The Institute Letter

Institute for Advanced Study Summer 2016

The Veil and the Political Unconscious of French Republicanism

Why have women become the object of so much concern?

BY JOAN WALLACH SCOTT

REUTERS

Citizens demonstrate in favor of the Islamic headscarf in a march in Strasbourg, Eastern France; the banner reads: "A law against the headscarf or against Islam." (December 20, 2003)

The official French preoccupation with the veil exceeds that of most other countries in Western Europe. In the Anglo-American world, even post-9/11, the veil is not seen as the flag of an insurrection; nor is the suppression of ethnic, racial, and religious differences a requirement for inclusion in the nation. A line from the American poet Walt Whitman captures something of the way diversity is celebrated here: "I am large, I contain multitudes," he wrote. This is not to say that there aren't terrible and enduring problems of discrimination based on differences (of race especially) in the U.S., just to note that differences are here recognized as part of the national heritage. They are tracked in the

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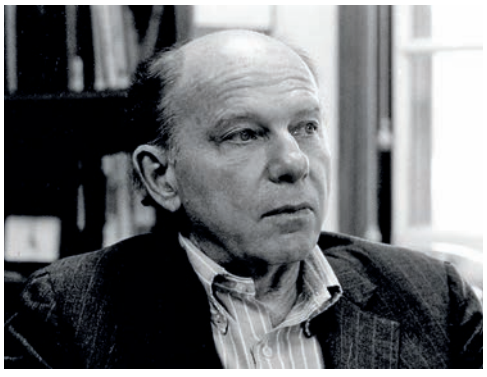
Morton White

1917–2016



HELMAN LANDSHOFF/IAS, SHELBY WHITE AND LEON LEVY ARCHIVES

Morton White, 1981

Morton White, one of America's most distinguished philosophers and historians of ideas, died at the age of 99 on May 27 at Stonebridge at Montgomery in Skillman, New Jersey. He was Professor Emeritus in the School of Historical Studies at the Institute for Advanced Study, where he served as Professor from 1970 until he retired in 1987.

White is credited with broadening the scope of topics traditionally studied by philosophers, with incisive analysis in the realms of epistemology and social and political philosophy. In his philosophy of holistic pragmatism, he bridged the positivistic gulf between analytic and synthetic truth as well as that between moral and scientific belief. He maintained that philosophy of science is not philosophy enough, thereby encouraging the examination of other aspects of civilized life—especially art, history, law, politics, and religion—and their relations with science.

"A most formidable intellect, White was a philosopher who was able to reach

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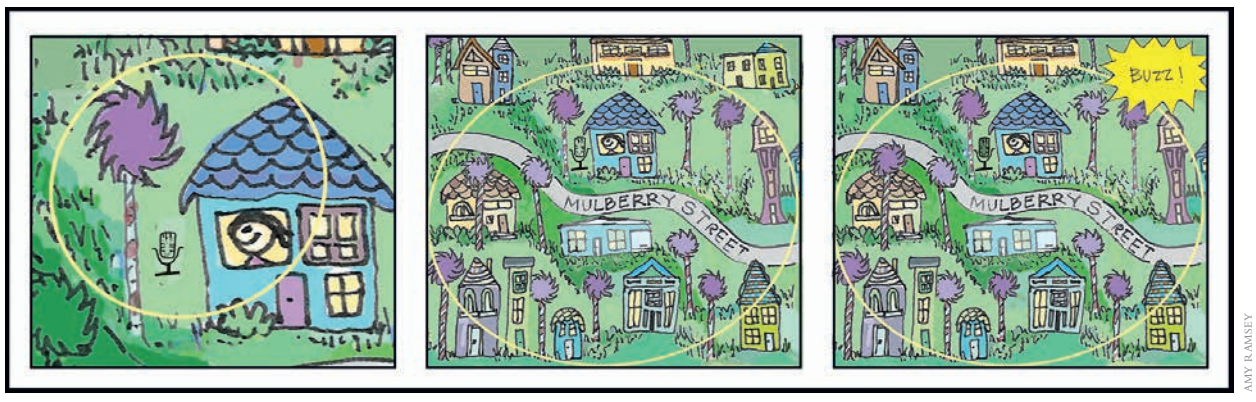
The Astrophysics Behind LIGO's Detection

Or the trees that grow on Mulberry Street

BY DORON KUSHNIR



AMY RAMSEY

Panel 1: Kay McLigo places a microphone in her backyard to look for a hum from her Neutrula tree. The range of the microphone is indicated. Panel 2: Kay McLigo replaces the small microphone with a larger, more sensitive microphone. Panel 3: After only six months, the microphone records a buzz (not a hum) from an invisible Blakhula tree.

On September 14, 2015, the two detectors of the Laser Interferometer Gravitational-Wave Observatory (LIGO) observed a gravitational-wave signal from the merger of a pair of black holes. While this impressive technological triumph was celebrated around the world, the astrophysical source that emitted the gravitational radiation reminded us to remain humble while making predictions in terra incognita.

Like any antenna, the LIGO detectors were tuned to a particular frequency and to reach some sensitivity. The frequency enables LIGO to detect only mergers involving a pair of massive objects, each of which is much smaller than one thousand kilometers. We only know of two classes of such objects: neutron stars (NSs) and black holes (BHs). The mass of an NS is roughly the mass of our Sun (one solar mass) and its radius is roughly ten kilometers (somewhat larger than Mount Everest). It is so dense that the velocity required to escape from its surface is not much smaller than the speed of light. The masses of BHs, on the other hand, vary significantly; while some of them have masses of millions or billions of solar masses with radii much larger than relevant for LIGO, some of them are smaller, with masses of roughly ten solar masses and radii of tens of kilometers, which satisfy LIGO's frequency requirements. The velocity required to escape from a BH surface is exactly the speed of light, as the name suggests.

To estimate the required sensitivity of the detectors, we must know how many pairs of each type (NS+NS, NS+BH, or BH+BH) exist in the universe and how long it would take for them to merge. This provides the rate of such mergers throughout the universe. The rarer such systems are, the larger the volume the detectors have to monitor, which in turn determines their sensitivity. The

(Continued on page 19)

News of the Institute Community

Yve-Alain Bois, Professor in the School of Historical Studies, has been elected to the American Philosophical Society, along with Trustee **Roger W. Ferguson, Jr.**

Jean Bourgain, IBM von Neumann Professor in the School of Mathematics, has been awarded the 2016 Antonio Feltrinelli International Prize for Mathematics by the Accademia Nazionale dei Lincei.

Didier Fassin, James D. Wolfensohn Professor in the School of Social Science, has coauthored *Four Lectures on Ethics: Anthropological Perspectives* (*Masterclass*) (Hau, 2015) with Michael Lambek, Institute Trustee **Veena Das**, and **Webb Keane**, Member (1997–98) in the School. He has also published *Prison Worlds. An Ethnography of the Carceral Condition* (Polity Press, 2016), the second volume of his diptych on the punitive state, as well as *La Fuerza del Orden. Una etnografia del accionar policial en las periferias urbanas* (Siglo XXI, 2016) and *Quando i corpi ricordano. Esperienze e politiche dell 'AIDS in Sud Africa* (Argo, 2016). He delivered in April the Tanner Lectures on Human Values at the University of California, Berkeley, and in June the Adorno Lectures at the Johann Wolfgang Goethe University in Frankfurt.

Patrick J. Geary, Andrew W. Mellon Professor in the School of Historical Studies, has been appointed a Global Fellow by Peking University.

Stanislas Leibler, Professor in the School of Natural Sciences, has been elected to the National Academy of Sciences, along with **Ian Agol**, Distinguished Visiting Professor (2015–16) in the School of Mathematics.

Peter Sarnak, Professor in the School of Mathematics, has received an honorary doctorate from the University of St. Andrews in recognition of his groundbreaking work on analytic number theory.

Sabine Schmidtke, Professor in the School of Historical Studies, has coauthored *Al-Ṣāḥib Ibn ʿAbbād: Promoter of Rational Theology* (Brill, 2016), as well as a new edition of *A Jewish Philosopher of Baghdad* (Isfahan, 2016).

Nathan Seiberg, Professor in the School of Natural Sciences, has been awarded the 2016 Dirac Medal from the International Centre for Theoretical Physics for his contributions to a better understanding of field theories in the non-perturbative regime, particularly for exact results in supersymmetric field theories.

Edward Witten, Charles Simonyi Professor in the School of Natural Sciences, has been awarded the 2016 Albert Einstein World Award of Science from the World Cultural Council for his visionary research across physics and mathematics.

Stephen L. Adler, Professor Emeritus in the School of Natural Sciences, was honored with the 2016 First Award by the Gravity Research Foundation for his work "A Frame-Dependent Gravitational Effective Action Mimics a Cosmological Constant, but Modifies the Black Hole Horizon."

Caroline Walker Bynum, Professor Emerita in the School of Historical Studies, has been elected a Fellow of the Ecclesiastical History Society.

Peter Goddard, Professor (2012–16) in the School of Natural Sciences and past Institute Director (2004–12), and **Jonathan Israel**, Andrew W. Mellon Professor (2015–16) and Professor (2001–15) in the School of Historical Studies, became Professors Emeriti effective July 1.

Irving Lavin, Professor Emeritus in the School of Historical Studies, has been named an Honorary Member of the Fondazione Museo Galleria Borghese in Rome.

Peter Paret, Professor Emeritus in the School of Historical Studies, along with six former Members, have contributed to *The Second Generation: Émigrés from Nazi Germany as Historians* (Berghahn Books, 2015).

Joan Wallach Scott, Professor Emerita in the School of Social Science, has received an honorary doctorate from Concordia University in recognition for her scholarly contribution to the understanding of gender history.

Michael Walzer, Professor Emeritus in the School of Social Science, has been elected to the British Academy as a Corresponding Fellow.

Brill Academic Publishers has published *Collected Studies in Three Volumes* by **Patricia Crone**, past Professor Emerita (2014–15) and Andrew W. Mellon Professor (1997–2014) in the School of Historical Studies.

Institute Trustee **Afsaneh M. Beschloss** has received the 2016 Investor Lifetime Achievement Award from *Institutional Investor* magazine.

James H. Simons, Vice Chair of the Institute Board of Trustees, has received an honorary doctorate from York University in recognition of his contributions to mathematics.

James D. Wolfensohn, Chair Emeritus of the Institute Board of Trustees, has received the National Committee on American Foreign Policy's George F. Kennan Award for Public Service.

The Simons Foundation has selected as a 2016 Simons Investigator **Vladimir Markovic**, Member (2015) in the School of Mathematics.

Hirosi Ooguri, Member (2015, 1988–89) in the School of Natural Sciences, has received a 2016 Chunichi Cultural Award for his development of innovative methods of modern mathematics in high energy theory, and has been elected to the American Academy of Arts and Sciences.

Elisheva Baumgarten, Member (2008–09) in the School of Historical Studies, has been awarded the Michael Bruno Memorial Prize of the Yad-Hanadiv Foundation and the Israeli Institute for Advanced Study for transformative work in Jewish historical studies.

Alexei Borodin, Member (2001–02) in the School of Mathematics, and **Anastasia Volovich**, Member (2010–11, 2005–06) in the School of Natural Sciences, have been named National Award Finalists in the 2016 Blavatnik Awards for Young Scientists.

Subhash Khot, Member (2003–04) in the School of Mathematics, has been named a 2016 Fellow of the John D. and Catherine T. MacArthur Foundation for providing critical insight into unresolved problems in the field of computational complexity.

The American Association for the History of Medicine awarded its 2016 William H. Welch Medal to **Sean Hsiang-lin Lei**, Member (2013–14) in the School of Historical Studies, for his book "*Neither Donkey nor Horse: Medicine in the Struggle over China's Modernity* (University of Chicago Press, 2014).

Jay Pasachoff, Member (1989–90) in the School of Natural Sciences, has been selected to receive the 2017 Richtmyer Memorial Lecture Award by the American Association of Physics Teachers for contributions to physics and effectively communicating those contributions to physics educators.

Adriana Petryna, Visitor (2006) and Member (2003–04) in the School of Social Science, has been awarded the Wellcome Medal from the Royal Anthropological Institute of Great Britain and Ireland for her contributions to research in anthropology as applied to medical problems.

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Questions and comments regarding the *Institute Letter* should be directed to Kelly Devine Thomas, Editorial Director, via email at kdthomas@ias.edu or by telephone at (609) 734-8091.

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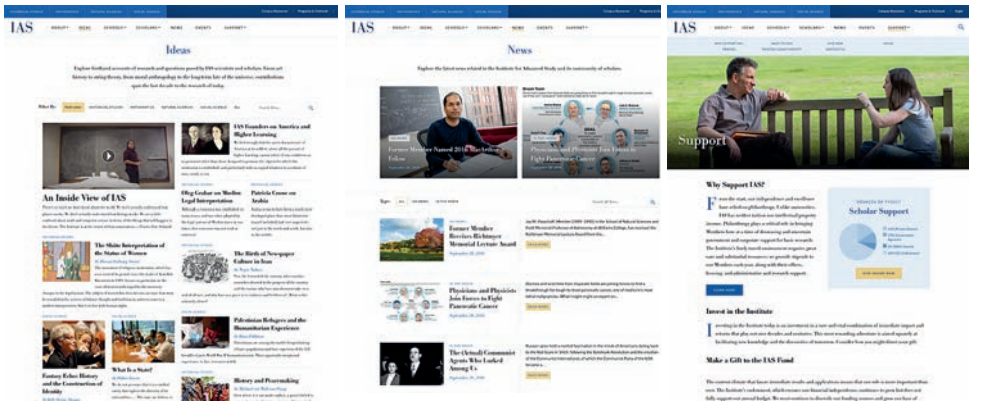


www.ias.edu

The Institute for Advanced Study website offers first-hand accounts of research by IAS scientists and scholars that span the last decade to the research of today; news of the Institute's community interacting with the world at large; and ways to give to help sustain the Institute and its mission for generations to come.

Elizabeth Boluch Wood Appointed IAS Chief Development Officer

The Institute for Advanced Study has appointed Elizabeth Boluch Wood as its new Chief Development Officer. Wood, who was Vice President for Development at Princeton University from 2010 to 2016, and most recently served as Assistant to the President for Capital Gifts, joined the Institute in September. Among her many accomplishments at Princeton, Wood successfully concluded the largest fundraising campaign in the University's history, Aspire, and, during her tenure, oversaw a total of $1.7 billion in capital gifts and annual giving. Under Wood's leadership, Princeton had the two largest fundraising years in its history—$341 million in 2012 and $550 million in 2015. Wood replaces Fred Van Sickle, who left the Institute earlier this year to become Vice President for Alumni Affairs and Development at Cornell University.

As the Institute's Chief Development Officer and Associate Director for Development and Communications, Wood will lead a comprehensive program advancing the Institute's singular role as one of the world's leading institutions for basic research. Wood will further develop and evolve the Institute's fundraising, working closely with the development staff, the Institute's Trustees, and Robbert Dijkgraaf, Director and Leon Levy Professor at the Institute.

Dijkgraaf commented, "I am very pleased to welcome Liz to the Institute to lead, guide, and expand our development efforts with her consummate professionalism and impressive depth of experience. I am personally looking forward to collaborating with Liz to further engage our network of existing donors and to activate new prospects."

Regarding her appointment, Wood said, "I am excited and honored to be joining the Institute for Advanced Study. I look forward to working with the many dedicated scholars and staff to advance the mission of this exceptional institution."

ANDREA KANE

Elizabeth Boluch Wood

Wood began her career at Princeton University in 1995 as a Senior Associate Director of Leadership Gifts. In 2001 she joined the Cancer Institute of New Jersey as Chief Development Officer, returning to Princeton in 2005 to become Director of Principal Gifts. After serving in other leadership positions, Wood became Vice President for Development in 2010. Prior to 1995, Wood was a development officer at Harvard University, Brown University, Simmons College, and Amherst College. Wood earned her undergraduate degree in English Language and Literature from Amherst. From 2013 to 2016, she chaired the steering committee for the Council for Advancement and Support of Education's top 50 fundraising organizations in higher education. Wood is a board member of the American Repertory Ballet. She resides in Princeton with her husband and children. ■

New Grants Support Shii, Early Modern Spanish, and East Asian Studies

ANDREA KANE

Professor Sabine Schmidtke (left) led a conference on Allographic Traditions at the Institute in June.

The School of Historical Studies has recently received three grants supporting Shii studies and two new Memberships in the School.

The Carnegie Corporation of New York has given the School a three-year, $500,000 grant to explore and elevate the understanding of Shii studies. The grant will support two research positions in the School of Historical Studies and create a themed annual conference and workshop aimed at leading scholars in the field, which will be led by Sabine Schmidtke, Professor in the School. The long-term goal of the project funded by Carnegie Corporation is to build a collaborative research and teaching structure focused on Shii Islam with a partner institution, to be identified, in the United States.

The Center for Spain in America, directed by José Luis Colomer, Member (1997) and Visitor (1998) in the School, has created a John Elliott Membership. The membership, named in honor of John Elliott, former Faculty (1973–90) in the School, will support scholars focused on the history and culture of early modern Spain. Fabien Montcher of Saint Louis University is the first John Elliott Member.

The Tang Research Foundation, led by Xin Luo, Member (2014–15) in the School, has endowed the Roger E. Covey Membership in East Asian Studies. Andrew Chittick of Eckerd College is the first Roger E. Covey Member in East Asian Studies. Nicola Di Cosmo, Luce Foundation Professor in East Asian Studies, commented, "The exceptional generosity of the Tang Research Foundation strengthens the commitment of the School of Historical Studies to the East Asian humanities, with special emphasis on the pre-modern period. The endowed Membership is a testament to the closer ties that have been established between the School and Asian scholars in various fields, which we will strive to expand and develop even further in the future." ■

Veena Das and Lorraine Daston Appointed to the Board of Trustees

Two new members have been appointed to the Board of Trustees of the Institute for Advanced Study, effective May 7, 2016. Veena Das, Krieger-Eisenhower Professor of Anthropology at Johns Hopkins University, was nominated by the School of Social Science to succeed Margaret Levi. Lorraine Daston, Director at the Max Planck Institute for the History of Science and Visiting Professor in the Committee on Social Thought at the University of Chicago, was nominated by the School of Historical Studies to succeed Carmela Vircillo Franklin.

PHOTO OF LORRAINE DASTON COURTESY OF SKÚLI SIGURDSSON

Veena Das (left) and Lorraine Daston

Das is a leading scholar in the field of anthropology. With research that spans across many fields, she explores the question of how ethnography generates concepts. Previously, Das taught at the Delhi School of Economics for more than thirty years and held a joint appointment at the New School for Social Research from 1997–2000. In addition to her Ph.D. from the University Delhi in 1970, she has since received honorary doctorates from the University of Chicago and the University of Edinburgh. Das is the author of many books including *Affliction: Health, Disease, Poverty* (Fordham University Press, 2015), *Life and Words: Violence and the Descent into the Ordinary* (University of California Press, 2007), and *Four Lectures on Ethics* (HAU Books, 2015, with Michael Lambek, Webb Keane, and Didier Fassin), and she has coedited *The Ground Between: Anthropologists Engage Philosophy* (Duke University Press, 2014) and *Living and Dying in the Contemporary World: A Compendium* (University of California Press, 2015). She has received many accolades for her work, including the Nessim Habif Prize by the University of Geneva (2014), the John Simon Guggenheim Fellowship (2009), and the Anders Retzius Award of the Swedish Society of Anthropology and Geography (1995). Das is a Fellow of the American Academy of Arts and Sciences and of the Academy of Scientists from Developing Counties.

Daston, a leading historian of science, has published on a range of topics, including the history of probability and statistics, wonders in early modern science, the emergence of the scientific fact, scientific models, objects of scientific inquiry, the moral authority of nature, and the history of scientific objectivity. Her many books include *Kuhn's Structure of Scientific Revolutions at Fifty: Reflections on a Science Classic* (University of Chicago Press, 2016), coauthored with Robert J. Richards, *How Reason Almost Lost Its Mind: The Strange Career of Cold War Rationality* (University of Chicago Press, 2014), coauthored with Paul Erikson et al., and *Objectivity* (MIT Press, 2007), coauthored with Peter Galison. Daston has been recognized for her many contributions to scholarship with awards including the Lichtenberg Medal from the Göttingen Academy of Sciences, the Schelling Prize from the Bavarian Academy of Sciences, and the Sarton Medal from the History of Science Society. She earned her Ph.D. from Harvard University and received an honorary doctorate from Princeton University. Daston is a Fellow of the American Academy of Arts and a Permanent Fellow of the Wissenschaftskolleg zu Berlin. ■

From Analysis and Beyond with Jean Bourgain to Celebrating the Science of Nathan Seiberg

Bourgain receives 2016 Antonio Feltrinelli International Prize for Mathematics ✦ Seiberg awarded 2016 Dirac Medal

The work and impact of Jean Bourgain, IBM von Neumann Professor in the School of Mathematics, and Nathan Seiberg, Professor in the School of Natural Sciences, were recognized with conferences in honor of their sixtieth birthdays. Both recently also received major prizes. Bourgain was awarded the 2016 Antonio Feltrinelli International Prize for Mathematics by the Accademia Nazonale dei Lincei. Seiberg was awarded the 2016 Dirac Medal from the International Centre for Theoretical Physics. Seiberg received the honor for his important contributions to a better understanding of field theories in the non-perturbative regime and in particular for exact results in supersymmetric field theories. The Dirac Medal is named in honor of Paul Dirac, who was a Member at the Institute on several occasions, beginning in 1934. ■

Jean Bourgain's Coat of Arms

In association with his being bestowed the title of Baron by the Belgian government last summer, Jean Bourgain designed a coat of arms (left) inscribed "In hope against hope." Bourgain explains elements of the design:

> The essential part is the center where you see four mutually tangent circles that generate a so-called Apollonian circle packing (named after Apollonius of Perga, 2nd century B.C.). Such a packing is a fractal set in the plane, which one obtains if one keeps removing from the curvilinear triangles the tangent discs. In the Renaissance, these configurations were a subject of study for the French philosopher and mathematician René Descartes and later, in the twentieth century, for Frederick Soddy, who won the 1921 Nobel Prize in Chemistry. Soddy discovered the integral Apollonian packings (IACP) where the reciprocals of the radii are integers, for all circles in the packing. The theory of these IACP is today a rich mathematical research area, at the interface of hyperbolic geometry, dynamics, and number theory.

Recommended Reading and Viewing:

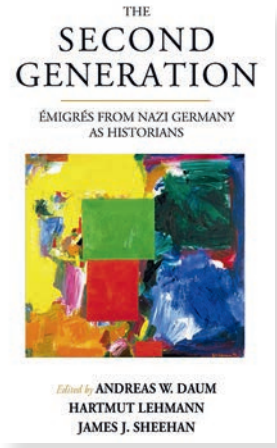
Videos of talks from Analysis and Beyond: Celebrating Jean Bourgain's Work and Impact: www.ias.edu/ideas/2016/bourgain-analysis

Videos of talks from NatiFest: Celebrating the Science of Nathan Seiberg: www.ias.edu/ideas/2016/natifest

"Conversation with Nathan Seiberg," *Kavli IPMU News* 34 (June 2016): http://bit.ly/kavli-seiberg

The Second Generation: Émigrés from Nazi Germany as Historians

Felix Gilbert's way of encountering the past



Of the thousands of children and young adults who fled Nazi Germany in the years before the Second World War, a remarkable number went on to become trained historians in their adopted homelands. The following are excerpts from The Second Generation *(Berghahn Books, 2016), which places autobiographical testimonies alongside historical analysis and professional reflections by Institute scholars including Peter Paret, Professor Emeritus in the School of Historical Studies, and former Members Fritz Stern, Steven E. Aschheim, Jeffrey Herf, Majorie Lamberti, and Jürgen Kocka, among others.*

From the preface, contributed by Hartmut Lehmann, and James J. Sheehan, Members (1973–74) in the School of Historical Studies:

In 1973-74, Felix Gilbert [Member, 1939–43; Professor, 1962–75; Professor Emeritus, 1975–91] invited us to spend a year at the Institute for Advanced Study in Princeton. We occupied adjoining studies where we pursued our individual projects, but there was ample time to talk during the tea break in the morning and the coffee hour in the afternoon. Felix Gilbert, the most learned of Friedrich Meinecke's many *Doktoranden*, was generous with his time. He seemed to like the idea that two young historians, who could have been his children, one from the United States and one from Germany, one from the country of his origins and one from the country to which he now belonged, began an intensive exchange of ideas and became friends.

Felix Gilbert belonged to that great generation of German historians who had completed their education in Germany and were forced into exile by the Nazis. When Hartmut Lehmann became the founding director of the German Historical Institute in Washington, D.C., he chose this generation as the subject of the institute's first scholarly conference, held in December 1988. Organized with the help of James Sheehan, it had three aims: first, to explore this important chapter in the relationship between German and American history and historians; second, to celebrate the scholarly achievements of these émigré scholars; and finally, to establish an agenda for the institute's scholarly activities for the next several years.

HERMAN LANDSHOFF / INSTITUTE FOR ADVANCED STUDY, SHELBY WHITE AND LEON LEVY ARCHIVES

Felix Gilbert, 1981

From the chapter "External Events, Inner Drives," contributed by Peter Paret, Professor Emeritus:

As immigrants and historians-to-be, we shared in the collective act of leaving Germany for the United States as the Weimar Republic collapsed into the Third Reich, but each of us set out from particular circumstances, and each encountered the new differently.… A young historian arriving in this country in the thirties, even one who had already done significant work, could encounter considerable difficulties, and [Felix] Gilbert's first years in the United States were far from easy ones. Still, he was outspoken in his gratitude for the opportunities he was offered. His person and the years he spent here vastly benefitted the study and teaching of history in the United States. In turn, he and his work gained much—a duality of giving and receiving that I suspect has characterized or at least been noticeably present in every relationship of host country and émigré historian. Gilbert's historical interests were exceptionally diverse. His early work on Johann Gustav Droysen, and his first writings on the ideas and politics of Renaissance Italy, enriched his studies of later times and other places, from the political ideas of the early American Republic to the ideology and practices of the Third Reich. His way of encountering the past, a way he inherited from his teachers and then refined, belongs to the scholarly and cultural history of the country in which he grew up and from which he fled, to survive and add to the intellectual energy of his new home. With rare specificity, his work reminds us that knowledge in one area may complement our understanding of other areas, whether linked or far apart. Interpreting the history of one time, one country, one activity, helps us see the history of other countries, other societies, related activities, more clearly. And if we look once more at the subject that partly or wholly has occupied most members of the first and second generation of German émigré historians—the history of the country from which they came—we see again that by achieving an understanding of any phase of German history, we may contribute to the recognition and understanding of its other aspects, be they sublime, ordinary and commonplace, or murderous. ■

Of Historical Note: Reflections on Analytic Vectors

Edward Nelson, Member in the Schools of Mathematics (1956–59, 79–80) and Natural Sciences (1963–64, 67–68, 73–74) and Professor of Mathematics at Princeton University until his death in 2014, was an original thinker best known for successfully applying probability to quantum field theory. The following article, first published in volume 17 of Current Contents *(April 25, 1983), reflects upon the work he did at the Institute on analytic vectors.*

BY EDWARD NELSON

INSTITUTE FOR ADVANCED STUDY, SHELBY WHITE AND LEON LEVY ARCHIVES

Edward Nelson (left), Mahgoub Taha (center), and Nancy Nelson (right) at a social gathering of the School of Mathematics on October 13, 1967, at the home of Louise and Marston Morse

When I did this work twenty-three years ago, I was twenty-three years younger than I am now. I was invited to lecture about it at Harvard University, and I went with every expectation of a job offer that did not materialize. The title of my lecture was "The Heat Equation on Lie Groups." Someone told me that when the title was announced at the previous week's colloquium, the audience burst into laughter. What struck them as funny was the juxtaposition of something with applied connotations (heat equation) with something that sounded pure (Lie groups). Today's mathematical audiences, even at Harvard, are more sophisticated, and a similar title now would strike no one as funny—which shows that the world does make progress.

When I did this work, I was a fresh Ph.D. at the Institute for Advanced Study. My wife and I lived in the brand-new Institute housing. On the other side of our apartment wall lived Lars Gårding. He was intrigued by the use of the heat equation to produce analytic vectors and told me, ruefully and quite rightly, that it was a method he should have thought of himself. He invited me to his apartment to explain to him the use of diffusion processes in deriving properties of the heat equation—at that time this technique appeared bizarre, and he wrote a paper[1] eliminating probability theory from the proof. Our new apartments were frequently invaded by field mice that had been displaced by the construction. Gårding would balance a soup bowl on a matchstick over bait, so that he could release the mice alive and unharmed.

I knew the referee for the paper to be Pierre Cartier, who had written a paper[2] with Dixmier on analytic vectors and who was spending a year at the Institute, because shortly after I told Cartier about the work André Weil asked me to submit it to the *Annals of Mathematics*. Mathematicians are prone to some defects in character, as my wife—and any outspoken mathematician's spouse—is not loath to point out. But one crucial trait that makes us pleasanter than our colleagues in the humanities ensures that a totally unknown scholar has no difficulty in having worthwhile work recognized.

For a modern account of operator commutation relations, see the monograph[3] by Jorgensen and Moore.

I suspect that this paper has been frequently cited because it provided a useful way of showing a Hermitean operator to be self-adjoint. Then courtesy demanded that anyone using this rather simple method give a reference to my paper.[4] No one, asked to name a seminal paper of the late-1950s in functional analysis or group representations, would choose this paper. This indicates the absurdity of using a citation index as a measure of quality. The American passion for the seemingly objective as a substitute for informed personal judgment is symptomatic of a failure of vigor and self-reliance. ■

—Many thanks to Sarah Jones Nelson for sharing this article, which was found among Edward Nelson's papers.

1. Gårding, L., "Vecteurs analytiques dans les représentations des groupes de Lie," *Bull. Soc. Math. Fr.*(1960) 88:73–93.
2. Cartier, P. and Dixmier, J., "Vecteurs analytiques dans les représentations des groupes de Lie," *Amer. J. Math.* (1958) 80:131–45.
3. Jorgensen, P. E. T. and Moore, R. T., *Commutation Relations for Operators, Resolvents, and Semigroups with Applications to Group Representations and Mathematical Physics*, Preprint, Mathematics Institute, Aarhus University, 1982.
4. Nelson, E., "Analytic Vectors," *Annals of Mathematics* (1959): 70:572–615.

Anti-Red Hysteria in American Life

An entangled fear of Communism and Soviet espionage

BY JONATHAN HASLAM

Russian spies held a morbid fascination in the minds of Americans dating back to the Red Scare in 1919, following the Bolshevik Revolution and the creation of the Communist International, of which the Communist Party of the USA became a constituent member, subject to extra-territorial discipline imposed from Moscow.

Global domination was indeed Moscow's declared aim. The issue, however, was whether this goal was at all practicable.

The Red Scare blended neatly with popular hostility to mass immigration in America, particularly against a surge of Jews fleeing the anti-Semitic heartlands of Eastern Europe. Responding to hostility, many Jews embraced the inclusive internationalist ideals of Communism rather than the outlandish idea of building a Jewish state in the deserts of British-controlled Arab Palestine. But they were a minority, drawn in by radical idealism and anti-fascism. And the American opposition to wider Jewish immigration from these areas was clearly colored by racism, especially the anti-Semitism of the time.

Although there was little justification for the scare-mongering, the hysteria was enough to spur the passage of the Johnson-Reed Act of 1924, which put a halt to the inflow of immigrants without visas. Fears began to dissipate. The 1927 execution of Niccola Sacco and Bartolomeo Vanzetti, Italian-born anarchist immigrants accused of murder on doubtful evidence, marked the high tide of the irrational anti-red (and mostly anti-foreigner) hysteria in American life.

Ironically, it was around this time that real dangers actually began to emerge. But, having cried wolf once too often, doomsayers then faced an uphill task through the '30s trying to convince the government and the American public that Communist threats of any kind actually existed.

Fear of Communism and fear of Soviet espionage were closely entangled because a few members of the miniscule American Communist Party were, in fact, involved in spying for Moscow. Most adherents had no idea this kind of thing was going on—the practice was confined to the shadows, restricted to a few specially chosen for what they had to offer. But, as was the case with Communist Parties elsewhere in the world, those recruited saw it as their duty to serve. And recent archival revelations from Moscow show just how persistent the Kremlin was in its attempts to penetrate the American system.

Initially the civilian branch of Soviet intelligence—OGPU, then NKVD—had little luck recruiting American spies. Yuri Markin (codename Oskar), the illegal "rezident"—as the Russians called their station chiefs—from 1932-34, was murdered by persons unknown, the victim of a violent encounter in a New York bar. His replacement, Boris Bazarov (codenames, Kin, Da Vinci, Nord), worked in tandem with the "legal" rezident (who was under diplomatic cover), Pyotr Guttseit (codename Nikolai). He had much better luck, including recruiting sources with direct access to the State Department and one connected to President Franklin Roosevelt's inner circle. But the successful spy was recalled to Moscow in 1937, where he became a victim of Stalin's paranoid purge of those seen as connected to foreigners (mass executions that included even George Kennan's dentist at the American embassy). His successor, Ishak Akhmerov (codename Yung), took over and married a distant relative of Communist Party chief Earl Browder. Browder himself ensured that ties to Soviet intelligence became indistinguishable from Party work; his wife, Kitty ("Gipsy") Harris, worked for the Soviets and assisted (and slept with) their British spy Donald Maclean in London and then Paris in the late '30s.

The most successful operation at that time, however, came from a group of covert operatives organized by the American agriculturalist Harold Ware. The ring included Alger Hiss, Donald, and other federal officials who were convinced that the need to confront the threat from fascism eclipsed all other loyalties. They believed that the road to socialism was inevitable, and that the socialist-leaning policies of Roosevelt's New Deal were merely the taste of things to come. This operation came under Soviet military intelligence, known as the Fourth Directorate, the NKVD's main rival. Although their infiltration went deep, none of it added up to much—it was simply "music of the future."

The stakes were raised, however, when the U.S. entered WWII in December 1941—and the Americans joined the British to develop the atomic bomb. Soviet focus on scientific and industrial intelligence (NTR), which had its own section within the NKVD, switched abruptly from London to Washington. Though intelligence boss Lavrenty Beria dragged his feet on the issue, the NTR foresaw the significant role the bomb would play and pushed it to the forefront of their priorities. Once the directive was set by Stalin in 1942, Soviet efforts knew no limits. Operation Enormoz, directed at uncovering the secret of atomic bomb construction, took high priority. The Kremlin was looking ahead to the aftermath of war. The balance of power could ultimately depend on who had the bomb. And those who volunteered for the cause were putting their lives at risk, as they were soon to find out.

REPUBLIC PICTURES/PHOTOFEST

A movie poster for *The Red Menace,* an anti-Communist, anti-Soviet film released in 1949 in the United States

The American authorities had absolutely no idea what the Russians were up to until very late in the game. Good liberals scoffed at the idea that Moscow could be spying on a wartime ally, even as some of their best friends were actually secret members of the Communist Party and spies for Russia. The Roosevelt administration declined to follow up on tips about suspected infiltration. It wasn't until the very public defection of a Soviet Embassy cipher clerk, who snuck out documentation showing the magnitude of Soviet atomic espionage that had been going on, that the issue finally came to a head. Soviet spy networks were quickly rooted out. The consequences proved cataclysmic for Americans caught serving the Communist cause. Among those swept up were Julius Rosenberg, an engineer who handed Moscow classified information about the U.S. atomic program, and his wife Ethel (against whom there was little solid evidence).

By the early 1950s, when the Rosenbergs were executed, Washington was again gripped with widespread hysteria about Communist penetration of American society and government.

The Russians, meanwhile, had been closing down all operations in the late 1940s in order to save their agents; and only well after the death of Stalin in 1953 were they able to begin seriously rebuilding their networks in America. But these networks never acquired the significance they had once had. Atomic espionage in the United States, carried out by misguided idealists who saw in the Soviets a progressive force, proved the high point of Russian intelligence operations targeting America.

Nikita Khrushchev's denunciation of Stalin in 1956, followed by the Soviet intervention in Hungary, destroyed any remaining allure Moscow may have held for young idealists in the West. Thus, although President Lyndon Johnson dearly hoped to uncover Moscow's clammy hand at work behind the protest movement against the Vietnam War in the 1960s, no amount of effort by the FBI and CIA could uncover anything of significance. International communism, whatever challenges it still posed overseas, no longer posed the threat of creating a fifth column at home.

GLOBAL DOMINATION WAS INDEED MOSCOW'S DECLARED AIM. THE ISSUE, HOWEVER, WAS WHETHER THIS GOAL WAS AT ALL PRACTICABLE.

Though the Russians did have dramatic success in penetrating both the FBI and CIA in the 1980s, it didn't impact the American psyche as they would have two decades earlier. Yes, they were serious security lapses, but they involved lone, disaffected, or greedy double agents like Aldrich Ames or Robert Hanssen. There was nothing idealistic, nothing connected to a larger Soviet appeal, in their betrayal.

By the 1980s, the issue of socialism in American political life had become completely divorced from the issue of relations with the Soviet Union. And as the USSR dissolved from within and came to an end in 1992, the long dark shadow it cast over America finally passed forever.

Even when revelations of post-Soviet Russian spying reemerged in more recent years, most Americans just shrugged their shoulders, or met the news with a nostalgic chuckle and a mention of the good old Cold War days. Other challenges, most prominently 9/11 and Islamic fundamentalist terrorism, had reconnected domestic internal security concerns with international relations in an even more dramatic manner. And as the generations move on, distant memories of grossly exaggerated fears recede from our shared consciousness. ■

This article by Jonathan Haslam, George F. Kennan Professor in the School of Historical Studies, originally appeared in Zócalo Public Square. Haslam is a leading scholar on the history of thought in international relations and the Soviet Union whose work builds a bridge between historical studies and the understanding of contemporary phenomena through critical examinations of the role of ideology.

The Appeal of Drones

Are drones an effective tool for achieving the goals of the American national security state?

BY HUGH GUSTERSON

This book was written when I spent a year at the Institute for Advanced Study. It is hard to imagine an environment that is more stimulating or more congenial to writing. Many colleagues at the Institute helped shape my thinking, but six deserve special mention—Didier Fassin for his mentorship and remarkable breadth of knowledge and ideas; Joan Scott, who helped me think through the nature of "remote intimacy"; Michael Walzer, also writing on drones, whose questions forced me to think more deeply; Freeman Dyson, who, as smart as ever at ninety-one, is deeply committed to dialogue between the natural and social sciences and, for the founder of the company that makes the Predator and Reaper drones, is surprisingly skeptical of drone warfare; Richard Wilson, who in answer to a stray question over lunch about drones and the law, gave me an impromptu minilecture that provided the framework for my penultimate chapter; and Anver Emon, who was kind enough to review that chapter for legal accuracy and overall acuity.—HG

Less than fifteen years after the first use of an armed drone by the United States, over 50 percent of the pilots being trained by the U.S. Air Force are drone pilots, and the proportion of remotely piloted aircraft in the U.S. fleet went from 5 percent in 2005 to 31 percent by 2012. This is an extraordinary turnabout. Drones have proved attractive to the U.S. military for four principal reasons. First, they are far superior to both satellites and manned aircraft as tools for reconnaissance. Manned aircraft run out of fuel after a few hours, satellites pass over a site and then move on, but drones can linger over a location for a day or more, watching who enters and leaves a building or tracking the movements of people and vehicles that seem suspicious. They can also use infrared cameras to track people at night. And the video footage they generate can be archived so that it can be searched after attacks for signs of insurgent preparation. In such ways, drone surveillance helps in the mapping of insurgent networks and patterns of life as well as in locating arms caches and hiding places. The holy grail for drone advocates is a massive archive of drone surveillance footage that can be rewound so that analysts can work backward along an insurgent network—beginning with the explosion of a buried improvised explosive device and moving back to the insurgent who buried the device, the person from whom he collected it, and the bomb maker. So far, however, the enormous quantity, and often poor quality, of imagery has largely stymied attempts at this kind of data mining.

Second, in the words of General David Deptula, "The real advantage of unmanned aerial systems is that they allow you to project power without projecting vulnerability." Because the drone operator is safely ensconced in a trailer in Nevada, no American is killed or injured if a drone crashes or is shot down. This is beneficial in that the military does not like to see pilots killed, but also in the political sense that a war without American casualties is more likely to be a war without American opposition. Admiral Dennis Blair, former director of national intelligence, describes drone warfare as "politically advantageous." Saying that drone warfare enables a president to look tough without incurring American casualties, he adds, "It plays well domestically, and it is unpopular only in other countries." In the words of British commentator Stephen Holmes, drones have "allowed the Pentagon to wage a war against which antiwar forces are apparently unable to rally even modest public support."

Third, drones are cheaper than other aircraft, even after the costs of large support crews are considered, according to most analysts. Manned planes cost more to build because they have added features and redundant systems for the safety and comfort of their human occupants. (Drones, for example, have only one engine.) A Predator drone costs about $4.5 million, and a Reaper around $22 million. By comparison, an F-16 is about $47 million, and each new F-35 is projected to cost the American taxpayer between $148 million and $337 million. And training a drone operator costs less than 10 percent of what it costs to train a fast-jet pilot. Even though up to 50 percent of the U.S. Predator fleet has been involved in crashes, many of which destroyed the plane, they are still a bargain.

Finally, their video surveillance capability and laser-guided munitions afford drones high levels of precision in the execution of attacks. Ground artillery certainly cannot match the precision of a Hellfire missile. Although other aircraft with laser-guided bombs may be able to achieve comparable levels of accuracy, the drone can linger for hours waiting for a good shot. Reportedly, this has been particularly important to President Obama. The *New York Times* said that "the drone's vaunted capability for pinpoint killing appealed to a president intrigued by a new technology and determined to try to keep the United States out of new quagmires. Aides said Mr. Obama liked the idea of picking off dangerous terrorists a few at a time, without endangering American lives or risking the years-long bloodshed of conventional war."

It is important to understand that the drone is not just a new machine that has been slotted into existing war plans in a space formerly occupied by other kinds of airpower. Instead, in concert with special forces on the ground, it is a pivot around which the United States has created a new approach to counterinsurgency warfare and border policing that is organized around new strategies of information gathering, precision targeting, and reconceptualizing enemy forces as a cluster of networks and nodal leaders.

Politicians, pundits, and military leaders portray the turn to drones as a sign of American strength. As one of the few countries with the technical sophistication and the infrastructure of satellites and military bases that are required to operate drones, the United States is now able to kill its enemies while remaining invulnerable. It is moving toward war that is so asymmetrical that only the other side will incur casualties, so asymmetrical that it is more like hunting than war.

But another way of looking at this development is that American attempts to occupy Iraq and Afghanistan with ground forces or even to make a single U.S. assault force raid in Somalia in 1993 proved so disastrous in terms of military defeat on the ground and political opposition at home that the United States has been forced to retreat into the air and to cede the terrain it wants to control on the ground to the enemy. Drones have enabled improvements in aerial surveillance and in the interception of cell phone and radio signals on the ground, but insurgents have partly adapted to this by changing cell phones frequently, using couriers, spoofing aerial video cameras, and altering their meeting habits. Sometimes insurgents hide under bridges, where drones cannot see them, then change direction or switch cars. They also take advantage of urban topography, where cars may look alike or be hard to follow as they drive behind buildings, to elude surveillance. On occasion, adversaries have also succeeded in hacking U.S. drones. In 2009, Shia insurgents in Iraq used software available for $29.95 on the Internet to hack into drone video feeds that were not encrypted so that they could use U.S. drone footage for their own battle planning. More seriously, in 2011, Iran succeeded in capturing a U.S. RQ-170 surveillance drove by hacking into its communications and reprogramming it to land— intact—within Iran, where it was promptly put on display to the international media.

Ever since General Giulio Douhet claimed in the early twentieth century that wars would now be won from the air, advocates of air power have repeatedly prophesied the imminent obsolescence of ground forces, but their prophecies remain as yet unfulfilled.

> AS ONE OF THE FEW COUNTRIES WITH THE TECHNICAL SOPHISTICATION AND THE INFRASTRUCTURE OF SATELLITES AND MILITARY BASES, THE U.S. IS NOW ABLE TO KILL ITS ENEMIES WHILE REMAINING INVULNERABLE.

In the words of the Israeli Eyal Weizman, "The fantasy of a cheap aerial occupation, or 'aerially enforced colonization,' is … as old as air forces themselves." But as former U.S. Air Force pilot Shane Riza writes, "Sole aerial efforts at controlling—the word choice is important—populations or militaries on the ground have not worked ever since the British first tried it in Iraq in the 1920s." Thus, as well as inquiring into the experience of those who fly drones and probing the implications of drones for democratic governance in the United States, we must ask the question almost all commentators conspire to bury: are these alleged new wonder weapons an effective tool at all for achieving the goals of the American national security state? ■

Hugh Gusterson, Member (2014–15) in the School of Social Science, is Professor of Anthropology and International Affairs at George Washington University. This article is excerpted from Drone: Remote Control Warfare *(Massachusetts Institute of Technology, 2016), which Gusterson wrote while a Member at the Institute. Gusterson is also the author of two books on nuclear weapons scientists,* People of the Bomb *(University of Minnesota Press, 2004) and* Nuclear Rites *(University of California Press, 1996).*

Open Problems in Mathematics with John Nash

An unconventional and creative collaboration

BY MICHAEL TH. RASSIAS

This therefore, is mathematics: she reminds you of the invisible forms of the soul; she gives light to her own discoveries; she awakens the mind and purifies the intellect; she brings light to our intrinsic ideas; she abolishes oblivion and ignorance which are ours by birth.—Proclus

Looking back in life, there are experiences that one considers important and stand out, whereas others just become memories that fade away. However, sometimes, experiences might be so precious or even surreal that it takes time to digest that they were even part of your past in the first place. Such experiences might even influence aspects of your life altogether. Spending time and collaborating with John F. Nash, Jr., was one such experience.

It all started in September 2014, in one of the afternoon coffee/tea meetings that take place on a daily basis in the common room of Fine Hall, the building housing the Mathematics Department of Princeton University. John Nash silently entered the room, poured himself a cup of decaf coffee, and then sat alone in a chair close by. That was when I first approached him and had a really pleasant chat about problems in the interplay of game theory and number theory. From that day onwards, our discussions became ever more frequent. From the common room to his office, to the library and the beautiful parks of Princeton, our discussions about various topics in mathematics often lead us—in one way or another—to some intriguing open problem in mathematics. In one of those occasions, we happened to chat about David Hilbert's famous list of twenty-three problems. That very mathematical/philosophical dialogue influenced our later decision to collaborate on the preparation of a book titled *Open Problems in Mathematics*, recently published by Springer. Of course, as we also explain in the preface of our book, we intend neither to compare (in any degree!) nor to associate our list of open problems with that of the great Hilbert. After all, this would be almost blasphemy. Among the readers of the present article, mathematicians surely know and non-mathematicians probably don't know about Hilbert's list. Thus, I now briefly write for the latter readers a few words to clarify this mysterious list of twenty-three problems and how it came about.

A picture of Nash and M. Th. Rassias, which was captured in the office of John Nash at Fine Hall around the beginning of their collaboration for the book *Open Problems in Mathematics* (ca. October 2014)

Every four years in one city of the world, the International Mathematical Union hosts the International Congress of Mathematicians (ICM), which is the largest and most prestigious conference devoted to the field of mathematics. The first (official) ICM was held in Zürich in 1897. There were just a few exceptions when the ICM was not organized after a period of four years. The first such exception[1] was 1900, when the second ICM took place in Paris. This happened so that it would coincide with the *Exposition Universelle* in Paris and, most importantly, so that this ICM would mark the opening of the new century of mathematics. A couple of years prior to this event,[2] the great French mathematician Henri Poincaré proposed to Hilbert the preparation of a list as well as an elaborate presentation of open problems that Hilbert considered to be the most—or among the most—important open problems in the entire field of mathematics at that time: a list of open problems that would help guide generations of bright mathematicians for the coming century. Hilbert accepted Poincaré's proposition,[3] and for the ICM of 1900 he prepared his celebrated list of twenty-three problems. This collection of open problems has been extremely influential and has channeled a great deal of important research ever since. Several prominent figures in the history of mathematics from 1900 onward invested years of research in their efforts to solve one of Hilbert's problems. One of those luminaries was Nash, who independently of Ennio de Giorgi solved Hilbert's nineteenth problem. At the time of my discussion with Nash in September 2014 about Hilbert's problems, we decided to prepare together the book *Open Problems in Mathematics*. The content of that dialogue can be mainly summarized by the following part of the preface we later jointly composed for our book:

> It has become clear to the modern working mathematician that no single researcher, regardless of his knowledge, experience, and talent, is capable anymore of overviewing the major open problems and trends of Mathematics in its entirety. The breadth and diversity of Mathematics during the last century has witnessed an unprecedented expansion. […] Perhaps Hilbert was among the last great mathematicians who could talk about Mathematics as a whole, presenting problems which covered most of its range at the time. One can claim this, not because there will be no other mathematicians of Hilbert's caliber, but because life is probably too short for one to have the opportunity to expose himself to the allness of the realm of modern Mathematics. Melancholic as this thought may sound, it simultaneously creates the necessity and aspiration for intense collaboration between researchers of different disciplines. Thus, overviewing open problems in Mathematics has nowadays become a task which can only be accomplished by collective efforts.

The above excerpt basically manifests the ideology with which this project was initiated. The day we made the decision to prepare this book, Nash turned to me and said with his gentle voice, "I don't want to be *just a name* on the cover though. I want to be really involved." After that, we met almost daily and discussed mathematics for several hours at a time, examining a vast number of open problems ranging over several areas. During these discussions it became even clearer to me that his way of thinking was very different from that of almost all other mathematicians I have ever met. He was thinking in an unconventional, most creative way. His quick and distinctive mind was still shining bright in his late eighties. He still had this spark, the soul of a young mathematician. The fact that he moved slowly and talked with a quiet voice had nothing to do with the enthusiasm with which he did mathematics. The scope of the book we were preparing was to publish invited survey papers by world experts presenting the status of some essential open problems in pure and applied mathematics, including old and new results as well as methods and techniques used toward their solutions. One expository paper is devoted to each problem or constellation of related problems.

After having been asked to contribute the present article regarding the experience of working with John Nash, I started recollecting all those moments from my privileged year as his collaborator and frequent companion. Among all those memories, I recalled a freezing winter day at Princeton that still makes me shiver. It was late January 2015, classes and seminars were canceled, and the University had advised all its members to remain home due to an upcoming snowstorm. Nash and I also postponed our meeting until the storm would pass. While working from home that night, I received from him an email, which was a kind of an account or even a testimony of his career as a problem-solver. Interestingly enough, he didn't mention his work in game theory for which he is more widely known. It also surprised me that he signed the email with his full name rather than just "John" as he would normally do in our correspondence. This email is enclosed below.

Date: 26/01/2015 (22:15:05 EST)
From: John F. Nash Jr.
To: michailrassias@math.princeton.edu
Cc: John F Nash

You replied to all recipients of this message on 26/01/2015 22:45:28.

Text (3 KB)

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Dear Michail,

    Now, of the little family here, we are clustered in our house for
the storm (which I hope will really not be so bad!).
    I recently thought of how I can be thought of as a "problem solver"
in my mathematical career. There WAS, actually, an existing open problem
about the representabliity of geometrically defined entitities throuh
means of algebraic varieties.
    So I achieved that, at an early time in my career, and this was a known problem
solved.
    And then later I published "The Imbedding Problem for Riemannian
Manifolds". (This had an error in Part D which was for non-compact
manifolds.)
   That was certainly an existing "problem" but it was not, for example,
defined to be a "Hilbert" problem.
   %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
   Well, I hope that you and we (in our house), in the next days will
have good luck experiencing the snow storm!!

                                                    John F. Nash, Jr.

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(Continued on page 9)

The Exploits of *Maqāma*

A premodern literary form inviting reason, knowledge, and experience

BY MAURICE A. POMERANTZ

Although the *maqāma* is less familiar to Western readers than the fantastic tales of the *Arabian Nights*, which achieved their prominence as a result of Antoine Galland's eighteenth-century French translation, the *maqāma* was long central to Arabic and Middle Eastern literatures and is one of the longest traveling and widest circulating of premodern literary forms.

The picaresque *maqāma* tales were the subject of a workshop, The *Maqāma* and Its Readers, that I organized last May with Sabine Schmidtke, Professor in the School of Historical Studies. The workshop, generously supported with funds from New York University Abu Dhabi, brought together scholars of Arabic and Hebrew literatures.

Invented in the tenth century in Central Asia, *maqāma*s are collections of rhymed prose tales that recount the exploits of tricksters who travel throughout the major cities of the Muslim world and beyond. Each tale follows a similar pattern in which a narrator recounts his entrance into a new city where he goes to a particular space (a market, a mosque, a hospital). There, he asks the audience for money. The narrative reaches a climax when the narrator and/or audience recognize the individual as the notorious rogue and the two depart only to meet one another again in a different locale. The genre celebrates the boundless creativity of the author's inventions, as each *maqāma* invites readers to use their own reason, knowledge, and experience to uncover the rogue's latest plot.

DAN KOMOZDA

On May 27, 2016, scholars of Arabic and Hebrew literatures convened for the *Maqāma* and Its Readers workshop hosted by Sabine Schmidtke, Professor in the School of Historical Studies, and Maurice Pomerantz, Member in the School.

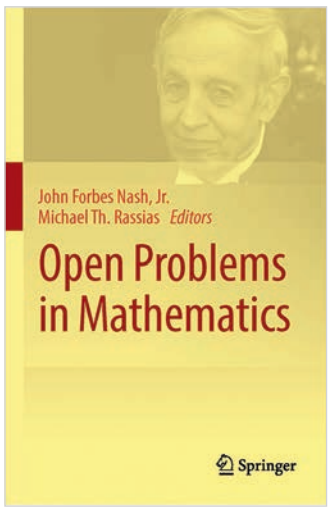
Over the course of nearly a millennium, authors composed hundreds or possibly even thousands of *maqāma* works and collections in Arabic in nearly every major region of the Muslim world from West Africa to China. Writers in Persian, Hebrew, Syriac, and Ottoman directly borrowed themes and forms when composing their own *maqāma* works. Early modern Spanish novels such as the *La Vida de Lazarillo de Tormes* (1554) and Cervantes' *Don Quijote* (1605) owe some inspiration to the *maqāma*. Similarly, the first Arabic novels of the late nineteenth-century renaissance of Arabic literature, Aḥmad Fāris al-Shidyāq's *Leg over Leg* and Muḥammad al-Muwayliḥī's *What ʿĪsā b. Hishām Told Us, or A Period of Time* signal their debts to the *maqāma* genre.

Conference participants presented papers on the history, circulation and interpretation of the *maqāma*. The morning papers began with a paper by Bilal Orfali (American University of Beirut) who discussed the *Maqāma* of Mosul by al-Hamadhānī, which features a seriocomic portrayal of a trickster prophet who raises a dead man back to life. This was followed by a paper I devoted to the ways that the earliest *maqāma* writers interpreted the work of the progenitor of the genre, al-Hamadhānī. This was followed by a presentation by Matthew Keegan (New York University) who discussed early commentaries on the text of the twelfth-century author al-Ḥarīrī whose collection of fifty *maqāmāt* were believed by many to be the pinnacle of Arabic literary eloquence. Devin Stewart (Emory University) presented a paper discussing the "Anti-Shi'ism" in the *maqāmāt* which he discussed with IAS Member Hassan Ansari.

The next two papers of the workshop were devoted to the tradition of *maqāma* writing in Hebrew, represented by the thirteenth-century Judah al-Ḥarīzī who translated and authored *maqāmāt* in Hebrew. Jonathan Decter (Brandeis University) discussed the peculiarities of al-Ḥarīzī as a bilingual author conscious of both the Hebrew and Arabic traditions. Raymond Scheindlin (Jewish Theological Seminary) discussed the curious absence and presence of religious themes throughout al-Ḥarīzī's collection of *maqāma* works. The day was ably concluded by Orit Bashkin (University of Chicago) who discussed "post-Andalusi" *maqāmāt* and the image of the Other found therein. ■

Maurice Pomerantz, Member (2015–16) in the School of Historical Studies, is Assistant Professor of Literature at New York University Abu Dhabi. He is writing a literary history of Arabic picaresque tales. His research examines how the imaginary itineraries of these tales' rogue characters reflect the intellectual, social, and economic networks of Muslim merchants in North Africa, the Middle East, and South Asia from the eleventh to the nineteenth century C.E.

OPEN PROBLEMS *(Continued from page 8)*



Months went by, winter passed, and our almost daily discussions continued and remained deeply interesting, as well as a source of everlasting inspiration for me. The book was nearly ready before John and Alicia Nash left in May for Oslo, where he was awarded the 2015 Abel Prize from the Norwegian Academy of Science and Letters. We had even prepared the preface of this volume, which he was so much looking forward to seeing published.

On this occasion, I would also like to say just a few words about the man behind the mathematician. In the famous movie *A Beautiful Mind*, which portrayed his life, he was presented as a really combative person. It is true that in his early years he might have been, having also to battle with the demons of his illness. Being almost sixty years younger than he, I had the chance to get acquainted with his personality in his senior years. All the people who were around him, including myself, can avow that he was a truly wonderful person. Very kind and disarmingly simple, as well as modest. This is the reason why, among friends at Princeton, I used to humorously say that the movie should have been called *A Beautiful Mind and a Beautiful Person*. What was certainly true, though, was the dear love between John and Alicia, who together faced and overcame the tremendous challenges of John Nash's life. It is somehow a romantic tragedy that fate bound them to leave this life together on their return from Oslo, where Nash had received the Abel Prize, in May 2015.

One can say that among the mathematicians who have reached greatness, there are some—a selected few—who have gone beyond greatness to become legends. John Nash is one such legend. I remember when there was a celebration organized at the Mathematics Department of Princeton University in March 2015 for the announcement that Nash and Louis Nirenberg would share the 2015 Abel Prize, Morgan Kelly from the University's office of communications asked me what it was like to collaborate with John Nash. What I felt then about my collaboration with Nash is what I still feel now. If you were a musician and had an opportunity to work with Beethoven and compose music with him, it would be astonishing. This was the same thing. If a mathematician of the stature of John Nash so generously invests his time and energy in a researcher more than half a century younger, it makes you wonder what we should do, when the time comes, for the younger generations of scientists eager to learn and explore. ■

Michael Th. Rassias is a visiting researcher in the Program in Interdisciplinary Studies of the IAS and a postdoctoral researcher at the Institute of Mathematics of the University of Zürich. His research interests lie in mathematical analysis and analytic number theory, particularly exponential/trigonometric sums, zeta functions, approximation theory, functional equations, and analytic inequalities. He is also interested in the distribution of prime numbers, the analytic investigation of elliptic curves, and cryptography.

1 The other exceptions when the ICM was not held in the standard four-year period were during World War I and World War II, as well as the one scheduled in Warsaw for 1982, which was postponed until 1983 due to political turmoil in Poland.

2 The following historical remark was communicated by Dirk Struik (1894–2000) to Themistocles M. Rassias at MIT in 1980. Struik had the privilege of obtaining this information from David Hilbert (1862–1943) himself!

3 In the actual conference, he presented ten of the problems, whereas the entire list was published a bit later. See: David Hilbert, "Mathematische Probleme," Vortrag, gehalten auf dem internationalen Mathematiker-Kongress zu Paris 1900, *Nachrichten von der königl. Gesellschaft der Wissenschaften zu Göttingen. Mathematisch-physikalische Klasse* (1900): 253–297. An English version can be found here: David Hilbert, "Mathematical Problems," *Bulletin of the American Mathematical Society* 8(10) (1902): 437–479.

The Birth of Newspaper Culture in Nineteenth-Century Iran

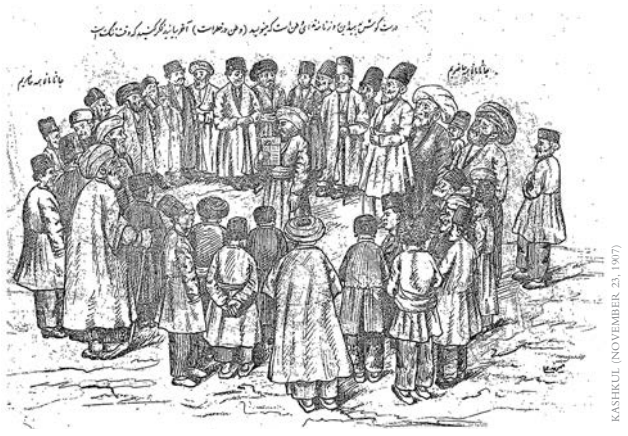
Why did a state-sponsored newspaper suddenly see it as necessary to engage a readership?

BY NEGIN NABAVI

In March 1882, Iran's newspaper readers encountered an unprecedented editorial appeal:

> You, the learned of the country, who consider yourselves devoted to the progress of the country and the nation: why have you chosen to take on a seal of silence, and why have you given in to isolation and feebleness?...What is this untimely silence? You, thoughtful and insightful scholars, say something! Do something! Express an opinion! Think of how to resolve some problems! Haven't the elders said that he who knows but does not talk, it is as if he does not know, and he who can do good but takes no action, is as if he is incapable of doing anything?[1]

This appeal to the "learned" to get involved, to "say something," and to share their learning about how to bring about progress, appeared in the Iranian state newspaper, *Ettela`,* published in Tehran. It was an attempt by the newspaper to present itself as a forum that could reflect the opinions of its intended audience, and thus to gain their trust. *Ettela`* further claimed that it was free from "all official constraints" and that it would publish any article that was sent in to the newspaper as long as "it was useful to the nation and did not defy religion and state." The evidence suggests that readers were skeptical about *Ettela`*'s appeals, yet *Ettela`* persisted and would repeat its appeal periodically. That *Ettela`* repeatedly solicited reader contributions was paradoxical in a number of ways. First, it was a departure from past practice in Iran. When the first government newspaper, *Vaqaye`-e Ettefaqiyeh*, for example, began publication in 1851, its explicit aim had been to inform the "inhabitants of the domains of Persia (mamalek-e Iran)" of the decrees of state. In subsequent years, when *Vaqaye`-e Ettefaqiyeh* went through a number of reincarnations in terms of name, style, and patronage, and by the mid-1860s became one of four official newspapers, there was no evidence of any concern with winning a reading public. After all, a readership for these newspapers was ensured as a result of a requirement that all government employees and officials subscribe to at least three of the four newspapers. Those found to have been noncompliant were penalized by having to forego the equivalent of the cost of subscription from their government salaries. Secondly, the founder and publisher of *Ettela`* was Mirza Mohammad Hasan Khan E`temad al-Saltaneh. He was not only a confidant of the shah and in charge of the Ministry of Publications, a government office that had the task of overseeing all the material that was to appear in the state-sponsored newspapers prior to publication at this time, but a few years later, in order to ingratiate himself with the shah, and inspired by the censorship laws in Europe, he would launch Iran's first bureau of censorship. So why did a state-sponsored newspaper like *Ettela`* suddenly see it as necessary to engage a readership and why was this important?



KASHKUL (NOVEMBER 23, 1907)

The above cartoon, from an issue of the Persian newspaper *Kashkul* published in 1907, a time of low literacy across Iran, depicts a man reading a newspaper aloud to those around him. He says, "Listen carefully! It is *Neda-ye Vatan* newspaper that says 'the country is in danger.' Come, think! Time is short!" The people reply, "We are ready with all our hearts!"

ETTELA` AKHTAR

Ettela` was first published in Tehran in 1881. *Akhtar*, a Persian-language newspaper, was first published in Istanbul in 1876.

From the 1870s onward, the world in which Iran found itself was increasingly interconnected. Not only had the introduction of new communication networks such as the telegraph helped to expose the towns and the cities of Iran progressively to the wider world, but in the domain of print-culture, too, the state-run press could no longer pretend to constitute the only source of news within the country. A range of European newspapers had become available, at least in some elite circles. More importantly, Persian-language newspapers published outside the country had begun to appear and to gain a following among broader segments of the population in Iran. In due course, these expatriate newspapers, published in Istanbul, London, Calcutta, Cairo, and Baku, would represent an independent press that went beyond the reach of Qajar court censors, raising political consciousness and providing a forum for the discussion of new ideas.

By the early 1880s, when *Ettela`* made its public appeal, the first Persian-language expatriate newspaper had begun publication. Titled *Akhtar*, this newspaper had first appeared in 1876 in Istanbul, and in less than ten years, had gained the trust of quite a few readers in Iran. Although *Akhtar* was not particularly radical in tone, it had struck a chord because in addition to translating and publishing articles from the foreign press that were critical of the Iranian government, it invited contributions and/or letters from readers both inside and outside Iran. According to one contemporary, Yahya Dawlatabadi, *Akhtar* had caught people's attention because it published articles sent from Iran, especially from those who were dissatisfied with the state of Iran's government. While in most cases, these articles were published anonymously, rumors often attributed them to reform-minded officials within court circles. This development both incurred the shah's wrath and also undermined his grip on power. In short, the new reality that what was published in Istanbul could now be read and discussed in Iran meant that not only was the state no longer in control of the dissemination of information, but also that it could not remain impervious to public opinion.

Ettela`* was thus a response to *Akhtar*, both as a means to project a more favorable image of the country and also to provide an alternative forum to answer the allegations made by *Akhtar.* However, in order to succeed, *Ettela` had to try to win over a readership that would otherwise have been drawn to expatriate publications such as *Akhtar. Ettela`*, therefore, saw itself in competition with *Akhtar.* As a result, it had to make sure that it took measures to retain its subscribers. It thus made a point of publishing on time and encouraged its readers to write in, stating that it would publish "letters or contributions about anyone or any place, providing news of misdeeds and wrongdoings of any official … without revealing the name of the writer." *Ettela`*, in addition, changed its look from lithograph to type, both so as to make it easier to read and also to be on par with the "best newspapers in Istanbul and Europe." This element of rivalry was not lost on readers; on a number of occasions, when critical letters were sent to *Ettela`*, they were accompanied by taunts that if the letter did not get published in *Ettela`*, it would be sent to *Akhtar* with the next post. Conversely, at times, when contributions were not accepted by *Akhtar*, they were published in *Ettela`*.

Ettela`*, in short, was proof of the changing times in the 1880s; *Ettela`, after all, represented the first instance of a state newspaper giving recognition to the fact that it was the reading public that ultimately legitimized and made a newspaper viable. By appealing to readers, even if they were limited to an imagined circle of the educated and the well-to-do, and projecting itself as a forum for the expression of ideas, *Ettela`* had given expression to the idea of a public, and to the newspaper as a public space where there could be limited exchange. While *Ettela`* never gained the popularity or indeed the trust that it sought among readers, it had started a conversation within Iran about what constituted a newspaper culture. At the same time, a view had gained ground among the reform-minded in Iran that a literate public was the key to a prosperous country, and that learning in general and the printed word, in particular, could bring about progress. Newspapers were thus said to open "the eyes and the ears of the people" and make them aware of the wider world and the times that they lived in. Therefore, when by the turn of the century, a seemingly lax political climate that followed the accession of a new king in 1896 led to some optimism about the possibility of change and the power of newspapers to bring this about, privately-owned newspapers began to appear in Iran. While these newspapers were subject to censorship, and restricted in what they could print, they could not remain impervious to either the goings-on in the world or the element of competition from new newspapers, whether published outside or inside the country. Moreover, in order to ensure that they were relevant, these new newspapers had to win over, if not entirely create, a reading public. It was in this context that questions of affordability and accessibility to a broader public that also included the less educated became issues of concern for newspapers in a way that they had never before. ■

1 *Ettela`*, no. 30, 19 March 1882, p. 4.

Negin Nabavi, Elizabeth and J. Richardson Dilworth Fellow and Member (2016) in the School of Historical Studies, explores the shaping of publics and public spheres in the context of late nineteenth- and early twentieth-century Iran. Nabavi is Associate Professor of History at Montclair State University.

Going Against History?

Illicit love and intermarriage

BY ANN MCGRATH

When leading church elders posted the wedding banns on the church doors in Cornwall, Connecticut, in the summer of 1825, all hell broke loose. The banns proclaimed that Harriett Gold, a nineteen-year-old white woman, was to marry Elias Boudinot, a young Cherokee man and a recent graduate of the town's Foreign Mission School.

Born Gallegina Uwatie, or Buck Watie, Elias had already crossed the boundaries of nations. He took his new name out of respect for Elias Boudinot (1740–1821), the School patron and congressional statesman of New Jersey, whom he had met on the journey from his native Georgia to Cornwall. The original Boudinot had married Hannah Stockton, whose Princeton family had bought their land from William Penn and whose brother was one of the signers of the Declaration of Independence. A trustee of the College of New Jersey (later Princeton University), Boudinot founded the American Bible Society, a nationalistic effort that included James Fenimore Cooper, author of *The Last of the Mohicans*. His religious tracts expounded theories that the Indians were from the lost tribes of Israel. He also wrote sentimental poems about his beloved wife and the happiness brought by their marriage.

COURTESY OF THE BOUDINOT FAMILY

Locket images of Elias and Harriett, ca. 1826

Boudinot the statesman died before Elias, his Cherokee protégé, went, in the words of his Cornwall patrons, "against history." In the 1820s, intermarriage between "whites" and Native Americans was illegal in several states. Elsewhere, community opprobrium acted as a powerful deterrent. These romances crossed the boundaries of the national imagination. They conflicted with the plans envisaged for the early Republic. In Cornwall, a nativist sense of belonging was starting to displace any thoughts of the prior residency of indigenous peoples. Meanwhile, the Cherokee had constituted themselves as a nation with written laws that in ways mirrored those of the United States.

Due to its respectable citizens and "sober youth," church leaders chose Cornwall as a suitable town for a mission school. In the 1810s and '20s, Pacific Islanders and some Native American men studied there. The School's founders had not anticipated trouble, for surely no white woman would marry an "Indian," let alone leave the United States to emigrate to the imperiled Cherokee Nation.

Back home in New Echota, capital of the Cherokee Nation, Harriett's fiancé received a letter containing a drawing of a gallows. Harriett did not receive any of Elias's letters. Church leaders confiscated what they called their "secret correspondence" and intercepted the others. Despite my extensive searches, the letters seem forever lost.

The townspeople's reactions took on all the color of a Hollywood drama. After Harriett disclosed her marriage plans, her brother Stephen exploded, shouting and screaming so uncontrollably that he had to be locked in a room. Harriett and Stephen had been close, singing, walking, and riding together.

Harriett had always lived in her family home, but she began hiding in the house of a family friend. Looking out of a window toward Cornwall's attractive village green, she wrote that she witnessed a "full prospect of the solemn transactions in our valley."

Gathering all her steel, Harriett described the events. She heard a chorus of youthful squeals, jeering, and rude shouting. Metallic vibrations of the church bell filled the town, tolling and echoing—as they had when her sister died. Harriett looked down at her fine writing paper and breathed in the aroma of the moist black ink. Then she smelled the fresh smoke.

Harriett's brother Stephen and her childhood friends gathered together on the town common to burn effigies of herself and her fiancé Elias in a huge bonfire. Once invited into the church elders' homes to dine, Elias was now rendered nameless—"the Indian," the enemy—a stereotypical cardboard cutout effigy to be thrown into hellfire.

The house in which Harriett wrote overlooked the village green. Too frightened to go out, she spoke of herself in the third person. Harriett loved singing, and Sunday hymns gave her an exhilarating communion with her peers and a way of communicating with God. However, Harriett was no longer permitted to join her choir group. The last time she attended, the girls wore black crepe around their arms—bands used to mourn the dead. In Harriett's words, "the publick," "good people and bad," are not only against her, they wish her dead.

As she wrote, Harriett mustered a sense of moral rectitude, stating what she could hardly describe: "the scenes we have witnessed the week past. Yes, in this Christian land. The members of the Mission School many of them said it was more than they ever knew among the heathen."

The prospect of this marriage tested the boundaries of frontier, of social inclusion, and of colonizer virtue. I will summarize the complex plotline that followed. Harriett's respectable parents Eleanor and Benjamin were rocked. Their other daughters had "married well"—to a colonel, a pastor, and so forth. They opposed the marriage vehemently, sending a letter to Elias refusing his request for their daughter's hand. But when Harriett became very ill, they feared that she would die. Conceding that Harriett had done nothing wrong against law or religion, they saw her illness as a sign that they were going against "God's will." They declared her brother-in-law's accusations that "the milk will spill" and her children will be "black" as caused by "pride and prejudice." Some outside pastors agreed to marry the couple in Cornwall. Protected by supporters, the newlyweds traveled back to the Cherokee Nation under the cover of night.

Elias's family lovingly welcomed Harriett into the Cherokee Nation; the stories of her courage had preceded her arrival. Elias edited the first indigenous newspaper, the *Cherokee Phoenix*, and became an influential political figure. The couple had children that Harriett described as more beautiful than any in New England. The first boy was called William Penn Boudinot.

When Harriett contracted a fatal illness in 1836, Elias lamented the hurt that she still carried. After many months of grieving for her, he announced that he would marry another white woman, their children's schoolteacher, Delight Sargeant.

A few years later, in June 1839, Elias was murdered. Prominent in a push to ensure the Cherokee Nation's political survival, he signed the Treaty of Echota in 1835, which caved in to federal pressure for his Nation to move from their homelands to the "Indian Territories" in the West. Rescinding land without the full consent of the Cherokee Nation was a crime punishable by death. His assailants cut off his right hand—the hand that had signed the treaty. At the same time, another former Cornwall scholar and Cherokee, John Ridge, who had also married a Cornwall girl, and his wealthy and powerful father, The Ridge, were also killed.

Although John Ross, who would become the longest serving Chief of the Nation, was never found culpable, it was common knowledge that people from Ross's faction carried out the assassinations.

One member of the Ridge–Boudinot party, Elias's brother Stand Watie, survived the attacks and planned to retaliate by assassinating Ross. However, Elias's widow, Delight Sargeant, warned Ross of the imminent attack, saving his life.

From the 1820s, the Cherokee Nation enacted various laws to curb intermarriage and prevent white men from marrying Cherokee women. Ross famously railed against intermarriage. On at least two occasions, he prevented family members from marrying outsiders.

Yet, in the 1840s, after the Trail of Tears, when renegotiating treaties with the United States government, Ross himself actively courted white women. When he and the schoolgirl Mary Brian Stapler of Wilmington, Delaware, started a courtship correspondence, it was marked by a self-conscious humor that playfully subverted all the colonizing clichés about such "history-defying" unions.

Despite Ross's trading and transport business and a palatial plantation, they joked about his "wigwam" in the "wilderness" and about Mary as a captive white bride. To one of his friends, he referred to Mary as a "trophy" from the North that he was stealing to take to the wilds of the "West." Engaged in ongoing diplomatic negotiations, Ross quipped about the parallels between contracting a treaty with the United States government and a treaty for marriage.

Although she was a Quaker, Mary took on the role of mistress of his plantation and its slaves. The Society of Friends "unfriended" her for marrying an outsider. Pastor Orson Douglass of the Mariner's church conducted the ceremony in Philadelphia, Pennsylvania. Their wedding party included Ross's nieces and nephews, students at prestigious schools in the East. Dolley Madison, the former First Lady, sent them flowers.

Mary and John had beautiful, dark-eyed children they called Annie and John Junior, and a romantic, loving marriage. When their daughter turned nineteen, Mary reminisced to John, who was still engaged in treaty negotiations: "Well my dear Husband how is thee & they Brother of the Forest Land getting along. I hope the Red & Pale faces will act together as friendly & well, as in the times of my good old Quaker ancestor, William Penn." (June 2, 1864) Mary and John continued to exchange wry remarks about their transnational union. Making light of the fact that their marriage and family were implicated in the making of nations, they knew that both marriage and sovereignty required ongoing performances. In every sense, they both knew that their "illicit love" would play a role in subverting "history." ■

Ann McGrath, Professor of History and Director of the Australian Centre for Indigenous History at Australian National University, finished her book Illicit Love: Interracial Sex and Marriage in the United States and Australia *(University of Nebraska Press, 2015) while the Louise and John Steffens Founders' Circle Member (2013–14) in the School of Social Science. The book has won The New South Wales Premier's 2016 General History Prize and the 2016 John Douglass Kerr Award of Distinction in Researching and Writing.*

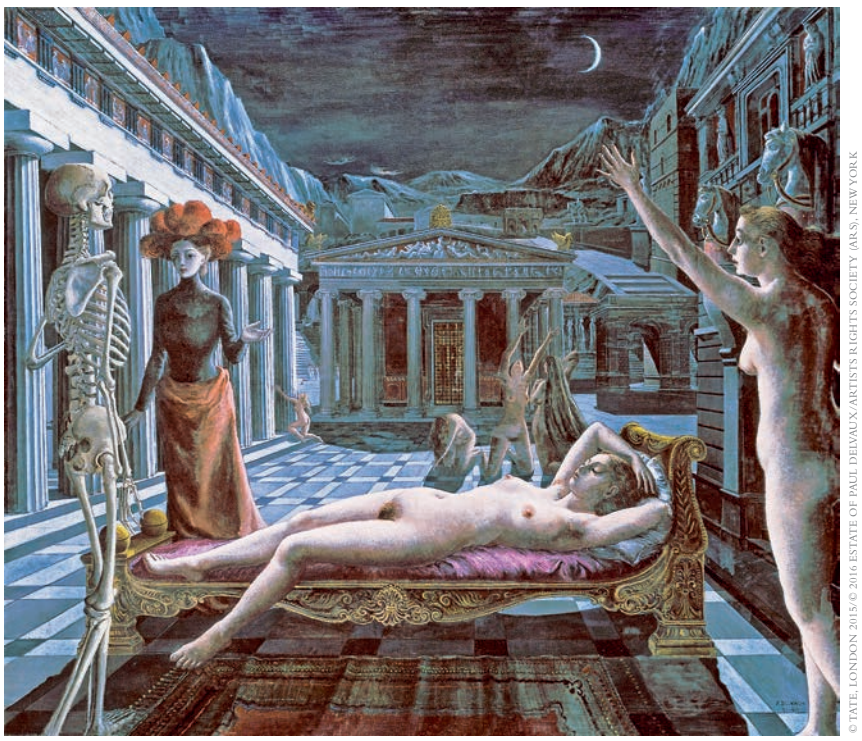
Democracy and the Death of Shame

Examining the politics of shame's alleged decline

BY JILL LOCKE

This is a book about a phenomenon I call *The Lament That Shame Is Dead. The Lament* is a nostalgic story of an imagined past that represents a longing for a mythical place and time when shame secured and regulated social life. It operates as a narrative of civilizational decline that expresses a fear of untethered, autochthonous, self-fashioning and self-authenticating subjects who wreak havoc on the social order and status quo. These subjects are named and disciplined as "shameless" threats who operate with an unfettered and unregulated desire to fulfill their own needs above and beyond any concern for others. They are positioned as lacking reflection, judgement, and regard for others, and characterized as natural forces—rushing rivers and raging seas that need civilization's dikes, levees, and canals to harness their nonreflective and uncivilized urges and passions.

And what do I mean by shame? I understand shame in this context as a *felt* ethic of obligation and regulation that involves an actual or internalized audience that judges one's thoughts and acts in terms of their relationship to norms or standards that one shares (or is expected to share) with others. Shame thus involves a social script, the departure from which occasions a set of negative feelings about oneself—feelings that most people seek to avoid. It is also corporeal—felt as the red on the face and ache in the gut. It is much deeper and more self-lacerating than embarrassment, the transient blush that occurs when one does something (either intentionally or accidentally) outside of particular social expectations. The unzipped pants, the shirt on inside out, the spilled coffee in the meeting, the forgotten lecture notes, the child's unpacked lunch, or for that matter the unexpected public praise and recognition—these are sites of embarrassment that people with relatively stable social standing often experience as fleeting sensations. Contrast this with what Homer's people know: shame often gives a sense that one would *rather die* than have to face it. Because of the felt experience of shame or the fear of feeling it, people act in particular ways to avoid it. And sometimes the feeling of shame or the desire to avoid experiencing it publicly leads to a closing in on the self—a kind of stasis or paralysis that involves wishing one could disappear from the surface of the earth altogether.



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The figures in Paul Delvaux's *Sleeping Venus* (1944) conjure ambivalence about the "death of shame." On the one hand, there is a naked and unashamed female body—Venus, no less—who is at ease. And on the other hand, there is death, Victorian mores cloaked in black as if in mourning, Furies-like supplication by other nude women, and vacant buildings that suggest they used to contain the bustle of activity and politics. The images conjure threat, stasis, and possibility. The stories people tell about democratic politics do much of the same. —*JL*

But I also want to argue that even as shame involves a set of generally agreed-upon psychological and bodily sensations, it has no clear ontology. Rather, shame is discursively and corporeally produced through lamentations about its death, conversations about what it involves, disavowals of its requirements, and tactics of its deployment. That is why shame is not at all *dead* in the moments I explore in this book. Rather, it is generated and enforced through The Lament—the declaration of its fragile, moribund, or decimated status—as well as the unashamed disavowals that name and politicize what shame is invoked to conjure, discipline, and secure.

Accordingly, I focus on preoccupations with "the shameless" or "shame*lessness*" rather than "shame*ful*" behavior. This distinction is significant. Identifying something as "shame*ful*" marks it as a transgression against largely agreed-upon social codes of conduct. The person who commits shameful acts is not a threat to the social order. When we express that something is shameful, we state what we believe is already known: There are certain norms and rules of conduct, a given action falls outside their bounds, the person who commits it knows, and will feel shame—either through hiding or atonement (or both). In fact, the performance of hiding and shame about a particular transgression ultimately shores up the social codes that were breached. The charge of "shamelessness," which is my focus, calls a person, a people, or particular behavior or practices shameless as a way of noting they are outside of the bounds of the agreed-upon social codes rather than in violation of them. With the calling of "shame*less*," the assumption is that the person either does not know (having come from the "wrong" place) or does not care that what she or he does violates agreed-upon codes of conduct. The shameless person flaunts the requirements of shame and is therefore constituted as a threat to the social order.

The Lament That Shame Is Dead, I argue, emerges most pointedly when ordinary people, especially those lacking significant political power and status, resist and refashion the demands of shame and its requirements. It marks as civilization-destroying all political action that self-consciously disavows the terms of shame and reimagines who counts as a citizen and what counts as a civic practice. I argue that The Lament responds to both moments and movements of increased egalitarianism, periods during which ideals about equality extend into the realm deemed "social" and expose the borders between political and personal, public and private as protective cover for the status quo. That is to say, The Lament is preoccupied with what happens when an acceptable level of democratic skepticism toward hierarchy breaks out of the narrow category of formal politics and makes its way into what it deems nonpolitical (i.e., private/familial and social) spheres. The Lament pathologizes these ruptures in the borders among putatively "natural" spheres of personal/social/political by identifying them as evidence that shame—a good upon which all presumably agree as necessary for people to live together—is dead and needs resurrection….

At first glance, The Lament appears to be the wail of royalists, aristocrats, patriarchs, and their sympathizers—the cry of Joseph de Maistre or Edmund Burke as they bemoan rising social equality and the death of *politesse* and *honnêteté*. Indeed, The Lament's most obvious manifestations involve straightforward elite nostalgia for political hegemony and the social order on which it rests. The imperial phrase "beyond the pale," expresses the ideology of The Lament especially well. To call something or someone's behavior "beyond the pale" is to conjure an image of deviance that is moral, aesthetic, and spatial in its characteristics. To be shameless is to be (from) "beyond the pale." It suggests bodies out of order, not in the right place, not behaving in agreed upon ways. And who suffers when someone or something is "beyond the pale?" The entire social order; that is, all who are constituted in relation to "the pale"—the paradigmatic metaphor of the empire, the sphere past which the "uncivilized" cannot cross. These newly or seeking-to-be enfranchised bodies who are struggling for citizenship and political recognition or fighting to preserve the political equality on which their presence turns, do not typically comport with received mores. They look and sound unfamiliar; they act, by definition, inappropriately; they are often too loud; they eat unfamiliar foods; they wear the wrong clothes; they appear to have and live by their own social rules. They are outsiders whose proper place lies "beyond the pale." They are uncivil. They are shameless. The world in which shame is dead is therefore the world *engulfed* by those beyond the pale, de-civilizing the empire and its standards of morality and decency. Given this fear of engulfment, of decivilization, those bodies must be marked as shameless or seen as evidence that "shame is dead." And yet—even with this banishment—they are everywhere, drawn into the fold of the public world in democratic moments. ■

> THE LAMENT THAT SHAME IS DEAD EMERGES MOST POINTEDLY WHEN ORDINARY PEOPLE, ESPECIALLY THOSE LACKING SIGNIFICANT POLITICAL POWER AND STATUS, RESIST AND REFASHION THE DEMANDS OF SHAME AND ITS REQUIREMENTS.

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The Most Wanted Man in China

A journey from scientist to enemy of the state

BY FANG LIZHI

When Fang Lizhi, one of China's most distinguished scientists, began in 1986 to talk to his students about the "universal rights" of human beings, he knew the risks. In those days, the use of the term "rights" in China was highly sensitive, even dangerous, and three years later, Fang would pay the price for his candor. He spent the last twenty-two years of his life in exile from China, but his ideas, on their home turf, were not so easy to stamp out: the concept of "rights" lived on, and it gradually became less perilous to mention the word. In 2003, a "defend rights" movement took root among Chinese lawyers and activists, and by the time of Fang's death in 2012, factory workers, miners, petitioners, and even farmers in small villages had begun to conceive and pursue their interests as "rights." The trend had grown beyond anything China's rulers could reverse. It was a sea change and thus had many causes; no person did it single-handedly, or could have. But if we ask which person, among the many, did the most, the name Fang Lizhi must surely arise.

A brilliant physicist, Fang was recruited out of college to work on Mao Zedong's project to build an atomic bomb. Later he became one the youngest people ever appointed to China's Academy of Sciences. When he began speaking out about human rights, he was already vice president of the prestigious University of Science and Technology of China. It was the highest position from which anyone in China had ever stepped out to be a "dissident." … This book shows how, step by step, it was the axioms of science—skepticism, freedom of inquiry, respect for evidence, the equality of inquiring minds, and the universality of truth—that led Fang toward human rights and to reject dogma of every kind, including, eventually, the dogma of the Chinese Communism that he had idealistically embraced during his youth.—From the foreword by Perry Link, Professor Emeritus of East Asian Studies at Princeton University, who translated Fang's memoir

As of 1985 it was still not entirely safe to write about cosmology. In May of that year, I published an article in the Chinese journal *Science* in which I introduced quantum cosmology and referred in passing to the view that "the universe arose from nothing." In November, when Hu Qiaomu circulated his proposal that I be removed from the Party, he simultaneously wrote a letter to the editors of *Science* stating that Fang Lizhi's ideas on quantum cosmology were non-Marxist "subjective idealism" and advising that the editors publish an article "that took a different view from Fang Lizhi's." (In such contexts, "take a different view from" is a synonym for "denounce.") Science of course thrives on criticism and denials—but it does not welcome political interference. I was a deputy editor of *Science*, and my fellow editors resisted Hu's interference. What the incident did show, however, was that even as late as 1985, top ideologues in China felt entitled to rule with authority in the field of cosmology.

When I shared this story with some colleagues at Princeton, one of them, the possessor of a sly wit, suggested that this great teacher of ideology be invited to the 124th IAU symposium to speak on the topic "Cosmology Today." It was a joke, of course. The great teacher fell well short of the minimum standard for symposium participation. The ABCs of the field were over his head.

Cosmology as a field was hardly alone in this predicament. The problem illustrated a much broader paradox that was hampering China. Almost everyone was strongly in favor of "modernization," seeing it as a goal that the country had been pursuing for more than a century. But at the same time, a modernization phobia was loose in the land, especially in ruling circles. Any noun that followed the word "modern" was automatically suspect: modern cosmology was "objective idealism"; modern physics (quantum mechanics) was "subjective idealism"; modern art was emptiness and decadence; modern music was profligacy and spiritual pollution; modern Western countries were founts of bourgeois iniquity. Modern technology wasn't so bad, and moreover, much of it had been invented in China long ago. The upshot of this line of thinking was that if you wanted modernization, Chinese tradition was the place to look for it.

So, as I saw things from Princeton, the project of getting modern science and civilization accepted in China still seemed urgent. I felt fortunate to have played a role in getting cosmology accepted. I reflected on the fact that three centuries earlier, five of my predecessors at the Beijing Observatory had been executed for attempting to use modern methods of astronomy to figure out calendars. Those pioneers had paid with their lives, and today we were luckier. Still, it was our job to keep diehards like Hu Qiaomu from messing up an IAU symposium.

The IAU meetings in Beijing went smoothly. The forms and procedures of these symposia are always the same, so I needn't review them here. The high point in our case was a banquet, done to the standards of a state dinner, that was held on the evening of August 29 in the State Dinner Room of the Great Hall of the People, next to Tiananmen Square. The Chinese proverb "Money can make ghosts turn millstones" in recent times had acquired a new version: "Money can make the Communist Party turn millstones." This was why we scientists, even though we didn't have any state-level guests, could get state-banquet treatment. We had the money to buy it.

Fang Lizhi at the student-led demonstrations in Tiananmen Square, Beijing, 1989

At the end of the banquet the astronomers—sated, slightly inebriated, and heady with the sense of being national-level guests—virtually floated out of the Great Hall and into Tiananmen Square. The gentle winds of the autumn evening may have magnified the inebriation, because Allan Sandage, a forty-year veteran in the field of cosmology, was led to make the immoderate pronouncement that "this meeting marks the true beginning of observational cosmology." The next day Malcolm Longair, the distinguished British physicist, invoked Sandage's words to open his summary remarks on the meetings, and the line later appeared prominently in the published symposium summary. It had become famous. It seemed to add a new item of glory to Tiananmen's storied history: the great square was now the official birthplace of observational cosmology. ■

Fang Lizhi, Director's Visitor (1991) at the Institute, Member (1986) in the School of Natural Sciences, and Professor of Physics at the University of Arizona until his death in 2012, received the 1989 Robert F. Kennedy Human Rights Award. This article is excerpted from Fang's memoir, which he began writing in October 1989 while he and his wife were in refuge at the residence of the U.S. Ambassador to China after Party leaders blamed him for the Tiananmen Square protests. Excerpted from The Most Wanted Man in China: My Journey from Scientist to Enemy of the State *by Fang Lizhi and translated by Perry Link, published by Henry Holt and Company, LLC.*

In his review of Fang Lizhi's The Most Wanted Man in China *(Henry Holt and Company, 2016) in the* New York Review of Books*, Freeman Dyson, Professor Emeritus in the School of Natural Sciences, writes:*

For the last ten years of his life in China, Fang was often free to travel.… One of the places that he visited during this time was the Institute for Advanced Study in Princeton, where he spent the academic year 1985–86. I got to know him as a scientific colleague at the Institute, and learned much from our conversations about the cosmological problems that he was studying.

During these conversations, he never mentioned the political struggles in China in which he was deeply engaged. I thought of him as a scientist, not as a famous political dissident. That was the way he wanted it. He says in his book that his primary purpose in life was always to do science, with politics as a sideline. He frequently encountered enthusiastic young people who wanted to be full-time political activists and came to him for advice. He always advised them to become professionally qualified in some nonpolitical line of work, so that their political activities would be independent of financial needs. He said emphatically that it was wrong to depend on political activity to pay for groceries. He practiced what he preached. Throughout his life, from his first days as a teaching assistant in China to his last week as a distinguished professor at the University of Arizona, he taught students and gave lectures regularly. He knew that he was an outstanding teacher, and he took great pride in doing the job well. . . .

After he was exiled from China and before he settled permanently in Arizona, Fang came again to the Institute for Advanced Study for the academic year 1991–92. When he came for the second time, everyone knew that he was a famous political dissident, but he still talked mostly about science and not about politics.…

Fang left behind a two-sided heritage, as a leading political dissident and as a leading scientific educator. He always considered his work as an educator to be the more important and more valuable contribution. History has proved him right. During his lifetime, he was more famous as a political dissident. He knew that his impact on the world as an educator would be more lasting and more transformative. As a political dissident, his heritage is to be a role model for a group of rebellious spirits, some of them exiles and others witnesses to the injustices of Chinese society. As a scientist and educator, his heritage is the rebirth of Chinese science as a full partner in the emerging world community of inquiring minds.—*From "The Heritage of a Great Man" by Freeman Dyson,* New York Review of Books*, May 26, 2016, www.nybooks.com/articles/2016/05/26/*

From Dynamics to Contact and Symplectic Topology and Back

Unpacking the information hidden in the notions of energy and action

BY JO NELSON

1. Introduction

Symplectic and contact topology is an active area of mathematics that combines ideas from dynamical systems, analysis, topology, several complex variables, and differential and algebraic geometry. Symplectic and contact structures first arose in the study of *classical mechanical systems*, allowing one to describe the time evolution of both simple and complex systems such as springs, planetary motion and wave propagation [3]. Understanding the evolution and distinguishing transformations of these systems led to the development of global invariants of symplectic and contact manifolds.

The equations of motion in classical mechanics are determined by the notion of a conserved quantity, *energy*. A related quantity is *action*, which is minimized by solutions to the equations of motion. For a closed system, such as the Kepler problem, whose solutions describe paths of planets orbiting the sun, the energy is the sum of the kinetic and potential energy in the system, and the action is given by the (minimized) mean value of kinetic minus potential energy. Symplectic and contact structures emerge as we investigate these systems by unpacking the information hidden in the notions of energy and action.

The position of a particle in a mechanical system is a point $x = (x_1,.., x_n)$ in Euclidean space, and the vector space $\mathbb{R}^n$ defined by these coordinates is called the *configuration space*. The position and momentum of a particle allows us to predict the particle's motion at all future times within a system. The *phase space* of a system is precisely this space that represents all possible states of the system, consisting of both the position and momentum of a particle. In the case that there are n degrees of freedom, the phase space is $\mathbb{R}^{2n}$. The assumption that the trajectories of a particle $x(t)$ minimize an action functional gives rise to a system of n second-order differential equations called the *Euler-Lagrange equations*, discovered in 1808 by Joseph-Louis Lagrange [32].

These equations grew out of Lagrange's observation that the possible elliptic motions of a single planet under the sun's gravitational pull can be described by six real parameters. However, the influence of other planets perturbs this ellipticity. In order to describe the variation, one must study the derivatives of these real parameters. These three equations are extremely complicated, but they can be simplified by introducing *Lagrange brackets*, which are combinations of the derivatives with respect to position and velocity at fixed time. Lagrange then showed that these equations can be transformed into what is now known as a *Hamiltonian system* of six first-order differential equations that conserve energy [33]. At the time, his notion of energy was a "disturbing function," which described the variance from elliptic motion. Moreover, these Lagrange brackets turn out to be the coefficients of humanity's oldest symplectic structure [48].

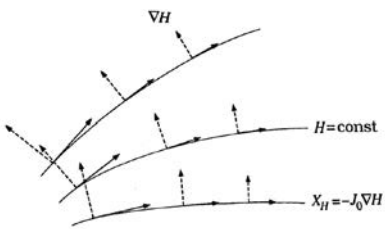


Figure 1: The symplectic gradient X_H [34]

In the mid 1800s, William Rowan Hamilton and Carl Jacobi realized the theoretical consequences of Lagrange's work, in particular that the n Euler-Lagrange equations can be transformed into a Hamiltonian system of $2n$ equations [49]. The Hamiltonian system is governed by the conservation of an energy function, called the Hamiltonian function $H(x,y)$, which defines the *Hamiltonian vector field* X_H. The flow line of this vector field is composed of solutions to Hamilton's equations of motion,

$$\dot{x} = \frac{\partial H}{\partial y}, \quad \dot{y} = -\frac{\partial H}{\partial x}.$$

In the coordinates $z = (x_1, ...x_n, y_1, ...y_n) \in \mathbb{R}^{2n}$ the Hamiltonian system can be written in the form of a system of $2n$ differential equations,

$$J_0\dot{z} = \nabla H(z).$$

where ∇H denotes the gradient of H and J_0 is the $2n \times 2n$ matrix

$$J_0 = \begin{pmatrix} 0 & -\mathbb{1} \\ \mathbb{1} & 0 \end{pmatrix}.$$

The Hamiltonian vector field or *symplectic gradient* of H, seen in Figure 1, is defined by

$$X_H = -J_0\nabla H : \mathbb{R}^{2n} \to \mathbb{R}^{2n},$$

Systems whose Hamiltonian function explicitly depends on time, such as those describing the motion of a charged particle in a time-dependent electric field, use *extended phase space*, which includes the $2n$-phase space plus the time variable. Extended phase space results in the notion of a *contact structure*. In this setting, solutions to equations of motion yield flows of a Hamiltonian-like vector field, called the Reeb vector field.

Contact structures appear naturally in other areas of mathematics and physics, including thermodynamics [2]. In particular, contact geometry allows one to understand geodesic flow on the tangent bundle of a Riemannian manifold. Geodesics are locally the shortest distance between points, where distance is defined in terms of a metric intrinsic to a manifold. An n-dimensional *manifold* is a smooth object that locally looks like $\mathbb{R}^n$.[1] One can interpret a Riemannian manifold as a model for an optical medium, in which case geodesics with respect to the metric correspond to light rays. This in turn yields *Huygens's principle*, which states that every point on a wavefront is a source of wavelets, which spread forward at the same speed.

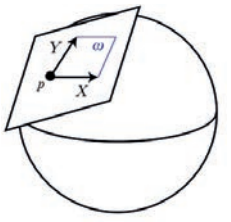


Figure 2: At the infinitesimal level, ω measures oriented area spanned by vectors X and Y at a point p.

2. Symplectic and contact manifolds

To study more general even-dimensional Hamiltonian systems, we need to allow symplectic manifolds to serve as the phase space. In classical mechanics, replacing the standard $2n$-dimensional phase space with a $2n$-manifold results in a canonical *symplectic structure* on the manifold, reflecting the conservation of energy. Formally, a symplectic form ω is a closed nondegenerate 2-form. It allows one to measure two-dimensional areas in a well-defined way, as seen in Figure 2, and as a result forces symplectic manifolds to be even dimensional. Using the symplectic form, one can define the *Hamiltonian vector field*, X_H, on a symplectic manifold by

$$\omega(X_H, \cdot) = dH(\cdot).$$

The name *symplectic* arose in 1939 due to Hermann Weyl, who studied the symplectic linear group. This group manifests itself when one studies the *canonical transformations*[2] of a Hamiltonian system, which are changes of coordinates that preserve Hamilton's equations. Weyl recalls in a footnote on page 165 [50], "The name *complex group* formerly advocated by me in allusion to line complexes, as these are defined by the vanishing of antisymmetric bilinear forms, has become more and more embarrassing through collision with the word *complex*, [a Latin adjective], in the connotation of complex number. I therefore propose to replace it by the corresponding Greek adjective *symplectic*."

Many contact manifolds arise as hypersurfaces or boundaries of symplectic manifolds, and the geometry of contact and symplectic manifolds is closely intertwined. A *contact structure* ξ is a maximally nonintegrable hyperplane distribution. In three dimensions, this means that the planes of ξ twist so much that even locally there is never a surface whose tangent planes are all contained in ξ, which is in contrast to the notion of an integrable hyperplane distribution, seen in Figure 3. An integrable hyperplane distribution is one in which all the planes are given by tangent planes of a submanifold. Any 1-form α whose kernel defines a contact structure is called a *contact form*.

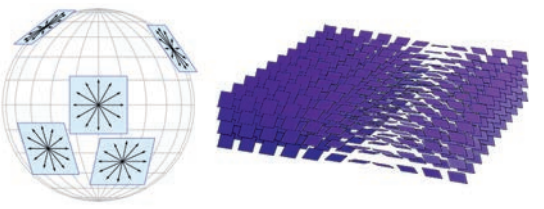
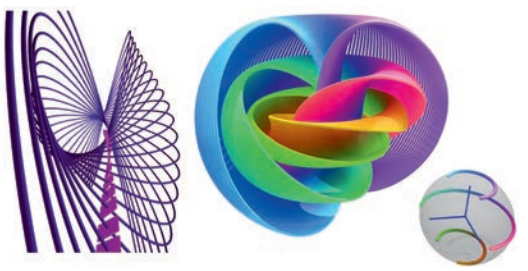


Figure 3: An integrable (right) and contact (left) structure on $\mathbb{R}^3$.

The *Reeb vector field* R_α depends on the choice of contact form α and is defined by

$$\alpha(R_\alpha) = 1, \quad d\alpha(R_\alpha, \cdot) = 0.$$



PATRICK MASSOT (S³); NILES JOHNSON (S²).

Figure 4: The flows of two Reeb vector fields; the right is on S^3 and is parametrized by S^2.

The flow of R_α preserves the form α and hence the contact structure ξ. It can also follow very complex patterns, as in Figure 4.

Moreover, the flows Reeb vector fields of different contact forms defining the same contact structure may have wildly different properties.

An interesting result about symplectic and contact manifolds is Darboux's theorem, which states that locally all contact structures look like the

(Continued on page 15)

kernel of the standard contact form on $\mathbb{R}^{2n+1}$,

$$\xi_0 = \ker \alpha_0 = \ker \left(dz + \sum_{i=1}^{n} x_i dy_i \right),$$

and that locally all symplectic forms look like the standard symplectic form on $\mathbb{R}^{2n}$,

$$\omega_0 = \sum_{i=1}^{n} dx_i dy_i.$$

Hence, there can be no local invariants of symplectic and contact manifolds, a stark contrast to Riemannian geometry where the notion of curvature provides local invariants. In the symplectic realm, the absence of local invariants means that there is an infinite-dimensional group of diffeomorphisms that preserve the symplectic structure and a discrete set of nonequivalent *global* symplectic structures in each cohomology class. Analogously in the contact realm, there is an infinite-dimensional group of diffeomorphisms that preserve the contact structure and a discrete set of nonequivalent global contact structures in each planar homotopy class.

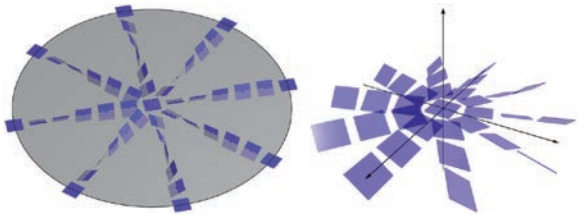
> WHY DID I COME INTO SYMPLECTIC GEOMETRY? I HAD THE FLU AND THE ONLY THING TO READ WAS A COPY OF RABINOWITZ'S PAPER WHERE HE PROVES EXISTENCE OF PERIODIC ORBITS ON STAR-SHAPED ENERGY SURFACES.—*HELMUT HOFER*

The ability to distinguish contact structures in a planar homotopy class is not obvious. One of the first results along these lines is the celebrated theorem of Yakov Eliashberg from 1989 [11], which states that the 3-sphere admits two homotopy classes of contact structures which are homotopic as plane fields but which are not homotopic via contact structures. One of these structures is the *standard structure*, given in cylindrical coordinates $(r, \theta, z) \in \mathbb{R}^3$ by

$$\xi_{std} = \ker \alpha_0 = \ker (dz + r^2 d\theta),$$

and the other is the *overtwisted contact structure*,

$$\xi_{OT} = \ker (\cos r dz + r \sin r d\theta).$$



PATRICK MASSOT (L), OTTO VAN KOERT (R)

Figure 5: The overtwisted (left) and standard (right) contact structure

These are visualized in the $z = 0$-plane in Figure 5. Both ξ_{std} and ξ_{OT} are horizontal along the z-axis and along any ray they both turn counterclockwise as one moves outward from the z-axis. However, the rotation angle of ξ_{std} approaches (but never reaches) $\pi/2$, while the contact planes of ξ_{OT} make infinitely many complete turns .

3. From Rabinowitz to Floer: The evolution of variational methods

A closed orbit of a vector field X on a manifold M is a map,

$$\gamma : \mathbb{R}/T\mathbb{Z} \to M,$$

for some $T > 0$, which satisfies the ordinary differential equation

$$\dot{\gamma}(t) = X(\gamma(t)).$$

One is then led to wonder when a (smooth) vector field X on a closed manifold M admits a closed orbit. For some special three manifolds like the 3-torus, it is easy to construct vector fields with no closed orbit. On the other hand, when M is the 3-sphere, this question turns out to be incredibly difficult and not always possible; see [29] for a brief history.

The *Weinstein conjecture* is one of the most famous questions in regard to the existence of periodic orbits [47]. It originated from work in the 1970s by Alan Weinstein, who demonstrated the existence of periodic orbits on convex compact hypersurfaces in $\mathbb{R}^{2n}$ [46], and Paul Rabinowitz, who demonstrated the existence of periodic orbits on star-shaped hypersurfaces in $\mathbb{R}^{2n}$ [39]–[41]. In reading Rabinowitz's papers, Weinstein realized that there was a simple geometric feature common in the different results, namely what he called *contact type*, which is a special contact hypersurface in a symplectic manifold. Weinstein's realization connected the existence of periodic orbits of Hamiltonian systems to contact geometry, spurring further interest in the study of contact manifolds.

The Weinstein conjecture: Let (M,ξ) be a closed co-oriented contact manifold. Then for any contact form α for ξ the Reeb vector field R_α admits a closed periodic orbit.

At the same time, Rabinowitz's paper [40] had a profound effect on a young graduate student, Helmut Hofer. Helmut reminisced at his sixtieth birthday conference:

> Why did I come into symplectic geometry? I had the flu and the only thing to read was a copy of Rabinowitz's paper where he proves existence of periodic orbits on star-shaped energy surfaces [40]. It turned out to contain a fundamental new idea, which was to study a different action functional for loops in the phase space rather than for Lagrangians in the configuration space.[3] Which, actually, if we look back, led to the variational approach in symplectic and contact topology, which is reincarnated in infinite dimensions in Floer theory and has appeared in every other subsequent approach. The flu turned out to be really good.

This variational approach led to further progress by Claude Viterbo, in 1987, for hypersurfaces of contact type in $\mathbb{R}^{2n}$ [45], which was extended further by Hofer–Viterbo ([23] in 1987), Hofer–Zehnder ([28] in 1988), and Struwe ([43] in 1990).

Meanwhile, the Arnold conjecture haunted the dreams of geometers.

The Arnold conjecture: A symplectomorphism on a closed symplectic manifold that is generated by a time-dependent Hamiltonian vector field should have at least as many fixed points as a function on the manifold must have critical points.

The minimal number of critical points is a topological invariant, which means that it is unchanged under homeomorphisms. Thus, the very flexible topology of the manifold determines qualitative aspects of Hamiltonian flows. In 1983, Charles Conley and Eduard Zehnder proved this conjecture for tori of arbitrary dimension via a finite-dimensional approximation of the symplectic action functional on the loop space [9]. The other affirmative result was due to Eliashberg in 1979, who proved it for closed two-dimensional symplectic manifolds, Riemann surfaces. At this point, the variational methods involving finite-dimensional approximations of the action functional on the loop space stalled.

Fortunately, in 1985, Mikhail Gromov pioneered the study of moduli spaces of pseudoholomorphic curves [21] to prove his celebrated nonsqueezing theorem, demonstrating that symplectic mappings are very different from volume-preserving ones.

The Gromov nonsqueezing theorem: A standard symplectic ball cannot be symplectically embedded into a thin cylinder.

Andreas Floer's subsequent breakthrough was to marry the variational methods of Conley and Zehnder with Gromov's theory of pseudoholomorphic curves, by adapting ideas from Edward Witten's interpretation of Morse theory [51].[4] Floer realized that the gradient trajectories counted in Morse theory didn't need to come from a flow, but instead just needed to satisfy a sufficiently nice partial differential equation with appropriate asymptotics, see [13]–[16]. Gromov's pseudoholomorphic curves are maps between closed Riemann surfaces and symplectic manifolds that satisfy the Cauchy-Riemann equation, a nonlinear elliptic partial differential equation. Floer modified them, studying moduli spaces of noncompact pseudoholomorphic curves perturbed by a Hamiltonian term. These *Floer trajectories* are maps from the cylinder to a symplectic manifold that converge at the ends to 1-periodic solutions of the associated Hamiltonian vector field.

At first, Gromov was skeptical of Floer's ideas.[5] Floer, however, successfully formulated the nonlinear Fredholm theory describing his Floer trajectories as the zero set of an infinite-dimensional bundle, thereby realizing the gradient trajectories of the highly degenerate action functional on the loop space. This led to the creation of what is now called *Floer theory*, an infinite-dimensional extension of Witten's reformulation of Morse theory. Floer used his new theory and its variants to define symplectic invariants [18] and prove the Arnold conjecture in many cases [17].

4. Continuing to hunt for periodic orbits with pseudoholomorphic curves

In 1993, Hofer realized he could study moduli spaces of pseudoholomorphic maps from the complex plane to the symplectization[6] of a contact 3-manifold to prove the Weinstein conjecture for S^3 [22]. However, the study of the moduli spaces of pseudoholomorphic planes is not straightforward due to additional difficulties in establishing compactness and transversality. Clifford Taubes went on to prove the Weinstein conjecture in dimension three in 2007, relying on deep results in Seiberg–Witten theory [44].

(Continued on page 21)

Jo Nelson is a Member (2014–16) and past Visitor (2013–14) in the School of Mathematics. She is interested in the relationships between symplectic and contact homology theories, and is working to provide foundations and computational results. She is an NSF Postdoctoral Fellow at Barnard College, Columbia University.

Volumes of Hyperbolic Link Complements

What is three-dimensional topology? What is hyperbolic geometry? What are the volumes of link complements?

BY IAN AGOL

During the 2015-16 academic year, the School of Mathematics hosted a program on the topic of geometric structures in three dimensions. This article is an adaptation of a talk I gave in fall 2015, as part of the School's biweekly Mathematical Conversations series, designed for a general mathematics audience. Below, I introduce a particular three-dimensional geometric structure, which is ubiquitous in the study of knots and links, and focus on topology in three dimensions, its relation to geometry, and the following questions: What is three-dimensional topology? What is hyperbolic geometry? What are the volumes of link complements?

What is three-dimensional topology?

Topology has its origins in the work of Henri Poincaré, who wanted to study the global structure of solutions to differential equations. Poincaré coined his theory analysis situs, but eventually it became known as the modern theory of topology.

Topology codifies the notion of continuity, meaning the identification of global properties of spaces that do not change under small (local) deformations without cutting or gluing. Two spaces are equivalent if one can be deformed to the other.

Topologists are fond of saying that they cannot distinguish a doughnut from a coffee mug. They call such objects *homeomorphic*, which may be demonstrated by deforming one to the other as if they were made of clay.

However, what about this coffee mug?

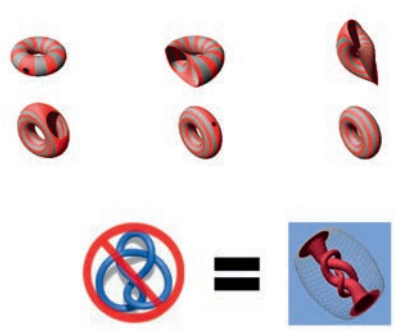
These objects are still intrinsically equivalent (*homeomorphic*), but cannot be deformed one to the other in three-dimensional space. We need a doughnut to sit differently in three-dimensional space.

Topologists call these doughnuts *knots*, referring to closed loops of string.

How do we tell when two doughnuts (or knots) are not equivalent to each other by deformation (*isotopy*)?

A knot complement is what is left when you remove a knot from space. For example, take an inner tube (surface of a doughnut), puncture it with a little hole, and turn it inside out.

What happens if we do this to an inner tube tied in a figure 8? We get a *figure-8 knot complement*.

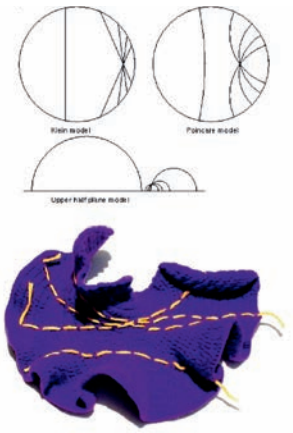


If we can distinguish knot complements (up to homeomorphism), then we can distinguish the knots up to deformation (isotopy). Under a deformation of a knot, the knot complement gets carried along like an aether. The goal of knot theory is to find invariants to distinguish knots up to deformation, so that two knots with different invariants could not possibly be isotopic. I'll discuss one such invariant, which is based on the knot complement.

Cameron Gordon and John Luecke proved in 1989 that two knots with homeomorphic complements are equivalent up to isotopy and taking a mirror image.

It is a bit hard to visualize, but it could a priori be possible that a homeomorphism between two knot complements might not extend over the 3-sphere. There exist such knots in other 3-manifolds, and there exist many links with homeomorphic complements.

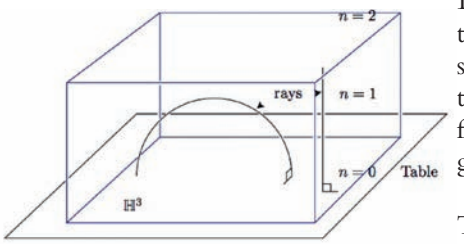
What is hyperbolic geometry?



Non-Euclidean (or *hyperbolic*) geometry was discovered by János Bolyai (1832) and Nikolai Lobachevsky (1830). The shortest distance between two points is a line, but the parallel postulate fails: lines have many parallels (that do not meet). In two dimensions, hyperbolic geometry may be modeled by straight lines in a disk (the Klein model), arcs of circles perpendicular to the boundary of a disk (the Poincaré model), or semicircles perpendicular to the x-axis in the upper half plane.

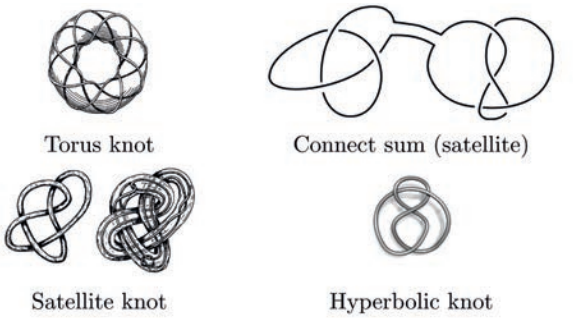
A tactile demonstration of the hyperbolic plane may be crotcheted.

To visualize what is meant by three-dimensional hyperbolic geometry, a rich area of interest for mathematicians and physicists, consider a chunk of glass sitting on a table, such that the speed of light n is proportional to the height above the table. Light will follow a minimal path in the glass, which is a semicircle or line perpendicular to the table surface.



This gives a physical approximation of the upper-half space model of hyperbolic space. Hyperbolic distance is measured in the minimal time it takes for light to get from point a to point b. Light will follow geodesics (the paths of shortest distance).

A fundamental discovery of Bill Thurston in the 1970s is that "most" knot complements admit a geometry modeled on hyperbolic geometry. There is a trichotomy: a knot is either a torus knot (sitting on the surface of a standard doughnut), a satellite knot (made by tying a knot within a knot), or else is hyperbolic.

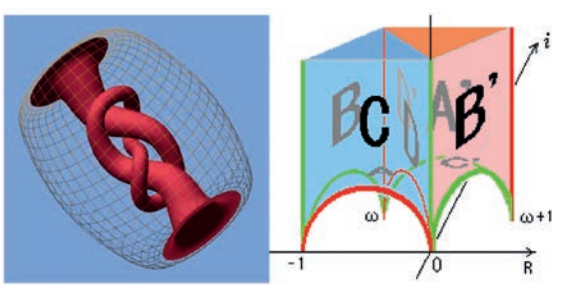


Torus knot — Connect sum (satellite)

Satellite knot — Hyperbolic knot

Hyperbolic volume

A region in the upper-half space has a *hyperbolic volume*, obtained by integrating $1/n^3$ over the region.



The hyperbolic volume of this knot complement = 2.0289.

Thurston's theorem is much more general and applies to links (collections of disjoint knots) as well. Here are some examples of links with hyperbolic complements:

Whitehead link

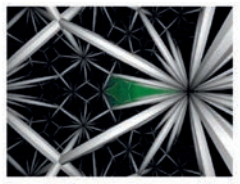
Borromean rings

(Continued on page 17)

A theorem by George Mostow implies that a hyperbolic link admits a unique hyperbolic structure of finite volume. Thus, the hyperbolic structure becomes an invariant of the link complement.

What would it look like to be inside of a space with hyperbolic geometry?

Here is a rendition of the universal cover of the Borromean rings:



This hyperbolic structure has finite volume, the volume of a fundamental domain (see the video *Not Knot*, among the references below, for a visualization of the polyhedron on the right).

The volume is:

$$= 7.3277\ldots = 8 \cdot (1 - \frac{1}{3^2} + \frac{1}{5^2} - \frac{1}{7^2} + \frac{1}{9^2} \cdots) = 8G,$$

where G is known as *Catalan's constant*. It is unknown if this constant is irrational!

The volume is a very powerful invariant of link complements. Thurston and Troels Jørgensen showed that for any given volume, there exists only a finite number of link complements with that volume.

Whitehead link

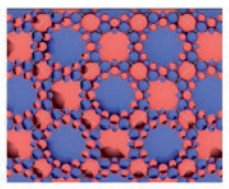
(-2,3,8) pretzel link

For example, these two links both have volume $4G = 3.66$.

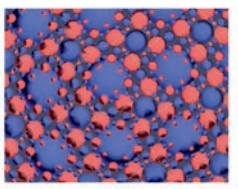
Caveat: There may be many hyperbolic links with homeomorphic complements, and thus the same volume, although it is understood how they can differ.

Even though these two link complements have the same volume, they are not homeomorphic.

There are certain geometrical invariants in the upper-half space model that distinguish them (computed with the program *SnapPy* by Marc Culler and Nathan Dunfield, based on the program *SnapPea* by Jeff Weeks). The links in the previous figure have the same volume, but are distinguished by their *horoball diagrams* (computed by *SnapPea*):

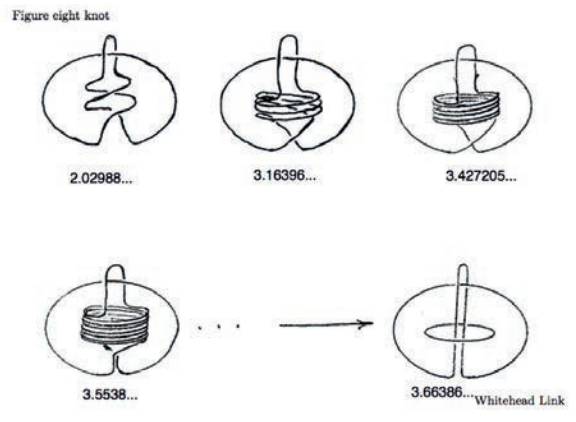


Whitehead link horoball diagram



(-2,3,8) pretzel link horoball diagram

Moreover, volumes are "well-ordered": any decreasing sequence of distinct hyperbolic link volumes is finite (i.e., limits of volumes can only increase). Thus, they are sometimes referred to as the "volume spectrum," by analogy. For example, consider these twist knots:



Their volumes limit to that of the Whitehead link complement.

The smallest link volumes of 1, 2, and 4 components and the second smallest knot volume have been proved to be:

Volume	Proved by / when	link
2.029...	Cao-Meyerhoff 2001	
2.828...	Gabai-Meyerhoff-Milley 2009	and $(-2, 3, 7)$ pretzel
3.663...	Agol 2010	
7.327...	Yoshida 2012	

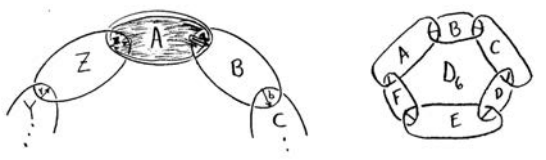
Open questions

The proofs of the first two theorems are computer aided. The proofs of the last two theorems make use of a theorem of A.-Storm-Thurston from 2007, which in turn uses such technology as minimal surfaces and Ricci flow used by Grigori Perelman to solve Thurston's geometrization conjecture and the Poincaré conjecture.

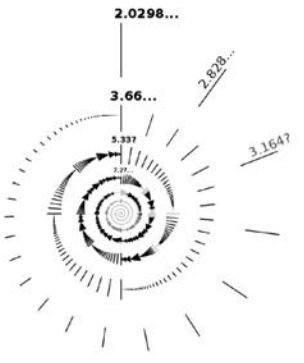
Open question: What is the smallest hyperbolic link complement with three components? Conjecturally it is the 3-chain link with volume = 5.33348.

What is the smallest volume hyperbolic link complement with n components?

In his thesis, Rupert Venzke pointed out that the smallest volume links up to ten components seem to be minimally untwisted chain links. For eleven or more components, he pointed out that these are beaten by cyclic covers of the Whitehead link complement (this was proven by Kaiser-Purcell-Rollins in 2012 for $n \geq 60$, and holds numerically in general).



Conjecture: The minimal volume of an n-component link $\div n \to 4G$. ■



Ian Agol, Distinguished Visiting Professor (2015–16) in the School of Mathematics, led the School's special program on geometric structures on 3-manifolds, with the goal to investigate recent advances connected to such structures and to understand relations between them. Agol, Professor at the University of California, Berkeley, received the 2016 Breakthrough Prize in Mathematics for his contributions to low-dimensional topology and geometric group theory, including work on the solutions of the tameness, virtual Haken, and virtual fibering conjectures.

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census, documented in official data collections, understood to be the source of our cultural richness. Hyphenated designations (African-American, Italian-American, Jewish-American, Muslim-American) signal acceptance of the fact that political and cultural identities can co-exist without damaging the essential unity of the nation. If, as in the current presidential primary season, major fissures have been exposed, these are based more on economic than on ethnic or religious differences. It is vast inequalities of wealth and not communal affiliations that are dividing the electorate and our politicians in the U.S. right now.

"Political Hysteria"

For these reasons, the French obsession with the veil seems to many of us to have taken the form of what Emmanuel Terray diagnosed in 2004 as "political hysteria." The furious rhetoric, dire warnings, and punitive laws directed at articles of women's clothing (hijab, voile intégrale, abaya) seem excessive, if not unreasonable. The warning in 1989 from Alain Finkielkraut, Elisabeth Badinter, and others that failure to ban the hijab in schools would become "the Munich" of the Republic led some of us to wonder how these supposedly serious intellectuals could so overstate their case. In recent days, Laurence Rossignol's comment likening wearing the veil to submitting oneself to slavery elicited a similar response—did she have any idea of the history to which she was referring? And when *Charlie Hebdo* and then the editors of *Libération* warned of the inevitable slippery slope from the veil to terrorist bombings and condemned as "Islamo-gauchistes" those who denounced their conflation of Muslim customs with political Islam, it was hard not to read their texts as exemplifying the very Islamophobia they were so vociferously denying.

The insistence that laïcité requires banning the veil in the name of women's equality is another troubling aspect of the obsession with Muslim women's clothing. Those of us who know something of the history of this term are surprised to find it invoked as a principle of gender equality. That was surely not a consideration for the anti-clericals who coined the term in 1871, nor for the authors of the 1905 law. While the 1905 law requires state neutrality in matters of religion, it says nothing at all about how women should be treated. It is instead "la nouvelle laïcité" (so named by François Baroin in 2003 as the headscarf ban was being debated) that attributes a concern for the equality of women and men to the founding principles of the Republic. It is also la nouvelle laïcité that relocates a requirement of neutrality from the state to its citizens, from state offices and state representatives to all public space and to all inhabitants of that space. La nouvelle laïcité demands that individuals understand that religious neutrality, defined as the absence of all but the most discreet signs of religious affiliation, is a prerequisite for membership in the nation.

From its first usage in 1871 by anti-clerical campaigners, the word laïcité has been a polemical term; then it was aimed at ending the public power of the Catholic Church, now it is used to define a Frenchness that excludes Muslims. Both usages of the term have identified women as a particular danger to the Republic. In the nineteenth and early twentieth centuries, these were French women said to be under the influence of priests; in the twenty-first century, these are Muslim women whose veils signify an unacceptable "defaut d'assimilation," and an aggressive refusal of the equality said to be a hallmark of the Republic. Finkielkraut put it baldly during an interview with the *New York Times*: "Secularism has got to prevail," he insisted. "And we can't compromise on the status of women.… Everything plays out there." (March 12, 2016)

Uncovered Marianne

It is well known that cultural assimilation is a defining characteristic of Frenchness. The goal of representing France as a homogeneous nation is an old one; generations of immigrants have been expected to perfect the language, identify with "nos ancêtres les Gaulois," and declare their primary loyalty to the cultural as well as political aspects of the country. But it is rare that proponents of assimilation have singled out women as the target in the way they have now. Why have women become the object of so much concern? Most terrorists are men; the armies of ISIS are overwhelmingly male. Why have French politicians, notoriously resistant to passing laws about domestic violence, sexual harassment, or equal pay, and (for the most part) actively opposed to implementation of the law on parité—why have these men (with some feminist support) become so concerned about the status of women when it comes to Islam? What does their obsession with the clothing of Muslim women tell us about the anxieties of French Republicans?

Certainly, Republicans are appealing to a long-standing idea of homogeneous Frenchness and to a vision of laïcité in which religion is privatized, a matter of individual conscience not to be publicly displayed. From this perspective, perhaps, Muslim women's dress is seen to more visibly mark their religious affiliation than the clothing of Muslim men. Republicans are also drawing on the remainders of the colonial "civilizing mission" which touted the superior treatment of French women (well before they voted or were free of the restrictions of the Napoleonic Code) to that of "native" women, whose veils then were taken as a sign of erotic enticement, not (as today) of sexual repression. And, too, there is the uncovered Marianne, an idealized symbol of the nation; breast bared she is Delacroix's *Liberty leading the people,* or the icon who sits in the hôtels de ville of many municipalities. In the current polemic, the uncovered Marianne is the embodiment of emancipated French women in contrast to the veiled woman said to be subordinated by Islam.

Recommended Reading: "France's Burkini Debate: About a Bathing Suit and a Country's Peculiar Secularism," James McAuley, *Washington Post,* August 26, 2016: bit.ly/burkini16

"From Bikinis to Burkinis, Regulating What Women Wear," Alissa J. Rubin, *New York Times,* August 27, 2016: bit.ly/burkini2016

Unacknowledged but Persistent Contradiction

But I think there is more to it than that, something that might be called the political unconscious of French republicanism, which is fueling the hysteria around Muslim women's dress. The hysteria we are witnessing stems from an unacknowledged but persistent contradiction within French republicanism between political equality and sexual difference. It may not be the direct motive for Badinter, or for that matter, Manuel Valls, but I think it troubles even their adamant defense of the secular Republic and helps explain the more general obsession with Muslim women and their veils.

THE HYSTERIA WE ARE WITNESSING STEMS FROM AN UNACKNOWLEDGED BUT PERSISTENT CONTRADICTION WITHIN FRENCH REPUBLICANISM BETWEEN POLITICAL EQUALITY AND SEXUAL DIFFERENCE.

The contradiction has been evident since 1789 and did not disappear when women won the vote in 1944. Citizenship in France is based on abstract individualism. The individual is the essential unit, regardless of religion, ethnicity, social position, or occupation. When they are abstracted from these traits, individuals are considered to be the same, that is equal. In the long history of French politics, the one obstacle to sameness has been sexual difference, taken to be a natural distinction and therefore not susceptible to abstraction. Nature has decreed a lack of sameness (an inequality) that society cannot correct. In this view, men can escape their sex, but women cannot. There is then a deep incompatibility between the universal promise of equality in republican political theory and the inequality decreed by nature. Sexual difference does not seem susceptible to republican logic.

When women won the vote, it was as a particular group, not as individuals. In the debates about parité, the position that finally won passage of the law offered the heterosexual couple as a substitute for the singular individual. Sylviane Agasinki argued [for parité and against the PaCS (the law on domestic partnerships) in 1999] that there could be neither same-sex parliaments nor same-sex families. The complementarity of difference substituted for the equality of all individuals. In the éloges to seduction as a trait of French national character complementarity is asymmetrical: women "lovingly consent" to their subordination to men.

The emphasis on the openness of seductive play between women and men, and especially the public display of women's bodies, serves to demonstrate the difference of women and the need for different treatment of them. As such, it denies the problem that sex poses for republican political theory. Paradoxically, the objectification of women's sexuality serves to veil a constitutive contradiction of French republicanism—its inability to reconcile "natural" sexual difference with the promise of equality for all.

Challenging the Republication Theory

Muslim women's dress seems to present a challenge to this view of things, threatening to expose the denied or repressed contradiction of republican theory. Modest dress directly addresses the problems that sex and sexuality pose for social relations and for politics. It declares that sexual relations are off-limits in public places. Some Muslim feminists say this actually liberates them, but whether it does or not, or whether, indeed every woman who dons a veil understands its symbolism in this way, the veil signals the acceptance of sexuality and even its celebration, but only under proper circumstances—that is, in private, within the family. The paradox here is that the veil makes explicit—available for all to see—the rules of public gendered interaction, which declare sexual exchanges out of bounds in public space.

(Continued on page 19)

LIGO *(Continued from page 1)*

inventory of such systems that are known is summarized in Table 1. During the construction of the LIGO detectors, only one type of system was known: NS+NS. The few known examples of this system were sufficient for Sterl Phinney to estimate, in 1991, the required sensitivity of the detectors. LIGO's goal is to detect an NS+NS merger at a distance of 650 million light years (compared to the edge of the observable universe of about 46.5 billion light years away) or equivalently to monitor about one million galaxies to observe a few NS+NS merger events every year. There were no known examples of other types of systems (NS+BH and BH+BH), which would produce stronger gravitational waves as they merge, making any useful predictions by astrophysicists impossible. The ambitious effort to reach the required sensitivity to detect NS+NS mergers was done in stages, with each improvement in sensitivity being tested for a period of time. Long before they reached the required sensitivity to detect an NS+NS merger, the LIGO detectors observed a BH+BH merger at a distance of about one billion light years away. It was impossible to robustly predict this merger that happened one billion years ago, as it was the first time in human history that any evidence for such a system was obtained. Unfortunately, this system no longer exists, as it merged into a single larger BH.

Table 1. Inventory list of potential LIGO sources

Date	NS-NS	NS-BH	BH-BH
7/2/1974	1	0	0
9/13/2015	13	0	0
9/14/2015 09:50:45 UTC	13	0	1
9/14/2015 09:50:46 UTC	13	0	0

Let me try to explain the previous paragraph with a simple analogy. Kay McLigo is a curious girl living on Mulberry Street. In her backyard, there is a Neutrula tree. According to a tale that her mother tells her, a Neutrula tree produces a fruit exactly every one hundred years. Nobody has ever seen this fruit, since a Bar-ba-loot bear eats it the moment it pops. However, the popping of the fruit makes a very low hum (this is how the Bar-ba-loot bears find it), and you may hear it if you listen very carefully. Kay McLigo is a smart girl, so she does not believe everything her mother tells her, and instead she decides to confirm this tale with a simple experiment. She places a microphone in her backyard, and she looks for the hum in her recordings. Unfortunately, the microphone can only record hums in Kay McLigo's own backyard, so she realizes that she would have to wait roughly one hundred years. Since Kay McLigo wants to know the answer much sooner than that, she decides to replace the small microphone with a larger, more sensitive microphone. The larger microphone can also record hums from other Neutrula trees on Mulberry Street, and Kay McLigo estimates that there are about ten such trees, meaning she only has to wait for roughly ten years. Kay McLigo is quite happy with her new instrument (she has no plans of moving out of her parents' house for the next ten years or so). However, after only six months, her microphone records a buzz (not a hum)! Very excited, Kay McLigo tells this to her mother, who has a vague memory of her own mother telling her about invisible trees, known as Blackhula trees. Blackhula trees are similar to Neutrula trees, but the popping of their fruit makes a very low buzz. Eureka! Kay McLigo has made a wonderful discovery, which also allows her to estimate how many invisible Blackhula trees grow on Mulberry Street.

> LONG BEFORE THEY REACHED THE REQUIRED SENSITIVITY TO DETECT A NEUTRON STAR–NEUTRON STAR MERGER, THE LIGO DETECTORS OBSERVED A BLACK HOLE–BLACK HOLE MERGER ABOUT ONE BILLION LIGHT YEARS AWAY. IT WAS THE FIRST TIME IN HUMAN HISTORY THAT ANY EVIDENCE FOR SUCH A SYSTEM WAS OBTAINED.

Returning to LIGO's discovery, some light can be shed on the origin of this BH+BH system. The detected signal allows us to estimate the mass of each BH, as well as the average spin (or rotation) of the BHs. One likely scenario for the origin of this system is two massive stars orbiting each other. Each of these massive stars explodes as a supernova, leaving a BH remnant behind. Before the second star explodes, the system consists of a BH and a massive star. The longer it takes them to orbit each other, the further they are from each other. If we assume that as the massive star explodes the separation between the old and new BHs is roughly the same as the separation between the massive star and the BH, then we can directly calculate how long it would take for the BH+BH system to merge. If they are too far apart, they will not merge within the age of the universe (roughly fourteen billion years). The result of this calculation is that the massive star and the BH complete a full revolution around each other faster than about once per day. The closer they are, the faster it takes the BH+BH system to merge. In a paper[1] that I coauthored with Professor Matias Zaldarriaga, Junior Visiting Professor Juna A. Kollmeier of Carnegie Observatories, and Roni Waldman of Hebrew University, it was shown that the merger time of the BH+BH system must be longer than about 100 million years by exploiting the low observed average spin of the BHs. If the merger time was shorter than this constraint, then the BH and the massive star would have been very close to each other, and in this case, the gravity of the BH would have spun up the massive star using tides, leading to a tidal locking of the massive star. This is similar to the tidal locking between Earth and its moon, in which the spin of the moon is exactly equal to its rotation around Earth (meaning that it takes the moon one month to complete a full revolution around its axis; this is also the reason why only one side of the moon is visible from Earth). The tidal locking of the massive star would make its spin very high, and this would later lead to a high spin of the remnant BH that would contradict the low observed average spin of the BHs. On December 26, 2015, LIGO observed another BH+BH merger, and many more BH+BH systems will be discovered in the upcoming years. With them, much stronger constraints will be placed on the origin of these spectacular systems.

What about the NS+NS systems? Kay McLigo is still looking for a Neutrula tree's hum in her recordings … ■

Doron Kushnir is a John N. Bahcall Fellow and Member (2012–16) in the School of Natural Sciences. His areas of interest include a number of problems within the field of high-energy astrophysics and, in particular, he is supporting the ideas that supernova explosions of type Ia are due to direct collisions of white dwarf stars and that core-collapse supernovae are thermonuclear explosions.

THE VEIL *(Continued from page 18)*

It is this explicit acknowledgment of a problem that French political theory wants to deny that makes the veil "conspicuous" in the sexual sense of that word. Muslim women's dress is a statement about the difficulties that sex presents for public interactions—difficulties French republicans want to deny. Their pious pronouncements about equality are at odds with their deep uneasiness about sharing power with the opposite sex. Seduction is, for them, a preferable alternative.

I don't want to deny the patriarchal aspects of Muslim practices, but nor should we ignore the fact that there is not perfect gender equality in France. Women are objectified in both systems, albeit in different ways. My point here is that the current political hysteria about the veil needs to be understood not as a simple and logical response to terrorism, nor as a principled endorsement of gender equality. It is instead a way of denying existing and persisting inequalities within French society (inequalities that extend from gender to race and ethnicity). These inequalities are not an aberration; they are integral to a political system that makes an abstract sameness the ground for equality and the concrete difference of sex the exception and the justification for an inequality, which because it is "natural," cannot be named as such.

This is perhaps another way of saying that all the attention to the inequality said to be the plight only of Muslim women is a way of denying persistent problems of inequality for French women—different ones to be sure, but inequalities that have not been resolved by law (the vote, changes in the civil code, parité) or other means. To be sure, gender inequality exists in the Anglo-American world as well, but it hasn't taken the form of an obsession with Muslim women and their veils—an obsession that we might characterize as "une singularité française." ■

This article by Joan Wallach Scott, Professor Emerita in the School of Social Science, was first published in the online journal Orient XXI-Infos. *Scott joined the Institute Faculty in 1985, and has challenged the foundations of conventional historical practice, including the nature of historical evidence and historical experience and the role of narrative in the writing of history, from gender and questions of difference to underlying ideological systems.*

Recommended Reading: "Morton White, Philosopher of Holistic Pragmatism, Dies at 99," William Grimes, *New York Times,* June 10, 2016: bit.ly/mortonwhite

out from his specialisms in epistemology and from the narrow language analysis preoccupations of much post–World War II American philosophy, in a way few others could, to write usefully about and contribute with force and insight on a vast range of historical, legal, social, and cultural issues," said Jonathan Israel, Professor Emeritus in the School of Historical Studies at the Institute. "This made him a unique asset in the large and small discussions regularly held in the Institute's School of Historical Studies."

Robbert Dijkgraaf, Director of the Institute and Leon Levy Professor, added, "Morty left a deep and meaningful imprint as a philosopher and intellectual historian, driven by his keen curiosity and intrepid spirit. He will be greatly missed here at the Institute."

INSTITUTE FOR ADVANCED STUDY, SHELBY WHITE AND LEON LEVY ARCHIVES

Morton White in his office at the Institute for Advanced Study, 1980

Born in New York City on April 29, 1917, White was influenced early on by his upbringing on the Lower East Side, where his father, Robert Weisberger, owned a shoe store frequented by neighborhood politicians. The daily exposure to lively exchanges of ideas and commentary inspired White to enroll at the age of fifteen at the City College of New York to study philosophy. After completing his bachelor's degree, White was accepted as a graduate student at Columbia University in 1936, where he obtained his A.M. in 1938 and then his Ph.D. in philosophy in 1942.

At both City College and Columbia, he taught Western intellectual history, and even elementary physics, in addition to philosophy. From 1946–48, White was Assistant Professor at the University of Pennsylvania, after which he moved on to Harvard University, where he was Assistant Professor (1948–50) and subsequently Associate Professor (1950–53) and Professor (1953–70). While at Harvard, White also served as Chairman (1954–57) and Acting Chairman (1967–69) of the Department of Philosophy. He was a Member in the School of Historical Studies at the Institute in 1953–54, 1962–63, and in 1968.

White's first appointment as a Member in 1953 was encouraged by the Institute's then Director J. Robert Oppenheimer, who was seeking a scholar in American intellectual history. Oppenheimer and White had known each other from Harvard and had mutual admiration for each other's work, despite their divergent views on analytic philosophy and related topics. White, in contrast to his philosopher colleagues at Harvard, publicly supported Oppenheimer as an "intellectual force for good" and appreciated the environment that he created for historians at the Institute. In his memoir, *A Philosopher's Story* (The Pennsylvania State University Press, 1999), White remarked, "From the moment I first came to the Institute in 1953, I longed to be there forever. The idyllic surroundings, the conveniently close residential quarters, the company of distinguished colleagues, and ideal working conditions made it seem like an academic heaven." White's three visits as a Member were incredibly productive and enabled work on three books: *Toward Reunion in Philosophy* (Harvard University Press, 1956), which is considered a milestone in analytic philosophy; *Foundations of Historical Knowledge* (Harper & Row, 1965); and *Science and Sentiment in America: Philosophical Thought from Jonathan Edwards to John Dewey* (Oxford University Press, 1972).

IN HIS MEMOIR, *A PHILOSOPHER'S STORY*, WHITE REMARKED, "FROM THE MOMENT I FIRST CAME TO THE INSTITUTE IN 1953, I LONGED TO BE THERE FOREVER. THE IDYLLIC SURROUNDINGS, THE CONVENIENTLY CLOSE RESIDENTIAL QUARTERS, THE COMPANY OF DISTINGUISHED COLLEAGUES, AND IDEAL WORKING CONDITIONS MADE IT SEEM LIKE AN ACADEMIC HEAVEN."

White's influence on the field has been broad and deep through his numerous books, articles, and critical reviews. One of his earliest books, *Social Thought in America: The Revolt Against Formalism* (Viking Press, 1949), spurred a powerful response and dialogue across the field and has since become a classic text in American intellectual history. White assessed the work of John Dewey, Thorstein Veblen, Oliver Wendell Holmes, Jr., Charles A. Beard, and James Harvey Robinson, who collectively opposed formalist and deductive approaches to the study of philosophy, economics, law, politics, and history. In his bold critique of their similarities, White linked their views as "anti-formalist, evolutionary, historically oriented" in the face of their well-known political differences, and simultaneously illuminated understanding of American social thought in the early twentieth century.

On White's influence, Stanley N. Katz, Lecturer with rank of Professor in Public and International Affairs at the Woodrow Wilson School, Princeton University, and President Emeritus of the American Council of Learned Societies, noted, "I am a historian, and for decades Morty seemed to me philosophy's ambassador to history and the humanities. His *Social Thought in America* demonstrated for us as historians the sort of rigor we had seldom employed in writing modern intellectual history. Morty had an uncompromisingly hard-edged analytical style, and, unlike his close friend Isaiah Berlin, took no intellectual prisoners. He held his students (he was a great teacher of philosophy) to his own standards, and they were much the better for it. He was a tough guy intellectually, and certainly one of the major beneficial influences on the humanities in this country and internationally."

White's later books have had a similarly profound impact on the field, stemming from his call for a broadening of the topics traditionally studied by philosophers. In *From a Philosophical Point of View: Selected Studies* (Princeton University Press, 2005), he asserts, "We should use this stock (of fundamental beliefs) not only while reflecting on mathematics and natural science but also while examining other institutions such as politics, art, literature, history, law, education, and religion." Experience and morality, White argued, influence the way we think and cannot be ignored in any sophisticated philosophical study. In his book *The Question of Free Will: A Holistic View* (Princeton University Press, 1993), he notes, "My corporatism differs from the view of some other holists insofar as I hold that moral beliefs may be included in a tested body of beliefs that also includes nonmoral beliefs." In promoting a philosophy of culture, White helped to change fundamental assumptions about what philosophers should study, contributing to a new holistic and all-encompassing definition of the philosopher's mission in life.

The broader philosophy that White compellingly advocated led him to explore a more "practical" way of applying philosophy to institutions present in everyday life, as he noted in *Science and Sentiment in America*: "In the middle of the spectrum, however, between highly specialized epistemologists and great-souled sages, there are philosophers who have their epistemologies all right, but who keep them warm by linking them to reflections on the great disciplines and institutions of civilization." While White maintained a strong philosophical grounding for his arguments, he used this foundation to promote a wider study of culture. In his works on the political philosophy of the American Revolution, White demonstrated how a philosophy of culture functions in practice, and how philosophy of science is most definitely not philosophy enough. In collaboration with his first wife, Lucia Perry White, he explored the theme of anti-urbanism in American thought and the role of the city in relation to societal values and attitudes in *The Intellectual Versus the City: From Thomas Jefferson to Frank Lloyd Wright* (Harvard University Press, 1962). The Whites were greatly influenced by numerous trips to Japan and were among the first Western academics invited there after the Pacific War in 1952; they subsequently made four more trips, the last one in 1979. During these visits, as documented in *Journeys to the Japanese, 1952–1979* (University of British Columbia Press, 1986), the Whites developed close ties with many Japanese intellectuals and their families and were able to observe Japan and Japanese life during a pivotal time.

White's work was acknowledged with many awards, fellowships, and other honors during his lifetime, including the Woodbridge Prize in Philosophy (1943) and the Butler Medal in Philosophy (1961), both from Columbia University. He was a recipient of a Guggenheim Fellowship (1950–51) and was a Fellow at the Center for Advanced Study in Behavioral Sciences at Stanford University (1959–60). He received an honorary L.H.D. degree from the City University of New York in 1975, and was a member of the American Academy of Arts and Sciences, the American Antiquarian Society, the American Council of Learned Societies, and the American Philosophical Society.

White was predeceased by Lucia in 1996, and by his second wife, Helen Starobin White, in 2012. He is survived by his sons, Nicholas of Cologne, Germany, and Stephen of Somerville, Massachusetts, five grandchildren, and two great-grandchildren.—*Christine Ferrara, Director of Communications, cferrara@ias.edu*

During the later '90s, Helmut Hofer, Kris Wysocki, and Eduard Zehnder continued their study of pseudoholomorphic curves in contact geometry, leading to a wealth of new dynamical results. This work led Hofer, together with Eliashberg, to the concept of contact homology. In 2000, constructions of these moduli-based theories looked promising with the advent of a comprehensive *symplectic field theory* announced in [12], a generalization of Floer theory and Gromov–Witten theory [35]. This field theory involves the study of pseudoholomorphic curves from punctured Riemann surfaces to noncompact symplectic manifolds with cylindrical ends.

These curves are still the zero set of an infinite-dimensional bundle, but there is typically a failure of transversality. As a result, one must perturb the zero set describing these curves, using either the ambient geometry or an abstract functional analytic framework. Otherwise, the resulting moduli spaces will not yield well-defined invariants. Hofer, Wysocki, and Zehnder have developed the abstract analytic framework, collectively known as *polyfolds*, to systematically resolve these issues, see [24]–[27], and provide foundations for symplectic field theory.[7] My research, in part joint with Michael Hutchings, makes use of geometric perturbation methods to provide complete foundations for a subset of symplectic field theory known as *cylindrical contact homology*. These geometric methods require additional assumptions on the underlying space, but are preferable for computations and applications [30, 31, 37, 38].

Recent work has shown that the three-body problem can be studied via contact geometry [1, 8, 19]. As a result, the modern methods of pseudoholomorphic curves are expected to give insight into the movement of satellites, allowing one to make predictions about the existence and number of energy-efficient orbits that cannot be found by classical methods [4]. It would then be fitting to conclude with the words of an anonymous, albeit optimistic, symplectic geometer: "The future of contact and symplectic geometry looks so bright that we all have to wear shades." ■

Endnotes

1 For example, the surface of a donut or beach ball is a 2-manifold. If we cut out a small piece of either surface and "zoom in," it would look like a flat sheet of paper (e.g., $\mathbb{R}^2$).

2 Now such isomorphisms are called symplectomorphisms, due to Jean-Marie Souriau's contributions [42].

3 In 1976, Jürgen Moser wrote that this action functional was "certainly not suitable for an existence proof" [36, (1.5)]. Paul Rabinowitz, on the other hand, showed more optimism than his former adviser in 1977 [39, Remark 4.44].

4 This brings to mind the anecdote of how Edward Witten, a physicist, came to develop his unique perspective of Morse theory. Raoul Bott recalls first exposing Witten to Morse theory: "In 1979, I gave some lectures at Cargèse on equivariant Morse theory … to a group of very bright physicists, young and old, most of whom took a rather detached view of the lectures. 'Beautiful and oh so far from Physics,' was Wilson's reaction, I remember. On the other hand, Witten followed the lectures like a hawk, asked questions, and was clearly very interested. I therefore thought I had done a good job indoctrinating him, so that I was rather nonplussed to receive a letter from him some eight months later, starting with the comment, 'Now I finally understand Morse theory!'" [6].

These lectures led to Witten's 1982 paper [51], which used ideas from quantum physics to streamline Morse theory. He recalled the evolution of these ideas in his Commemorative Lecture for the 2014 Kyoto Prize: "Trying to get to the bottom of things, I considered simpler and simpler models, each of which turned out to contain the same puzzle. After pondering this for a long time, I eventually remembered—I think while in a swimming pool in 1981—a lecture that I had heard by Raoul Bott about two years earlier … I am sure that just like me, most of the physicists at that school had never heard of it, and had no idea what it might be good for in physics. And I had probably not heard of Morse theory again until that day in 1981 when—dimly managing to remember part of what Bott had told us—I realized that Morse theory was behind what I had been puzzling over."

5 In 1997, when Mikhael Gromov was awarded the Steele Prize for a Seminal Contribution to Research for his pseudoholomorphic curves, he recalled: "Floer has morsified them [pseudoholomorphic curves] by breaking the symmetry, and I still cannot forgive him for this. (Alas, prejudice does not pay in science.)" [7].

6 The symplectization of $(M, \ker\alpha)$ is $(\mathbb{R} \times M, d(e^t\alpha))$.

7 This development indicates some clairvoyance on the part of George David Birkhoff, who in 1938 indicated his "disturbing secret fear that geometry may ultimately turn out to be no more than the glittering intuitional trappings of analysis" [5]. On the other hand, in 1980, Alan Weinstein noted, "the recent success of symplectic geometric methods in linear partial differential equations suggests that one might need the glitter to find the gold" [49].

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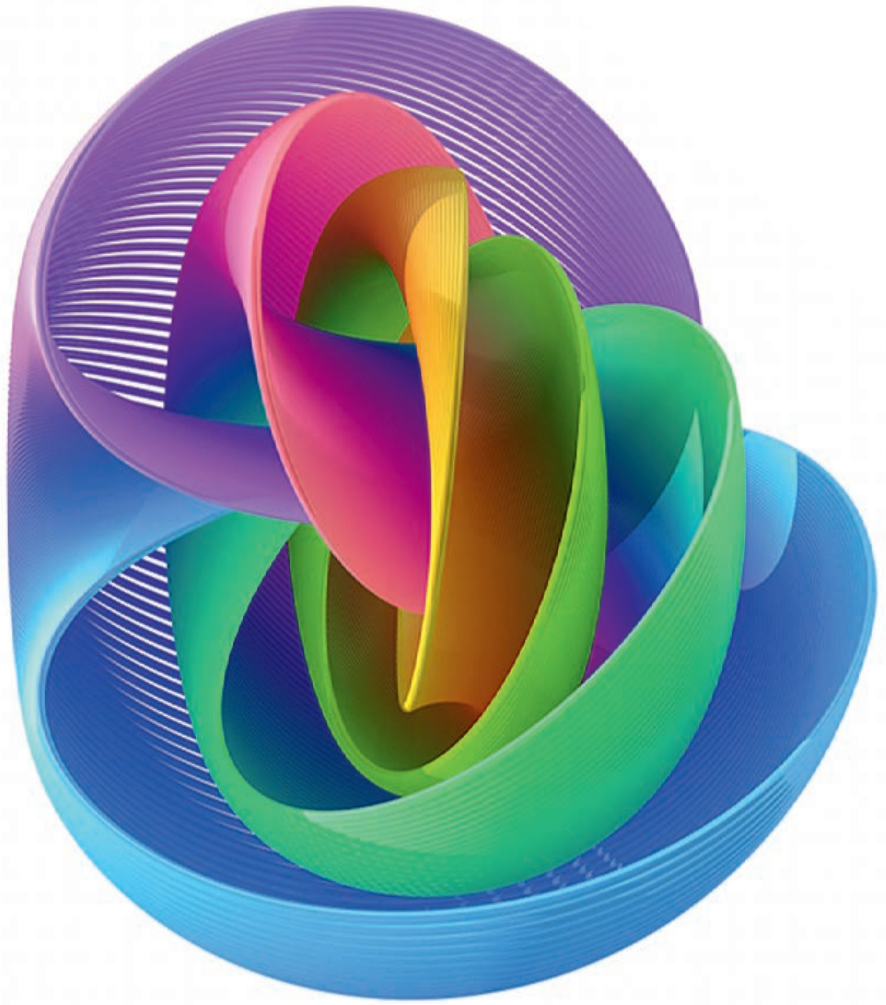

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