year. He developed a method to interpret the "one matrix model" of two dimensional gravity in terms of topological field theory. Apart from the interest that it attracts among physicists, this gave rise to remarkable predictions, of quantum field theoretic origin, concerning the geometry of the moduli space of Riemann surfaces. He continued this work in the spring of 1990, showing that the general properties of practically all of the known soluble models of string theory agreed with what was expected from the topological field theory point of view.

Professor Witten was also concerned during this period with new ideas about the quantization of Chern-Simons gauge theories in three dimensions. With Axelrod and DellaPietra, he developed a detailed quantization of Chern-Simons theory with compact gauge group, allowing a new perspective on such matters as the Jones representations of the braid group. He also extended this to the case of certain non-compact gauge groups, a case that is relevant, among other things, to understanding three dimensional quantum gravity.

In 1990-1 Professor Witten continued his work on topological field theories, their relations to string theory, and their geometrical applications. One aspect of this work involves the study of simple models of string theory (variously called $c \leq 1$ models, or models with a target space dimension ≤ 2). It is hoped that experience gained from studying these models will help with the "real thing." On the one hand, he has been interested in the worldsheet properties of these theories, and in particular the extension of his previous work on the algebraic geometry of "matrix models" of two-dimensional gravity to the N matrix model. This leads to a very surprising description, coming from quantum field theory, of intersection theory on a certain family of covers of the moduli space of Riemann surfaces. When expressed in the language of classical geometry, the construction involves one or two interesting novelties.

On the other hand, Professor Witten has also been interested in the target space interpretation of these simple models of string theory, where one hopes to see glimmers of the "real" putative applications of string theory to space-time physics. He has made two contribution in this direction. The first was to discover,

for the most physical $D = 2$ case, an exact conformal field theory describing a black hole solution of string theory. There is reasonable hope that this may lead, in due time, to a significantly better understanding of the mysteries of "ordinary" four-dimensional black holes. The second was to discover a new "ground ring" whose existence comes close to explaining why the $D = 2$ conformal field theory has a matrix model interpretation.

Professor Witten also extended his earlier work on three dimensional Chern-Simons gauge theories and their close cousins, developing the semiclassical expansion for non-compact gauge groups (which should be related among other things to three-dimensional quantum general relativity) and studying, in depth, the dimensional reduction of Chern-Simons theory to two dimensions. He also developed further the gauge theory approach to holomorphic factorization of WZW models.

Much work by other members of the School of Natural Sciences was closely related to some of the themes mentioned by Professor Witten. Erik Verlinde and collaborators (including Robbert Dijkgraaf, currently at the IAS) wrote two papers connected with some of these themes. The first was on topological field theories derived from Landau-Ginzberg potentials, and the second was on using $SL(2,R)$ group theory to understand the string theory black hole solution mentioned above. Boris Blok and A. Varchenko (School of Mathematics) investigated the same Landau-Ginzberg models studied by Dr. Verlinde, et al. in the light of catastrophe theory. Nigel Burroughs, M. DeGroot, and a collaborator at Princeton constructed an elegant generalization of the Drinfeld-Sokolov hierarchies of integrable systems in two dimensions. Jan Lacki investigated the integrable models related to the N matrix model. M. Roek and collaborators found new superspace constructions of supersymmetric nonlinear sigma models. Roek and Eric Verlinde illuminated the geometrical interpretation of certain duality transformations of conformal field theories. G. Mandal, Spenta Wadia and collaborators analyzed the space-time physics of $D = 2$ string theory including the validity of the collective J. Cohn and S. de Alwis (formerly of the School of Natural Sciences) studied the applicability of string field theory to the $D \leq 2$ models.

FUNDING

THE SCHOOL OF NATURAL SCIENCES

MEMBERS, VISITORS AND RESEARCH STAFF
1989 – 90

JOSEPH J. ATICK
Particle physics
Princeton, New Jersey · M

ITZHAK BARS
Particle physics
University of Southern California · S

CHARLES BEICHMAN
Astrophysics
California Institute of Technology

MICHAEL BERSHADSKY
Particle physics
Princeton, New Jersey

GYAN BHANOT
Particle physics
Florida State University · S

JAMES BINNEY
Astrophysics
University of Oxford · V

BORIS BLOK
Particle physics
Tel Aviv University

RICHARD BOND
Astrophysics
University of Toronto · V

STEVEN J. CARLIP
Particle physics
Princeton, New Jersey

YI HONG CHEN
Particle physics
Harvard University

JOANNE COHN
Particle physics
Princeton, New Jersey

THOMAS CURTRIGHT
Particle physics
University of Miami · S

RICHARD L. DAVIS
Particle physics
Tufts University

BRUCE T. DRAINE
Astrophysics
Princeton University · F

DAVID FAIRLIE
Particle physics
University of Durham, United Kingdom · F

ANDREW P. GOULD
Astrophysics
Princeton, New Jersey

V. N. GRIBOV
Particle physics
Landau Institute for Theoretical Physics, Moscow · D

BERNARD S. GROSSMAN
Particle physics
Rockefeller University

PURAGRA GUHATKAHURTA
Astrophysics
Princeton University

GERHARD HEGERFELDT
Particle physics
University of Göttingen

LARS HERNQUIST
Astrophysics
Princeton, New Jersey

ROMAN JUSZIEWICZ
Astrophysics
Copernicus Astronomical Center, Warsaw · V

NICK KAISER
Astrophysics
University of Toronto

MICHIO KAKU
Particle physics
City College of New York · S

RUSSEL KULSRUD
Plasmaphysics
Princeton Plasma Physics Laboratory · s

OFER LAHAV
Astrophysics
University of Cambridge · F

ABRAHAM LOEB
Astrophysics
Princeton, New Jersey · M

GUATAM MANDAL
Particle physics
Tata Institute, Bombay

MICHAEL D. McGUIGAN
Particle physics
Rockefeller University

GREGORY MOORE
Particle physics
Princeton, New Jersey · M

KEVIN J. MORIARTY
Particle physics
Princeton, New Jersey

CHIARA NAPPI
Particle physics
Princeton, New Jersey · M

CARLOS ORDOÑEZ
Particle physics
Rockefeller University · s

DONALD E. OSTERBROCK
Astrophysics
University of California, Santa Cruz

JAY M. PASACHOFF
Astrophysics
Williams College

WILLIAM PRESS
Astrophysics
Harvard University · s

ELIEZER RABINOVICI
Particle physics
Racah Institute of Physics, Jerusalem · v

ROGER W. ROMANI
Astrophysics
University of California, Berkeley · M

DONALD P. SCHNEIDER
Astrophysics
Princeton, New Jersey · M

ALFRED D. SHAPERE
Particle physics
Princeton, New Jersey

CHARLES SOMMERFIELD
Particle physics
Yale University · F

GLENN D. STARKMAN
Astrophysics
Princeton, New Jersey

PAUL J. STEINHARDT
Particle physics
University of Pennsylvania

ERIK P. VERLINDE
Particle physics
Princeton, New Jersey

MARTIN D. WEINBERG
Astrophysics
Princeton, New Jersey

XIAO–GANG WEN
Particle physics
Institute of Theoretical Physics, Santa Barbara · MS

YONG-SHI WU
Particle physics
University of Utah

YUEMING XU
Astrophysics
University of Colorado

MEMBERS, VISITORS AND RESEARCH STAFF
1990 – 91

JOSEPH ATICK
Biophysics/neural systems
Institute for Advanced Study · M

BELAL BAAQUIE
Strings/field theory
National University of Singapore

CHARLES BEICHMAN
Astrophysics
California Institute of Technology

GYAN BHANOT
Computation/statistical physics
Thinking Machines Corporation · F

BORIS BLOK
Particle/mathematical physics
Institute for Advanced Study

NIGEL BURROUGHS
Quantum groups
University of Cambridge

JOANNE COHN
Field theory/string theory
Institute for Advanced Study

RICHARD DAVIS
Particle physics
Institute for Advanced Study

DAVID DEVORKIN
History of astronomy
Smithsonian Institution · S

YESHAYAHU EISENBERG
Particle physics
Weizmann Institute

CHRIS FLYNN
Astrophysics
Institut Heidelberg · VF

PETER GOLDREICH
Astrophysics
California Institute of Technology · VF

ANDREW GOULD
Astrophysics
Institute for Advanced Study

PURAGRA GUHATHAKURTA
Observational cosmology
Institute for Advanced Study

LAWRENCE HORWITZ
Particle physics
Tel Aviv University · VF

BUELL JANNUZI
Observational cosmology
Steward Observatory

ROMAN JUSZKIEWICZ
Astrophysics
North Copernicus Astronomical Center · F

JAN LACKI
Mathematical physics
Université de Genève

ARI LAOR
Astrophysics
Tel Aviv University

OLAF LECHTENFELD
String theory
The City University of New York

ZHAOPING LI
Biophysics/neural systems
California Institute of Technology

ABRAHAM LOEB
Astrophysics
Institute for Advanced Study · M

JUNICHIRO MAKINO
Astrophysics
University of Tokyo · VF

GAUTAM MANDAL
String theory
Institute for Advanced Study

DAN MAOZ
Observational cosmology
Tel Aviv University

MICHAEL McGUIGAN
String theory/particle physics
Institute for Advanced Study

CHIARA NAPPI
Particle physics
Institute for Advanced Study · M

P. JAMES PEEBLES
Cosmology
Princeton University

SARADA RAJEEV
Field theory
University of Rochester · S

DOUGLAS RICHSTONE
Astrophysics
University of Michigan

MARTIN ROCEK
Particle physics
State University of New York at Stony Brook · S

ROGER ROMANI
Astrophysics
Institute for Advanced Study · M

HERB ROOD
Astrophysics
Institute for Advanced Study · V

DONALD SCHNEIDER
Observational cosmology
Institute for Advanced Study · M

ALFRED SHAPERE
String theory
Institute for Advanced Study

NICOLAS SOURLAS
Neural networks
École Normale, Paris

GLENN STARKMAN
Particle astrophysics
Institute for Advanced Study

CLAUDIO TEITELBOIM
Particle physics
Centro de Estudios Científicos de Santiago · M

SANDIP TRIVEDI
String/quantum field theory
California Institute of Technology

ERIK VERLINDE
Particle physics
Institute for Advanced Study · M

SPENTA WADIA
String Theory
Tata Institute

XIAO-GANG WEN
Condensed Matter Physics
Institute for Advanced Study · M

PAUL WIEGMANN
Particle physics
University of California, San Diego · F

YUEMING XU
Astrophysics
Institute for Advanced Study

BRIAN PHILIP YANNY
Astrophysics
University of Chicago

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Faculty

CLIFFORD GEERTZ *[Harold F. Linder Professor]*
JOAN WALLACH SCOTT
MICHAEL WALZER *[UPS Foundation Professor]*

Professor Emeritus

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THE SCHOOL OF SOCIAL SCIENCE

INTERPRETIVE SOCIAL SCIENCE

Since its inception, the School has been committed to broadly humanistic, "interpretive" approaches to the social sciences. Interpretive social science embraces all the complex ways in which scholars make sense of the social world — policy, economy, religion, and family — through empirical study, discussion within and across disciplinary communities, and the critical revision of accepted conceptions. The School is interested in cultural concepts as they shape the disciplines and, more generally, as they organize all forms of social activity. From this perspective "interpretive social science" is the study of the ways in which human beings create their societies and make life within them meaningful.

With a faculty of four members, the School can hardly hope to "cover" all the relevant academic disciplines. Yet the presence of a permanent faculty provides continuity and coherence for the program of the School over the years and in any single year. Faculty members have participated actively in the most important contemporary debates about the centrality of culture, language, ritual, and moral and aesthetic understandings in the study of society. And although each is rooted in his or her own discipline, all do work that cuts across disciplinary boundaries. It is the common interest in interpretation, and in the construction of meaning, that lends coherence to the School's program. The School is committed to bringing scholars each year who address issues of culture and meaning through concrete study and from different disciplinary backgrounds, as well as scholars who work in the same discipline as one or another faculty member but differ in intellectual perspective. The result is a wide-ranging membership that represents in any given year a more or less coherent set of arguments — the arguments through which, at that moment, the shape of scholarly work is being decided.

ACADEMIC ACTIVITIES OF THE SCHOOL

During the 1989-90 academic year, the School of Social Science had 18 Members, two visitors and three research assistants. Of these 15 were supported wholly or in part by sponsored fellowships. The National Endowment for the Humanities grants provided support for five; The Ford Foundation, two; The Rockefeller Foundation, three; The John D. and Catherine T. MacArthur Foundation, nine; and the Volkswagen-Stiftung, one. UPS Foundation provided general support.

Fields of inquiry among these 23 scholars from Australia, Canada, Germany, and Israel as well as from the United States were anthropology, economics, history, political science and sociology.

A group of faculty, members and guests met biweekly to discuss "National Identity of Post-Colonial Third World States," the theme for this last year of a three-year emphasis on Group Identities. The Thursday Luncheon Seminars continued with 26 presentations, including some from other Schools and nearby universities and audiences drawn from a wider scholarly community.

In 1990-91 the School of Social Science had 17 Members and two research assistants. Full or partial support for four of these Members came from The Andrew W. Mellon Foundation; the MacArthur Foundation provided support for two and the Volkswagen-Stiftung also funded two. The UPS Foundation provided general support.

Fields of inquiry among these scholars from Argentina, France, Germany, Poland, Israel and the United States were: anthropology, three; history, five; literature, one; philosophy, two; political science, three; sociology, two; and history of science, one.

1990-91 marked the beginning of a three-year focus on the philosophy of history, politics, law, and science, and the conceptual and organizational processes by which knowledge is produced. Faculty and a core group of Mellon Foundation fellows were joined by other members in a biweekly "History" seminar that explored changing approaches to history and the turn to history in the social sciences. The Thursday Luncheon Seminars continued with 21 presentations to audiences drawn from the School of Social Science, other Schools, nearby universities, and the wider scholarly community.

FACULTY

CLIFFORD GEERTZ was the 1989-90 Hitchcock Professor at the University of California, Berkeley, and gave lectures at UC, Berkeley; UC, Los Angeles; and UC, San Francisco, in April. He served as Distinguished Visiting Professor at Hebrew University, Jerusalem, and gave the Jerusalem Harvard Lectures there in May. He has become a Member of the Editorial Board of *History and Anthropology*; Member of the Advisory Board of the *Philosophy of History and Culture* Publication Series; consultant for anthropology to *Columbia Encyclopedia*; and published several articles on various subjects in anthropology.

In 1990-91 Professor Geertz gave lectures to the American Museum of Natural History and the Russell Sage Foundation, New York City; Carleton College, Northfield, Minnesota; and Millersville University, Pennsylvania. He participated in the Tenth Anniversary Symposium of the Whitney Humanities Center, Yale University, and the "Other Orients" symposium at Dartmouth College, and has become a Member of the Editorial Board of *Common Knowledge*. His

recent publications include: "History and Anthropology," *New Literary History* 21:321-335, and "Popular Art" and the Javanese Tradition," *Indonesia*, October 1990.

During 1989-90 JOAN SCOTT published "French Feminists and the Rights of 'Man': Olympe de Gouges' Declarations," in *History Workshop* 28 (Autumn 1989) and "Women's History," in *New Perspectives on Historical Writing*, edited by Peter Burke (Polity Press). She gave a paper at a conference on "Women in the French Revolution" at UCLA in October. In March she gave a paper at a conference on "History" at Princeton. She gave lectures at the University of Michigan, Princeton, Kenyon College, Cambridge University and The University of Amsterdam. In December, she was a distinguished visitor at the Rutgers Center for the Critical Analysis of Contemporary Culture.

During 1990-91 Professor Scott lectured at Cambridge University, the University of Amsterdam, the University of California at Santa Cruz, Stanford University, and the New School for Social Research. She gave papers at the meetings of the American Anthropological Association, the American Historical Association, and the Wesleyan University Center for the Humanities. She gave the Herbert G. Gutman Memorial Lecture at City University of New York. She was the Tobias and Hortense Cohen Lewin distinguished professor and lecturer at Washington University in St. Louis. She also served on the selection committee for the Bicentennial Fellowships awarded by the French-American Foundation.

The Tanner Lectures presented in Oxford in May 1989 by MICHAEL WALZER were published in 1990 in *The Tanner Lectures on Human Values*, vol. XI, under the title "Nation and Universe." A number of his books appeared in translation in the period of this report: *Regicide and Revolution* in French; *Just and Unjust Wars* in Italian; *Interpretation and Social Criticism* in French and German; and *Exodus and Revolution* in Japanese. He lectured at Yale, Wesleyan, the Naval War College, Rutgers, Princeton, Pacific Lutheran, University of Washington, New York University, Dickinson College, and Harvard Law School (the John Dewey Lecture). In the 1989-90 spring semester he taught a graduate seminar on "Biblical Politics" at the New School for Social Research.

Professor Walzer gave the first Gunnar Myrdal Memorial Lecture at the University of Stockholm in October 1990. In the course of the 1990-91 academic year, he also lectured at Columbia Law School, Harvard, Johns Hopkins, the University of Utah, the University of Cincinnati, and Hebrew Union College. Several new translations of his books appeared: *Interpretation and Social Criticism* into Italian, *The Company of Critics* into German, and *Spheres of Justice* (abridged) into Swedish. His articles on the Gulf war appeared in *The New Republic* in this country and also in German, Italian, and French periodicals.

Professor Emeritus ALBERT O. HIRSCHMAN completed a book on the "rhetoric of reaction," to be published in 1991 by Harvard University Press. He published "How the Keynesian Revolution was Exported from the United States, and Other Comments" in *The Political Power of Economic Ideas: Keynesianism across Nations*, edited by Peter A. Hall, Princeton University Press, 1989, and "Opinionated Opinions and Democracy" in *Dissent*, Summer 1989. He presented a paper at the Lionel Trilling Seminar at Columbia University and gave other invited lectures at Stanford University and Massachusetts Institute of Technology. In March 1990, he was an invited guest at the inauguration of Patricio Aylwin, the new democratically elected President of Chile, and participated in two pre-inauguration seminars that were held on that occasion. In June 1990, he participated in a seminar on social choice theory organized by the Polish Academy of Sciences in Warsaw.

He received honorary degrees from the universities of Buenos Aires, Campinas (State of São Paulo, Brazil), Georgetown (Washington, D.C.), and Yale.

In November 1989, the Inter American Development Bank organized a symposium on "Hirschman's Work and a New Development Strategy for Latin America," held in Buenos Aires, hosted by the Instituto di Tella. In April 1990, the International Studies Association devoted a special session at its 31st annual meeting, held in Washington, D.C, to various aspects of Hirschman's work.

In 1990-91 Professor Hirschman published *The Rhetoric of Reaction: Perversity, Futility, Jeopardy*, Belknap Press of Harvard University Press. The book was published almost simultaneously in French under the title *Deux siècles de rhétorique réactionnaire*, Fayard, Paris. German, Italian, Spanish, Portuguese, and Japanese translations are in progress.

He also published "The Case against 'One Thing at a Time'," *World Development*, August 1990 and "Good News is Not Bad News," *New York Review of Books*, October 11, 1990. The latter paper, written originally for the Spanish-language quarterly *Pensamiento Iberoamericano*, dealt with the likely effects of the Eastern European events of 1989 on the Third World, particularly Latin America.

Professor Hirschman spent the 1990-91 academic year at the Wissenschaftskolleg (Institute for Advanced Study) in Berlin. There he helped organize an international colloquium, held in November 1990, on "transitions to market economies in Eastern Europe" and participated in a seminar on comparative history and anthropology at the Free University of Berlin, presenting a paper on "Industrialization and its Manifold Discontents — West, East, and South." This paper, written in German, is to be published in the journal *Geschichte und Gesellschaft*.

He also gave a talk at the Wissenschaftszentrum Berlin (WZB) on the relations between the 1989/90 collapse of the German Democratic Republic and the concepts of *Exit, Voice, Loyalty*, as analyzed in his 1970 book. He has started to write an essay along these lines. In June 1991 he was invited to lecture at the Hungarian Academy of Sciences, as well as at the University of Budapest. On that occasion, he also stopped in Prague, where he conferred with various social scientists and other scholars.

THE SCHOOL OF SOCIAL SCIENCE

MEMBERS, VISITORS AND RESEARCH STAFF
1989 – 90

THOMAS A. ABERCROMBIE
Anthropology
Stanford University

ARJUN APPADURAI
Anthropology
University of Pennsylvania

EDMUND BURKE, III
Modern history
University of California, Santa Cruz

KATHLEEN M. CANNINGS
Economics
University of Montreal

JOSHUA COLE
French social history
University of California, Berkeley · R

EMILIA V. DA COSTA
Modern history
Yale University

NICHOLAS B. DIRKS
Modern history
University of Michigan, Ann Arbor

LAURA ENGELSTEIN
History
Princeton University · V

DRU GLADNEY
Anthropology
Harvard University

LIAH V. GREENFELD
Sociology
Harvard University

TIMUR KURAN
Economics
University of Southern California

WILLIAM LAZONICK
Economics
Barnard College, Columbia University

MENACHEM LORBERBAUM
Philosophy
Shalam Hartman Institute, Jerusalem · R

ANTHONY C. MILNER
Modern history
Australian National University, Canberra

JOHN NAPORA
Anthropology
University of Virginia · R

CATHARINE NEWBURY
Political science
University of North Carolina, Chapel Hill

SHERRY ORTNER
Anthropology
University of Michigan · V

PEARL T. ROBINSON
Political science
Tufts University

WOLFGANG SEIBEL
Political science
University of Constance, Germany

FRED SIEGEL
Modern history
The Cooper Union, New York

ROBERT J. THORNTON
Anthropology
University of Cape Town, South Africa

MAURIZIO VIROLI
Political science
Princeton University

JUDITH R. WALKOWITZ
Modern history
Rutgers University

JOHN WATERBURY
Political science
Princeton University

F First Term · S Second Term · V Visitor · A Research Assistant · R Research Associate

MEMBERS, VISITORS AND RESEARCH STAFF
1990 – 91

JAMES BONO
History
State University of New York, Buffalo

CHRISTINA CROSBY
Literature
Wesleyan University

MICHAEL DONNELLY
Sociology
Universita di Trento, Italy

GENEVIÈVE FRAISSE
Philosophy
Centre National de Recherche Scientifique, Paris

CHRISTOPHER FYNSK
Philosophy
State University of New York, Binghamton

GARY GERSTLE
History
Princeton University

JANET HOSKINS
Anthropology
University of Southern California

EIKO IKEGAMI
Sociology
Yale University

JACEK KOCHANOWICZ
History
Warsaw University

CHUN LIN
Political Science
Harvard University

MENACHEM LORBERBAUM
Philosophy
Shalom Hartman Institute, Jerusalem · A

DAVID RICCI
Political Science
Hebrew University, Jerusalem

HILDA SABATO
History
University of Buenos Aires

SYLVIA SCHAFER
History
University of California, Berkeley · A

PETER SCHOTTLER
History
Centre National de la Recherche Scientifique, Paris

CHRISTINE STANSELL
History
Princeton University

VALERIO VALERI
Anthropology
University of Chicago

PETER WAGNER
Political Science
Wissenschaftszentrum Berlin fur Sozialforschung

ALEX WEINGROD
Anthropology
Ben Gurion University of the Negev

F *First Term* · S *Second Term* · V *Visitor* · A *Research Assistant* · R *Research Associate*

THE LIBRARIES

The *Historical Studies – Social Science Library* [Dr. Elliott Shore, Librarian] contains about 100,000 volumes and has subscriptions to about 1,000 journals. The library is strongest in classical studies, ancient history and archaeology, but it contains basic document collections, reference works and important secondary works of scholarship in most fields of history and the social sciences. The journal collection is extensive, and fairly complete back runs exist to the founding of the Institute. The library has occupied its present building since 1964.

The Institute's rare book collection, the gift of Lessing J. Rosenwald, consists of about 2,000 volumes on the history of science and was compiled by Herbert M. Evans in the 1930s. The collection, which is housed in a special room, includes numerous first editions of important scientific works in mathematics, astronomy, physics and the life sciences.

The library has an extensive offprint collection that includes offprints received by Professors Kurt Gödel, Ernst H. Kantorowicz, Elias Avery Lowe, Millard Meiss and Erwin Panofsky and former visiting member Walther Kirchner.

The microfilm collections of the library include a large selection from *Manuscripta,* a collection of several thousand fifteenth-to nineteenth-century printed books from the Vatican Library. The Bavarian Academy has given the Institute a microfilm copy of slips prepared for the *Thesaurus Linguae Latinae*. The library has microfilm copies of the papers of Albert Einstein, Kurt Gödel and Simone Weil.

The Historical Studies – Social Science Library houses the Institute archives. The papers in the collection date from the 1930s and include official correspondence of the Director's Office, minutes of meetings of the Faculty and the Board of Trustees, miscellaneous correspondence concerning past Faculty members, records of the Electronic Computer Project and other documents. The archives also include the Institute's extensive photograph collection.

The *Mathematics – Natural Sciences Library* [Momota Ganguli, Librarian] located on the second floor of Fuld Hall contains about 30,000 volumes (including bound periodicals and monographs) and has subscriptions to about 190 journals. Its collection of older periodicals (prior to 1940) are housed in compact shelving on the lower level of the Historical Studies – Social Science Library. The areas covered by this collection are pure and applied mathematics, astrophysics and theoretical, particle and mathematical physics.

Both of the Institute's libraries participate in the shared cataloguing system of the Research Libraries Group, which gives Institute scholars computerized access to a database that contains more than fourteen million records. Searches of this database retrieve bibliographic information and identify the location of materials in all participating libraries. Scholars who use the Historical Studies – Social Science Library can also conduct computerized searches in the Avery Art Index, the Eighteenth Century Short Title Catalogue and such indexes as Art Index, Humanities Index and the Social Science Index.

All scholars affiliated with the Institute enjoy the same privileges as Princeton University faculty in the Harvey S. Firestone Memorial Library and the nineteen special-subject libraries in the Princeton University Library System and also in the Robert E. Speer Library of the Princeton Theological Seminary.

Librarians, the faculties and visiting scholars of all four Schools at the Institute warmly appreciate gifts, too numerous to mention here, of books and articles from former permanent and visiting members of the Institute community.

RECORD OF EVENTS

What follows is a calendar of events sponsored by the Schools of
Historical Studies, Mathematics, Natural Sciences and Social Science
and by the Director's Office

Academic Year 1989 – 90

September 22
School of Natural Sciences
Lunchtime Seminar: "Conformal Field Theory
Results from Quantization of Chern-Simon
Theory"
SCOTT AXELROD, *Princeton University*

September 28
School of Historical Studies
Art History Colloquium: "Painting and
Possession: Poussin's Self-Portrait for
Chantelou and the *Essais* of Montaigne"
M. ELIZABETH CROPPER, *School of Historical
Studies*, IAS

October 3
School of Mathematics
Automorphic Forms Seminar: "Congruences
between cusp forms and modular Galois
representations"
BRUCE JORDAN, *School of Mathematics*, IAS

October 4
School of Social Science
National Identity of Post-Colonial Third World
States Seminar: Planning meeting
EDMUND BURKE III, SHERRY ORTNER, *School of
Social Science*, IAS

October 5
School of Historical Studies
Art History Colloquium: "Incontriamoci alla
Consolata"
ANTHONY CUTLER, *School of Historical Studies*, IAS

School of Social Science
Luncheon Seminar: "Changing Social
Foundations of Industrial Dominance and
Decline"
WILLIAM LAZONICK, *School of Social Science*, IAS

October 6
School of Mathematics
Math/Physics Seminar: "Is there a connection
between Ising models and the Riemann
hypothesis"
CHARLES NEWMAN, *Courant Institute*

October 10
School of Mathematics
Automorphic Forms Seminar: "Congruences
between cusp forms and modular Galois
representations, concluded"
BRUCE JORDAN, *School of Mathematics*, IAS

October 11
Faculty Lectures: "Gibbon's Byzantium"
GLEN W. BOWERSOCK, *Professor, School of Historical
Studies*, IAS

October 12
School of Mathematics
Automorphic Forms Seminar: "Modular
construction of field extensions and of mixed
motives, Part I"
GUNTER HARDER, *School of Mathematics*, IAS

School of Social Science
Luncheon Seminar: "What Does It Mean to be An
'American'?"
MICHAEL WALZER, *Professor, School of Social
Science*, IAS

October 13
School of Mathematics
Math/Physics Seminar: "Quantum chaos in
hydrogen: Dynamical group approach and a
resonance anomaly"
GERHARD C. HEGERFELDT, *School of Natural
Sciences*, IAS

October 16
School of Mathematics
Members Seminar: "Irregularities in the
distribution of prime numbers"
ANDREW GRANVILLE, *School of Mathematics*, IAS

October 17
School of Mathematics
Automorphic Forms Seminar: "Modular
construction of field extensions and of mixed
motives, Part II"
GUNTER HARDER, *School of Mathematics*, IAS

October 18
School of Social Science
National Identity Seminar: Discussion of Nicholas
Dirks, "Colonialism and Culture"; Timothy
Mitchell, "The World as Exhibition"; Ann Laura
Stoler, "Rethinking Colonial Categories: European
Communities and the Boundaries of Rule"; and
Michael Taussig, "Culture of Terror — Space of
Death"
EDMUND BURKE III, SHERRY ORTNER, *School of Social
Science*, IAS

October 19
School of Social Science
Luncheon Seminar: "The Hand of the Past:
Collective Conservatism, Preference Rigidity, and
Social Evolution"
TIMUR KURAN, *School of Social Science*, IAS

October 20
School of Mathematics
Math/Physics Seminar: "Semi classical properties
of point spectra"
ALEJANDRO URIBE, *School of Mathematics*, IAS

School of Natural Sciences
Lunchtime Seminar: "Wormholes in $2 + 1$
Dimensional Gravity"
STEVEN CARLIP, *School of Natural Sciences*, IAS

October 23
School of Mathematics
Members Seminar: "Local-global principles in
algebra and algebraic number theory"
VLADIMIR PLATONOV, *Minsk, USSR*
School of Natural Sciences
Theoretical Physics Seminar: "Superstring Field
Theory"
CHARLES THORN, *University of Florida*

October 24
School of Mathematics
Special Seminar: "A new local-global principle for
algebraic groups"
VLADIMIR PLATONOV, *Minsk, USSR*

October 26
School of Social Science
Luncheon Seminar: "The Constraints upon
Economic Growth in Pre-Industrial Societies"
ANTHONY WRIGLEY, *Cambridge University*

October 27
Board of Trustees Lecture
"Why Spain? A Historian's Perspective
JOHN H. ELLIOTT, *Professor, School of Historical Studies*,
IAS

October 31
School of Mathematics
Automorphic Forms Seminar: "*l*-independence of
Galois envelopes"
MICHAEL LARSEN, *School of Mathematics*, IAS

November 1
School of Mathematics
Special Seminar: "Discrete subgroups of Lie
groups applied to combinatorics, computer science
and finite groups"
ALEXANDER LUBOTZKY, *Hebrew University*

School of Social Science
National Identity Seminar: Discussion of Partha
Chatterjee, *Nationalist Thought and the Colonial World:
A Derivative Discourse?*
EDMUND BURKE III, SHERRY ORTNER, *School of Social
Science*, IAS

November 2
School of Historical Studies
Art History Colloquium: "Self-Representation in
Poussin's *Mars and Venus*"
CHARLES DEMPSEY, *School of Historical Studies*, IAS

School of Social Science
Luncheon Seminar: "Two Hundred Years of
Reactionary Rhetoric: The Futility Thesis"
ALBERT O. HIRSCHMAN, *Professor Emeritus, School of
Social Science*, IAS

School of Mathematics
Algebraic Group Seminar: "The minimum of co-volumes for lattices in SL_2"
ALEXANDER LUBOTZKY, *Hebrew University*

November 3
School of Natural Sciences
Lunchtime Seminar: "Conformal Field Theory, Twisted Vertex Operators and the Monster Group"
LOUISE DOLAN, *Rockefeller University*

November 6
School of Mathematics
Members Seminar: "The inaudible geometry of nilmanifolds"
DENNIS DETURCK, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "The Quantum Group Structure of 2D Gravity and Minimal Models"
J.-L. GERVAIS, *Ecole Normale Superieure, Paris*

November 7
School of Mathematics
Automorphic Forms Seminar: "*l*-independence of Galois envelopes (Conclusion)";
MICHAEL LARSEN, *School of Mathematics*, IAS

November 8
Faculty Lectures: "Illusion and Disillusion: Spain and the Indies"
JOHN H. ELLIOTT, *Professor, School of Historical Studies*, IAS

November 9
School of Social Science
Luncheon Seminar: "The 'Third Sector' and the Crisis of the Welfare State: A Comparative Analysis of Institutional Elasticity"
WOLFGANG SEIBEL, *School of Social Science*, IAS

November 13
School of Mathematics
Members Seminar: "Homogeneous vector bundles and families of Calabi-Yau threefolds"
CIPRIAN BORCEA, *School of Mathematics*, IAS

November 14
School of Mathematics
Automorphic Forms Seminar: "Kolyvagin's analytic hypothesis (Part I)"
KUMAR MURTY, *School of Mathematics*, IAS

November 15
School of Social Science
National Identity Seminar: "II. Countries," chapter from projected book, *After the Fact*
CLIFFORD GEERTZ, *Professor, School of Social Science*, IAS

November 16
School of Mathematics
Special Seminar: "Converse theorem for GL(n)"
ILYA PIATETSKI-SHAPIRO, *Yale University*

School of Social Science
Luncheon Seminar: "The Emergence of National Identity: An Historical Sociological Explanation"
LIAH GREENFELD, *School of Social Science*, IAS

Director's Visitor Lecture: "Whatever Happened to the Future? A Personal View on the Energy Crisis"
RICHARD J. EDEN, O.B.E., *University of Cambridge*

November 17
School of Mathematics
Special Seminar: "Converse theorem for GL(n) "
ILYA PIATETSKI-SHAPIRO, *Yale University*

School of Natural Sciences
Lunchtime Seminar: "Stringy Cosmic Strings"
AL SHAPERE, *School of Natural Sciences*, IAS

November 20
School of Natural Sciences
Theoretical Physics Seminar: "The Large N Limit of W-Algebras and Area Preserving Diffeomorphisms"
YANNIS BAKAS, *University of Maryland*

School of Mathematics
Members Seminar: "Finite dimensional representations of the quantum group GLq(N)"
HIROFUMI YAMADA, *School of Mathematics*, IAS

November 21
School of Mathematics
Automorphic Forms Seminar: "Kolyvagin's analytic hypothesis (Part II)"
KUMAR MURTY, *School of Mathematics*, IAS

School of Mathematics
Special Seminar: "L-functions for classical groups"
ILYA PIATETSKI-SHAPIRO, *Yale University*

November 27
School of Mathematics
Members Seminar: "Filtration of G-modules"
OLIVIER MATHIEU, *School of Mathematics*, IAS

November 28
School of Mathematics
Automorphic Forms Seminar: "Riemann-Roch in functorial form" (Part I)
JENS FRANKE, *School of Mathematics*, IAS

November 29
School of Historical Studies
Lecture: "New Developments in the Archaeology of Cyprus"
VASSOS KARAGEORGHIS, *School of Historical Studies*, IAS

School of Social Science
National Identity Seminar: "Disjuncture and Difference in the Global Cultural Economy" and "Global Ethnoscapes: Notes and Queries for a Transnational Anthropology"
ARJUN APPADURAI, *School of Social Science*, IAS

November 30
School of Social Science
Luncheon Seminar: "Why States Shrink — If They Do"
JOHN WATERBURY, *School of Social Science*, IAS

December 1
School of Natural Sciences
Lunchtime Seminar: "Infrared Behavior at Negative Curvature"
FRANK WILCZEK, *Professor, School of Natural Sciences*, IAS

December 4
School of Mathematics
Members Seminar: "Scalar-flat Kähler surfaces and anti-self-duality"
CLAUDE LEBRUN, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "Nonperturbative Quantum Gravity: New Results and Directions"
LEE SMOLIN, *Syracuse University*

December 5
School of Mathematics
Automorphic Forms Seminar: "Riemann-Roch in functorial form (Part II)"
JENS FRANKE, *School of Mathematics*, IAS

December 7
School of Historical Studies
Art History Colloquium: "Triumphal Entries and the Villa of Andrea Doria in Genoa"
GEORGE GORSE, *School of Historical Studies*, IAS
School of Social Science
Luncheon Seminar: "Ethnic and Gender Imagery in the Construction of Bolivian Identities: Festive and Photographic Representations of Possible Selves"
THOMAS ABERCROMBIE, *School of Social Science*, IAS

December 11
School of Mathematics
Members Seminar: "Alexander Polynomials for Projective Hypersurfaces"
ALEXANDRU DIMCA, *School of Mathematics*, IAS

December 12
School of Mathematics
Automorphic Forms Seminar: "Special values of L-functions and mixed motives, (Part I)"
ANTHONY J. SCHOLL, *School of Mathematics*, IAS

December 13
School of Social Science
National Identity Seminar: Dru Gladney, "Dialogic Ethnicity: The State and National Identity in China"; and Vivienne Shue, *The Reach of the State*, chapters 3 and 4
DRU GLADNEY, *School of Social Science*, IAS

Faculty Lectures: "Cicero and Caesar"
CHRISTIAN HABICHT, *Professor, School of Historical Studies, IAS*

December 14
School of Social Science Luncheon Seminar: "How Does Measurement Mean?"
ARJUN APPADURAI, *School of Social Science*, IAS

December 15
School of Natural Sciences
Lunchtime Seminar: "Surprises With Topological Field Theories"
EDWARD WITTEN, *Professor, School of Natural Sciences*, IAS

December 18
School of Natural Sciences
Theoretical Physics Seminar: "Statistical
Mechanics of Strings at High Energies"
SANJAY JAIN, *Brown University*

School of Mathematics
Members Seminar: "Conformal Field Theories
on Riemann Surfaces"
ROBERTO SILVOTTI, *School of Mathematics, IAS*

December 19
School of Mathematics
Automorphic Forms Seminar: "Special values
of L-functions and mixed motives (Part II)"
ANTHONY J. SCHOLL, *School of Mathematics, IAS*

December 20
School of Natural Sciences
Lunchtime Seminar: "SU(∞), the Sine Bracket
and the Large N Limit of Yang Mills"
DAVID FAIRLIE, *School of Natural Sciences, IAS*

January 9
School of Mathematics
Automorphic Forms Seminar: "Thue's Method
and Mordell's Conjecture, Part I"
PAUL VOJTA, *School of Mathematics, IAS*

January 10
School of Historical Studies
Colloquium: "The Enlightenment in Venice and
the Constitutional Problems of the Republic of
Saint Mark"
FRANCO VENTURI, *University of Turin, Italy*

School of Mathematics
Number Theory Seminar: "The Generalized
Fermat Equation in Function Fields"
ENRICO BOMBIERI, *Professor, School of
Mathematics, IAS*

January 11
School of Historical Studies
Art History Colloquium: "How Art History
Mistook Christ for the Emperor"
THOMAS MATHEWS, *School of Historical Studies, IAS*

January 12
School of Natural Sciences
Lunchtime Seminar: "Topological Orders &
Edge Excitations in Quantum Hall States"
XIAO-GANG WEN, *School of Natural Sciences, IAS*

January 15
School of Mathematics
Members Seminar: "Simple Closed Geodesics
on Convex Surfaces"
JIANGUO CAO, *School of Mathematics, IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Unitary
Irrational Central Charge on Compact G"
MARTIN HALPERN, *University of California, Berkeley*

January 16
School of Mathematics
Automorphic Forms Seminar: "Thue's Method
and Mordell's Conjecture, Part II"
PAUL VOJTA, *School of Mathematics, IAS*

School of Mathematics
Math/Physics Seminar: "Cyclic Cohomology
and Supersymmetric Field Theory"
ANDRZEJ LESNIEWSKI, *Harvard University*

School of Historical Studies
Medievalist Seminar: "Empire: A Medieval
Concept in Early Modern Political Discourse"
JAMES MULDOON, *School of Historical Studies, IAS*

January 17
School of Mathematics
Number Theory Seminar: "Irregularities in the
Distribution of Primes in Arithmetic
Progressions, and as the Values of Other
Polynomials"
ANDREW GRANVILLE, *School of Mathematics, IAS*

Faculty Lectures: "Medieval Monasticism and
Modern Society"
GILES CONSTABLE, *Professor, School of Historical
Studies, IAS*

January 18
School of Social Science
Luncheon Seminar: "From Politics to Reason
of State"
MAURIZIO VIROLI, *School of Social Science, IAS*

January 22
School of Mathematics
Members Seminar: Quasi Hojsf Alegräs
VLADIMIR DRINFEL'D, *School of Mathematics, IAS*

January 23
School of Mathematics
Automorphic Forms Seminar: "P-adic Periods
on Abelian Varieties, Part I"
DON BLASIUS, *School of Mathematics*, IAS

School of Mathematics
Math/Physics Seminar: "Random walk in a
random environment"
JAN BRICMONT, *Université Catholique de Louvain,
Belgium*

School of Mathematics
Special Seminar: "Local Systems on Moduli
Spaces"
DAVID KAZHDAN, *Harvard University*

January 24
School of Mathematics
Number Theory Seminar: "Baker's Method and
Mordell's Conjecture-I"
DAVID MASSER, *School of Mathematics*, IAS

January 24
School of Social Science
National Identity Seminar: "Mothers and
Mistresses of the Nation: Ethnic and Gender
Imagery in the Construction of Bolivian
Identities" and *"Q'aqchas* and *La Plebe* in
'Rebellion': Carnival vs Lent in 18th century
Potosi"
THOMAS ABERCROMBIE, *School of Social Science*, IAS

January 25
School of Social Science
Luncheon Seminar: "Charter for a Theory of
Myth: Malinowski's Reading of Nietzsche's
'Birth of Tragedy' "
ROBERT THORNTON, *School of Social Science*, IAS

January 26
School of Natural Sciences
Lunchtime Seminar: "Open String Field Theory
in Arbitrary Background"
A. SCHWARZ, *School of Natural Sciences*, IAS

January 29
School of Natural Sciences
Theoretical Physics Seminar: "Dynamical
Symmetry in the Vortex/Chern-Simons
Interaction"
ROMAN JACKIW, *MIT & Columbia*

School of Mathematics
Members Seminar: "Signature Defects and
Derivatives of Hirzebruch's L-Polynomial"
MARK STERN, *School of Mathematics*, IAS

January 30
School of Mathematics
Automorphic Forms Seminar: "P-adic Periods
on Abelian Varieties, Part II"
DON BLASIUS, *School of Mathematics*, IAS

School of Historical Studies
Medievalist Seminar: "From Republic to
Duchy: The Social-Spatial Reorientation of
Florence, 1551-1632"
R. BURR LITCHFIELD, *School of Historical
Studies*, IAS

January 31
School of Mathematics
Number Theory Seminar: "Baker's Method and
Mordell's Conjecture, II"
DAVID MASSER, *School of Mathematics*, IAS

February 1
School of Historical Studies
Art History Colloquium: "The Joys of
Architectural Restitution"
PIERRE DU PREY, *School of Historical Studies*, IAS

School of Mathematics
Topology Seminar: "Polyhedral Metrics and the
Structure of 3-Manifolds"
J.H. RUBINSTEIN, *School of Mathematics*, IAS

School of Mathematics
Special Seminar: "Mordell's Conjecture"
PAUL VOJTA, *School of Mathematics*, IAS

School of Social Science
Luncheon Seminar: "Castes of Mind"
NICHOLAS DIRKS, *School of Social Science*, IAS

February 5
School of Mathematics
Members Seminar: "On the Generalized Cycle
Map for Algebraic Varieties"
PAULO LIMA-FILHO, *School of Mathematics*, IAS

February 6
School of Mathematics
Automorphic Forms Seminar: "Eisenstein
Series on Symplectic Groups"
TAMOTSU IKEDA, *School of Mathematics*, IAS

School of Mathematics
Special Seminar: "Grothendieck-Teichmuller
Group"
VLADIMIR DRINFEL'D, *School of Mathematics*, IAS

February 7
School of Social Science
National Identity Seminar: "Islam and Social
Movements: Methodological Reflections,"
"Understanding Arab Protest Movements, and
"Rural Collective Action and the Emergence of
Modern Lebanon: A Comparative Historical
Perspective"
EDMUND BURKE III, *School of Social Science*, IAS

School of Mathematics
Number Theory Seminar: "Baker's Method and
Mordell's Conjecture, Conclusion"
DAVID MASSER, *School of Mathematics*, IAS

School of Mathematics
Geometry Seminar: "Non-Abelian Hodge
Theory, Part I"
CARLOS SIMPSON, *Princeton University*

February 8
School of Social Science
Luncheon Seminar: "Writing Post-Orientalist
Histories of the Third World: Perspectives from
Indian Historiography"
GYAN PRAKASH, *Princeton University*

School of Mathematics
Topology Seminar: "Intersection Theory on the
Moduli Space of Riemann Surfaces and the
KdV Hierarchy
EDWARD WITTEN, *Professor, School of Natural
Sciences, IAS*

School of Mathematics
Special Seminar: "Mordell's Conjecture"
PAUL VOJTA, *School of Mathematics*, IAS

February 9
School of Mathematics
Geometry Seminar: "Non-Abelian Hodge
Theory, Part II"
CARLOS SIMPSON, *Princeton University*

School of Natural Sciences
Lunchtime Seminar: "Quantum Mechanical
Hair"
JOHN PRESKILL, *California Institute of Technology*

February 12
School of Mathematics
Members Seminar: "Incompressible Flow:
Energy and Asymptotic Crossing Number"
ZHENG-XU HE, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "On Superstrings
at the Multi-Loop Level"
OLAF LECHTENFELD, *City College of New York*

February 13
School of Historical Studies
Medievalist Seminar: *"Forma vitae*: From
Religious Rule to Social Organization"
JAMES POWELL, *School of Historical Studies*, IAS

School of Mathematics
Automorphic Forms Seminar: "Location of
Poles of Triple L-functions"
TAMOTSU IKEDA, *School of Mathematics*, IAS

February 14
Faculty Lectures: "Between Social Science and
History: 'Clausewitz's *On War*' "
PETER PARET, *Professor, School of Historical
Studies*, IAS

School of Mathematics
Special Seminar: "Geometry of the Space of
Knots"
JEAN-LUC BRYLINSKI, *Pennsylvania State University*

February 15
School of Social Science
Luncheon Seminar: "The Invention of Politics
in Malaysia"
ANTHONY MILNER, *School of Social Science*, IAS

School of Mathematics
Topology Seminar: "Singular Spaces,
Characteristic Classes and Intersection
Holology"
J. SHANESON, *University of Pennsylvania*

February 16
School of Mathematics
Special Seminar: "Mordell's Conjecture"
PAUL VOJTA, *School of Mathematics*, IAS

School of Mathematics
Mathematics/Physics Seminar: "Anderson
Localization in One-Dimensional Quasi
Periodic Media"
VICTOR CHULAEVSKY, *School of Mathematics*, IAS

February 19
School of Mathematics
Members Seminar: "Weighted Derangements
and Orthogonal Polynomials"
JIANG ZENG, *School of Mathematics*, IAS

February 20
School of Mathematics
Automorphic Forms Seminar: "A Local Trace
Formula"
JAMES ARTHUR, *University of Toronto*

February 21
School of Social Science
National Identity Seminar: Discussion of
Valentine Mudimbe, *The Invention of Africa*, and
Oyekan Owomoyela, "Africa and the
Imperative of Philosophy: A Skeptical
Consideration"
PEARL ROBINSON, *School of Social Science*, IAS

February 22
School of Historical Studies
Art History Colloquium: "Michelangelo's
Campidoglio: Architectural Iconography,
Palace Typology and Social History"
CHARLES BURROUGHS, *School of Historical
Studies*, IAS

School of Social Science
Luncheon Seminar: "Reading America:
Preliminary Notes on Class and Culture"
SHERRY ORTNER, *School of Social Science*, IAS

February 23
School of Natural Sciences
Lunchtime Seminar: "Topological Field Theory
Approaches to Yang-Mills & Gravity in Four
Dimensions"
B. GROSSMAN, *School of Natural Sciences*, IAS

School of Mathematics
Math/Physics Seminar: "Constructive Criterion
for Ergodicity of Probabalistic Cellular
Automation"
CHRISTIAN MAES, *Leuven*

February 26
School of Mathematics
The Thirteenth Marston Morse Lectures:
"Rigidity of Symmetric Spaces and Related
Topics, Part I"
MIKHAEL GROMOV, *Institut des Hautes Etudes
Scientifiques*

School of Natural Sciences
Theoretical Physics Seminar: "Direct Method
for Braid Group Representations & Explicit
Yang-Baxterization"
MO-LIN GE, *Nankai Math Institute*

School of Mathematics
Members Seminar: "Jones Polynomials for Lens
Spaces; Skein Modules for 3-manifolds"
JÓZEF PRZYTYCKI, *School of Mathematics*, IAS

February 27
School of Historical Studies
Medievalist Seminar: "Towards an Urban
History of Medieval and Renaissance Genoa"
GEORGE GORSE, *School of Historical Studies*, IAS

School of Mathematics
Automorphic Forms Seminar: "Hecke
Algebras, Unipotent Representations, and the
Fundamental Lemma for SL(n), Part I"
THOMAS HALES, *School of Mathematics*, IAS

February 28
School of Mathematics
Number Theory Seminar: "Eigenvalues of the
Laplacian for Hecke Triangle Groups"
DENNIS HEJHAL, *School of Mathematics*, IAS

School of Mathematics
The Thirteenth Marston Morse Lectures:
"Rigidity of Symmetric Spaces and Related
Topics, Part II"
MIKHAEL GROMOV, *Institut des Hautes Etudes
Scientifiques*

March 1
School of Historical Studies
Art History Colloquium: "Gustave Courbet's
Contemporaneity"
PETRA TEN-DOESSCHATE CHU, *School of Historical
Studies*, IAS

School of Mathematics
Topology Seminar: "The Geometry and
Cohomology of Sporadic Simple Groups and
Groups of Twisted Lie Type"
RICHARD J. MILGRAM, *Stanford University*

School of Social Science
Luncheon Seminar: "Creating Political Culture:
Neotraditional Corporatism and the Politics of
Participation in Niger"
PEARL ROBINSON, *School of Social Science*, IAS

March 2
School of Mathematics
Special Seminar: "Mordell's Conjecture"
PAUL VOJTA, *School of Mathematics*, IAS

School of Mathematics
Math/Physics Seminar: "On the Regularity of
the Density of States"
ILYA GOLDSHEID, *USSR*

School of Natural Sciences
Lunchtime Seminar: "Quantizing the Chiral
Schwinger Model on a Riemann Surface"
YON-SHI WU, *School of Natural Sciences*, IAS

March 5
School of Mathematics
Members Seminar: "Explicit Formulae for
Volumes on Cohomology via Theta Functions"
JAY JORGENSON, *School of Mathematics*, IAS

School of Natural Sciences
Lecture: "The Biggest Kind of Big Science:
Astronomy and the Space Telescope"
ROBERT W. SMITH, *National Air and Space Museum
of the Smithsonian Institution; The Johns Hopkins
University*

March 6
School of Mathematics
Automorphic Forms Seminar: "Hecke
Algebras, Unipotent Representations and the
Fundamental Lemma for SL(n), Conclusion"
THOMAS HALES, *School of Mathematics*, IAS

March 7
School of Social Science
National Identity Seminar: Discussion of excerpts
from Newbury, *The Cohesion of Oppression:
Clientship and Ethnicity in Rwanda, 1860-1960*; Peter
Ekeh, "Colonialism and the Two Publics in Africa:
A Theoretical Statement"; Richard A. Joseph,
"Class, State, and Prebendal Politics in Nigeria";
and Kathleen Staudt, "Sex, Ethnic and Class
Consciousness in Western Kenya"
CATHARINE NEWBURY, *School of Social Science*, IAS

March 8
School of Social Science
Luncheon Seminar: "Reactionary Rebels?
Janissaries, Artisans and the Roots of Anti-Modern
Protest in the 18th-Century Ottoman Empire"
EDMUND BURKE III, *School of Social Science*, IAS

School of Mathematics
Topology Seminar: "Topological Aspects of
Quantum Field Theory"
FRANK QUINN, *Virginia Polytechnic Institute*

March 9
School of Natural Sciences
Lunchtime Seminar: "Non-Polynomial Closed
String Field Theory"
M. KAKU, *School of Natural Sciences*, IAS

School of Mathematics
Special Seminar: "Mordell's Conjecture"
PAUL VOJTA, *School of Mathematics*, IAS

March 12
School of Mathematics
Members Seminar: "Spectral Theory on Locally
Symmetric Spaces and Related Topics"
WERNER MÜLLER, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "Baryon Number
Violation in the Standard Model: Fact or Fiction"
MICHAEL DINE, *City College of New York*

March 13
School of Historical Studies
Medievalist Seminar: "Roger of Sicily, Bohemund
of Antioch, and Their Chronicles"
KENNETH WOLF, *School of Historical Studies*, IAS

School of Mathematics
Automorphic Forms Seminar: "Unitary Groups,
Cohomology and Endoscopy, Part I"
JONATHAN ROGAWSKI, *School of Mathematics*, IAS

March 14
Faculty Lectures: "Picasso's Lithograph(s) *'The
Bull(s)'* and the History of Art in Reverse"
IRVING LAVIN, *Professor, School of Historical Studies*, IAS

March 15
School of Social Science
Luncheon Seminar: " 'Fields of Chains': Women
and Agrarian Change in Eastern Zaire"
CATHARINE NEWBURY, *School of Social Science*, IAS

March 19
School of Mathematics
Members Seminar: "Yang-Mills Invariants for 4-
manifolds with Boundary"
DIETER KOTSCHICK, *School of Mathematics*, IAS

March 20
School of Mathematics
Automorphic Forms Seminar: "Unitary Groups,
Cohomology and Endoscopy, Conclusion"
JONATHAN ROGAWSKI, *School of Mathematics*, IAS

March 21
School of Mathematics
Number Theory Seminar: "Analytic Number
Theory and Integer Programming"
GREGORY FREIMAN, *School of Mathematics*, IAS

March 22
School of Mathematics
Topology Seminar: "Euler Characteristics of Some
Weighted Homogeneous Complex Affine
Hypersurfaces"
ALEXANDRU DIMCA, *School of Mathematics*, IAS

School of Social Science
Luncheon Seminar: "Worlds Turned Upside
Down: John Smith and the Demerara Slave
Rebellion of 1823"
EMILIA DA COSTA, *School of Social Science*, IAS

March 23
School of Mathematics
Special Seminar: "Mordell's Conjecture"
PAUL VOJTA, *School of Mathematics*, IAS

School of Natural Sciences
Lunchtime Seminar: "The Geometry of Calabi-
Yau Moduli Space & Superstring Effective
Lagrangians"
S. FERRARA, *CERN, UCLA*

March 26
School of Mathematics
Members Seminar: "A New Kind of Geometry and
How to Use it for Classifying Deformations"
PAUL BURCHARD, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "Lattice Gauge
Theory on the Columbia Parallel Supercomputer"
FRANK BROWN, *Columbia University*

School of Natural Sciences
Special Theory Seminar: "Theoretical Physics
Meets Experimental Neurobiology"
WILLIAM BIALEK, *University of California, Berkeley*

March 27
School of Historical Studies
Medievalist Seminar: "The Study of the Bible,
c. 1000-1200 C."
MARGARET GIBSON, *School of Historical Studies*, IAS

School of Mathematics
Automorphic Forms Seminar: "Base Change of
Representations with Cohomology: Archimedean
Case, Part I"
JOSEPH JOHNSON, *School of Mathematics*, IAS

March 29
School of Mathematics
Automorphic Forms Seminar: "Base Change of
Representations with Cohomology: Archimedean
Case, Part II"
JOSEPH JOHNSON, *School of Mathematics*, IAS

School of Mathematics
Topology Seminar: "Floer Homology of Oriented
3-Manifolds"
KENJI FUKAYA, *University of Maryland/
University of Tokyo*

School of Social Science
Luncheon Seminar: "Science, Feminism and
Romance: Karl Pearson's Men and Women's Club,
1885–1889"
JUDITH WALKOWITZ, *School of Social Science*, IAS

March 30
School of Mathematics
Special Seminar: "Mordell's Conjecture"
PAUL VOJTA, *School of Mathematics*, IAS

School of Mathematics
Automorphic Forms Seminar: "Base Change of
Representations with Cohomology: Archimedean
Case, Part III"
JOSEPH JOHNSON, *School of Mathematics*, IAS

March 31
School of Social Science
National Identity Seminar: Discussion of John L.
Comaroff, "Of Totemism and Ethnicity," and
Charles F. Keyes, "The Dialectics of Ethnic
Change"
THOMAS ABERCROMBIE and DRU GLADNEY, *School of
Social Science*, IAS

April 2
School of Mathematics
Members Seminar: "Constructions of Wavelets and
Analysis of Differential Operators"
STÉPHANE JAFFARD, *School of Mathematics*, IAS

April 3
School of Mathematics
Automorphic Forms Seminar: "Shintani's Lemma
for GL(n)"
AKIHIKO YUKIE, *School of Mathematics*, IAS

April 4
School of Social Science
National Identity Seminar: Discussion of Rey
Chow, " 'It's you and not me': Domination and
'Othering' in Theorizing the 'Third World' ";
Fatima Mernissi, Introduction to the Revised
Edition (1987) of *Beyond the Veil*; and Zakia Pathak
and Rajeswari Sunder Rajan, "Shahbano," *Signs*
1989, vol. 14, no. 3
JOAN SCOTT, *Professor, School of Social Science*, IAS

April 5
School of Historical Studies
Art History Colloquium: "Visual Texts:
Documents of the Early Industrial City"
EVE BLAU, *School of Historical Studies*, IAS

School of Mathematics
Topology Seminar: "An Equivariant Theorem for
Singular Varieties"
SYLVAIN CAPPELL, *Courant Institute*

School of Mathematics
Automorphic Forms Seminar: "Unstable Morse
Strata of the Space of Pairs of Conics"
AKIHIKO YUKIE, *School of Mathematics*, IAS

School of Social Science
Luncheon Seminar: "Behavior and Gender in
Bureaucratic Careers"
KATHLEEN CANNINGS, *School of Social Science*, IAS

April 6
School of Mathematics
Special Seminar: "Mordell's Conjecture"
PAUL VOJTA, *School of Mathematics*, IAS

School of Natural Sciences
Lunchtime Seminar: "Strings & Fields in Superfluids
and Superconductors"
R. DAVIS, *School of Natural Sciences*, IAS

April 9
School of Mathematics
Members Seminar: "Vertex Operators, Symmetric
Functions and the Spin Group Γ_N"
NAIHUAN JING, *School of Mathematics*, IAS

April 10
School of Historical Studies
Medievalist Seminar: " 'The Social History of
Satan' — How Satan emerged in apocalyptic
Jewish and early Christian literature"
ELAINE PAGELS, *School of Historical Studies*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "The Neutron
Electric Dipole Moment"
BRUCE MCKELLAR, *University of Melbourne*

April 11
School of Mathematics
Special Seminar: "Mordell's Conjecture"
PAUL VOJTA, *School of Mathematics*, IAS

April 12
School of Social Science
Luncheon Seminar: "The New Deal, Lost and Found"
FRED SIEGEL, *School of Social Science*, IAS

School of Mathematics
Topology Seminar: "Periodic Homotopy of Lie Groups"
MARTIN BENDERSKY, *CUNY*

School of Mathematics
Special Seminar: "The Structure of the Tate-Shafarevitch Group (d'après Kolyvagin)"
NORBERT SCHAPPACHER, *School of Mathematics*, IAS

School of Natural Sciences
Special Seminar: "Quantum Gravitational Measure for Four-Geometries"
PAWEL MAZUR, *UCLA*

April 16
School of Mathematics
Members Seminar: "Stochastic Structure and Nonlinear Dynamics of Food Webs"
JOEL E. COHEN, *Director's Visitor*, IAS

April 18
School of Social Science
National Identity Seminar: "The Work of Leisure, the Culture of Place: The Humble Geographies of Tourism in India"
CAROL BRECKENRIDGE, *University of Pennsylvania*

April 19
School of Social Science
Luncheon Seminar: "Prospects for Democratization in Latin America"
GUILLERMO O'DONNELL, *University of Notre Dame and CEBRAP, São Paulo, Brazil*

School of Mathematics
Topology Seminar: "Local Rigidity and the PSL(2,C) Representation Space of Link Complements"
STEVE KERCKHOFF, *School of Mathematics*, IAS

April 20
School of Natural Sciences
Lunchtime Seminar: "Strings from Reduced Large-N QCD via Area Preserving Diffeomorphisms"
I. BARS, *School of Natural Sciences*, IAS

April 23
School of Natural Sciences
Theoretical Physics Seminar: "Geometrical Critical Models on a Random Surface"
BERTRAND DUPLANTIER, *Saclay*

April 26
School of Mathematics
Topology Seminar: "Topological Classification of Stratified Spaces"
SHMUEL WEINBERGER, *University of Chicago*

School of Social Science
Luncheon Seminar: "Bodily Positions and Mediated Dispositions: Sexuality, Nationality and Tiananmen"
DRU GLADNEY, *School of Social Science*, IAS

May 1
School of Natural Sciences
Special Seminar: "CP Violation in B-Decays"
BORIS KAYSER, *NSF — Division of Physics*

May 3
School of Natural Sciences
Special Seminar: "Rational Conformal Field Theory & the Fractional Quantum Hall Effect"
NICK READ, *Yale University*

School of Social Science
Luncheon Seminar: "Women on the Margins: Seventeenth-Century Europeans Confront the 'Other' in Quebec and Surinam"
NATALIE DAVIS, *Princeton University*

May 4
School of Natural Sciences
Lunchtime Seminar: "Quantum Algebra Deforming Maps, Clebsch-Gordan Coefficients, Coproducts, U and R Matrices"
T. CURTRIGHT, *School of Natural Sciences*, IAS

Board of Trustees Lecture
Lecture: "A French Feminist Claims the 'Rights of "Man" ' "
JOAN WALLACH SCOTT, *Professor, School of Social Science*, IAS

May 7
School of Natural Sciences
Theoretical Physics Seminar: "String Fields in 2-D
Gravity & Matrix Models"
SUMIT DAS, *Tata Institute*

May 9
School of Social Science
National Identity Seminar: Discussion of chapters
from Emile Boonzaier and John Sharp, eds., *South
African Keywords: The Uses and Abuses of Political
Concepts,* 1988
ROBERT THORNTON, *School of Social Science,* IAS

May 11
School of Natural Sciences
Lunchtime Seminar: "A Solution of 2-D
Topological Gravity"
E. VERLINDE, *School of Natural Sciences,* IAS

May 14
School of Natural Sciences
Special Historical Talk: "The Pauper and the
Prince: George Willis Ritchey, George Ellery Hale,
and Big American Telescopes"
DONALD E. OSTERBROCK, *School of Natural Sciences,*
IAS

May 18
School of Natural Sciences
Lunchtime Seminar: "Scattering Theory in
Quaternionic Quantum Mechanics"
S. ADLER, *Professor, School of Natural Sciences,* IAS

May 21
School of Natural Sciences
Theoretical Physics Seminar: "Statistical Mechanics
of Flux Lines in High Temperature
Superconductors"
DAVID NELSON, *Harvard University*

May 25
School of Natural Sciences
Lunchtime Seminar: "First Order Phase Transitions
in 1-Matrix Models"
G. MANDAL, *School of Natural Sciences,* IAS

RECORD OF EVENTS
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September 21
School of Natural Sciences
Lunchtime Seminar: "Introduction to the
Twistor Transform"
EDWARD WITTEN, *Professor, School of Natural
Sciences,* IAS

September 24
School of Mathematics
Special Seminar: "Very cuspidal pseudo-
coefficients"
J-P LABASSE, *University of Paris VII*

School of Natural Sciences
Theoretical Physics Seminar: "Complex
Random Surfaces"
VIPUL PERIWAL, *ITP, Santa Barbara*

September 25
School of Natural Sciences
Biophysics & Computation: "Acoustic Imaging
Computations in Bat Sonar"
JAMES SIMMONS, *Brown University*

October 4
School of Historical Studies
Art History Colloquia: "The Cappella Palatina
in Palermo"
WILLIAM L. TRONZO, *School of Historical Studies,*
IAS

School of Natural Sciences
Biophysics & Computation: "Brain Modeling
Using Neural Networks"
M. VIRASORO, *University of Rome 1*

October 5
School of Natural Sciences
Lunchtime Seminar: "Introduction to the
Twistor Transform"
EDWARD WITTEN, *Professor, School of Natural
Sciences,* IAS

October 8
School of Mathematics
Members Seminar: "Area-minimizing cycles in
Grassmannians"
FRANK MORGAN, *School of Mathematics,* IAS

School of Natural Sciences
Theoretical Physics Seminar: "Aspects of $N = 2$
Strings"
CUMRUN VAFA, *Harvard University*

October 9
School of Mathematics
Arithmetic Groups and Related Topics:
"Harmonic analysis in weighted L_2-spaces"
JENS FRANKE, *School of Mathematics,* IAS

October 11
School of Mathematics
Joint IAS — Rutgers University School of
Mathematics Analytic Number Theory
Seminar: "Automorphic L-functions and
analytic number theory"
FREYDOON SHAHIDI, *School of Mathematics,* IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Smooth numbers and factorization"
CARL POMERANCE, *School of Mathematics,* IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Algorithms in number theory"
HENDRIK LENSTRA, *School of Mathematics,* IAS

School of Natural Sciences
Biophysics & Computation: "Order, Chaos &
Complexity in Random Logical Networks: A
Model of Genome Function"
STUART KAUFMAN, *University of Pennsylvania and
the Santa Fe Institute*

School of Social Science
Social Science Thursday Luncheon Seminar:
"Three Challenges for the Literary Theory of
Science: Theoretical Texts, Mathematics, and
Technology"
BRUNO LATOUR, *University of California, San Diego,
and L'Ecole des Mines, Paris*

October 12
School of Social Science
History Seminar: Organizational Meeting

October 15
School of Mathematics
Members Seminar: "Lattices in U(1,n) and
hypergeometric functions"
G. DANIEL MOSTOW, *School of Mathematics*, IAS

October 16
School of Historical Studies
Medievalists: "Problems in Medieval History
Arising from a New Edition of Gibbon"
PATRICIA B. CRADDOCK, *School of Historical Studies*,
IAS

School of Mathematics
Number Theory Seminar: "An elementary
approach to the Mordell conjecture"
ENRICO BOMBIERI, *Professor, School of Mathematics*,
IAS

School of Mathematics
Arithmetic Groups and Related Topics:
"Harmonic analysis in weighted L_2-spaces
[continued]"
JENS FRANKE, *School of Mathematics*, IAS

School of Mathematics
Topology/Geometry Seminar: "Quantum
group invariants of 3-manifolds"
PAUL MELVIN, *Bryn Mawr College*

October 17
Faculty Lectures: "Frontiers in Theoretical
Physics: The Very Small, The Very Large, and
The Complex"
STEPHEN ADLER, *Professor, School of Natural Sciences*,
IAS

October 18
School of Mathematics
Joint IAS — Rutgers University Analytic
Number Theory Seminar: "Integers without
large prime factors"
ADOLF HILDEBRAND, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar: "The
number field sieve"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Natural Sciences
Biophysics & Computation: "Statistical
Mechanics & Error Correcting Codes"
NICOLAS SOURLAS, *School of Natural Sciences*, IAS

School of Social Science
Social Science Thursday Luncheon Seminar:
"The Rise of Washington Think Tanks"
DAVID RICCI, *School of Social Science*, IAS

October 19
School of Natural Sciences
Lunchtime Seminar: "Integrability in Random
Matrix Models"
JAN LACKI, *School of Natural Sciences*, IAS

October 22
School of Mathematics
Members Seminar: "Supersingular Abelian
varieties"
FRANS OORT, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "String Field
Theory, Conformal Field Theory & Matrix
Models"
ASHOKE SEN, *Tata Institute*

October 23
School of Mathematics
Arithmetic Groups and Related Topics:
"Harmonic analysis in weighted
L_2-spaces [continued]"
JENS FRANKE, *School of Mathematics*, IAS

School of Mathematics
Topology/Geometry Seminar: "Vassilev's knot
invariants"
XIAO-SONG LIN, *Columbia University*

October 25
School of Mathematics
Joint IAS — Rutgers University Analytic
Number Theory Seminar: "The Lang-Trotter
conjectures"
RAM MURTY, *School of Mathematics*, IAS
"Smooth numbers in arithmetic progressions"
ANDREW GRANVILLE, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Smooth numbers and factorization
[continued]"
CARL POMERANCE, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar: "The
number field sieve [continued]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Natural Sciences
Biophysics & Computation: "Efficient Methods
for Real-Time Learning"
JOHN MOODY, *Yale University*

School of Social Science
Social Science Thursday Luncheon Seminar:
"From Counting Deviants to Moral Statistics:
Some Nineteenth-Century Roots of Social
Measurement"
MICHAEL DONNELLY, *School of Social Science*, IAS

October 26
Board of Trustees Lecture: "Medieval
Jerusalem: The City as a Work of Art and
Object of Piety"
OLEG GRABAR, *Professor, School of Historical Studies,*
IAS

October 29
School of Mathematics
Members Seminar: "Non-abelian
hypercohomology and Galois cohomology of
linear algebraic groups"
MIKHAIL BOROVOI, *School of Mathematics*, IAS

October 30
School of Historical Studies
Medievalists: "Comparison Between the Letter
of Avitus of Vienne to Clovis with the Account
by Gregory of Tours of the Conversion of
Clovis"
OLIVIER GUILLOT, *University of Paris*

School of Mathematics
Arithmetic Groups and Related Topics:
"Harmonic analysis in weighted L_2-spaces
[continued]"
JENS FRANKE, *School of Mathematics*, IAS

School of Mathematics
Topology/Geometry Seminar: "Evolution of
curves on surfaces"
JOEL HASS, *School of Mathematics*, IAS

October 31
School of Social Science
History Seminar: "How Do We Historicize?"
Discussion of Scott, "Historicizing
Experience"; additional readings, John Toews,
"Intellectual History after the Linguistic Turn";
and William Sewell, Jr., review of Scott
JOAN SCOTT, *Professor, School of Social Science*, IAS

November 1
School of Mathematics
Joint IAS — Rutgers University Analytic
Number Theory Seminar: "On the convex hull
of the integer points in a disc"
Antal Balog, School of Mathematics, IAS
"A theorem of Goldbach type"
JOHN FRIEDLANDER, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Algorithms in finite fields"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Natural Sciences
Biophysics & Computation: "Theory of Retinal
Processing in Space, Time & Color"
JOSEPH J. ATICK, *School of Natural Sciences*, IAS

School of Social Science
Social Science Thursday Luncheon Seminar:
"On Comparing Cultures: Morocco and
Indonesia Described and Redescribed"
CLIFFORD GEERTZ, *Professor, School of Social Science,*
IAS

November 2
School of Mathematics
Math/Physics Seminar: "Hydro dynamic
scaling limits"
S.R.S. VARADHAN, *Courant Institute*

School of Natural Sciences
Lunchtime Seminar: "Quantum Hair on Black
Holes"
FRANK WILCZEK, *Professor, School of Natural
Sciences*, IAS

November 5
School of Mathematics
Members Seminar: "A problem related to one
of Littlewood and Offord"
ROBERT VAUGHAN, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "Topological
Gravity with Minimal Matter"
KEKE LI, *California Institute of Technology*

November 6
School of Mathematics
Arithmetic Groups and Related Topics:
"Harmonic analysis in weighted
L_2-spaces [continued]"
JENS FRANKE, *School of Mathematics*, IAS

School of Mathematics
Topology/Geometry Seminar: "Essential
laminations in non-Haken 3-manifolds"
MARK BRITTENHAM, *School of Mathematics*, IAS

November 7
School of Mathematics
Special Seminar: "Representations of groups
with bounded generation and the congruence
subgroup problem"
VLADIMIR PLATONOV, *Minsk*

November 8
School of Historical Studies
Art History Colloquia: "Ut Poesis Architectura:
Louis H. Sullivan's Poetic Means of
Expression"
LAUREN S. WEINGARDEN, *School of Historical Studies*,
IAS

School of Mathematics
Joint IAS — Rutgers University Analytic
Number Theory Seminar: "Integers without
large prime factors"
JOHN FRIEDLANDER, *School of Mathematics*, IAS
"Exponential Sums and the Riemann zeta
function"
NIGEL WATT, *Rutgers*

School of Mathematics
Algorithmic Number Theory Seminar:
"Smooth numbers and factorization
[continued]"
CARL POMERANCE, *School of Mathematics*, IAS
"Algorithms in finite fields [continued]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Natural Sciences
Biophysics & Computation: "Modeling
Neuronal Dynamics"
LARRY ABBOTT, *Brandeis University*

School of Social Science
Social Science Thursday Luncheon Seminar:
"Reading the Gothic Revival: 'History' and
Hints on Household Taste"
CHRISTINA CROSBY, *School of Social Science*, IAS

November 12
School of Mathematics
Special Seminar: "Some simple models for
percolation"
ROBERT LANGLANDS, *Professor, School of
Mathematics*, IAS

School of Mathematics
Members Seminar: "Controlling topology by
Ricci curvature"
SHUN-HUI ZHU, *School of Mathematics*, IAS

November 13
School of Historical Studies
Medievalists: "Compostela and Vézelay"
MICHEL HUGLO, *School of Historical Studies*, IAS

School of Mathematics
Seminar: "Geometry of Kinzhnik-
Zamolodchikov equations, Part 1"
VADIM V. SCHECHTMAN, *School of Mathematics*, IAS

School of Mathematics
Arithmetic Groups and Related Topics:
"Harmonic analysis in weighted
L_2-spaces [continued]"
JENS FRANKE, *School of Mathematics*, IAS

School of Mathematics
Topology/Geometry Seminar: "Simple
manifolds obtained by adding a 2-handle to a
3-manifold"
MARIO EUDAVE-MUÑOZ, *School of Mathematics*, IAS

November 14
School of Mathematics
Math/Physics Seminar: "Non-Gaussian hierarchical renormalization group fixed points"
HANS KOCH, *University of Texas at Austin*

School of Mathematics
Special Seminar: "Integral lattices with an automorphism"
HELMUT KOCH, *Berlin*

November 15
School of Mathematics
Joint IAS — Rutgers University Analytic Number Theory Seminar: "Small gaps between primes"
DAN GOLDSTON, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar: "Modifications of the number field sieve"
DON COPPERSMITH, *IBM, Yorktown Heights*
"Curves of genus 2 with given moduli"
JEAN-FRANCOIS MESTRE, *University of Paris VII*

School of Natural Sciences
Biophysics & Computation: "Genetic Algorithms: Theory & Application"
JOHN HOLLAND, *University of Michigan and The Santa Fe Institute*

School of Social Science
Social Science Thursday Luncheon Seminar: "The Red Iguana: Gender Relations and Cloth Design among the Minianka of Mali"
SARAH BRETT-SMITH, *School of Historical Studies*, IAS

School of Social Science
History Seminar: "How Is Historical Perspective Established, and Lost?" Discussion of Crosby, "The Erasure of History"; additional reading, Fredric Jameson, "Immanence and Nominalism in Postmodern Theory," Part I
CHRISTINA CROSBY, *School of Social Science*, IAS

November 16
School of Natural Sciences
Lunchtime Seminar: "The Gowdy Cosmology & Two-Dimensional Gravity"
MICHAEL MCGUIGAN, *School of Natural Sciences*, IAS

November 19
School of Mathematics
Special Seminar: "Remarks on base change for orthogonal groups"
I. PIATETSKI-SHAPIRO, *Yale University*

School of Mathematics
Members Seminar: "Dedekind sums, continued fractions and signature cocycles"
ROBION KIRBY, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "Free Field Approach to Two-Dimensional Conformal Field Theories"
JIM MCCARTHY, *Brandeis*

November 20
School of Mathematics
Seminar: "Geometry of Knizhnik-Zamolodchikov equations, Part II"
VADIM V. SCHECHTMAN, *School of Mathematics*, IAS

School of Mathematics
Arithmetic Groups and Related Topics: "Harmonic analysis in weighted L_2-spaces [continued]"
JENS FRANKE, *School of Mathematics*, IAS

School of Mathematics
Topology/Geometry Seminar: "A Proof of Gilbert-Pollak conjecture on Steiner ratio"
DING-ZHU DU, *Princeton University/Chinese Academy*

November 21
School of Mathematics
Special Seminar: "Twin buildings and groups of Kac-Moody type"
JACQUES TITS, *Yale University/College de France*

School of Mathematics
Special Seminar: "Some remarks on base change for orthogonal groups"
JAMES COGDELL, *University of Oklahoma*

November 26
School of Mathematics
Members Seminar: "Perverse sheaves and Langlands' duality"
VICTOR GINZBURG, *School of Mathematics*, IAS

November 27
School of Mathematics
Arithmetic Groups and Related Topics:
"Introduction to Marina Ratner's Work on
Unipotent Flows"
MARC BURGER, *School of Mathematics*, IAS

School of Mathematics
Topology/Geometry Seminar: "Slicing and
Area Minimization"
GARY LAWLOR, *Princeton University*

November 28
School of Mathematics
Special Seminar: "Kirillov-Kostant Theory and
Feynman Path Integrals on Coadjoint Orbits"
KIYOSATO OKAMOTO, *Hiroshima University*

November 28
Faculty Lectures: "How the Sun Shines"
JOHN BAHCALL, *Professor, School of Natural Sciences*,
IAS

School of Social Science
History Seminar: "Constructing Historical
Memory" Discussion of Fynsk, "The Realities
at Stake in a Poem"; additional reading,
selections from Paul Celan, *Collected Prose*
CHRISTOPHER FYNSK, *School of Social Science*, IAS

November 29
School of Mathematics
Joint IAS — Rutgers University Analytic
Number Theory Seminar: "Counting lattice
points on certain varieties"
WILLIAM DUKE, *Rutgers University*
"Estimates for Character Sums"
HENRYK IWANIEC, *Rutgers University*

School of Mathematics
Algorithmic Number Theory Seminar:
"Factoring with quadratic forms"
CARL POMERANCE, *School of Mathematics*, IAS
"Primality Testing"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Social Science
Social Science Thursday Luncheon Seminar:
"Lucie Varga, an Austrian Historian in the
'Annales'-Circle (1904-1941)"
PETER SCHÖTTLER, *School of Social Science*, IAS

November 30
School of Natural Sciences
Lunchtime Seminar: "Effective Theories of the
Fractional Quantum Hall Effect"
BORIS BLOK, *School of Natural Sciences*, IAS

December 3
School of Mathematics
Math/Physics Seminar: "What is Quantum
Chaos"
MARTIN GUTZWILLER, *IBM, Yorktown Heights*

School of Mathematics
Members Seminar: "Lie groups and ergodic
theory"
MARINA RATNER, *Berkeley*

School of Natural Sciences
Theoretical Physics Seminar: "Fractional
Statistics, Gauge Symmetries &
Superconductivity"
ZHOU ZOU, *Stanford University*

December 4
School of Mathematics
Special Seminar: "Truncation and Plancherel
measure"
WILLIAM CASSELMAN, *University of British Columbia*

School of Mathematics
"Geometry of Knizhnik-Zamolodchikov
equations, Part III"
VADIM V. SCHECHTMAN, *School of Mathematics*, IAS

School of Mathematics
Arithmetic Groups and Related Topics:
"Raghunathan's topological conjecture"
MARINA RATNER, *Berkeley*

School of Mathematics
Topology/Geometry Seminar: "Two-
dimensional quantum gauge theory"
EDWARD WITTEN, *Professor, School of Natural
Sciences*, IAS

December 6
School of Mathematics
Joint IAS — Rutgers University Analytic
Number Theory Seminar: "Simple zeros of the
Riemann zeta function"
DAN GOLDSTON, *School of Mathematics*, IAS
"Turàn Inequalities and the zeros of certain
Dirichlet Series"
AMIT GHOSH, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Primality Testing [continued]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Natural Sciences
Biophysics & Computation: "Neuroethological
Analysis of Pitch Perception"
ANDREA SIMMONS, *Brown University*

School of Social Science
Social Science Thursday Luncheon Seminar:
"The Logic of Cultural Change: Samurai,
Honor, and State-Making"
EIKO IKEGAMI, *School of Social Science*, IAS

School of Historical Studies
Art History Colloquia: "Illusionism and Artistic
Self-Consciousness North of the Alps, 13th —
16th Centuries"
JAMES H. MARROW, *School of Historical Studies*, IAS

December 7
School of Mathematics
Special Mathematics Seminar: "Truncation and
Plancherel measure"
WILLIAM CASSELMAN, *University of British Columbia*

December 10
School of Mathematics
Members Seminar: "Quantum groups,
homology of local systems and representations
of braid groups"
ALEXANDRE VARCHENKO, *School of Mathematics*,
IAS

December 11
School of Mathematics
Topology/Geometry Seminar: "The canonical
metrics on teardrops and footballs: The Ricci
flow on 2-orbifolds"
LANG-FANG WU, *Princeton University*

December 12
Faculty Lectures: "Carbon Dioxide in the
Atmosphere and the Biosphere"
FREEMAN DYSON, *Professor, School of Natural
Sciences*, IAS

School of Social Science
History Seminar: "The Place of Metaphor in
the History of Science"
Discussion of Bono, "Science, Discourse, and
Literature" additional reading, selections from
Nancy Leys Stepan, *Race and Gender: The Role of
Analogy in Science*
JAMES J. BONO, *School of Social Science*, IAS

December 13
School of Mathematics
Joint IAS — Rutgers University Analytic
Number Theory Seminar: "Vibrating fractal
strings and the Riemann zeta function"
MICHAEL LAPIDUS, *University of California*
"On the distribution of zeros of Epstein zeta
functions"
DENNIS A. HEJHAL, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Factoring with quadratic forms [continued]"
CARL POMERANCE, *School of Matheamtics*, IAS
"Primality testing [continued]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Natural Sciences
Biophysics & Computation: "Modeling the
Olfactory Bulb"
ZHAOPING LI, *School of Natural Sciences*, IAS

School of Social Science
Social Science Thursday Luncheon Seminar:
"Liberty and Discipline: Once Again, towards
a Sociohistorical Understanding of Modernity"
PETER WAGNER, *School of Social Science*, IAS

December 14
School of Natural Sciences
Lunchtime Seminar: "Knot Invariants from the
Chiral Potts Model"
TETSUJI MIWA, *RIMS, Kyoto*

December 17
School of Mathematics
Members Seminar: "The dynamics of free
group automorphisms"
MLADEN BESTVINA, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "Non Self-Dual
Solutions to the Yang-Mills Equations"
JEREMY SCHIFF, *Columbia University*

December 18
School of Mathematics
Topology/Geometry Seminar: "Bending and
sliding and rubberbands"
PETER DOYLE, *Princeton University*

December 19
School of Mathematics
Math/Physics Seminar: "Dynamical model for
intermittency in turbulence"
Z.S. SHE, *Princeton University*

January 4
School of Natural Sciences
Lunchtime Seminar: "Exact Solutions & Pairing
in the Fractional Quantum Hall Effect"
MARTIN GREITER, *School of Natural Sciences*, IAS

January 7
School of Mathematics
Special Seminar: "The classical trilogarithm and
values of zeta functions of number fields at
s = 3"
A. GONCHAROV, *Massachusetts Institute of Technology*

School of Natural Sciences
Theoretical Physics Seminar: "Linear Stability
of de Sitter Space with a Scalar Quantum Field"
BARRETT ROGERS, *Massachusetts Institute of
Technology*

January 8
School of Mathematics
Topology/Geometry Seminar Topic: "Soap
bubble clusters, minimal surfaces, and norms on
R^n"
FRANK MORGAN, *School of Mathematics*, IAS

January 10
School of Historical Studies
Art History Colloquia: "Banana Sculptors: The
Theft of Feminity and the Creation of Art"
SARAH C. BRETT-SMITH, *School of Historical Studies*,
IAS

School of Natural Sciences
Biophysics & Computation: "Energy Function
Models for Motion Perception & Brain
Development: Video Demonstration, Theory &
Experiments"
ALLAN YUILLE, *Harvard University*

January 14
School of Mathematics
Members Seminar: "Algorithmic design"
ROBERT TARJAN, *Princeton University*

January 15
School of Mathematics
Topology/Geometry Seminar: "Geometry of
bounded homogeneous domains"
JOSEPH D'ATRI, *School of Mathematics*, IAS

School of Mathematics
Arithmetic Groups and Related Topics:
"Regularization of Eisenstein periods and the
density of integral points on certain varieties"
PETER SARNAK, *Stanford University*

January 16
Faculty Lectures: "The Idea of Holy War in
Ancient Israel"
MICHAEL WALZER, *Professor, School of Social Science*,
IAS

School of Mathematics
Analysis and Math Physics Seminar:
"Mathematical problems of equilibrium shapes
of elastic crystals"
MICHAEL GRINFEL'D, *School of Mathemtaics*, IAS

January 17
School of Mathematics
Joint IAS — Rutgers University Analytic
Number Theory Seminar: "Smooth numbers
and additive number theory. An Introduction"
ROBERT C. VAUGHAN, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Primality testing [continued]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Natural Sciences
Biophysics & Computation: "Computational
Hierarchies of Real Neurons: Synaptic
Microcircuits & Dendritic Functional Units"
GORDON SHEPERD, *Yale University*

School of Social Science
Social Science Thursday Luncheon Seminar:
"Socialism and Human Emancipation"
CHUN LIN, *School of Social Science*, IAS

January 18
School of Natural Sciences
Lunchtime Seminar: "Exact Solutions & Pairing
in the Fractional Quantum Hall Effect"
MARTIN GREITER, *School of Natural Sciences*, IAS

January 21
School of Mathematics
Members Seminar: "On Fourier coefficients of
Eisenstein series on SO(5,2)"
MASAAKI FURUSAWA, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "Unpredictability
& Complexity in Dynamical Systems"
C. MOORE, *Cornell University*

January 22
School of Mathematics
Topology/Geometry Seminar: "Unknotted
graphs in the 3-sphere"
ABIGAIL THOMPSON, *School of Mathematics*, IAS

School of Mathematics
Arithmetic Groups and Related Topics: "Cusp
Forms and Fermi's golden rule"
PETER SARNAK, *Stanford University*

January 23
School of Mathematics
Analysis and Math Physics Seminar: "Classical
Fourier multipliers and an L_2-localization
principle"
FERNANDO SORIA, *School of Mathematics*, IAS

School of Social Science
History Seminar: "The *Annales* School,"
Discussion of Schöttler, "Althusser and *Annales*:
Historiography or Impossible Dialogue?";
additional reading, excerpt from L. Althusser,
Reading Capital
PETER SCHÖTTLER, *School of Social Science*, IAS

January 24
School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory
Seminar: "Divisor function over arithmetic
progressions"
HENRYK IWANIEC, *Rutgers University*
"Smooth numbers and additive number theory
[continued]"
ROBERT C. VAUGHAN, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Primality testing via elliptic curves"
CARL POMERANCE, *School of Mathematics*, IAS
"Primality testing [continued]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Social Science
Social Science Thursday Luncheon Seminar:
" 'Man is Political by Nature': The
Maimonidean Chapter of Jewish Political
Thought"
MENACHEM LORBERBAUM, *School of Social Science*,
IAS

January 28
School of Mathematics
Members Seminar: "Solvability for a class of
invariant differential operators of second order"
DETLEF MÜLLER, *School of Mathematics*, IAS

January 29
School of Mathematics
Topology/Geometry Seminar: "Group actions,
quotients and quarternionic manifolds"
KRYSZTOF GALICKI, *School of Mathematics*, IAS

January 31
Joint IAS — Rutgers/Analytic Number Theory
Seminar: "Large gaps between prime numbers"
JANÓS PINTZ, *School of Mathematics*, IAS
"Smooth numbers in additive number theory:
Technicalities"
ROBERT C. VAUGHAN, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Primailty testing via elliptic curves"
CARL POMERANCE, *School of Mathematics*, IAS
"Primality testing [continued]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Social Science
Social Science Thursday Luncheon Seminar:
"Citizenship, Political Participation and the
Formation of the Public Sphere in Buenos
Aires, 1850s-1880s"
HILDA SABATO, *School of Social Science*, IAS

February 1
School of Natural Sciences
Lunchtime Seminar: "Matrix Model Approach
to One-Dimensional String Theory"
SPENTA WADIA, *School of Natural Sciences*, IAS

February 4
School of Mathematics
Members Seminar: "Ramanujan duals — I"
MARC BURGER, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "Classical Closed
String Field Theory"
BARTON ZWIEBACH, *Massachusetts Institute of
Technology*

February 5
School of Historical Studies
Medievalists: "Dictators and Diplomats.
Medieval Letters and the Birth of Modern
Bureaucracy"
GILES CONSTABLE, *Professor, School of Historical
Studies*, IAS

School of Mathematics
Arithmetic and Related Topics: "Ramanujan
Duals — II"
MARC BURGER, *School of Mathematics*, IAS

School of Mathematics
Topology/Geometry Seminar: "Front
propagation for bi-stable reaction diffusion
equations"
LIA BRONSARD, *School of Mathematics*, IAS

February 6
School of Mathematics
Group Theory Seminar: "Finite Split BN-pairs
of rank 2"
DANIEL GORENSTEIN, *School of Mathematics*, IAS

School of Mathematics
Analysis and Math Physics Seminar: "Singular
solutions and asymptotic behavior of nonlinear
heat equations"
JUAN LUIS VAZQUEZ, *University of Autónoma,
Madrid*

School of Social Science
History Seminar: "Biography?"
Discussion of Lucien Febvre, *Martin Luther*
(1928), Chapters 1-5; additional reading,
Febvre's French-language introduction to the
1944 edition

February 7
School of Historical Studies
Art History Colloquia: "Before Toulouse and
Santiago di Compostela: Spanish Sculpture of
the 11th Century"
HORST BREDEKAMP, *School of Historical Studies*, IAS

School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory
Seminar: "Large gaps between prime
numbers — II"
JANÓS PINTZ, *School of Mathematics*, IAS
"Smooth numbers in additive number theory:
Refinements"
ROBERT C. VAUGHAN, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Primality testing via elliptic curves
[continued]"
CARL POMERANCE, *School of Mathematics*, IAS
"Primality testing [continued]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Natural Sciences
Biophysics & Computation: "Statistical
Mechanics Description of Supervised Learning"
SARA SOLLA, *AT & T, Bell Laboratories*

School of Social Science
Social Science Thursday Luncheon Seminar:
"History of Science and the 'Linguistic Turn' "
JAMES BONO, *School of Social Science*, IAS

February 11
School of Mathematics
Members Seminar: "Geometric interpretation
of vertex operator algebras"
YI-ZHI HUANG, *School of Mathematics*, IAS

February 12
School of Mathematics
Topology/Geometry Seminar: "Categories and
the first Pontrjagin class"
J.L. BRYLINSKI, *Penn State University*

School of Mathematics
Arithmetic Groups and Related Topics:
"Discrete groups of affine transformations"
G.A. MARGULIS, *School of Mathematics*, IAS

February 13

School of Mathematics
Group Theory Seminar: "Finite Split BN-Pairs
of rank 2 [continued]"
DANIEL GORENSTEIN, *School of Mathematics*, IAS

School of Mathematics
Analysis and Math Physics Seminar: "Woltjer's
variational principle for force free fields:
Eigenfunctions of the curl and linkage integrals
for trajectories of solenoidal vector fields"
PETER LAURENCE, *University of Milan*

February 14

School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory
Seminar: "How are primes distributed?"
ANDREW GRANVILLE, *School of Mathematics*, IAS
"Further applications of exponential sums over
smooth numbers"
TREVOR WOOLEY, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Primality testing via elliptic curves
[continued]"
CARL POMERANCE, *School of Mathematics*, IAS
"Primality testing [continued]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Mathematics
Around WZW Theories Seminar:
"Introduction"
PIERRE DELIGNE, *Professor,* and VADIM
SCHECHTMAN, *School of Mathematics*, IAS

School of Natural Sciences
Biophysics & Computation: "Processing of
Temporal Information in the Nervous System"
KATHERINE CARR, *University of Maryland*

School of Social Science
Social Science Thursday Luncheon Seminar:
"Class and Race in American Liberal Thought
and Politics, 1917-1970"
GARY GERSTLE, *School of Social Science*, IAS

February 18

School of Mathematics
Members Seminar: "Singular solutions of the
nonlinear Schröedinger equation"
GEORGE PAPANICOLAOU, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "String Field
Theory in Minimal & Topological
Backgrounds"
SUNIL MUKHI, *CERN/Tata Institute*

February 19

School of Historical Studies
Medievalists: "De l'Académie à l'École de
Chartres: La Transmission du "Timèe de Platon
l'Occident"
MICHEL HUGLO, *School of Historical Studies*, IAS

School of Mathematics
Topology/Geometry Seminar: "CR structures
and classical invariant theory"
ROBERT MIZNER, *Williams College*

School of Mathematics
Arithmetic Groups and Related Topics:
"Archimedean super-rigidity and hyperbolic
geometry"
KEVIN CORLETTE, *School of Mathematics*, IAS

February 20

School of Mathematics
Group Theory Seminar: "Algebra of $GL_2(Z)$,
$GL_3(Z)$ and $GL_4(Z)$ via geometry"
JOHN H. CONWAY, *Princeton University*

School of Mathematics
Analysis and Math Physics Seminar: "The
mathematical theory of renormalization and
Eddy diffusivity for turbulent transport"
ANDREW MAJDA, *Princeton University*

School of Social Science
History Seminar: "The Uses of Language, the
Limits of Language"
Discussion of Richard Rorty, *Contingency, Irony,
and Solidarity*; Jean-François Lyotard, "Universal
History and the Culture of Differences," in *The
Lyotard Reader*; Nancy Fraser, "Solidarity or
Singularity: Richard Rorty Between
Romanticism and Technocracy," Chapter 5 in
Unruly Practices

February 21
School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory
Seminar: "Averages of twin primes"
ALBERTO PERELLI, *School of Mathematics*, IAS
"Smooth numbers in additive Number Theory:
Cubes and sums of 3 case powers"
ROBERT C. VAUGHAN, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Primality testing via elliptic curves
[continued]"
CARL POMERANCE, *School of Mathematics*, IAS
"Primality testing [continued]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Mathematics
Around WZW Theories Seminar: "Tensor
Categories"
PIERRE DELIGNE, *Professor,* and VADIM
SCHECHTMAN, *School of Mathematics*, IAS

School of Natural Sciences
Biophysics & Computation: "Can There be
Mathematical Theories of Cognitive
Phenomena?"
L. VALIANT, *Harvard University*

School of Social Science
Social Science Thursday Luncheon Seminar:
"Changing Israeli Landscapes: Power, Prayer,
Mythologies"
ALEX WEINGROD, *School of Social Science*, IAS

February 25
School of Mathematics
Members Seminar: "The existence of regular
minimizing m-harmonic maps"
DONG ZHANG, *School of Mathematics*, IAS

February 26
School of Mathematics
Topology/Geometry Seminar: "Representations
of knot groups"
MASAAKI WADA, *University of Pennsylvania*

February 27
Faculty Lectures: "Gravity"
EDWARD WITTEN, *Professor, School of Natural
Sciences,* IAS

School of Mathematics
Number Theory Seminar: "On the square root
of special values of certain L-series"
FERNANDO RODRIGUEZ VILLEGAS, *School of
Mathematics*, IAS

School of Mathematics
Analysis and Math Physics Seminar:
"Asymptotic behavior of Maxwell-Higgs
fields"
WEI-TONG SHU, *School of Mathematics*, IAS

School of Mathematics
Group Theory Seminar: "Extended generalized
Polygons"
RICHARD WEISS, *Tufts University*

February 28
School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory
Seminar: "An additive point of view on the
problem of counting integral points on convex
curves"
JEAN-MARC DESHOUILLERS, *School of Mathematics*,
IAS
"Cyclotomic polynomials with large
coefficients"
HELMUT MAIER, *School of Mathematics*, IAS

School of Mathematics
Around WZW Theories Seminar: "Tensor
categories [continued]"
PIERRE DELIGNE, *Professor, School of Mathematics*,
IAS

School of Mathematics
Algorithmic Number Theory Seminar: "An
improved algorithm for counting points on
elliptic curves"
DAVID ROBBINS, *Center for Communications Research*
"Counting points on abelian varieties over finite
fields"
JONATHAN PILA, *Columbia University*

School of Natural Sciences
Biophysics & Computation: "Computational
Properties of Molecules, Cells & Local Circuits"
W. EDWARD SULLIVAN, *Princeton University*

School of Social Science
Social Science Thursday Luncheon Seminar:
"The Genealogy of Exclusionary Democracy
and Sexual Difference"
GENEVIÈVE FRAISSE, *School of Social Science*, IAS

March 1
School of Natural Sciences
Lunchtime Seminar: "The Consistent Covariant
Quantization of the Brink-Schwarz
Superparticle"
YESHAYAHU EISENBERG, *School of Natural Sciences*,
IAS

March 4
School of Mathematics
Members Seminar: "Hodge type of projective
varieties of low degree"
HÉLÈNE ESNAULT, *Essen University, Germany*

School of Natural Sciences
Theoretical Physics Seminar: "On String
Theory & Black Holes"
EDWARD WITTEN, *Professor, School of Natural
Sciences*, IAS

March 5
School of Historical Studies
Medievalists: "Ministerial Self-Consciousness:
The Iwein Frescoes in Rodenegg"
JOHN FREED, *School of Historical Studies*, IAS

School of Mathematics
Topology/Geometry Seminar: "Nilpotent
structures and invariant metrics on collapsed
manifolds"
JEFF CHEEGER, *Courant Institute*

School of Mathematics
Arithmetic Groups and Related Topics: "Non-
archimedean super-rigidity"
KEVIN CORLETTE, *School of Mathematics*, IAS

March 6
School of Mathematics
Group Theory Seminar: "On finite flag-transitive
geometries"
JAN SAXL, *Princeton University*

School of Mathematics
Analysis and Math Physics Seminar: "A review
of recent results on the thermo-diffusive model
for flame propagation"
HENRI BERESTYCKI, *University of Paris VI*

School of Social Science
History Seminar: "What is Foucault's History a
History Of?" Discussion of excerpts from
Michel Foucault, *Discipline and Punish* and
Language, Counter-Memory, Practice; and plates 1
and 30 from *Surveiller et punir*

March 7
School of Historical Studies
Art History Colloquia: "Delacroix and Political
Satire"
NINA ATHANASSOGLOU-KALLMYER, *School of
Historical Studies*, IAS

School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory
Seminar: "Constructing auxiliary polynomials"
THOMAS STRUPPECK, *Rutgers University*
"Effective irrationality types for a class of
algebraic numbers"
ENRICO BOMBIERI, *Professor, School of Mathematics*,
IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Primality testing with elliptic curves
[conclusion]"
CARL POMERANCE, *School of Mathematics*, IAS
"Primality testing [conclusion]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Mathematics
Around WZW Theories Seminar: Tensor
Categories [continued]
PIERRE DELIGNE, *Professor, School of Mathematics*,
IAS

School of Natural Sciences
Biophysics & Computation: "Relating
Mammalian Visual Systems to the Mammalian
Environment: An Analysis of the Statistical
Structure of Natural Scenes"
DAVID FIELD, *Cornell University*

School of Social Science
Social Science Thursday Luncheon Seminar:
"Dogs, Cats, and Chickens: On Some Huaulu
Taboos"
VALERIO VALERI, *School of Social Science*, IAS

March 8
School of Historical Studies
Public Lecture: "Henri Pirenne: Medievalist and
Historian of Belgium"
RAOUL C. VAN CAENEGEM, *University of Ghent*

March 11
School of Mathematics
Marston Morse Lecture: "Interaction Energy in
the calculus of variations"
CLIFFORD TAUBES, *Harvard University*

March 12
School of Mathematics
Topology/Geometry Seminar: "Norms of
differential forms and volume-minimizing
cycles"
DANA MACKENZIE, *Kenyon College*

School of Mathematics
Analysis and Math Physics Seminar:
"Hadamard's well-posedness for the Euler
compressible equations"
HUGO DA VEIGA, *University of Pisa*

School of Mathematics
Group Theory Seminar: "Sylow subgroups and
subnormality"
RICHARD LYONS, *School of Mathematics*, IAS

March 13
Faculty Lectures: "Debates about Women and
Citizenship in France in 1848"
JOAN SCOTT, *Professor, School of Social Science*, IAS

School of Mathematics
Marston Morse Lecture: "Some Equations on
Manifolds with Ends"
CLIFFORD TAUBES, *Harvard University*

March 14
School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory
Seminar: "Remarks on Selberg's conjectures on
Dirichlet series"
J. BRIAN CONREY, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar:
"Algorithms in algebraic number theory"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Mathematics
Around WZW Theories Seminar:
"Holomorphic factorization of WZW Models"
EDWARD WITTEN, *Professor, School of Natural
Science*, IAS

School of Natural Sciences
Biophysics & Computation: "Statistical Physics
of Random Neural Networks for Associative
Memory & Generalization"
DAVID SHERRINGTON, *University of Oxford*

March 15
School of Natural Sciences
Lunchtime Seminar: "Interactions & Scattering
in d = 1 String Theory"
GAUTAM MANDAL, *School of Natural Sciences*, IAS

School of Social Science
Social Science Thursday Luncheon Seminar:
"Community and the Limits of Theory"
CHRISTOPHER FYNSK, *School of Social Science*, IAS

March 18
School of Mathematics
Members Seminar: "Twisted endoscopy and
representations of p-adic Groups"
FREYDOON SHAHIDI, *School of Mathematics*, IAS

School of Natural Sciences
Theoretical Physics Seminar: "Is It Possible to
Create A Universe in the Laboratory by
Quantum Tunneling?"
ALAN GUTH, *Massachusetts Institute of Technology*

March 19
School of Historical Studies
Medievalists: "Religious History of Medieval
France: Recent Achievements and
Methodological Prospects"
ANDRÉ VAUCHEZ, *School of Historical Studies*, IAS

School of Mathematics
Topology/Geometry Seminar: "Tunnel
Number, Heegaard genus and hyperbolic
volume of 3-manifolds"
COLIN ADAMS, *Williams College*

School of Mathematics
Arithmetic Groups and Related Topics Seminar:
"Non-archimedean super-rigidity II"
KEVIN CORLETTE, *School of Mathematics*, IAS

March 20
Faculty Lectures: "The Anthropology of
Change: Two Towns, Four Decades, One
Observer"
CLIFFORD GEERTZ, *Professor, School of Social Science,*
IAS

School of Mathematics
Analysis and Math Physics Seminar:
FRANCO BREZZI, *Istituto di Analisi Numerica, Pavia*

School of Mathematics
Group Theory Seminar: "Symmetric genus of
sporadic groups"
ANDREW WOLDAR, *Villanova University*

School of Mathematics
Analysis and Math Physics Seminar: "An
inequality for the time constant in first-passage
percolation"
HARRY KESTEN, *Cornell University*

March 21
School of Mathematics
Around WZW Theories Seminar: "Classical
origin of quantum group symmetries in WZW
models"
KRZYSZTOF GAWEDSKI, IHES

School of Natural Sciences
Biophysics & Computation: "Optimal Signal
Processing: Filter Strategies in Vision &
Hearing"
W. BIALEK, *NEC Research Institute*

School of Social Science
Social Science Thursday Luncheon Seminar:
"An Alternate Historicity: Objects and Persons
in the Colonial Encounter on Sumba"
JANET HOSKINS, *School of Social Science,* IAS

March 23
School of Historical Studies
Public Seminar: The Methodology of Sources
"The Roman Jurists as Historical Sources"
BRUCE W. FRIER, *University of Michigan, Ann Arbor*
"The Limits of Images as Historical Sources"
OLEG GRABAR, *Professor, School of Historical Studies,*
IAS
"Supernatural Paraphernalia in Polybius's
Histories"
FRANK W. WALBANK, *University of Liverpool*

"Papyri as Historical Sources"
LUDWIG KOENEN, *University of Michigan, Ann Arbor*

March 25
School of Mathematics
Members Seminar: "Unitarizability of principal
series representations of p-adic groups"
HIROYUKI YOSHIDA, *School of Mathematics,* IAS

March 26
School of Mathematics
Topology/Geometry Seminar: "Computing
soap bubbles and growing crystals"
FRED ALMGREN, *Princeton University*

March 27
School of Mathematics
Group Theory Seminar: "Maximal subgroups
and chains in Lie-type groups"
RONALD SOLOMON, *Ohio State University*

School of Mathematics
Analysis and Math Physics Seminar:
"Numerical methods for the continuity
equations in semiconductor problems"
DONATELLA MARINI, *Universita di Genova/IAN-
CNR*

School of Social Science
History Seminar: "Philosophy and History"
Discussion of Fraisse, "Sexual Difference: A
"Historical Difference"; "De la destination au
destin, Histoire philosophique de la différence
des sexes"
GENEVIÈVE FRAISSE, *School of Social Science,* IAS

March 28
School of Mathematics
Joint IAS – Rutgers/Analytic Number Theory
Seminar: "Rational points on singular cubic
threefolds"
DONALD J. LEWIS, *School of Mathematics,* IAS
"$x^3 + y^3 + z^3 = k$"
ROGER HEATH-BROWN, *Oxford University*

School of Mathematics
Algorithmic Number Theory Seminar: "q x +
$a = y^2, 1 \leqslant x \leqslant N$"
ENRICO BOMBIERI, *Professor, School of Mathematics,*
IAS

School of Mathematics
Around WZW Theories Seminar:
"Holomorphic factorization of WZW models
[continued]"
EDWARD WITTEN, *Professor, School of Natural
Science*, IAS

School of Natural Sciences
Biophysics & Computation: "Real-Time
Coding & Computation in Sensory Systems"
F. RIEKE, *NEC Research Institute*

School of Natural Sciences
Lunchtime Seminar: "Target-Space Duality &
the Curse of the Wormhole"
JOHN SCHWARZ, *California Institute of Technology*

School of Social Science
Social Science Thursday Luncheon Seminar:
"Modernization from Above: Between Market
Romanticism and Statist Utopia"
JACEK KOCHANOWICZ, *School of Social Science*, IAS

March 29
School of Historical Studies and Department of
Near Eastern Studies, Princeton University
Colloquium: "Ghassanids, Umayyads, and
Qusayr Al-'amra"
IRFAN SHAHÎD, *Georgetown University*

April 1
School of Mathematics
Members Seminar: "Prescribing scalar
curvature on complete manifolds with negative
sectional curvature"
ZHIREN JIN, *School of Mathematics*, IAS

April 2
School of Historical Studies
Medievalists: "The Darker Side of Lay Literacy:
Epistolary Execution"
PATRICK GEARY, *School of Historical Studies*, IAS

School of Mathematics
Topology/Geometry Seminar: "Amalgams of
negatively curved groups"
MARK FEIGHN, *Rutgers University*

April 3
Faculty Lectures: "Anyons for Anyone"
FRANK WILCZEK, *Professor, School of Natural
Sciences*, IAS

School of Mathematics
Group Theory Seminar: "Generation of simple
groups, with an application to linear groups"
MARTIN LIEBECK, *Imperial College, London*

School of Mathematics
Analysis and Math Physics Seminar:
"Whiskered tori for soliton equations: chaotic
behavior in near soliton equations"
DAVID MCLAUGHLIN, *Princeton University*

April 4
School of Historical Studies
Art History Colloquia: "The Image in Time:
Painting and the Journal of Eugène Delacroix"
MICHELE A. HANNOOSH, *School of Historical Studies*,
IAS

School of Mathematics
Joint IAS – Rutgers/Analytic Number Theory
Seminar: "Equations in primes"
ANTAL BALOG, *School of Mathematics*, IAS
"The Distribution and Moments of $\Delta(x)$"
ROGER HEATH-BROWN, *Oxford University*

School of Mathematics
Algorithmic Number Theory Seminar:
"Algorithms in algebraic number theory"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Mathematics
Around WZW Theories Seminar:
VADIM SCHECHTMAN, *School of Mathematics*, IAS

School of Social Science
Social Science Thursday Luncheon Seminar:
"Love in Greenwich Village: Sex, Gender, and
Politics in Radical America, 1890-1920"
CHRISTINE STANSELL, *School of Social Science*, IAS

April 8
School of Mathematics
Special Seminar: "An Approach to Topological
Field Theory"
DAVID KAZHDAN, *Harvard University*

April 9
School of Mathematics
Topology/Geometry Seminar: "Calibrations
and non-orientable surfaces"
TIM MURDOCH, *Washington and Lee University*

April 10
School of Mathematics
Group Theory Seminar: "A 45-dimensional
view of M_{24}"
RICH MARGOLIN, *Princeton University*

School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory
Special Seminar: "On the distribution in
progressions of quadratic polynomials"
SAVERIO SALERNO, *University of Salerno*

April 11
School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory
Seminar: "Rational spproximations to some
classical constants"
CARLO VIOLA, *University of Pisa*
"On consecutive kth power residues"
ADOLF HILDEBRAND, *School of Mathematics*, IAS

School of Mathematics
Algorithmic Number Theory Seminar: "Small
solutions of quadratic congruences"
ROGER HEATH-BROWN, *Oxford University*
"Algorithms in algebraic number theory
[conclusion]"
HENDRIK LENSTRA, *School of Mathematics*, IAS

School of Mathematics
Around WZW Theories Seminar:
"Holomorphic factorization of WZW models
[conclusion]"
EDWARD WITTEN, *Professor, School of Natural
Sciences*, IAS

School of Natural Sciences
Biophysics & Computation: "The Quantum
Efficiency of Vision"
D. PELLI, *Syracuse University*

School of Social Science
History Seminar: "How Do New Categories of
Social Organization Emerge?" Discussion of
Schafer, " '*Les faits suivants . . .*': The
Investigation and Treatment of 'Morally
Abandoned Children,' 1889-1912"
SYLVIA SCHAFER, *School of Social Science*, IAS

April 12
School of Natural Sciences
Lunchtime Seminar: "String Field Theory for
$d \leq 1$"
JOANNE COHN, *School of Natural Sciences*, IAS

April 15
Theoretical Physics Seminar: "From Loops to
States in Two-Dimensional Quantum Gravity"
NATHAN SEIBERG, *Rutgers University*

April 16
School of Mathematics
Topology/Geometry Seminar: "Homological
category of 3-manifolds"
JOSE CARLOS GOMEZ LARRANGA, *UNAM*

April 18
School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory
Seminar: "On the Polya-Vinogradov
inequality"
ADOLF HILDEBRAND, *School of Mathematics*, IAS
"Large Values of the Riemann Zeta-function"
KAI MAN TSANG, *University of Hong Kong*

School of Mathematics
Around WZW Theories Seminar: "Central
Extensions"
PIERRE DELIGNE, *Professor, School of Mathematics,*
IAS

School of Natural Sciences
Biophysics & Computation: "Pattern Formation
in Neural Networks with Application to
Neurobiology & Psychobiology"
J. COWAN, *University of Chicago*

April 19
School of Natural Sciences
Lunchtime Seminar: "Fractional Topological
Charge & Its Physical Consequences in 2D
Sigma Models & 4D Gauge Theories"
ARIEL ZHITNITSKY, *Novosibirsk Institute of Nuclear
Physics & University of Minnesota*

April 23
School of Mathematics
Topology/Geometry Seminar: "Curve
shortening, equivariant Morse theory and
closed geodesics on the 2-sphere"
NANCY HINGSTON, *Trenton State University*

School of Mathematics
Analysis and Math Physics Seminar: "On uniformly rotating stars"
YANYAN LI, *Princeton University*

April 24
School of Mathematics
Analysis and Math Physics Seminar: "Deformation of varieties with trivial canonical line bundle and isolated singularities"
GANG TIAN, *SUNY, Stony Brook*

April 25
School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory Seminar: "Cubic Weyl sums"
ROBERT VAUGHAN, *School of Mathematics*, IAS
"On Šnirel'man's approach to Goldbach's problem"
OLIVIER RAMARÉ, *University of Bordeaux 1*

School of Mathematics
Around WZW Theories Seminar: "Central extensions [continued]"
PIERRE DELIGNE, *Professor, School of Mathematics*, IAS

School of Social Science
History Seminar: "Language, Inscription, and the History of Technology"
Discussion of selections from Friedrich A. Kittler, *Discourse Networks, 1800/1900*

April 26
School of Natural Sciences
Lunchtime Seminar: "Non-Abelian Statistics in the Fractional Quantum-Hall Effect"
XIAO-GANG WEN, *School of Natural Sciences*, IAS

April 29
School of Natural Sciences
Theoretical Physics Seminar: "Physical Properties of W Gravity & W Strings"
SUMIT DAS, *Tata Institute*

April 30
School of Mathematics
Topology/Geometry Seminar: "Gluing negatively curved groups"
RITA GITIK, *University of Michigan*

School of Natural Sciences
Biophysics & Computation: "Mathware for Wetware: Networks in Neurophysiology"
NANCY KOPELL, *Boston University*

May 2
School of Mathematics
Joint IAS — Rutgers/Analytic Number Theory Seminar: "Vinogradov's Mean Value Theory"
TREVOR WOOLEY, *School of Mathematics*, IAS
"Exponential sums and Newton polyhedra"
ALAN ADOLPHSON, *Oklahoma State University*

School of Mathematics
Special Seminar: "Some instances of non-archimedean uniformization"
MIKHAEL RAPOPORT, *Wuppertal*

School of Mathematics
Around WZW Theories Seminar: "Holomorphic factorization of WZW models [conclusion]"
EDWARD WITTEN, *Professor, School of Natural Sciences*, IAS

School of Natural Sciences
Lunchtime Seminar: "Topological Superconductivity"
PAUL WIEGMANN, *School of Natural Sciences*, IAS

May 3
Board of Trustees Lecture: "Prioritizing Scientific Initiatives"
JOHN N. BAHCALL, *Professor, School of Natural Sciences*, IAS

May 9
School of Natural Sciences
Biophysics & Computation: "Variability in the Firing of Retinal Ganglion Cells"
MICHAEL LEVINE, *University of Illinois at Chicago*

May 16
School of Natural Sciences
Biophysics & Computation: "Can There Be Mathematical Theories of Cognitive Phenomena?"
LES VALIANT, *Harvard University*

May 17
School of Natural Sciences
Lunchtime Seminar: "Strings in a Black Hole
Background"
ERIK VERLINDE, *School of Natural Sciences*, IAS

May 28
School of Natural Sciences
Theoretical Physics Seminar: "Long Distance
Physics of Compressible & Incompressible
Quantum Fields"
A. ZEE, *ITP, Santa Barbara*

May 31
School of Natural Sciences
Lunchtime Seminar: "The One-Matrix Model
& String Field Theory"
EDWARD WITTEN, *Professor, School of Natural
Sciences*, IAS

June 12
School of Natural Sciences
Theoretical Physics Seminar: "On 't Hooft's
Approach to Quantum Black Holes"
ERIK VERLINDE, *School of Natural Sciences*, IAS

June 14
School of Natural Sciences
Lunchtime Seminar: "The Kac-Moody Group:
Realization & Applications"
BELAL BAAQUIE, *School of Natural Sciences*, IAS