

## Promoting Human Rights in China

The costs and risks of fighting for human dignity and freedom



Human rights lawyers Gao Zhisheng, Li Heping, and Teng Biao surrounded by armed police in 2005

BY TENG BIAO

From the Chinese Revolution of 1911 to the May 19 Movement of 1957, from the Xidan Democracy Wall of 1978 to the Democracy Movement in 1989, Chinese people have never ceased in their struggle for democracy. When the Tiananmen Massacre shocked the world, I was

a brainwashed high school student. It was only several years later that I realized I was a survivor of the massacre. In a speech that I gave in 2014 at the June 4 Vigil in Hong Kong's Victoria Park, where around 180,000 people gathered to commemorate the twenty-fifth anniversary of the Tiananmen Massacre, I reflected: "If I had been born two years earlier, I could have been the one overrun by tanks and my mother could have been one of the mothers who had shed all her tears but had been forbidden to speak the truth or to simply commemorate."

In the 1990s, I was studying at Peking University, a leading university for promoting democracy and freedom since the 1910s. I had the opportunity to read some banned books and to meet a few open-minded professors. I gradually realized that I had been deceived for so many years by all of the textbooks, teachers, and Communist Party propaganda. "Think independently!"—I can still remember well how excited I was the first time I heard this sentence from an inspiring

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## Ahmed Almheiri: From the UAE to Firewalls

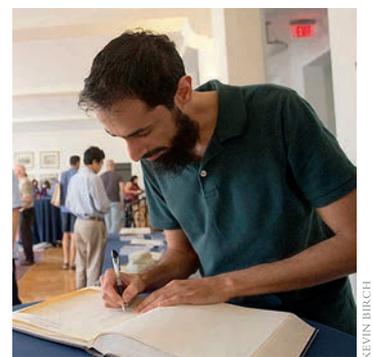
A journey in trying to find the right question to answer

In 2012, Ahmed Almheiri, current Member in the School of Natural Sciences, coauthored a paper that confounded theoretical physicists, sparked attention from the *New York Times* to *Scientific American*, and prompted the organization of workshops and the publication of dozens of papers around the world.

"Black Holes: Complementarity or Firewalls?" by Almheiri, Donald Marolf, Joseph Polchinski, and James Sully (collectively known as AMPS, after their initials) tried to understand how information gets out of a black hole. It was aimed at resolving Stephen Hawking's black hole information paradox of 1974, which showed that black holes will radiate particles, known as Hawking radiation, as they shrink in size, and eventually evaporate completely. In a quantum mechanical world, particles outside of the horizon of a black hole are mutually entangled with particles inside a black hole, meaning the release of Hawking radiation and the evaporation of the black hole would result in a loss of information. This idea, which has flummoxed physicists for more than forty years, violates the accepted rule of unitarity in quantum mechanics, wherein no information is ever lost and it should be possible to evolve backwards to the origins of a black hole and its constituents.

The confusion and debate underscored by the AMPS paper centers around the idea of quantum entanglement (currently used in quantum computing and cryptography) and how information is entangled inside and outside of a black hole and how or whether it is preserved. Einstein called quantum entanglement "spooky

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Ahmed Almheiri, Member in the School of Natural Sciences, signs the Institute Register, a multi-volume collection of signatures from visiting scholars, starting with Albert Einstein in 1933.

## Vladimir Voevodsky 1966–2017

A pioneer and catalyst who laid out a grand vision for the future of mathematics

Vladimir Voevodsky, a truly extraordinary and original mathematician who made remarkable advances in algebraic geometry, and whose most recent work concerned rewriting the foundations of mathematics to make them suitable for computer proof verification, died at age fifty-one on September 30 in Princeton, New Jersey. Voevodsky was Professor in the School of Mathematics at the Institute for Advanced Study, a position he held since 2002.

Voevodsky was able to handle highly abstract ideas to solve concrete mathematical problems. He had a deep understanding of classical homotopy theory, where the objects considered are flexible, meaning continuous deformations are neglected, and was able to transpose its methods in the very rigid world of algebraic geometry. This enabled him to construct new cohomology theories for algebraic varieties, which he used to prove the Milnor and Bloch-Kato conjectures, relating K-theory groups of



Professor Vladimir Voevodsky gives a talk on inconsistencies in mathematics during the Institute's eightieth anniversary celebration in 2010.

fields and Galois cohomology.

"When I first saw the basic definitions in motivic cohomology I thought, 'This is much too naïve to possibly work,'" said Pierre Deligne, Professor Emeritus in the School of Mathematics. "I was wrong, and Voevodsky, starting from those 'naïve' ideas, has given us extremely powerful tools."

More recently, Voevodsky had worked in type-theoretic formalizations of mathematics and automated proof verification. He was working on new foundations of mathematics based on homotopy-theoretic semantics of Martin-Löf type theories. This led him to introduce a new, very interesting "univalence" axiom.

"Vladimir was a beloved colleague whose contributions to mathematics have challenged and enriched the field in deep and lasting ways," said Robbert Dijkgraaf, IAS

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# News of the Institute Community

NIMA ARKANI-HAMED, Professor in the School of Natural Sciences, along with six former Members, has been elected to the National Academy of Sciences.

YVE-ALAIN BOIS, Professor in the School of Historical Studies, has coauthored *Ed Ruscha: Extremes and In-betweens* (Rizzoli, 2017), *Fred Sandback: Vertical Constructions* (David Zwirner Books, 2017), and *Amy Sillman: The ALL-OVER* (Portikus/Dancing Foxes Press, 2017).

DIDIER FASSIN, James D. Wolfensohn Professor in the School of Social Science, has authored *Le Monde à l'épreuve de l'asile. Essai d'anthropologie critique* (Société d'ethnologie, 2017) and *Das Leben. Eine Kritische Gebrauchsanweisung* (Suhrkamp Verlag, 2017). He is also the editor of *If Truth Be Told: The Politics of Public Ethnography* (Duke University Press, 2017).

JONATHAN HASLAM, George F. Kennan Professor in the School of Historical Studies, has launched a new blog, [www.throughrussianeyes.com](http://www.throughrussianeyes.com), which captures aspects of Russian affairs that are not covered in the mainstream media.

Oxford University Press has published *Lectures on Geometry* (2017), a collection of papers based on lectures by HELMUT HOFER, Professor in the School of Mathematics, EDWARD WITTEN, Charles Simonyi Professor in the School of Natural Sciences, and others.

The American Mathematical Society has published *Applications of Polyfold Theory I: The Polyfolds of Gromov-Witten Theory* (2017), coauthored by HELMUT HOFER, Professor in the School of Mathematics, KRZYZTOF WYSOCKI, Member (2009, 2011–12, 2015) in the School, and EDUARD ZEHNDER, Member in the Schools of Natural Sciences (1972–74, 1979–80) and Mathematics (2001, 2009, 2011–12, 2012–13).

SABINE SCHMIDTKE, Professor in the School of Historical Studies, has been elected to the American Philosophical Society, along with Institute Trustee LORRAINE DASTON and two former Trustees. Schmidtke has also been nominated as a member of the Accademia Ambrosiana in Milan.

GLEN W. BOWERSOCK, Professor Emeritus in the School of Historical Studies, has authored *The Crucible of Islam* (Harvard University Press, 2017).

CAROLINE WALKER BYNUM, Professor Emerita in the School of Historical Studies, along with three former Members, has been elected to the British Academy as a Corresponding Fellow.

JONATHAN ISRAEL, Professor Emeritus in the School of Historical Studies, has authored *The Expanding Blaze: How the American Revolution Ignited the World, 1775–1848* (Princeton University Press, 2017).

Cold Spring Harbor Laboratory Press has published *The p53 Protein: From Cell Regulation to Cancer* (2016), coedited by ARNOLD J. LEVINE, Professor Emeritus in the Simons Center for Systems Biology.

PETER PARET, Professor Emeritus in the School of Historical Studies, has received the 2017 Pritzker Military Museum & Library Literature Award for Lifetime Achievement in Military Writing. Additionally, an expanded edition of his most recent book, *Clausewitz in His Time*, has been published in Germany.

JOAN WALLACH SCOTT, Professor Emerita in the School of Social Science, has authored *Sex and Secularism* (Princeton University Press, 2017). Additionally, Éditions Amsterdam has published *La Politique du Voile* (2017), a French translation of Scott's *The Politics of the Veil* (2007).

The American Mathematical Society has published *Finite Simple Groups: Thirty Years of the Atlas and Beyond*, coedited by MANJUL BHARGAVA, Institute Trustee and Member (2001–02) in the School of Mathematics, ROBERT GURALNICK, Member (2005–06) and Visitor (2008, 2012–13, 2015) in the School, and others.

Institute Trustee NARAYANA MURTHY has been awarded the 2017 Thomas Jefferson Foundation Medal in Global Innovation.

SANDRA E. PETERSON, Trustee of the Institute, has received the Corporate Citizenship Award from the Committee for Economic Development.

SHELBY WHITE, Vice Chair of the Institute's Board of Trustees, and JAMES D. WOLFENSOHN, Chair Emeritus of the Board, have each received the 2017 Carnegie Medal of Philanthropy.

ADRIAN HAMERS, current Member in the School of Natural Sciences, and MORGAN MACLEOD, Member (2016–17) in the School, have each been awarded inaugural IAU Ph.D. Prizes from the International Astronomical Union.

JUNE HUH, Visiting Professor in the School of Mathematics, has received the 2017 Blavatnik Regional Award for Young Scientists. DOUGLAS STANFORD, current long-term Member in the School of Natural Sciences, is recognized as a finalist for the award for his work on quantum gravity and chaos.

JOHN LARDAS MODERN, current Member in the School of Social Science, has been awarded a 2017 Frederick Burkhardt Residential Fellowships for Recently Tenured Scholars by the American Council of Learned Societies.

RASHID SUNYAEV, Maureen and John Hendricks Distinguished Visiting Professor in the School of Natural Sciences and Director of the Max Planck Institute for Astrophysics, has received the State Prize of the Russian Federation in Science and Technology.

SUBO DONG, Member (2009–13) in the School of Natural Sciences, has been awarded the Su-Shu Huang Prize of the Chinese Astronomical Society.

The Royal Society of Canada has awarded the 2017 Kitty Newman Memorial Award to ANVER EMON, Member (2014–15) in the School of Social Science. Emon has also been named to the Society's College of New Scholars, Artists, and Scientists.

SHARON GERSTEL, Member (2010–11) in the School of Historical Studies, has been awarded the Maria Theocharis Prize by the Christian Archaeological Society in Greece for her book *Rural Lives and Landscapes in Late Byzantium: Art, Archaeology, and Ethnography* (Cambridge University Press, 2015), which she completed during her time at the Institute.

JAEJUN KIM, Member (2016–17) in the School of Social Science, has been awarded the 2017 Thomas and Znaniecki Distinguished Book Award and the 2017 Book Award on Asia/Transnational by the American Sociological Association for *Contested Embrace: Transborder Membership Politics in Twentieth-Century Korea* (Stanford University Press, 2016).

The 2017 Shaw Prize in Mathematical Sciences has been awarded to JÁNOS KOLLÁR, Member (1986, 2014–15) in the School of Mathematics, and CLAIRE VOISIN, Distinguished Visiting Professor (2014–15) in the School. The 2017 Shaw Prize in Astronomy has been awarded to SIMON D. M. WHITE, Visitor (1982) in the School of Natural Sciences.

ANN MCGRATH, Member (2013–14) in the School of Social Science, has been appointed a Member of the Order of Australia.

DAVID PIETZ, Member (2011–12) in the School of Historical Studies, has been awarded the 2016 Cecil B. Currey Book Award from the Association of Global South Studies for *The Yellow River: The Problem of Water in Modern China* (Harvard University Press, 2015). The manuscript was written during his tenure at the Institute.

PETER REDFIELD, Member (2016–17) in the School of Social Science, has been named President of the Society for Cultural Anthropology.

ELS ROSE, Member (2015) in the School of Historical Studies, has received the 2016 Vici Prize from the Netherlands Organization for Scientific Research.

TRACY SLATYER, Member (2010–13) in the School of Natural Sciences, has been awarded the 2017 Henry Primakoff Award for Early-Career Particle Physics by the American Physical Society and the inaugural Future of Science Award from the MIT School of Science.

CÉDRIC VILLANI, Member (2009) in the School of Mathematics, has been elected to the French National Assembly.

SITTA VON REDEN, Member (2013–14) in the School of Historical Studies, has been awarded the Advanced Grant from the European Research Council for "Beyond the Silk Road," an international, multidisciplinary research project she developed at the Institute.

ITTAI WEINRYB, Member (2012–13) in the School of Historical Studies, has been awarded the 2017 Book Prize from the International Center of Medieval Art for *The Bronze Object in the Middle Ages* (Cambridge University Press, 2016), which he completed at the Institute.

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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](mailto:kdthomas@ias.edu) or by telephone at (609) 734-8091.

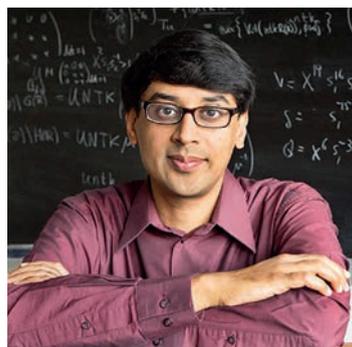
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Articles from issues of the *Institute Letter* are available online at [www.ias.edu/ideas](http://www.ias.edu/ideas).

To receive monthly updates on Institute events, videos, and other news by email, subscribe to *IAS eNews* at [www.ias.edu/enews](http://www.ias.edu/enews).

## Manjul Bhargava and Christopher A. Cole Appointed to Board of Trustees

The Institute for Advanced Study has appointed Manjul Bhargava and Christopher A. Cole to its Board of Trustees, effective May 6, 2017.



Manjul Bhargava

Manjul Bhargava, R. Brandon Fradd Professor of Mathematics at Princeton University and Member (2001–02) in the Institute's School of Mathematics, is a leading scholar in number theory with interests in combinatorics and representation theory. Bhargava was awarded the prestigious Fields Medal in 2014 for developing powerful new methods in the geometry of numbers. In addition to the Fields Medal, Bhargava has earned many accolades for his contributions to the field, including the Infosys Prize (2012), the Fermat Prize (2011), and the American Mathematical Society's Cole

Prize (2008). Additionally, he has received honorary doctorates from the University of Toronto (2016), Bates College (2015), and the Indian Institute of Technology Madras (2015). He is a Foreign Fellow of the Indian National Science Academy and a member of both the National Academy of Sciences and the American Academy of Arts and Sciences. Prior to his position at Princeton University, Bhargava held visiting positions at the Mathematical Science Research Institute in Berkeley and Harvard University. He earned his Ph.D. from Princeton in 2001. Bhargava has been nominated by the School of Mathematics and succeeds Benedict Gross.



Christopher A. Cole

Christopher A. Cole is the founder and Chairman of Ardea Partners, an independent investment banking advisory firm based in New York, London, and Princeton. Previously, Cole served for thirty years at Goldman Sachs, most recently as Chairman of Investment Banking, where he served on the Firm's Management Committee and Finance Committee. Cole was also on the Board of ICBC, the largest bank in China, as well as the Board of Trustees at Princeton University. He presently serves on the Board of Trustees of the Environmental Defense Fund. Cole graduated cum laude with a Bachelor of Arts degree in history from Princeton University and also received a Master of Business Administration with distinction from Harvard University. ■

## IAS/Park City Mathematics Institute Receives \$1.25 Million Gift

The IAS/Park City Mathematics Institute (PCMI), an Institute for Advanced Study outreach program of professional development for the entire mathematics community, has received a \$1.25 million gift from a private foundation. This grant, which is a renewal of a \$1 million gift from the same foundation, will support the existing K–12 Teacher Leadership Program, which provides a unique and unparalleled opportunity for American K–12 teachers of mathematics to connect with a diverse community of fellow teachers, students, and researchers of mathematics, and to immerse themselves in targeted activities that help them to become better educators and leaders. The gift will also further extend the reach and impact of the Teacher Leadership Program by providing access to meaningful teacher development at numerous points throughout the year in communities across the United States.

"PCMI touches an incredible number of people, and brings together K–12 teachers, students at all levels, and researchers in a remarkable way," said Rafe Mazzeo, Director of PCMI and Professor at Stanford University. "The Teacher Leadership Program within PCMI provides a strong, mathematically-driven professional development and networking opportunity for teachers. This grant renewal is a strong show of support for what we are doing and will make it possible to continue and increase the reach and effectiveness of the program."

PCMI is supported by the National Science Foundation, Math for America, the Clay Mathematics Institute, and a private foundation.

For more information about the Park City Mathematics Institute, visit <http://pcmi.ias.edu>. ■

## Eric and Wendy Schmidt Support Launch of IAS Program in Theoretical Machine Learning



Visiting Professor Sanjeev Arora (right) leads the Program in Theoretical Machine Learning

A \$2 million donation from Eric and Wendy Schmidt has supported the launch of a Program in Theoretical Machine Learning in the Institute for Advanced Study's School of Mathematics. Eric Schmidt is the Executive Chairman of Google; Wendy Schmidt is President of The Schmidt Family Foundation and Co-Founder of the Schmidt Ocean Institute. The Schmidts have a history of supporting innovation. In 2009, they established the Eric and Wendy Schmidt Transformative Technology Fund at neighboring Princeton University.

This gift launched a three-year program, which began this fall, focused on developing the mathematical underpinnings of machine learning, including unsupervised learning, deep learning, optimization, and statistics. The program also explores connections to neighboring fields, including biology, computer vision, natural language processing, neuroscience, and social science.

Sanjeev Arora of Princeton University, Visiting Professor in the Institute's School of Mathematics, leads the Program in Theoretical Machine Learning. The program includes postdocs and visitors in the School of Mathematics, and will culminate in 2019–20 with a special year focused on theoretical machine learning.

The quest to understand the power and limits of machine learning methods will create a rich source of questions in the field and lead to new collaborations with the Institute's continuing Computer Science and Discrete Math program, which has been led by Avi Wigderson, Herbert H. Maass Professor, since he joined the Faculty in 1999.

"We are grateful to Eric and Wendy for this generous donation, which enables the expansion of computer science research at the Institute and positions us with the most exciting developments in the field," said Wigderson. "Machine learning techniques are finding new applications almost daily and are already transforming society in numerous ways, but these methods, and the resulting technology, are far from well understood, both from efficiency and vulnerability viewpoints. These important issues beg theoretical understanding and guidance."

Foundational work on both theory and practice of computer science has taken place at the Institute from the early days of the field. In 1945, working outside of industry and the rules of academia, a group of engineers and School of Mathematics Professor John von Neumann developed one of the first stored-program computers, whose structure (von Neumann architecture) formed the mathematical basis of computer hardware and software, and strongly influenced the development of modern computing.

"This incredible gift from Eric and Wendy highlights the importance of basic research and supports our endeavors to explore the deepest and most relevant questions about our world," said Robbert Dijkgraaf, Institute Director and Leon Levy Professor. "We are honored to be able to continue the Institute's strong tradition and history of pioneering the fundamental aspects of computer science."

For more information on the Theoretical Machine Learning program, visit [www.math.ias.edu/theoretical\\_machine\\_learning](http://www.math.ias.edu/theoretical_machine_learning). ■

MACHINE  
LEARNING  
TECHNIQUES  
ARE FINDING  
NEW  
APPLICATIONS  
ALMOST DAILY

# A World of Prisons

## An ethnography of the carceral condition

BY DIDIER FASSIN

Presented by its promoters two and a half centuries ago as a moral progress in the administration of punishment, prison has become over the past decades one of the most vexing and unsettling issues in Western societies for both the spectacular increase of its population and the grim reality of its facilities. But while imprisonment is today in most countries the ineluctable reference and the ultimate horizon of the penal system, until recently neither its efficacy in reducing crime nor its adequacy with democratic principles had been seriously discussed beyond some academic circles. The correctional institution has been taken for granted and hardly made visible. An elephant in the room, it has largely been ignored by the public. To take the most extreme example, in the United States, the number of people incarcerated increased more than sevenfold in four decades, reaching the impressive figure of 2.3 million inmates in the early 2010s, which made the country's incarceration rate the highest in the world, yet without provoking a major debate. New laws were constantly passed, imposing new mandatory minimum sentencing and criminalizing new offenses. New facilities were steadily built, involving new private actors and new security measures. An ever-tougher legislation and an expanding correctional system were business as usual in government and these widely popular policies were little questioned. Only in recent years has the problem begun being addressed, in large part because of the colossal share it represents in the states' budgets. The political, moral, and social implications of mass incarceration have remained for the most part in the background.

In fact, what prisons entail involves two separate, albeit related, aspects: penal and correctional—how offenders are punished and how incarceration is conducted. Studying the penal system involves analyzing how problems are socially constructed, how the public emotionally reacts to particular events, how some crimes are deemed serious and others are not, how the executive and the legislator produce norms and laws, how the police use their discretionary power to focus on specific offenses or offenders, how prosecutors and judges decide to indict and sentence certain acts while ignoring others. In the end, it is this entire complex process that leads to filling or emptying prisons, and determines the composition of their population. Studying the correctional system implies examining the infrastructure and functioning of its facilities, the recruitment, training, activity, and supervision of its personnel, the rights and obligations that inmates are supposed to have, the daily interactions among those who are confined and with those who guard them, the formal and informal modes of regulating, settling, and sanctioning the various issues that may arise. Indeed, it is this dense network of material and immaterial elements that defines what life in prison looks like for those who serve a sentence as well as for those who work there.

Both the investigation of the penal chain and the inquiry into the correctional apparatus are indispensable to fully understand the prison system. However, they represent distinct challenges for social scientists since the former, being open, is much more accessible to direct observation and other scientific approaches than the latter, which is, by definition, closed. This explains why most research is carried out on the penal chain while little knowledge is available about the correctional apparatus. This is particularly true in the United States, where an impressive sum of sociological, historical, and legal studies exists on the logics and mechanisms that have led to the phenomenon known as mass incarceration but where what it means to be incarcerated for the millions of individuals who enter prisons and jails each year is hardly studied. Indeed, the Federal Bureau of Prisons, most of the fifty State Departments of Corrections, and the three thousand local jails have maintained a high degree of opacity regarding what goes on in their facilities, restricting both scientific activities and external assessment, and therefore avoiding public or legal accountability about how prisoners are treated. It is much less the case, however, in other countries such as Britain where observational methods and interview techniques have recently produced substantial works on prison.

In France, in contrast, the penal chain and correctional apparatus are

relatively open to outsiders' gaze. The Ministry of Justice, which is in charge of both, has its own small research unit, as does the National School of Prison Administration, and it finances the main public research center in criminology. Social scientists and legal scholars are regularly solicited to conduct surveys on various aspects of the justice and prison systems, notably to evaluate new policies or respond to specific questions, but independently conceived projects can also be granted permission, which has given birth to a growing field of research on justice and prison. *Prison Worlds* is a testimony of this relative opening.

Over four years, I have been able to spend time, day and night, for a total of seven months in the short-stay facility of an important urban area. Such an institution is in principle reserved for pretrial detainees, whose proportion has recently increased to almost one-third of the population, and convicted individuals sentenced to less than two years, although some inmates may remain for five years or more. During my research, I have gradually been authorized and have progressively authorized myself to be present in all parts of the facility and attend all sorts of its activities, from cultural programs to parole board meetings, from disciplinary hearings to the solitary confinement unit. It has logically been more difficult to gain the trust of the prisoners than that of the personnel, and probably also to have sufficient confidence in myself to sit with the former in their cells than to stay with the latter in the walkways. But however fascinating life in such a facility may be and however demanding its observation may become, I have repeatedly tried to step outside, on the one hand to study the everyday work of the justice system in the district criminal court, and on the other hand to examine the considerable body of legal, administrative, and statistical documents on the evolution of punishment practices, in



In an examination of the carceral condition, James D. Wolfensohn Professor Didier Fassin conducted an ethnography in a French short-stay prison over a four-year period.

order to apprehend the processes that have led the prison system to be what it is. The book is thus an attempt to analyze both the penal chain and the correctional apparatus. It aims at characterizing the punitive moment through which French society as many others is going, and at comprehending the carceral condition as it is experienced by those who endure it.

France has today the highest number of prisoners of its history in peacetime. Its incarceration rate is 100 per 100,000 inhabitants, still seven times less than the United States. In the past six decades, there has been more than a threefold increase in the prison population, which has swelled from 20,000 in 1955 to 70,000 in 2016. One could logically imagine the reason for this evolution to be a rise in crime. Such is not the case, however. Although the curve of crime statistics is always difficult to interpret since it is influenced by the way offenses are represented in the public sphere and constituted under the law as well as by the activity of the police and the decisions of the judges, for the most robust data available which also corresponds to the most serious crime, namely homicides, the trend over the past century and a half is clearly of decline, except for a short period in the 1970s when a moderate increase was observed. In fact, the dramatic expansion of the prison population is the consequence of a more severe penal system.

This repressive turn results from two main phenomena. First, new offenses have been criminalized. Driving without a license, for instance, was until the 1990s a rare violation of traffic laws usually sanctioned by a fine. In the following decade, with the creation of a penalty point system and the multiplication of radars on the roads, the number of suspended licenses has skyrocketed, while a 2004 law has made it an offense punishable by a one-year prison sentence. Today, driving with a suspended license is the cause of one new incarceration out of ten. Second, for a given breach of the law, prison sentences have been passed more frequently and for longer periods. Most notably, a 2007 law establishing mandatory minimum sentencing for recidivists has contributed to an increase of 9 percent in prison sentences and 17 percent in time to be served during the following five years. But when one closely examines these statistics, it appears that, paradoxically, the smaller the offense the greater the escalation in harshness. Other factors have also played a role, in particular the growing use of immediate appearance trials, which have a prison sentencing rate twice that of the normal procedure, and the activation of prison sentences for minor offenses perpetrated several years

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earlier for which probation was in progress. In sum, an increase in harshness rather than a rise in crime caused the expansion of the prison population. French society was undergoing a *punitive moment*.

This repressive trend being what it is, two further questions need to be asked. Is it justly allocated? Is it fairly distributed? In other words, are the crimes that cause more damage to society the most severely sanctioned (justice), and is the same offense punished in the same manner across society (fairness)? Ample discussion of these two points is provided in the book, and I will therefore limit the answers to an illustration: drug law violations. In terms of justice, suffice it to say that in the 2000s the number of convictions for use of marijuana has more than tripled, as a result of the establishment of quotas of arrests by the police, while for economic crime it has decreased by one-third, after the introduction of legal measures rendering the indictments for such law infringements more difficult. Few would argue that smoking a substance that is legal in certain countries might be more prejudicial to society than embezzling public money. Currently, in France, imprisonment sentences for drug law violations represent one incarceration out of seven, essentially for possession and resale of cannabis, with one-fourth of these violations corresponding to mere use. In terms of fairness, while epidemiological surveys show that marijuana consumption is widely distributed among the youth, being even slightly more frequent in the middle-class, those

sentenced to imprisonment only belong to disadvantaged groups and ethnoracial minorities. The main reason for this discrepancy is that law enforcement officers concentrate their activity in housing projects rather than around universities and use socioracial profiling to decide whom to stop and search. As a consequence, in French prisons, half of the prisoners are unemployed, half of them declare to have no profession, four out of five have not finished high school, and in the short-stay facility where I conducted my research, three-fourths of the inmates belonged to ethnoracial minorities, being mostly black and Arab men. The unjust and unfair allocation of punishment explains in good part the formidable disparities observed in the French correctional institution. In this respect, it should be noted that the expansion of the prison population with its socioracial component occurred at the very moment when socioeconomic inequalities started to deepen after a long period of contraction and when ethnoracial minorities became the target of stigmatization campaigns from right-wing parties. The penal state has definitely been a way of governing the poor.

With this analysis in mind, it is possible to enter the prison system itself and better apprehend the way it operates. Indeed, it is not enough to wonder how contemporary societies have come to incarcerate so many people with such a disproportionate representation of the most disadvantaged and discriminated categories. One has to ask: what does it imply to be confined in a French prison today? Guards often say that the only thing of which prisoners are deprived is their freedom, and this belief has been at the heart of the very idea of the prison since its inception. Judges even maintain that the so-called incarceration shock may be salutary for the person convicted in the sense that it allows him to realize the consequence of his act. Yet, were freedom the only deprivation endured and the incarceration shock actually salutary, French correctional facilities might not have the highest suicide rate in the European Union, twice that of comparable countries such as Germany or Britain and five times what it was half a century ago. While the reasons for this suicide epidemic are unclear, it suggests that what inmates lack in prison is not just liberty. It is also privacy in their shared cell; an affective and sexual life with the constraints imposed on their rare visitors; the possibility to make decisions on ordinary needs like taking a medicine when in pain; the right to express emotions like anger when facing frustrations. What they are deprived of is their dignity, as they are subjected to body searches, and fair treatment, when they are sanctioned for misdeeds that the administration knows they have not committed. What the incarceration shock implies can be the loss of their job with the anticipated difficulty of finding another one, the disruption of their marital, family, and social life, and the exposition to violent encounters and criminal networks. At the end of the four years I devoted to studying prison life, the most obvious conclusion I could draw was that, contrary to the common idea that the prison system is expanding like an archipelago beyond its walls, something remains irreducible in the *carceral condition*.

For the social scientist, and probably for the public as well, the question that then comes to mind is: what is prison life like under this carceral condition in France? Much of my ethnographic work has been an attempt to provide an answer to this question. Beyond the deprivations and the shock,

beyond the drastic security measures and the harsh conditions of confinement, what is the experience of the prison for both personnel and prisoners? As one gets progressively immersed into the correctional system, whether as a new inmate, a novice officer, or a scholar, one becomes aware of much more complex relationships and arrangements between the multiple agents and within the various contexts than what one could have thought. The imagined total institution appears as a field of forces where the rules are permanently tested, negotiated, and diverted by guards as well as inmates. Of course, these rules are defined by the prison staff; certain officers do misuse them; all ultimately enforce them strictly and even brutally in the event of conflicts. In other words, power is unevenly distributed and some abuse it. Yet, in the daily life of the facility, compromises permanently occur: a shower is authorized although it is not supposed to be, an inmate back from a visit is left for a while in the walkway instead of being locked up, an officer accepts to serve as intermediary to pass unlawfully tobacco or coffee from one cell to another. These adjustments are deemed to contribute to keeping the peace within the prison for the evident benefit of all. But they also reveal the existence, within limits steadily iterated by everyone, of mutual respect acquired through months and years of cohabitation.

The institution plays an important role in the production of this internal order. The threat of sanctions, which affects not only the stay in prison but also the time served and the possibility of parole, definitely counts. However, after having been publicly criticized at the turn of the century, and so as to conform with the European Prison Rules, the correctional system has undergone important transformations, both material and organizational, such as the improvement of the environment in the admissions unit or the presence of a lawyer during disciplinary hearings. A person familiar with the correctional apparatus in the United States would certainly be surprised

to discover that French inmates are incited to vote rather than being disenfranchised, and cannot be submitted to solitary confinement more than thirty days instead of having no maximum duration, whereas reciprocally, an observer of the French prison system would undoubtedly be astounded to learn that in the United States inmates may be shackled or controlled by pepper spray, and guards can beat up a prisoner and even kill him without being sanctioned by their institution or indicted by a prosecutor. National contexts differ. They matter. They influence legal guarantees, institutional regulations, and professional ethos.

Yet, beyond these differences that are certainly crucial for those who spend months or years behind bars, one question is of universal relevance: that of the sense and function of the prison. It can be formulated in philosophical terms but it has to be examined on an empirical basis. A common justification of the prison is utilitarian: it reduces crime via incapacitation, deterrence, and rehabilitation. For short-term sentences, which represent in France the great majority, with four out of five being less than one year, this justification is difficult to argue since studies show that recidivism is higher after an incarceration than when an alternative penalty is given. Indeed, the destructuring of family and professional life is not compensated by efforts towards reinsertion during prison time, the stay being too short to provide useful activities and plan re-entry under supervision. The months spent in prison are experienced as vainly lost: no work, no class, no sports, and no social work undertaken. Imprisonment reveals the naked truth of its sole meaning: the retribution of a wrong as a form of socialized vengeance. However, even if one accepts this justification, according to which the suffering inflicted on the person convicted must be commensurate with the injury to the victim or the damage to society, could one argue that smoking marijuana, driving with a suspended license, even stealing a cellphone is worth being incarcerated for months, even years?

In a time when in France the new president has announced his project to build more correctional facilities and in the United States the new administration requires more severe prison sentencing from federal prosecutors, one cannot not pose the question of the *raison d'être* of a punishment system that aggravates both insecurity and inequality in contemporary society. ■

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 This article is a slightly edited excerpt, including updated statistics, of the preface to the English edition of *Prison Worlds: An Ethnography of the Carceral Condition (Polity, 2016)* by Didier Fassin. An anthropologist, sociologist, and physician, Fassin has been James D. Wolfensohn Professor in the School of Social Science since 2009. His current work is on the theory of punishment, the politics of life, and the public presence of the social sciences.

# Genetics and Identity

Is a regional identity necessarily an ethnic identity?

BY PATRICK J. GEARY

We are probably all familiar with the AncestryDNA advertisement for its genetic testing service in which a man states that he and his family had always thought that they were German. He goes on to explain that he danced in a German dance group and wore lederhosen, until, thanks to AncestryDNA, he found out that, in his words, “We’re not German at all!” Fifty-two percent of his DNA came from Ireland, Wales, and Scotland. Thus, he explains, “I traded in my lederhosen for a kilt.” The ad is amusing and memorable, but it also reflects a disturbing trend in identity politics, namely the assumption that our genetic identity informs our ethnic identity, that it is somehow the essence of who we really are. The implication is that our cultural, social, religious, and political identities are secondary, dependent on our primary genetic identity, and we must bring them into harmony with our “real” selves, which is knowable only through our DNA.

There is nothing wrong or pernicious about having one’s genetic ancestry tested—it can be fun, enlightening, and I am sure that the millions of individuals who have paid for such tests have enjoyed learning about the putative geographic origins of their forbearers. Moreover, advanced genetic tests such as those offered by companies such as 23andMe can even screen for potential susceptibility to genetically transmitted health risks. However, at the same time, promoters of this testing are a bit too eager to equate geographical origin with ethnic origin. As one online advertisement states, “Your AncestryDNA results include information about your ethnicity across twenty-six regions/ethnicities.” But is a regional identity necessarily an ethnic identity?

The Greek term *ethnos*, from which our modern *ethnic* derives, has a long and troubled history. If for Homer a band of comrades or a group of people living and working together might be termed an *ethnos*, the word later came to mean more specifically a nation or a people, although this doesn’t help much since the definition of a people or a nation has always been dependent on cultural and normative rather than biological imperatives. The imagined unity of a people could derive from shared customs, language, a common law, and a belief in a common origin, whether or not this origin was factual. In many regions of the world, groups with very different cultural identities inhabit the same geographical areas, maintaining their group identities by policing their social boundaries by social custom and marriage prohibitions. In spite of this, individuals and families often move across these lines, in time changing their identities, merging with other ethnicities, and eventually even adopting the shared sense of a past that unites these groups.

What, if anything, does this have to do with genetics? Certainly, populations living in one place for generations intermarry with each other, not only increasing their cultural sense of distinctiveness, but also creating, through the generations, certain identifiable genetically transmitted characteristics. Specific variations in the genome, termed alleles, become more common in such groups, although most of these would have no perceptible influence on the appearance or behavior of those who bear them. Other genetic variations that determine body build, hair, skin, and eye color are more evident, while some, such as those that influence the ability of adults to digest milk or to withstand certain diseases, may be even more significant from an adaptive perspective, if less obvious. But no specific set of genetic similarities determines how an individual or group will be identified—what will be seen as essential in classifying members of a group is ultimately culturally determined. Moreover, cultural and political identities can trump genetic origins. Groups that are very similar genetically may hold vastly different and even hostile cultural identities, while people with divergent genetic origins can share a powerful sense of common identity that is the essence of ethnic consciousness.

And, of course, stability is not the rule in most of human history. Individuals and groups move about, in search of new opportunities, in wars of conquest and colonization, or, conversely, fleeing war and famine. As they merge with other populations, they bring new genetic material with the result that genetic admixture is the norm in human societies across the globe.

Migration and admixture can change not only the genetic profile of a region, but the complex and often dramatic act of migration can over time change the self-identity of both the host population and that of the new arrivals. These new identities are not specifically tied to genetic differences. Rather, they result from the introduction of new technologies, cultural traditions, social organizations, and the like, which themselves are changed by new environmental and social circumstances.

This confusion between genetic origin and ethnic identity becomes even more problematic when someone like myself is studying populations in the distant past. Together with an international, interdisciplinary team of geneticists, archaeologists, and historians, we are examining population structures and mobility along the collapsing Danubian frontier of the Roman Empire at the end of antiquity. Our comprehensive genetic analysis of almost all of the individuals buried in the sixth century in a single cemetery in what is now Hungary, for example, shows

two groups clearly differentiated by genetic origins. One group, if plotted on a modern European genetic map (the way AncestryDNA or 23andMe traces someone’s genetic origins today) would plot to somewhere in central Europe. A second, more diffuse group is most similar to the modern-day populations of Italy. A similar, comprehensive examination of an Italian cemetery near Turin that dates from a few decades later shows a similar pattern: a central European group is again present, as is another group that, while not a close match to the southern group in Hungary, still would plot to Italy today. Our archaeological analysis of the two cemeteries shows that the differences between these two groups are not limited to genetic origin. In both cases, the individuals who belong to the central European group are buried with distinctive weapons and jewelry, while the southern burials are much simpler and contain no grave goods. This suggests that we are dealing with two populations that had not only different genetic origins, but also distinctive cultural practices, at least in the burial of their dead. Moreover, using innovative algorithms we have been able to uncover the biological kinship uniting individuals in these two cemeteries. Most of the family groups we identify in both cemeteries (some spanning three generations) are within the central European group, and we see no evidence of intermarriage between the two.

Since the sixth century is the period when, according to written sources, the Longobards or Lombards, a Germanic population, invaded and conquered much of Italy from what is today Hungary, and some archaeologists have associated these cemeteries with Lombards based on grave goods, it is tempting to label the group from central Europe as Lombards. But is this justified? Lombard is, after all, a cultural, not a genetic label. Can we be sure that this population, either in Pannonia or in Italy, would have called themselves Lombards, and would have been recognized as such by their neighbors? It is not so simple. Since at least the fourth century, various Germanic groups had been pressing on the Danubian frontier, at times serving the Roman state and at times attacking and occupying the region. Our sources provide ethnic names for various groups: Rugians, Herules, Suebians, Gepids, as well as Lombards. Their origins, like those in our cemeteries, were likely somewhere in central Europe. Moreover, we read that the Lombards, as they expanded into the region in the early 500s, conquered these other groups as well as the local post-Roman population still inhabiting the area. Presumably, the warriors in these societies were absorbed into the Lombard military that marched into and conquered Italy in the later sixth century. Perhaps our central European population, rather than being the newly arrived Lombards, were remnants of these other Germanic populations that had lived in the region for centuries. Of course, even if that is the case, they might have been absorbed in the Lombard kingdom and thus, in some ways, might have considered themselves, and been considered by others, as Lombards. But while they may have been Lombard according to some criteria—Lombard law, for example, required that a foreigner seeking to enter the authority of the Lombard king had to accept Lombard law—in other respects, they may have continued to hold a different ethnic identity, perhaps in their religion, language, or cultural traditions. Thus the question “Who were they really?” is not one that can be answered through genetic analysis, no matter how detailed.

We can say even less about the two “southern” groups our analyses have discovered. Were they the local, civilian population in the region? Were they the servants or slaves of the militarized society with whom they were buried? How would they have identified themselves? As Romans, as Pannonians, as Italians? And how would that other population have identified them? As peasants? As slaves? Perhaps their fundamental identity would not have been ethnic at all—perhaps their identity was primarily religious—Christian versus pagan, or orthodox versus Arian. Nothing in their DNA can answer these questions.

Our genomic research can tell us a great deal about differences within populations in the past; it illuminates population movements and even suggests coincidences between cultural and biological contours within societies that can help us understand social organization. What it cannot do, just as AncestryDNA cannot do, is inform us about the ways that people in the past identified themselves, that deeply held and powerful conviction, regardless of biology, of who we really are. Nor can it tell us how others might have identified these people in the past. To return to our gentleman in the AncestryDNA commercial, while he may be fascinated by his genetic ancestry, he is no more a Scot than he was a German—whatever his biological origins may be, he is clearly an American, and would be so seen in Edinburgh or in Munich. ■

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*Patrick Geary, Andrew W. Mellon Professor in the School of Historical Studies, studies a vast range of topics in medieval history, both chronologically and conceptually—from religiosity and social memory to language, ethnicity, social structure, and political organization. He is leading a major project that studies the migration of European societies north and south of the Alps through the analysis of ancient DNA in Longobard-era cemeteries in Hungary and in Italy.*

# For a Different History of the Seventh Century C.E.

Syriac sources and Sasanian and Arab-Muslim occupation of the Middle East

BY MURIEL DEBIE

An arcane topic to most people, Syriac sources help shed a more complex light on the history of the Middle East from late antiquity to the Middle Ages. They reveal a non-imperial epoch and its rich contributions to the cultural and religious history of the region.

Although Greek and Latin are familiar to all, Syriac—that form of Aramaic used in Northern Mesopotamia (in Edessa/modern Urfa in southeastern Turkey) as the cultural and religious language of Aramaic speakers—is almost entirely unknown to most, although it was the third major language of Christians (as well as some Jews in Edessa, polytheists, and Manicheans) from the second to the fourteenth century. It is still today the religious and classical language of the Eastern Christians from Turkey, Iran, Syria, Lebanon, Iraq, and southwest India, belonging to a variety of churches (Syrian Orthodox, Assyrian Church of the East, Chaldean, Melkite, and Maronite, to cite only the main ones). Increasingly, it serves as a lingua franca among the diaspora of displaced people fleeing conflicts in the region.

The origins of Syriac, and of its distinct spoken and written script, go back to the second century B.C.E., when it served as the official language of the city-state of Edessa (by its Greek Hellenistic name, or Urhoy in its Aramaic one). Thanks to its double stem—Mesopotamian/Aramaic and Greek—Syriac blossomed to become the literary language of Christians from the second century C.E. onwards. Although Edessa came under Roman control in the first century C.E. and Edessan Aramaic never again had the support of a state, it came to be used, under the name of Syriac, as a literary language by Christians in the Roman as well as the Iranian Empires. Syriac Christianity spread along the maritime and terrestrial trade roads from the Mediterranean all the way to South India (purportedly converted by Saint Thomas), and to Central Asia, Tibet, China, and Mongolia.

Transversal to universal empires, Syriac literature was produced by—and conversely sheds light on—communities living on the borders of the Near Eastern polities, considered as a religious minority in the Zoroastrian Empire of the Sasanians, as heretics in the eyes of the Byzantine Orthodox (since the “universal” councils of Ephesus in 421 and Chalcedon in 531 that they refused), and as one of the religions of the book under Islamic powers. Syriac thus offers a crucial “internal” source for the history of the Mesopotamian region reaching as far as South Arabia and the Far East from the late antique to the medieval era. It helps articulate notions of multilingualism, as well as local versus imperial idioms and identities.

The new trend that considers the Qurʾān as a late antique text has emphasized the role of Syriac as one of the textual and scriptural traditions that was a basis for the Qurʾānic text. Syriac was the liturgical and religious language of members of the Arab tribes who converted to Christianity all the way from Syria to Southern Arabia. It became primarily the language of the Miaphysite denomination (that emphasized the unity of Christ’s human and divine natures after incarnation in one nature—*mia-physis* in Greek) that was officially condemned by the Byzantine Church and Empire. This Miaphysite opposition became a fully independent church in the seventh and eighth centuries, the Syrian Orthodox Church, and professed having remained truly orthodox since the origins of Christianity, in contrast to the Byzantine Orthodox Church, which allegedly strayed from orthodoxy after the council of Chalcedon.

It is not only the Byzantine Orthodox, Syrian Orthodox, and Church of the East (another independent church in the Persian, Sasanian Empire) that were competing with each other in the sixth and seventh centuries trying to convert peoples and tribes, but also powerful Miaphysite groups deemed heretic by the mainstream Miaphysites. These religious controversies on complex matters of faith concerned not only the theologians who participated in the church councils, they also drew ecclesiastical, social, and amical networks of members of the different affiliations, among whom letters were exchanged across the whole Middle East. By the sixth century there thus emerged a commonwealth of primarily Miaphysite groups and states (in Syria, Arabia, Egypt, and Ethiopia, notably) that shared not only the same religious ideas but also a certain understanding of imperial kingship.

It is in reading a letter from the well-known Syriac bishop and theologian Philoxenus of Mabbug (Hierapolis in ancient Syria) to a *stratelates* of al-Ḥīra (a Byzantine title for an official based in one of the “capital” camps/cities of the

Arabs in pre-Islamic late antiquity, and today in Iraq) that I came see the link these sources provide between Syriac theology and the Qurʾān. This letter discusses the presence in Arabia of groups among the Miaphysites that were considered as heretics. Called Julianists (on the name of Julian of Halicarnassus, d. 527) or Aphthartodocetae, they understood the alliance of the divine and human natures in Christ in a way that made them question Jesus’s suffering on the cross. In the 520s, a large group of Julianists took refuge against Byzantine persecutions in al-Ḥīra and in Upper Egypt. Some subsequently fled to Ethiopia and on to Arabia. These groups had an enduring presence until at least the eighth century in Southern Arabia where many churches belonged to them.

What this Syriac letter highlights are the discussions that were taking place in the Christian milieu in Arabia in the sixth century, barely a century before Islam, on issues close to those alluded to in the Qurʾān. An obscure passage of Surat *al-nisā* 4, 157 about Jesus’s crucifixion suggests that it was a matter of controversy and that nobody was sure about what happened then. It gave way to many subsequent interrogations: was it only a fantasy, an appearance of Jesus that was crucified by the Jews? Was it someone else, and were there two persons? The discussions of these very subjects between the dissident and mainstream Miaphysites in Arabia before Islam can explain the basis on which the Qurʾān expressed its own puzzlement about what exactly happened on the cross, and from there how the Islamic tradition tried to make sense of the obscure Qurʾānic passage.

More broadly, Syriac sources put a different emphasis on the events of the seventh century than the Byzantine and the later Arabic ones. To take only one example, the capture of Jerusalem by the Sasanians in 614 after a dramatic siege is mentioned in Syriac sources as in Greek and Arabic, but in the former the interest lies in the coming of the True Cross to the Sasanian Empire. Instead of seeing the displacement of the sacred palladium of the Christian Roman Empire in a black light, Syriac sources, particularly the Eastern ones, produced in the Iranian Empire, were more interested in taking notice of the people who were in charge of sending it to Persia and then bringing it back to Emperor Heraclius. They viewed in a more positive way its coming to Seleucia-Ctesiphon, the capital city of the Sasanians, than did their Greek counterparts, since it meant that it was now in the empire where they lived.

The non-imperial Christian communities were less affected by the events than the Byzantine Orthodox, who interpreted the events as a sign of God having abandoned them. Instead of celebrating the Byzantine Emperor Heraclius as the savior of Christianity when he eventually returned the True Cross to Jerusalem, they produced counter-propaganda in the form of apocalypses where they expected a last emperor of their own, a Syrian Greek king, descending from Alexander the Great to be the one who at the end of times would triumph over their enemies and remit all earthly power to God.

It is striking to see that the second capture of Jerusalem in 636 by the Arabs, only a few years after its retaking by Heraclius, is hardly mentioned in the Syriac chronicles where it is a non-event. Since the siege ended peacefully, after a negotiation between the Byzantine patriarch of Jerusalem and the caliph, and the city was not stormed by the Arab troops, the capture of the city is not mentioned in the most ancient Syriac sources.

Produced by the communities who were at the heart of the events, Syriac sources compel us to reconsider what “conquests” means. Modern historians talk about the Sasanian and then Arab-Muslim conquests, but Syriac sources never use the word or concept. There were sieges, battles, military operations that could be catastrophic and dramatic for the local populations, but there were also negotiations and cities taken by treaty. Contrary to Arab-Muslim sources that would subsequently create the genre of “futuh,” or “conquest” literature, in order to celebrate those who took part in the campaigns and the distribution of the booty, Syriac sources present a situation of occupation and change of rulership more than a conquest as such. They invite us thus to reconsider the categories, and the agendas, that we have inherited from later Arab-Muslim sources. ■

Muriel Debie, Member (2016–17) and Visitor in the School of Historical Studies, is working on a book that aims to deconstruct the prevalent monolithic view of the seventh century, show how the apocalyptic currents that pervaded the three monotheisms are a major interpretative key of the period, and advocate for a better appreciation of the various Christian affiliations’ understanding of history. Debie is Professor of Eastern Christianities at the Paris Science et Lettres, Research University.



Detail of a seventh-century Syriac manuscript depicting King David

# The People of Monotheism and Justice: Muʿtazilism in Islam and Judaism<sup>1</sup>

Why did Jewish thinkers in the tenth century start to adopt rationalist doctrines?

BY SABINE SCHMIDTKE

Monotheism constitutes one of the central doctrines of Islam. The notion is again and again voiced in the Qurʾān, for example in *sūra* 112 (titled “Sincere Religion”) which, in the translation of Arthur Arberry, reads: “Say: ‘He is God, One (*aḥad*<sup>um</sup>). God, the Everlasting Refuge, who has not begotten, and has not been begotten, and equal to Him is not any one.’” While initially it was apparently mostly a refutation of pre-Islamic polytheism in Arabia, the text was later on interpreted as primarily directed against the Christians.

The (post-Qurʾānic) Arabic term for monotheism is *tawḥīd*. The frequent use of the root *w-ḥ-d* in the self-appellation of numerous Islamic groups throughout the centuries up until the modern period indicates the central position the concept takes up in the self-perception of the Muslim believers. Mention should be made of the movement of the Almohads—

“Almohads” being the Latinized rendering for *al-Muwahḥidūn*, i.e., those who professed the unconditional unity of God (*tawḥīd*)—a Berber dynasty that ruled a region extending from al-Andalus to Tunisia during most of the twelfth and part of the thirteenth century. The notion of *tawḥīd* is also central to the doctrinal thought of Ibn ʿAbd al-Wahhāb (1703–92), a Ḥanbalī scholar from central Arabia whose theological vision was put into practice as a result of his allegiance with the central-Arabian *amīr* Muḥammad b. Saʿūd, the founder of the Wahhābī-Saʿūdī state that eventually resulted in the modern state of Saudi Arabia, a country that has been instrumental in spreading the ideas of Ibn ʿAbd al-Wahhāb far beyond its borders. Taking his cue from the thirteenth century neo-Ḥanbalite theologian Ibn Taymiyya (1263–1328), Ibn ʿAbd al-Wahhāb drew a distinction between *tawḥīd al-rubūbiyya*, the affirmation that God is the sole creator of the world, and *tawḥīd al-ulūhiyya* or *tawḥīd al-ibāda*, the notion that God is the sole object of worship according to the divine law.

Another central feature of *tawḥīd* according to Ibn ʿAbd al-Wahhāb is Islamic unity, and any kind of sectarianism or diversity is therefore to be rejected. During the twentieth century, Islamic activists increasingly singled out the notion of *tawḥīd* to be the one defining doctrine of Islam, a development that was perhaps ushered in by the publication in 1897 of Muḥammad ʿAbdūh’s (1849–1905) renowned *Risālat al-Tawḥīd*. Considering *tawḥīd* as the main organizing principle of human society, numerous activist organizations and Islamist parties adopted the term such as the “Dār al-Tawḥīd” (“Abode of Unity”), a Shīʿī organization in the Gulf region, the Sunnī “Ḥarakat al-Tawḥīd” (“Unity Movement”) in Palestine, or the “Hizb-ut Tawhid” (“Party of Unity”) in Bangladesh.

But what does the notion of *tawḥīd*, “monotheism” or “unity,” in fact stand for? The above-quoted Qurʾānic *sūra* conveys the notion of divine oneness, i.e., that God does not have a partner, no equal besides Him. This is also the understanding of the concept of *tawḥīd* as expressed in the first half of the *shahāda*, the Islamic profession of faith developed during the post-Qurʾānic period, but is already implied in a series of Qurʾānic verses (2:255; 27:26; 28:70; 47:19, etc.). This *shahāda*, which constitutes the first of the so-called Pillars of Islam, is in fact the act of declaring “*There is no god but God*, and Muḥammad is the Messenger of God.”

The renowned mystic Muḥyī al-Dīn Ibn al-ʿArabī (1165–1240) laid the foundation for what became later the doctrine of the “unity of being” (*waḥdat al-wujūd*) that proved influential ever since. Ibn al-ʿArabī distinguishes three levels of *tawḥīd*: the absolute, undelimited, and exclusive reality of the divine essence (*al-aḥadiyya al-ilāhiyya*) that is devoid of any multiplicity as the highest level of *tawḥīd*; inclusive unity (*waḥdāniyya / waḥidiyya*) constituting the next layer in Ibn al-ʿArabī’s system that comprises the divine names and attributes, each one pointing to another aspect of the Divine. These are also the cause for the multiplicity of created beings, the loci in which God manifests Himself. The *tawḥīd al-dalīl* finally constitutes the lowest level of unity in Ibn al-ʿArabī’s system and corresponds to the orthodox Islamic definition of *tawḥīd*, i.e., the

denial of polytheism as expressed in the Islamic profession of faith.

Among rational theologians, the *mutakallimūn*, it was primarily the question of the divine attributes and their ontological status and the manner in which they relate to the divine essence that was at stake. The Qurʾān asserts God’s omnipotence (“Indeed, God is over all things competent—*innā Llāh ʿalā kull shayʾ qadīr*,” as is stated in Q 2:20 and elsewhere) as well as His omniscience (“God is ever Knowing and Wise—*wa-kāna Llāh ʿalīman ḥakīman*,” Q 4:17 and elsewhere), as well as other attributes, and it states that God has “power” (*qudra*) and “knowledge” (*ilm*), etc. This gave rise to the controversial discussion of whether “power,” “knowledge,” etc., constitute eternal attributes that are distinct from God’s essence or not. Assuming they were not, in what manner would His being powerful be distinct from His being knowing? Conversely, if they were distinct eternal attributes, they would constitute separate eternal ontological entities and, therefore, a plurality of eternal beings, rather than the one eternal God. Furthermore, with these eternal entities inhering in God, God himself would be compound, which implies plurality with respect to Him—a clear violation of the doctrine of divine unicity.

While traditionalist theologians considered any rational speculation over the dicta of the revealed sources to be impermissible and willingly accepted the evident contradiction between divine unity and a multiplicity of eternal attributes attached to the Divine by referring to the dogmatic injunction that the revealed sources need to be accepted “without asking how” (*bi-lā kayfa*), the issue took center stage among the rationalist theologians who were unwilling to compromise on the doctrine of *tawḥīd*. The principal defenders of monotheism were the so-called Muʿtazila, the “People of Justice and Monotheism” (*ahl al-ʿadl wa-l-tawḥīd*) as their adherents called themselves, a theological movement that flourished between the eighth and thirteenth century C.E.

As is the case with many aspects of Islamic religio-intellectual history, discursive theology in general and Muʿtazilite dialectical reasoning

in particular were closely related in their evolution and development to parallel phenomena among the followers of other religions that were present in the Muslim world. The earliest preserved manifestations of discursive theology, “*kalām*” in Arabic, in Muslim circles can be traced back to the mid- or late eighth century. In two groundbreaking publications in 1980 and 1981, Michael Cook pointed out that characteristic features of Muslim *kalām* argumentation are already present in seventh-century Syriac Christological disputations and have some parallels in anti-Chalcedonian Syriac material as well. His findings have since been further refined.<sup>1</sup>

The methodological tools of discursive theology had begun to leave their mark on Jewish thinkers writing in Arabic since the ninth century, and it seems that it was again the Christian *kalām* tradition that proved influential for the formation of Jewish medieval theology. The earliest extant Jewish *kalām* work is the *ʿIshrūn maqāla*, *Twenty Chapters*, of Dāwūd b. Marwān al-Muqammaṣ, a student of the Syrian-Orthodox theologian Nonnus (Nānā) of Nisibis, who apparently flourished during the first half of the ninth century—so far the earliest theological summa in Arabic that we possess. As has aptly been shown by Sarah Stroumsa, it was primarily Nonnus’s characteristically Syriac Christian *kalām*—Aristotelian logic put to the service of Christian theology—that had “influenced and shaped al-Muqammaṣ’ thought.” “Against the backdrop of the glaring absence of previous Jewish systematic philosophy” al-Muqammaṣ “launched what was to develop into a remarkable tradition of Jewish rational thought,” to paraphrase Sarah Stroumsa’s evaluation of al-Muqammaṣ’s pioneering role in the evolution of a Jewish *kalām* tradition.<sup>2</sup> The *Kitāb al-Amānāt wa-l-ʿitqādāt*—that is, *The Book of Beliefs and Opinions*—of the tenth-century Rabbanite Jewish scholar Saʿadya Gaon (882–942) seems likewise to have been inspired by Christian theological literature as well as Islamic models. The *Kitāb*

(Continued on page 9)



A theological work by al-Sāhib Ibn ʿAbbād, who promoted the teaching of Muʿtazilī theology throughout Būyid territories and beyond, this manuscript from a Cairo Geniza store room is a testimony to the impact of al-Sāhib’s education policy on the contemporaneous Jewish community in Cairo.

1 See Alexander Treiger, “Origins of Kalām,” *The Oxford Handbook of Islamic Theology*, ed. Sabine Schmidtke (Oxford: Oxford University Press, 2016): 27–43.

2 The work has recently been reedited. See Dāwūd ibn Marwān al-Muqammaṣ’s *Twenty Chapters (ʿIshrūn maqāla)*, an edition of the Judeo-Arabic text, transliterated into Arabic characters, with a parallel English translation, notes, and introduction by Sarah Stroumsa (Provo, Utah: Brigham Young University Press, 2016).

1 An earlier version of this paper was presented at the Holberg Prize Symposium: Ancient Religions, Modern Dissent. Bergen, June 2014.

*al-Tawhīd, The Book of Divine Unity*, of Sa'adya's Karaite contemporary Ya'qūb al-Qirqisānī (d. 930) is unfortunately lost.

The new tradition of Jewish rational thought that arose during the ninth century was in its initial stage primarily informed by Christian theological literature in content as well as methodology. Increasingly, specifically Mu'tazilite Islamic ideas, such as theodicy and human free will, as well as the stress on God's oneness (*tawhīd*) resonated among Jewish thinkers, many of whom eventually adopted the entire doctrinal system of the Mu'tazila. The now emerging "Jewish Mu'tazila" dominated Jewish theological thinking for centuries to come. The choice for Mu'tazilism was by no means self-evident. During the first half of the tenth century, a strong rival movement arose, named Ash'ariyya or Ash'ara after its eponymous founder Abū l-Ḥasan al-Ash'arī (d. 936), which soon gained in prominence. Following the Mu'tazilites *methodologically*, al-Ash'arī—formerly a student of Abū 'Alī al-Jubbā'ī, the leading figure of the Mu'tazila at the time—"converted" *doctrinally* to the theological views of the traditionists. In this he followed—and popularized—some of the views of the ninth-century theologian 'Abd Allāh Ibn Kullāb (d. 855) who had already sought to amalgamate the discursive methodology of *kalām* with the traditional doctrinal notions of the traditionists in Arabic.

Unlike Mu'tazilism, Ash'arism never really caught on among the Jews. The famous Jewish thinker Moses Maimonides explains this Jewish predilection for Mu'tazilite *kalām* to be the result of mere chance: "... it has so happened," Maimonides writes in the *Guide of the Perplexed*, "that Islam first began to take this road owing to a certain sect, namely, the Mu'tazila, from whom our coreligionists took over certain things walking upon the road the Mu'tazila had taken. After a certain time another sect arose in Islam, namely, the Ash'ariyya, among whom other opinions arose. You will not find any of these latter opinions among our coreligionists. This was not because they preferred the first opinion to the second, but because it so happened that they had taken over and adopted the first opinion and considered it a matter proven by demonstration."<sup>3</sup>

This explanation is certainly unsatisfactory. We may, however, gather some observations that may eventually help to explain this choice. The earliest attested Jewish compendium of Mu'tazilite thought is the *Kitāb al-Ni'ma, The Book of Blessing*, of the Karaite Levi ben Yefet (in Arabic Abū Sa'īd Lāwī b. Ḥasan al-Baṣrī) (late tenth to early eleventh century), the son of the prominent Karaite Bible exegete and legal scholar Yefet ben Eli ha-Levi (whose Arabic name was Abū 'Alī Ḥasan b. 'Alī al-Lāwī al-Baṣrī) (d. after 1006). Levi wrote the book at the request of his father as a vindication of Judaism on the basis of Mu'tazilite rational theology, but unlike his father, who disapproved of Islamic Mu'tazilite theology, Levi adopted the doctrines of the Mu'tazila and implicitly recognized Muḥammad as a friend of God endowed with prophethood, though ranking below Moses. Further evidence as to when (and why) Jewish thinkers began to adopt Mu'tazilite thinking can be gleaned from the extant Jewish copies of Mu'tazilite works of Muslim representatives of the movement, as preserved in the various Genizah collections, most specifically the Abraham Firkovitch collection in St. Petersburg. Although a full inventory of the relevant collections and its Mu'tazilite materials is still a major desideratum, it seems that the writings of the Būyid vizier and patron of the Mu'tazila, al-Ṣāhib b. 'Abbād (938–95), who was himself an adherent of the movement, constitute the earliest Muslim Mu'tazilite works, copies of which can be traced in the various Jewish collections. Moreover, it is attested that Jewish theologians regularly participated in the *majālis* convened by Ibn 'Abbād at his court in Rayy, the most important center of Baṣran Mu'tazilism during the vizierate of Ibn 'Abbād (976–95), although we do not possess any names of the Jewish theologians who flourished there.

While these observations do not shed any light as to why Jewish thinkers started to adopt Mu'tazilite doctrines, they suggest, however, that the major turn toward Mu'tazilism occurred during the later decades of the tenth century, i.e., only some few decades after the lifetime of Sa'adya Gaon. Levi ben Yefet's *summa* was soon eclipsed by the theological writings of the Rabbanite Samuel ben Ḥofni Gaon (d. 1013) and his Karaite opponent and younger contemporary Abū Ya'qūb Yūsuf al-Baṣrī (d. between 1037 and 1039), whose *kalām* works gained an almost canonical status among the Karaites. Literary evidence suggests that Mu'tazilite ideas constituted the central doctrinal foundation of the Rabbanite community until the middle of the twelfth century. For the Karaites, Mu'tazilism continued to provide a significant doctrinal framework at least through the seventeenth century, an observation that also applies to the Byzantine Karaite milieu where many of the works originally composed in Arabic were transmitted in a Hebrew translation.

The most important center of Jewish Mu'tazilism during those centuries was Baghdad, which was soon replaced by Jerusalem and, following the Crusaders' capture of Jerusalem in 1099, Old Cairo (Fuṣṭāṭ). The emergence

and historical development of the "Jewish Mu'tazila" is not only an interesting phenomenon in itself—its literary testimonies also fill a glaring gap in the primary sources for the Muslim Mu'tazila that are available to modern scholarship. During the vizierate of Ibn 'Abbād, Rayy was the unrivalled center of Mu'tazilism. It was here that 'Abd al-Jabbār al-Hamadānī (ca. 937–1024) was appointed chief judge in 977, a position he held until the death of his patron Ibn 'Abbād in 995. In his function as head of the Mu'tazilite school of the Bahshamiyya, 'Abd al-Jabbār assembled a large circle of students around him. Ibn 'Abbād in turn initiated the foundation of a library that is said to have held between 100,000 and 200,000 volumes, making it one of the largest collections of books in the Islamic world at the time. When in 1029 Maḥmūd Ḡaznawī entered Rayy, the library was partially destroyed, including its Mu'tazilite holdings, and many adherents of the movement were driven out of the city. Mu'tazilism only survived within the Zaydī circles of Northern Iran, specifically Rayy and Bayhaq. Following the unification of the Zaydī state in Northern Iran with their coreligionists in Yemen during the thirteenth century, a massive transfer of Zaydī and non-Zaydī religious literature from Iran to Yemen occurred that also included a large amount of Mu'tazilite literature. However, the Zaydīs only preserved a specific layer of Mu'tazilite writings, most of which consists of the works of Zaydī and non-Zaydī students of 'Abd al-Jabbār. They did not preserve any of the writings of 'Abd al-Jabbār's predecessors, and even of 'Abd al-Jabbār himself, they only had his comprehensive *al-Mughnī fī abwāb al-'adl wa-l-tawhīd, The Sufficient [Book] on the Matters of Unity and Justice*, at their disposal. Other works of his were either not transmitted or preserved as paraphrastic renderings (for example his *al-Kitāb al-Muḥīṭ*, which only came down to the Zaydīs of Yemen as the *al-Majmū' fī l-muḥīṭ* of Ibn Mattawayh).

By contrast, the Jewish Mu'tazilites preserved an earlier layer of Baṣran Mu'tazilite literature, namely numerous writings of 'Abd al-Jabbār, many of which are otherwise only known by title, including commentaries by 'Abd al-Jabbār on a work by Abū Ḥāshim al-Jubbā'ī on natural philosophy and on a theological text by Ibn 'Abbād. In addition to this, extensive fragments of what seems to have been a voluminous theological *summa* by Ibn 'Abbād have been preserved, as well as a work on natural philosophy by 'Abd Allāh b. Sa'īd al-Labbād, another prominent student of 'Abd al-Jabbār whose works soon fell into oblivion among the Zaydī Mu'tazilites.

By way of illustration, I shall briefly refer to the case of Ibn 'Abbād's theological *summa*, possibly his *Kitāb Nahj al-sabīl fī l-uṣūl, The Book of the Procedure Along the Way on the Principles of Religion*. Islamic historical sources inform us that Ibn 'Abbād had composed comprehensive theological works, but none of these have been preserved in the Islamic world. So far we only possess some concise theological tracts of his that appear to have been written as introductions to the doctrine of the school. That he was widely read within Jewish Mu'tazilite circles is evident from two extensive fragments of a theological *summa* of his that are both written in Hebrew characters. Unlike the concise tracts that are preserved in Islamic collections, these fragments (which are now available in critical edition<sup>4</sup>) clearly show that al-Ṣāhib was not only an adherent of the Mu'tazila but a theologian in his own right. Moreover, as I suggested before, his writings may have played a decisive role in the formation of the Jewish Mu'tazila.

This example—one out of many—also illustrates what students of Muslim intellectual history can gain by looking for relevant source material beyond strict denominational borders. The scholarly investigation of the Jewish Mu'tazila, its historical connection to Muslim counterparts, and a systematic exploitation of the Islamic primary materials preserved in Jewish collections, are still in their infancy. While representatives of the "Wissenschaft des Judentums" ("Science of Judaism") toward the end of the nineteenth and beginning of the twentieth century, such as David Kaufmann, Martin Schreiner, or Arthur Biram, were aware of this important episode, the rise of the Nazi regime in Germany and World War II put an end to this early attempt to study Muslim and Jewish Mu'tazilites as part and parcel of one single intellectual phenomenon and to analyze the historical relations between them. It was only later that scholars of both Jewish and Islamic studies "rediscovered" this important field and joined forces to work on the relevant materials. ■

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Sabine Schmidtke, Professor in the School of Historical Studies, has played a central role in the exploration of heretofore unedited and unknown theological and philosophical writings. Schmidtke has applied rigorous study to the edition and critical analysis of manuscripts in Arabic, Judeo-Arabic, and Persian, and her work extends from Arabic-speaking countries to Israel, Iran, Russia, and Turkey. Prior to joining the Institute Faculty in 2014, Schmidtke came to the Institute as a Member in the School during the 2013–14 and 2008–09 academic years.

3 Moses Maimonides, *The Guide of the Perplexed*, trans. Shlomo Pines (Chicago: 1969):176f.

4 *Al-Ṣāhib Ibn 'Abbād Promoter of Rational Theology: Two Mu'tazilī kalām texts from the Cairo Geniza*, ed. Wilferd Madelung and Sabine Schmidtke (Leiden: Brill, 2016).

# Charting One's Course through Mirror Symmetry

Geometric phenomena, border crossings, and emergent concepts of space

BY PAUL SEIDEL

Geometry and physics have long gone hand in hand. All around us, physical processes play out in geometric terms, such as straight lines (rays of light), ellipses (planetary motion), or parallelograms (the combined effect of two forces). To earlier scientists, this meant that the universe was created to be comprehensible. Kepler went so far as to argue that God, in setting up the natural world, could use pentagons but never heptagons, since the heptagon can't be constructed with ruler and compass.<sup>1</sup> Kepler's enthusiasm for geometry still resonates with modern mathematicians, even though we may not share his metaphysical certainties. Our views also differ in another important respect. For Kepler, the elements of geometry, as set out by Euclid, were immutable (after all, they constrained even God). Today it seems clear that, in order for geometric thinking to remain a source of new insights (in mathematics, physics, computer science . . .), geometry must continue to evolve.

One of the current challenges comes from quantum physics, which indicates that space should be an emergent concept, rather than a fundamental one. To a geometer, this is rather disconcerting, like demanding that a painter start without a canvas. As a more easily graspable compromise, we can take our usual Euclidean space as a starting point, and then put that through a process that moves pieces of it around, like a series of small earthquakes (called "quantum corrections"). If the earthquakes get too violent, the process will get out of control, and its outcome must lie beyond geometry. But if the modifications are small enough, we will be able to see a new space gradually emerging as the result. In this article, I will try to explain one such construction. It comes from "mirror symmetry," which was the topic of the 2016–17 special year in the School of Mathematics. The specific structure governing the process is called the "tropical vertex group," and it is visualized through "scattering diagrams" (I have no intention of explaining any of those terms; but they do roll off the tongue beautifully). The construction was invented in 2006 by Maxim Kontsevich and Yan Soibelman<sup>2</sup> (Soibelman was a Visitor at the IAS program). Unlike the heptagon, which Kepler was so concerned about, it is still a developing mathematical subject.

When going about the mind-bending business of revisiting our concept of space, how can the imagination keep a foothold? A long-standing tradition is to imagine oneself a traveler in a faraway place. At various times, this kind of fiction has enabled us to conceive of the moon and planets as earthlike bodies;<sup>3</sup> to live in more or less than two dimensions;<sup>4</sup> or to run alongside a beam of light.<sup>5</sup> It will hopefully also help us here.

With that in mind . . . Once upon a time, there were two countries, Northlandia and Southlandia. Due to ideological disagreements, the countries' maps of the world use slightly different coordinates  $(x, y)$ . You may bring a South-made map to the North; when crossing the border, you will be handed a small paper slip with the formula for converting one kind of coordinates to the other, so that you can exchange geographical information with the locals. Here's what the slip says:

$(x, y)$  in Southern coordinates translates into  $(x, y + 0.01xy) = (x, y(1 + 0.01x))$  in Northern coordinates.

When looking at this slip, we see that North and South agree on what the  $x$ -coordinate should be (this has to do with the fact that the border between them is a horizontal West–East line), but disagree slightly on the  $y$ -coordinate. The strange-looking 0.01 is an arbitrarily chosen small number, measuring the ideological differences (if we replaced it by 0, the discrepancy between coordinate systems would disappear). Such coexisting coordinate systems, called "charts," are generally unproblematic (just like using degrees Celsius and Fahrenheit doesn't mean that our notion of temperature is problematic), as long as the conversion rules between them are consistent. To make things interesting, we have to look at a more complicated geography.

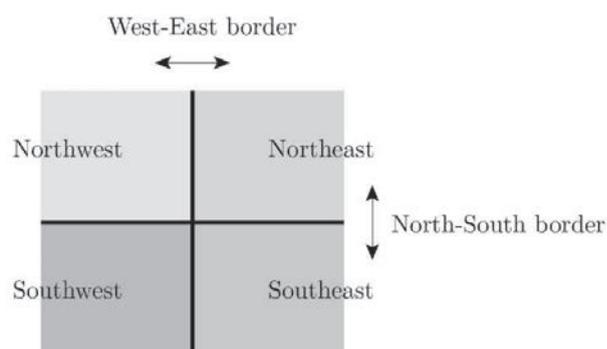


Figure 1

Take four countries, Northwestlandia, Southwestlandia, Southeastlandia, and Northeastlandia (figure 1). Each has its own coordinate system, and here are the conversion rules handed out at border crossings:

When crossing a border from South to North, change  $(x, y)$  to  $(x, y(1 + 0.01x))$ .  
When crossing a border from West to East, change  $(x, y)$  to  $(x(1 + 0.01y), y)$ .

The traveler trying to use these rules will be startled to find that the conversion from, say, Southwestern to Northeastern coordinates depends on whether you go through the Southeast or the Northwest. The difference is very small, on the order of 0.0001, but even the smallest discrepancy leads to logical inconsistencies. After all, the Cathedral of Northeastlandia should always be in the same place, no matter which route you choose on your visit from the Southwest. And if you take a trip all around the continent, the discrepancy means that landmarks in your home country would have shifted slightly when you return. Clearly, our cartography is insufficiently precise.

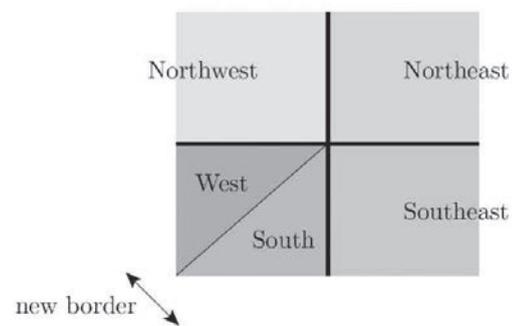


Figure 2

The local cartographers resolved this difficulty in the following way. Southwestlandia should be considered as two provinces, Southlandia and Westlandia, whose maps are not quite the same. When crossing the border from one province to the other (the thinner line in figure 2), another transition will be necessary, which had not been previously noticed since it's much less significant than the others:

$$(x, y) \rightarrow (x(1 + 0.0001xy), y/(1 + 0.0001xy)).$$

With that taken into account, consistency is restored, and all landmarks stay in place when travelling, to any order of precision (the mathematical computation which shows that, by following the traveler all around, is simple but still entirely surprising). The appearance of the new border, which gives us five "charts" instead of the original four, is what's called "scattering" in this context. In (vaguely) physics-inspired terminology, our initial border crossing rules are the initial "first order quantum corrections," which were given to us as part of the setup of the problem; consistency then forced us to introduce a "second order correction."

Now let's go through the same argument, but starting out with slightly different rules:

When crossing from South to North, change  $(x, y)$  to  $(x, y(1 + 0.01x)^2)$ .  
When crossing from West to East, change  $(x, y)$  to  $(x(1 + 0.01y)^2, y)$ .

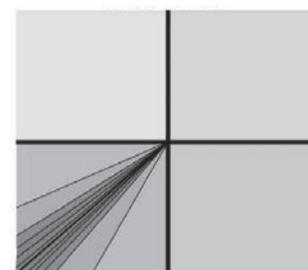


Figure 3

This is like having each of the previous border crossings repeat twice (say, passport control and then customs), and it gives rise to the same inconsistency. We may think we already know how to address this—let's repeat the previous trick, splitting one country in two, but now with terms raised to the appropriate power:

$$(x, y) \rightarrow (x/(1 + 0.0001xy)^4, y(1 + 0.0001xy)^4).$$

Unfortunately, this does not resolve all the inconsistencies! It leaves errors of order 0.000001. The actual solution involves an infinite number of new borders subdividing the former Southwest territory, which are accompanied by smaller

(Continued on page 11)

and smaller changes of coordinates (figure 3). This kind of “infinite factorization” process, involving “quantum corrections” of higher and higher order, is what we’ve been aiming for. As before, the process starts with only the original “first order” North–South and West–East rules. From then on, everything is governed by the need to avoid paradoxes, which will determine the new borders and all the formulae associated with them.<sup>6</sup>

One could argue that what I’ve described is not a complicated geometry, but merely one in which ideological differences (and overly mathematically trained cartographers) have created artificial complications. After all, the countries in the story didn’t undergo any actual earthquakes, only the way in which their maps were related kept changing. This is partly the effect of an unfortunate mix-up of metaphors, and partly a consequence of trying to keep to a specific simple example. One can still agree that describing the relative positions of places in different countries in a consistent way turned out to be unexpectedly difficult, far harder than in the usual Euclidean  $(x, y)$  plane; and that is certainly an interesting geometric phenomenon.

Since we’re already casting a critical eye back on our story, how about keeping track of the sizes of the various discrepancies? Undoubtedly 0.0001 is much smaller than 0.01, but small errors can easily accumulate. One would like to say that this is not a problem, even for infinitely many border crossings, in the same sense as Achilles overtaking the tortoise wasn’t impossible after all. But are we sure about that? One can circumvent the question by replacing 0.01 with a fictitious infinitely small number; but then, all answers will be in terms of that fictitious number. For the purpose of doing geometry on the resulting spaces, an answer involving just the usual numbers would clearly be more satisfying.<sup>7</sup> The

best I can say is that for some problems of this kind, mirror symmetry can be used to show that the infinite process makes sense, by an indirect argument. On the other hand, if you come to tea break at the Institute, it’s quite possible that someone here will be able to suggest a better approach to you! ■

1. “[...] quo minus Heptagonus, et caeterae hujus figurae, a Deo fuerint adhibite ad ornatum Mundi.” *Harmonices Mundi* (1619), Lib. I, Prop. XLV. Kepler’s discussion of such “unknowable” (inscible) figures is fascinating: he claims that even an Omniscient Mind cannot comprehend them “in a simple action.”
2. Kontsevich and Soibelman, *Affine structures and non-Archimedean analytic spaces*, in: *The Unity of Mathematics*, Birkhauser, 2006.
3. For an account of how literature and science in the sixteenth and seventeenth centuries worked together on that goal, see: F. Ait-Touati, *Contes de la lune: Essai sur la fiction et la science moderne*, 2011.
4. Abbott, *Flatland: A Romance of Many Dimensions*, 1884.
5. “Wenn man einer Lichtwelle mit Lichtgeschwindigkeit nachläuft.” Presumably, many readers of this newsletter will know what this refers to. The original reference is: Einstein, *Autobiographische Skizze*, in: Seelig (ed.), *Helle Zeit – Dunkle Zeit. In memoriam Albert Einstein*, 1956.
6. For further developments, see: Gross, Pandharipade, and Siebert, *The tropical vertex*, *Duke Math. J.* 153 (2010).
7. For a related construction where this is clearly an important problem, see: Gaiotto, Moore, and Neitzke, *Four-dimensional wall-crossing via three-dimensional field theory*, *Commun. Math. Phys.* 299, 2010.

During the 2016–17 academic year, Paul Seidel was Distinguished Visiting Professor in the School of Mathematics and led the School’s special program on homological mirror symmetry. Seidel, current Member in the School and Professor at the Massachusetts Institute of Technology, works on structures relevant to homological mirror symmetry, especially Floer cohomology, with applications to symplectic topology.

## The Power of Mirror Symmetry

BY ROBBERT DIJKGRAAF

Ideas that originate in particle physics have an uncanny tendency to appear in the most diverse mathematical fields. This is especially true for string theory. Its stimulating influence in mathematics will have a lasting and rewarding impact, whatever its final role in fundamental physics turns out to be. The number of disciplines that it touches is dizzying: analysis, geometry, algebra, topology, representation theory, combinatorics, probability—the list goes on and on.

A striking example of the magic of quantum theory is mirror symmetry—a truly astonishing equivalence of spaces that has revolutionized geometry. The story starts in enumerative geometry, a well-established but not very exciting branch of algebraic geometry that counts objects. For example, researchers might want to count the number of curves on Calabi–Yau spaces—six-dimensional solutions of Einstein’s equations of gravity that are of particular interest in string theory, where they are used to curl up extra space dimensions.

Just as you can wrap a rubber band around a cylinder multiple times, the curves on a Calabi–Yau space are classified by an integer, called the degree, that measures how often they wrap around. Finding the numbers of curves of a given degree is a famously hard problem, even for the simplest Calabi–Yau space, the so-called quintic. A classical result from the nineteenth century states that the number of lines—degree-one curves—is equal to 2,875. The number of degree-two curves was only computed around 1980 and turns out to be much larger: 609,250. But the number of curves of degree three required the help of string theorists.

Around 1990, a group of string theorists asked geometers to calculate this number. The geometers devised a complicated computer program and came back with an answer. But the string theorists suspected it was erroneous, which suggested a mistake in the code. Upon checking, the geometers confirmed there was, but how did the physicists know?

String theorists had already been working to translate this geometric problem into a physical one. In doing so, they had developed a way to calculate the number of curves of any degree all at once. It’s hard to overestimate the shock of this result in mathematical circles. It was a bit like devising a way to climb each and every mountain, no matter how high!

Within quantum theory it makes perfect sense to combine the numbers of curves of all degrees into a single elegant function. Assembled in this way, it has a straightforward physical interpretation. It can be seen as a probability amplitude for a string propagating in the Calabi–Yau space, where the sum-over-histories principle has been applied. A string can be thought to probe all possible curves of every possible degree at the same time and is thus a super-efficient “quantum calculator.”

But a second ingredient was necessary to find the actual solution: an equivalent formulation of the physics using a so-called “mirror” Calabi–Yau space. The term “mirror” is deceptively simple. In contrast to the way an ordinary mirror reflects an image, here the original space and its mirror are of very different shapes; they

do not even have the same topology. But in the realm of quantum theory, they share many properties. In particular, the string propagation in both spaces turns out to be identical. The difficult computation on the original manifold translates into a much simpler expression on the mirror manifold, where it can be computed by a single integral. *Et voilà!*

Mirror symmetry illustrates a powerful property of quantum theory called duality: Two classical models can become equivalent when considered as quantum systems, as if a magic wand is waved and all the differences suddenly disappear. Dualities point to deep but often mysterious symmetries of the underlying quantum theory. In general, they are poorly understood and an indication that our understanding of quantum theory is incomplete at best.

The first and most famous example of such an equivalence is the well-known particle–wave duality that states that every quantum particle, such as an electron, can be considered both as a particle and as a wave. Both points of views have their advantages, offering different perspectives on the same physical phenomenon. The “correct” point of view—particle or wave—is determined solely by the nature of the question, not by the nature of the electron. The two sides of mirror symmetry offer dual and equally valid perspectives on “quantum geometry.”

Mathematics has the wonderful ability to connect different worlds. The most overlooked symbol in any equation is the humble equal sign. Mirror symmetry is a perfect example of the power of the equal sign. It is capable of connecting two different mathematical worlds. One is the realm of symplectic geometry, the branch of mathematics that underlies much of mechanics. On the other side is the realm of algebraic geometry, the world of complex numbers. Quantum physics allows ideas to flow freely from one field to the other and provides an unexpected “grand unification” of these two mathematical disciplines.

It is comforting to see how mathematics has been able to absorb so much of the intuitive, often imprecise reasoning of quantum physics and string theory, and to transform many of these ideas into rigorous statements and proofs. Mathematicians are close to applying this exactitude to homological mirror symmetry, a program that vastly extends string theory’s original idea of mirror symmetry. In a sense, they’re writing a full dictionary of the objects that appear in the two separate mathematical worlds, including all the relations they satisfy. Remarkably, these proofs often do not follow the path that physical arguments had suggested. It is apparently not the role of mathematicians to clean up after physicists! On the contrary, in many cases completely new lines of thought had to be developed in order to find the proofs. This is further evidence of the deep and as yet undiscovered logic that underlies quantum theory and, ultimately, reality. ■

Robbert Dijkgraaf, Director of the Institute for Advanced Study and Leon Levy Professor since July 2012, is a mathematical physicist who has made significant contributions to string theory and the advancement of science education. This article is an edited excerpt from his *Quantized column*, “Quantum Questions Inspire New Math,” published by *Quanta Magazine* at <http://bit.ly/2kZkdtr>.

# Liquid Crystals and the Heilmann-Lieb Conjecture

## Characterizing the molecular patterns and properties underlying LCD technology

BY IAN JAUSLIN

Liquid crystals, discovered serendipitously by Friedrich Reinitzer in the late nineteenth century, have come to play an important role in the world of consumer electronics, specifically in the production of ever larger, thinner, and more energy-efficient displays. Starting with the small, black-and-white, monochrome displays found in many digital watches and pocket calculators, all the way to the large, colorful screens in computer monitors, flat-screen TVs, and smartphones, liquid crystals have come to form the backbone of many display technologies. As such, most of us have seen liquid crystals, used them, included them in our daily routines, let them into our homes, and allowed our children to play around with them. This beckons an important question: what is a liquid crystal?

The term itself is an oxymoron. From a materials science point of view, a crystal is characterized by *order*, whereas a liquid is *disordered*. In a crystal, the constituent atoms or molecules form ordered, regular, periodic structures, as is illustrated in figure 1a. For example, the atoms in a sodium chloride crystal (more commonly known as salt) are arranged in a simple cubic pattern, which persists over visible, human scales. This means that the atoms in a grain of salt are almost all aligned according to this simple pattern. As a striking consequence, crystals naturally take on very regular geometric shapes. In the picture in figure 1b, one can see four pyrite crystals, each of which naturally assumes the shape of a cube. This is due to its cubic molecular structure. It is rather astonishing that the tens of billions of trillions of atoms in the sample in figure 1b are all lined up!

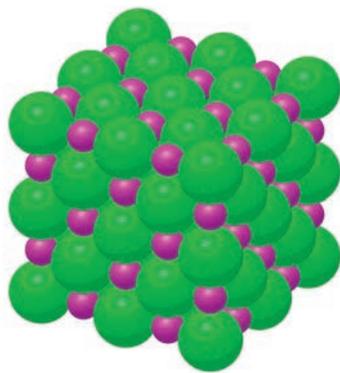


Figure 1a (left): The microscopic structure of a sodium chloride (salt) crystal. The small purple spheres represent sodium atoms and the large green ones, chlorine. They form a regular cubic structure. Figure 1b (right): A sample of pyrite, a mineral composed of iron and sulfur. It consists of four cubic crystals, melded together. The cubic structure of its molecular configuration determines the shape of the crystal. Note that this sample was not cut: pyrite naturally grows as cubes.

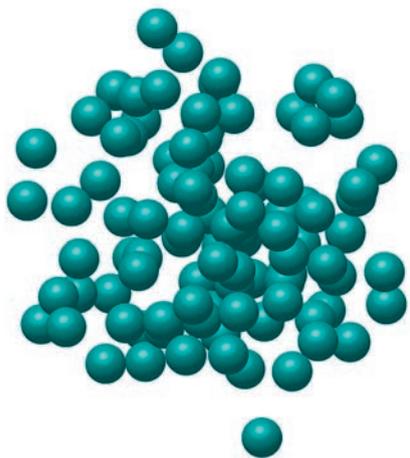


Figure 2: Idealized depiction of the atoms in a liquid. The configuration is disordered: it has no long-range structure.

On the other hand, the atoms or molecules in a liquid are completely disorganized, as is depicted in figure 2. In other words, there is no long-range structure, which means that the position of a molecule is independent of molecules that are sufficiently far from it, and, as a consequence, there is much more freedom in the way they are arranged. On human scales, this implies that liquids are easily deformed, and, as a consequence, flow.

Liquid crystals lie somewhere between crystals and liquids. They have *order* properties specific to the former, as well as *disorder* properties of the latter. This

is made possible by the anisotropy of the shapes of the molecules in liquid crystals. While there are other examples, let us focus on compounds whose molecules are shaped like rods, that is, they are long, thin, and straight (see figure 3). Such compounds can be synthesized in the lab, and occur in nature as well: the tobacco mosaic virus, which infects tobacco plants and other nightshades, is a single strand of RNA nestled in a cylindrical shell of proteins, fifteen times longer than it is wide. In this context, a liquid crystal phase is one in which the orientations of the molecules are ordered but their positions are disordered. There are several ways in which this can occur, but let us focus on *nematic* liquid crystals, an example of which is depicted in figure 3a. In this phase, most of the molecules point in the same direction, up to small local fluctuations. Similar to the molecular arrangements in crystals, the molecules in a droplet of liquid crystal will nearly all point in the same direction, even though there may be billions of trillions of them. This is the *ordered* aspect of the configuration. On the other hand, the positions of the molecules have no long-range structure. In other words, liquid crystals flow like a liquid.

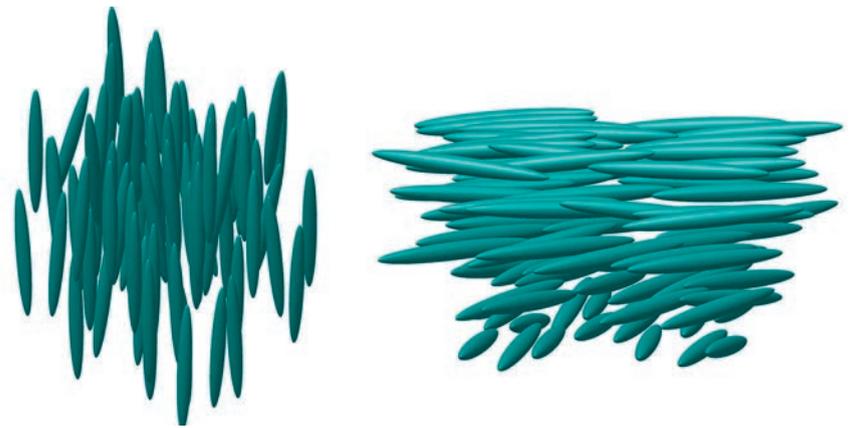


Figure 3a (left): Depiction of a nematic liquid crystal phase. Each molecule is represented by a long ellipsoid, which reflects its anisotropy. The molecules are mostly aligned, up to small, local fluctuations, but their positions are disordered. Figure 3b (right): A chiral nematic liquid crystal phase. The molecules are arranged in horizontal layers. In each layer, they are aligned, and the direction of the alignment rotates from one layer to the next.

On human scales, the manifestation of this cohabitation of order and disorder properties is that, while liquid crystals flow like liquids and form droplets, the uniform orientation of its molecules gives them peculiar optical properties, that is, they interact with light in a non-trivial way. For instance, certain liquid crystals change colors as the temperature is varied. In fact, the changing colors of mood rings often come from a layer of liquid crystal under a transparent gemstone (which can be replaced by glass or plastic). Other liquid crystals change the polarization of light. Polarization is a property of light rays that is invisible to the naked eye, but plays an important role in many technological applications. Polarized light can be obtained from most common

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### CAN ONE FIND A REALISTIC MOLECULAR MODEL FOR WHICH A LIQUID CRYSTAL PHASE CAN BE PROVED TO EXIST?

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light sources (such as the sun and incandescent bulbs) by applying a simple, inexpensive filter. For example, the lenses of Polaroid sunglasses contain such filters, as do those in the glasses handed out at certain 3D movie theaters. Liquid crystals of the so-called *chiral nematic* type (see figure 3b) change light polarization. These liquid crystals are used to build simple electronic light filters, which are at the basis of LCD (Liquid Crystal Display) technologies.

Here, an “electronic light filter” should be understood as a device that is transparent at rest, and turns black and opaque when an electric current is run through it. Such a filter can be built by putting two polarizing filters around a chiral nematic liquid crystal. In order not to get into the physics of

(Continued on page 13)

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Ian Jauslin (jauslin@ias.edu), Member in the School of Mathematics, focuses his research on the mathematical aspects of statistical mechanics and solid-state physics. In particular, he is interested in phase transitions in classical and quantum many-particle systems, and in rigorous implementations of the renormalization group.

polarization, I will make an analogy that, while it does not capture the full depth of the theory, may be more intuitive. I will replace the light coming towards the device with a coin, and the polarizing filters with slots through which the coin must pass in order to reach the other side. The first slot is vertical, while the second is horizontal. The coin is initially vertical, but the chiral nematic liquid crystal rotates it by 90 degrees as it passes through it. Thus, the coin goes through the vertical slot and is rotated by the liquid crystal so that it can pass through the horizontal slot to the other side. Beyond the analogy, this means that light can go through the filter, which is, thereby, transparent. If an electrical current is run near the liquid crystal, it turns the chiral nematic phase (figure 3b) into a regular nematic phase (figure 3a), which does not change the polarization of light, and, in the analogy, does not rotate the coin. Thus, when a current is run through the device, the coin is still vertical when it reaches the horizontal slot and cannot fit through. Light cannot go through the filter, which turns black and opaque.

In digital watch displays, each digit is assigned seven rod-shaped electronic light filters. In order to display a number, the appropriate filters are switched on, which turns them black. The mechanism used in computer monitors, TVs, and smartphones is slightly different, but conceptually similar. Images are broken up into several million colored dots, called *pixels*. Each one is a red, green, or blue light source with an electronic light filter in front of it. By turning the appropriate filters on or off, the intensity of each pixel is adjusted, and an image is displayed.

Let us briefly summarize what we have so far: liquid crystals are materials that exhibit order in the orientations of their molecules, and disorder in their positions. They flow like liquids, and interact with light in intriguing and useful ways. From a scientific point of view, the natural next question is: *how* do liquid crystals exist? Put another way, can one find a model that adequately represents the molecules in a liquid crystal, in which one can *prove* that the molecules spontaneously align, and yet flow?

A partial answer was provided in the pioneering work of Lars Onsager in

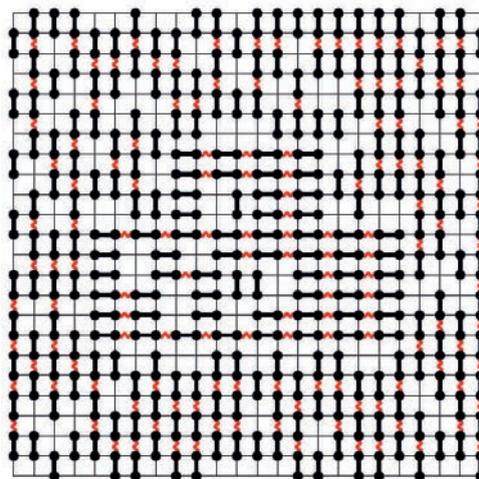


Fig. 4: A sample configuration in the Heilmann-Lieb model. The molecules are represented as rods. The forces between aligned neighboring rods are depicted as red wavy lines.

1949, in which it was shown that, *under certain approximations*, systems of many long rods spontaneously form nematic liquid crystals. But without such approximations, little was known until 1979, when Ole Heilmann, a chemist from Copenhagen, and Elliott H. Lieb, a mathematical physicist from Princeton University, introduced a family of models which may have a provable liquid crystal phase. I will now describe one of these, which I will call the Heilmann-Lieb model. First of all, it is a two-dimensional model, that is, it describes a liquid crystal on a flat surface. Second, it is defined on a *grid*, so the molecules are restricted to a square mesh. The molecules are represented as length-1 rods on this grid, as shown in figure 4. They can only take one of two orientations: horizontal or vertical. In addition, we introduce forces between the rods which favor alignment. One can think of these interacting rods as magnetized sticks, which tend to align with their neighbors. Heilmann and Lieb proved that the rods spontaneously align in this model. Therefore,

there is order in the orientation of the molecules. They did not prove that their positions are disordered, but conjectured it should be so. I will call this the *Heilmann-Lieb conjecture*.

Since the Heilmann-Lieb conjecture was formulated, other models were introduced in which the existence of nematic liquid crystal phases was proved. In the fall of 2016, Elliott H. Lieb, who had formulated the conjecture in 1979, and I revisited the Heilmann-Lieb model, and have recently announced a proof of the conjecture. Thus, in the Heilmann-Lieb model (in the appropriate range of parameters), the molecules spontaneously align, and yet, they flow, which implies that the system behaves like a nematic liquid crystal.

But one important open question remains. In the Heilmann-Lieb model, the molecules can only take two orientations, whereas in a real liquid crystal, they can point in any direction. Can one find a *realistic* molecular model, in which the orientation of the molecules is unrestricted, for which a liquid crystal phase can be proved to exist? By improving our understanding of simplified models, such as those introduced by Heilmann and Lieb, we are inching closer to the answer. ■



On May 29, 1919, a total solar eclipse provided evidence of Albert Einstein's general theory of relativity, one of the most profound and influential developments in modern science. Nearly a century later, the Institute community gathered to view the solar eclipse of August 21, 2017, which spanned the length of the country. Many IAS scholars traveled to various points along the path of totality, a strip of land that stretched from Oregon to South Carolina, to experience the four-minute period of complete darkness. Professor Matias Zaldarriaga (top right) observed from Idaho, and long-term Member Douglas Stanford (bottom right) visited Oregon for the event.

# Examining Contemporary Foreign Policy and the Role of Historical Analogy

Framing American power through the lens of the Iraq War

BY JON FINER

Just before Thanksgiving last year, I sent an email to the Institute's Director, Robbert Dijkgraaf, whom I had never met. Acknowledging that my missive was somewhat "out of the blue," I explained that I had spent most of the previous eight years working on foreign policy in President Barack Obama's White House and State Department, and that I was looking for a place to do some research and writing as I transitioned to the next phase of my career. Unexpectedly, and to my eternal gratitude, I received a response a bit more than a week later asking if I might be interested in serving as Director's Visitor at the Institute, starting in the spring. I enthusiastically accepted.

I was drawn to the Institute for a number of reasons. Having worked closely with outstanding scientists during my time in government—nuclear physicists, on the Iran nuclear talks, and climate scientists, on the Paris climate negotiations—I came to appreciate how essential such expertise and perspectives are to policymaking. And I looked forward to benefitting from the cross-pollination that can only occur when different disciplines coexist.

I also had two more personal reasons for wanting to spend time at the Institute. The first is that my uncle, Franklin Toker, a professor of art and architectural history at the University of Pittsburgh, had been a Member in the 1980s, and he and his family had always raved about the experience. The second is that the Institute was the academic home of the late George Kennan, a foreign policy luminary who in the 1940s had established and served as director of the State Department's Office of Policy Planning, a position I held at the end of the Obama Administration.

Since March, while also teaching at Princeton's Woodrow Wilson School of Public and International Affairs, I have been fortunate to spend time at the Institute researching and reflecting on two related topics, one contemporary and one historical: the new U.S. Administration's unorthodox approach to foreign policy and the role of history in the making of foreign policy.

The first topic ended up occupying more of my time here than I expected, in large part due to the many and complex ways in which the Trump Administration's approach to issues such as the role of the United States in the world and the process for making national security decisions has been such a break from that of past administrations of both parties.

Since arriving in Princeton, I have written and commented frequently on such subjects as the primacy (or diminishment) of diplomacy among the foreign policy tools at the Administration's disposal, the strategy (or lack thereof) being employed by the new Administration, and the most important areas of change (and, less often noted, continuity), between the new Administration and its predecessors. I gave a lunchtime talk on these topics at the Institute on May 31, in which I laid out the Administration's disruptive approach to the key determinants of policy: personnel, process, public posture, and principles.

The second topic I focused on while at the Institute is how policymakers use—and often misuse—so-called "lessons of history" or historical analogies. I have been interested in this topic since I was a graduate student, working with a scholar named Yuen Foong Khong, whose insightful book *Analogies at War* explores how history had influenced decisions made in the context of the Vietnam War. The seminal works in this subfield of international relations were produced in the 1970s and 1980s by Harvard's Ernest May (*"Lessons" of the Past* and *Thinking in Time*, which he wrote with Richard E. Neustadt). The thrust of these works is that, for policymakers faced with difficult decisions, history is seductive, essential, and frequently abused.

Drawing on the theoretical approaches in this literature, I spent time examining an area of our foreign policy that I've come to believe has replaced World War Two and Vietnam as the dominant lens through which decision-makers understand America's place in the world and the extent and limits of our power: Iraq, where the United States has been at war, more or less uninterrupted, for more than twenty-five years.

The beginning of this unlikely shift toward an Iraq-centric foreign policy is debatable. The United States first became engaged militarily in this region during the 1980s Iran–Iraq War, but the clearest starting point is the 1991 Persian Gulf War, which came just as the Cold War was ending and the United States, which for decades had defined its foreign policy in opposition to Soviet communism, was charting a new role in the so-called "new world order." After Saddam Hussein invaded Kuwait, President George H. W. Bush built a global coalition that cemented the United States' status as the lone superpower.

Bill Clinton then took office at the apex of American global power and quietly continued the conflict in Iraq throughout his presidency, an experience in low-cost, limited war that ultimately helped open his mind to intervening militarily in the Balkans. He shifted America's Iraq policy to regime change; developed a new foreign policy tool—crippling economic sanctions; and famously described America as the "indispensable nation" to justify further escalating the Iraq conflict at the end of his term.

George W. Bush elevated Iraq from prominent to preeminent among America's priorities by ordering, under a deeply dubious justification, the fateful U.S. invasion in 2003—an audacious, ambitious, and ultimately disastrous bet that America could forcefully refashion the world's most autocratic region in our democratic image.

The chaos that Bush's "war of choice" wrought, as the United States fatally bungled the aftermath, unleashed the twin forces that continue to ravage the Middle East to this day: sectarian hatred and jihadi extremism.

When Barack Obama, for whom opposition to the Iraq War was essential to his rise, became president by defeating two more experienced adversaries who were also Iraq War proponents, the lessons of Iraq seemed clear—prioritize diplomacy, be willing to engage difficult adversaries, resist military entanglements in the Middle East. These lessons played an outside role in Obama's diplomacy and decision-making on Iran and Syria (the subject of my course at the Woodrow Wilson School). On Iran, they helped bring about a nuclear agreement that, while controversial, is widely considered among the most important diplomatic breakthroughs in a generation. On Syria, while the lessons of Iraq arguably helped Obama avoid even worse outcomes, the result has been disastrous for the Syrian people, the region, and beyond.

The Trump Administration has drawn some similar and some entirely different conclusions from the U.S. experience in Iraq. Like President Obama, President Trump has said he believes the invasion of Iraq was a mistake (though Trump said otherwise at the time) and that he therefore believes the United States should avoid "quagmires."

However, Trump has also increased U.S. military involvement in Somalia, Yemen, Syria, Iraq, and Afghanistan. And his team also clearly believes Obama was far too focused on engagement with Iran, and too unwilling to confront a country responsible for more than one thousand American deaths in Iraq. He has severed diplomatic channels to Iran and accused it of violating the spirit of the nuclear agreement (which he calls "the worst deal in history") by supporting terrorists and testing long-range missiles—even though those activities are not proscribed by the deal, the Administration has formally certified Iran's compliance with it.

All of this bears continual observation and analysis going forward. At a time when our basic understandings about the world, objective facts, and academic rigor are under assault, it was gratifying to spend time at an Institute that stands for, and lives by, these essential principles. For these and many other reasons, the Institute's work has, perhaps, never been more important, and I am grateful to have had the opportunity to be a part of this extraordinary community. ■

Jon Finer, Director's Visitor (2017) at the Institute, was most recently Chief of Staff and Director of Policy Planning at the U.S. Department of State. He previously served as Senior Advisor to Deputy National Security Advisor Antony Blinken, and as both Special Advisor for the Middle East and Foreign Policy Speechwriter for Vice President Joseph R. Biden. He joined the Obama Administration in 2009 as a White House Fellow, having previously worked at The Washington Post as Foreign/National Correspondent.



Jon Finer (left) with then-Secretary of State John Kerry during the Iran nuclear talks in Vienna in July 2015

I WAS DRAWN TO THE INSTITUTE FOR A NUMBER OF REASONS. HAVING WORKED CLOSELY WITH OUTSTANDING SCIENTISTS DURING MY TIME IN GOVERNMENT—NUCLEAR PHYSICISTS, ON THE IRAN NUCLEAR TALKS, AND CLIMATE SCIENTISTS, ON THE PARIS CLIMATE NEGOTIATIONS—I CAME TO APPRECIATE HOW ESSENTIAL SUCH EXPERTISE AND PERSPECTIVES ARE TO POLICYMAKING.

# Peace and Quiet in Castile

## Baptized Muslims, Feudal Lords, and the Royal Expulsion

BY PATRICK J. O'BANION

To outsiders, the contentiousness, divisiveness, and downright un-neighborliness evident in the small Spanish town of Deza by the autumn of 1607 might well have seemed a tempest in a teapot. Those living in the newer Upper Neighborhood had been squaring off against the inhabitants of the older, medieval Lower Neighborhood for years, and the conflict appeared to be reaching a climax. Tensions had been building since the 1590s as recriminations, threats, public brawls, armed uprisings, and fiery sermons gave way to lawsuits and backroom political maneuvering that culminated in arrests, torture, murder, and exile. Heady stuff for small-town folk.

In December of that year, following the unexpected death of the town's feudal lord, his infant son, now Duke of Medinaceli in his own right, formally asserted seigniorial authority. Because of the boy's youth, a proxy appointed by his grandfather, the powerful Marquis of Velada, stood in during the traditional ceremony of possession in Deza. The official record of that event repeatedly informs us that the whole affair occurred "quietly and peacefully." But unmentioned is the fact that peace and quiet were strangers in Deza, brimming as it was with social, economic, political, and religious tensions.

Ceremonial occasions, in that age as in our own, articulated ideological aims and made social statements. They were about wielding power and asserting authority, but they were also moments of uncertainty and negotiation. King Philip II of Spain (r. 1556–98), for example, had been forced to modify his plan for entering Valencia before locals allowed it to proceed, and his 1548 entry into Genoa stirred up riots. If a king didn't always get what he wanted, neither did feudal lords. As Teofilo Ruiz has noted, ceremonies, because they were about the relationship between a people and their lord, could be dynamic and surprising. The message encoded in Deza's 1607 possession ceremony was something like, "Let there be peace in this town, for the duke is in charge." But, in politics as in life, when local plans converge with grander schemes, things rarely go as expected.

Deza had boomed during the sixteenth century. Its population spiked, its urban footprint expanded, a magnificent new parish church was constructed, and wealth increased. Local powerbrokers hatched big plans for the town, envisioning Deza as a dominant regional force that would manage its affairs with minimal interference from the duke. Deza's Moriscos (the descendants of Spanish Muslims baptized en masse in 1502) and Old Christians (who claimed to be free of Muslim or Jewish blood) collaborated in these efforts, pursuing agendas that would further enrich them, benefit their small *republica*, and bring glory to Spain.

Despite intermittent pressure from inquisitorial and episcopal authorities, Old Christians and Moriscos worked with, for, and alongside one another; they gossiped, formed relationships, and (very occasionally) intermarried. Together, they attended weddings, joined confraternities, worshiped in the church, and, by tradition, sat next to one another as officeholders on the town council, administering justice, overseeing finances, and managing day-to-day affairs.

At the turn of the century, however, as boom turned to bust, an Old Christian faction in Deza became increasingly concerned about the town's Morisco citizenry. Driven by a complex combination of economic and political interests, fear, inquisitorial activity, and the inflammatory encouragement of a local priest, many Old Christians came to see the Morisco minority as dangerous. And when, in 1600, the Morisco inhabitants of the Upper Neighborhood unilaterally withdrew from the town's lawsuit against its duke, Old Christians reacted. They secured a legal declaration that, they claimed, forbade Deza's Moriscos from serving on the town council. Yet, the Moriscos fought back and gained a surprising victory when the royal appellate court found that they had just as much right to hold municipal office as any other citizen and could not be barred merely on account of their ancestry.

Now, the Old Christians' fears were not entirely irrational. Many of Deza's Moriscos regarded themselves as Muslims and practiced the "Law of Mohammed," as it was known, more or less secretly. In an age where religious conviction and loyalty to king were deeply intertwined, this smacked of treason to many observers. Occasionally, Moriscos in Deza voiced eschatological hopes for liberation from Christian rule. A few wanted to take up arms against the state. The arrest, trial, and posthumous conviction of Dezano Román Ramírez (b. 1540), for diabolism and Islamizing, brought these concerns into focus, especially since he also had expressed a desire to see the Ottoman Empire overthrow Christian Spain.

Ramírez, a renowned healer and storyteller and a leader among the region's crypto-Muslims, frequently served on Deza's town council and was surprisingly friendly with the old duke. Transported to the inquisitorial jails of Cuenca in 1599 on trumped-up charges, Ramírez's health quickly turned and he died within the year, but his bones were consigned to the flames in Toledo before an audience that included King Philip III (r. 1598–1621), Queen Margaret, and royal favorite, the Duke of Lerma.

Ramírez's fate—proof of Morisco perfidy—galvanized Deza's Old Christians. Even before the royal appellate court definitively found for the Moriscos, a clique of Old Christians began making denunciations to the local inquisitorial agent. By autumn 1607, this work was bearing fruit: more than a dozen people had been

arrested by the Holy Office with many more to come over the next few years. Others evaded arrest by taking flight to parts unknown.

The death of Duke Juan de la Cerda, a man in his prime, at this critical juncture was bad news for the Moriscos, since he had often found it advantageous to favor them over Deza's Old Christians. He appointed Moriscos to offices despite their neighbors' complaints, granted them special privileges, and provided access to choice properties. One piece of land, a large garden and house just north of town owned by the duke, had been rented for decades to Román Ramírez, who made it a center of Islamic activity. After Ramírez's death, his son Miguel (b. ca. 1569) took over. Moriscos continued to gather and "perform their wickedness day and night" under his watch.

Bad news for the Moriscos, but uncertain tidings for the town. Who knew what the regime change would mean for local affairs? Yet, during the possession ceremony, ongoing divisions and feuds were briefly replaced by a veneer of unity. When the duke's stand-in arrived, the entire town assembled, but especially its officeholders—both Morisco and Old Christian. He claimed the keys to the town's archive as well as its fortress, which he entered, locked, and briefly occupied. Then, he ceremonially revoked all ducal appointments and collected staves of office and regalia. Finally, he took the key to the courtroom, which he entered. He took a seat on the bench beneath the Duke of Medinaceli's coat of arms and held court. All local secular authority was now, by proxy, vested in him.

In previous years, at other possession ceremonies, litigants had approached the bench seeking justice. But this time, no one moved, which is curious because important grievances were outstanding. Ten months earlier, in February, members of the Old Christian faction had formally petitioned the duke to remove three Moriscos from the town council since, they believed, their appointments were contrary to "the laws and decrees of the realm." But now, with an opportunity to press their case, they were silent. Nor did the Moriscos ask what would become of the old duke's promise to protect them from further inquisitorial investigations. For the moment, at least, the citizens presented a united front and no one mentioned the issues that were tearing the town apart.

Well, almost no one. The first formal action of the duke's proxy on the second day of the possession ceremony was to take a walk to the infamous garden. He ambled about the property and then declared that he "took possession of it in the name of the duke, my lord." This, too, occurred "quietly and peacefully," we are told. The assertion of seigniorial authority over that contentious piece of land—an act without precedent in previous possession ceremonies—was meant to bring peace and quiet to Deza by eliminating the garden as a focus for local conflict.

As the ceremony drew to an end, oaths were sworn and keys, staves, insignias, and titles restored. The Moriscos, it turned out, would keep their offices, but not the house and garden. Everything else over which the duke's stand-in had asserted authority was ceremonially returned, but that property remained under the immediate and direct control of Deza's feudal lord.

Despite this effort to assert peace, less than two months later, inquisitorial authorities ordered the arrest of another sixteen Dezanos, Miguel Ramírez among them. Some, including Ramírez, swore to "stay tough" and reveal nothing, but he was one of the few who kept his word.

Sentenced to serve in the king's galleys, Ramírez somehow managed to have his sentence commuted. In late 1611, despite the complaints of regional inquisitorial officials, he was released. It's possible (although unlikely) that he returned to Deza. If he did, he found a town transformed. On July 8 of that year, the town's Moriscos had been expelled by royal order. A very few remained behind, but nearly all of the roughly four hundred inhabitants of the Upper Neighborhood departed on foot and probably wound up in Muslim North Africa. Ramírez was also ordered to comply with the royal decree and, presumably, set off to locate his wife and daughter, wherever they were.

More recent decades have seen urbanization and regional emigration, leaving Deza depopulated and its future in doubt. Trains don't go near town and the bus only runs three days a week. Much of the year, barely more than a hundred people keep house there—although it swells to respectable levels on holidays and during the summer, when children's voices can be heard on the streets and patrons spill out from bars onto the plaza. Despite the social and economic forces that pull them toward the cities of Castile and Aragon, Dezanos come home because they remember that it's their town and therefore informs who they are. The Moriscos, who never returned, were likewise driven by historical forces beyond their control. Yet, their story and the stories of the hundreds of thousands of Spanish Moriscos exiled at the beginning of the seventeenth century are no less integrally tied to the houses, streets, and plazas of their homes than are those of more recent emigrants. ■

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*Patrick J. O'Banion, Felix Gilbert Member (2017) in the School of Historical Studies and Associate Professor of History at Lindenwood University, examines the relationship between Christianity and Islam in early modern Spain. He is the author of The Sacrament of Penance and Religious Life in Golden Age Spain (The Pennsylvania State University, 2012) and This Happened in My Presence: Moriscos, Old Christians, and the Spanish Inquisition in the Town of Deza, 1569–1611 (University of Toronto, 2017).*



Vladimir Voevodsky's photographs, taken between 2002–05, capture the remarkable range of insect, bird, animal, and plant life within the Institute Woods. To view more, visit: [www.ias.edu/ideas/voevodsky-woods](http://www.ias.edu/ideas/voevodsky-woods). Right, Voevodsky engages with Institute scholars during a lunchtime conversation.

Director and Leon Levy Professor. “He fearlessly attacked the most abstract and difficult problems with an approach that was exceptionally innovative yet decidedly practical. Most recently, he was focused on developing tools for mathematicians working in highly advanced areas, such as higher-dimensional structures, laying out a grand vision for the future of mathematics. He was a pioneer and a catalyst and will be greatly missed by the Institute community.”

“Vladimir had the courage to think about the hardest and most fundamental problems in mathematics,” said Richard Taylor, Robert and Luisa Fernholz Professor in the School of Mathematics. “He would look for the right conceptualization, in the belief that then the difficulties would become surmountable. Very few mathematicians have succeeded in pulling off such an approach, but Vladimir succeeded magnificently, particularly in his construction of the derived category of mixed motives and his use of it to prove the Milnor and Bloch-Kato conjectures in K-theory.”

Born in Moscow on June 4, 1966, Voevodsky was awarded the Fields Medal in 2002 at age thirty-six, shortly after his appointment as Professor in the School of Mathematics. He had spent the prior three years (1998–2001) as a long-term Member.

Voevodsky earned the Fields Medal for developing new cohomology theories for algebraic varieties, which have provided new insights into number theory and algebraic geometry. His achievement was deeply rooted in the work of Alexandre Grothendieck, who in the 1960s revolutionized algebraic geometry. Grothendieck's understanding of the notions of “space” and “localization” enabled him to construct for algebraic varieties over any field—where “continuity” does not make sense—cohomology groups similar to those known for complex algebraic varieties—where “continuity” makes sense. He constructed in fact a plethora of such theories, and dreamed that they should all be derived from a motivic theory, explaining their parallelism. By partially realizing this dream, Voevodsky gave us the powerful tool of motivic cohomology.

“Vladimir Voevodsky is an amazing mathematician,” observed Christophe Soulé, now Centre National de la Recherche Scientifique (CNRS) Research Director at the Institut des Hautes Études Scientifiques, when Voevodsky received his Fields Medal. “The field is completely different after his work. He opened large new avenues and, to use the same word as [Gérard] Laumon, he is leading us closer to the world of motives that Grothendieck was dreaming about in the sixties.”

A copy of Grothendieck's “Esquisse d'un Programme,” which had been circulating among mathematicians since its submission to the CNRS in January 1984, was given to Voevodsky, then a first-year undergraduate at Moscow University, by his first scientific adviser, George Shabat. Voevodsky proceeded to learn some French for the sole purpose of reading it.

In 1990, Voevodsky and Michael Kapranov authored “ $\infty$ -Groupoids as a Model for a Homotopy Category” in which they claimed to provide a rigorous mathematical formulation and a proof for Grothendieck's idea connecting two classes of mathematical objects:  $\infty$ -groupoids and homotopy types. They later tried to apply similar ideas to construct motivic cohomology.

Kapranov arranged for Voevodsky to attend Harvard University as a graduate student, where he earned his Ph.D. in 1992 under his adviser David Kazhdan. Together with Andrei Suslin and Eric Friedlander, Voevodsky developed an approach to motivic cohomology that relied on a paper, “Cohomological Theory of Presheaves with Transfers,” authored by Voevodsky while he was a Member at the Institute in 1992–93.

Consequences of Voevodsky's work, and two of his most celebrated achievements, are the solutions of the Milnor and Bloch-Kato conjectures, which for three decades were the main outstanding problems in algebraic K-theory. These results have striking consequences in several areas, including Galois cohomology, quadratic forms, and the cohomology of complex algebraic varieties. Voevodsky's work may have a large impact on mathematics in the future by allowing powerful machinery developed in topology to be

#### Recommended Viewing:

The Institute held a gathering in remembrance of Vladimir Voevodsky, convening friends, family, and the Institute community to celebrate his life and legacy: [www.ias.edu/ideas/2017/remembering-vladimir](http://www.ias.edu/ideas/2017/remembering-vladimir).

used for investigating algebraic varieties.

Voevodsky spent time at Harvard University as a junior fellow in the Harvard Society of Fellows from 1993–96 and as a visiting scholar from 1996–97 and again later from 2006–08. He was also a visiting scholar at the Max-Planck Institute in Bonn, Germany, from 1996–97, and Associate Professor at Northwestern University from 1997–98.

Voevodsky returned to the Institute as a long-term Member in 1998 and, in 1999–2000, gave a series of twenty lectures at IAS covering the foundations of the theory of motivic cohomology that he had developed with Suslin and Friedlander, subsequently published by Princeton University Press as *Cycles, Transfers, and Motivic Homology Theories*.

During these lectures, Voevodsky identified a mistake in the proof of a key lemma in his paper. Around the same time, another mathematician claimed that the main result of Kapranov and Voevodsky's “ $\infty$ -groupoids” paper could not be true, a flaw that Voevodsky confirmed fifteen years later. Examples of mathematical errors in his work and the work of other mathematicians became a growing concern for Voevodsky, especially as he began working in a new area of research that he called 2-theories, which involved discovering new higher-dimensional structures that were not direct extensions of those in lower dimensions. “Who would ensure that I did not forget something and did not make a mistake, if even the mistakes in much more simple arguments take years to uncover?” asked Voevodsky in a public lecture he gave at the Institute on the origins and motivations of his work on univalent foundations.

Voevodsky determined that he needed to use computers to verify his abstract, logical, and mathematical constructions. The primary challenge, according to Voevodsky, was that the received foundations of mathematics (based on set theory) were far removed from the actual practice of mathematicians, so that proof verifications based on them would be useless.

Voevodsky, who discovered an application of homotopy theory to the type theory used in computer proofs, had been working since 2005 on the ideas that led to the discovery of univalent models and gave the first public presentation on this subject at Ludwig-Maximilians-Universität München in November 2009. While he constructed his models independently, advances in this direction started to appear as early as 1995 and are associated with Martin Hofmann, Thomas Streicher, Steve Awodey, and Michael Warren.

In 2012–13, Voevodsky organized a special year in the School that focused on univalent foundations of mathematics, which resulted in a group of two dozen mathematicians writing a six-hundred-page book in less than six months. Voevodsky said that the main goal of his most recent work was “to advance the mathematical theory of dependent type theories to the level where it can be used for rigorous study of the complex type theories that are in use today and of the even more complex ones that will appear in the future.” Dependent type theories appear mostly in computer programs that use such theories as their foundation. Voevodsky formalized the mathematics in his papers using the proof assistant Coq and the UniMath library, which contains formalized mathematics for Coq of which Voevodsky was a cofounder and primary developer.

In addition to the Fields Medal, Voevodsky's many contributions in the field of mathematics have been recognized by numerous honors and awards. He received a Sloan Fellowship from 1996–98, Clay Prize Fellowships in 1999, 2000, 2001, and many National Science Foundation grants for his work. Voevodsky also was named an honorary professor of Wuhan University (2004) and received an honorary doctorate from the University of Gothenburg (2016). He was a member of the European Academy of Sciences.

Voevodsky is survived by his former wife, Nadia Shalaby, their two daughters, Natalia Dalia Shalaby and Diana Yasmine Voevodsky, his aunt, Irina Voevodskaya, and extended family in Russia and around the world. A gathering to honor Voevodsky's life and legacy was held at the Institute on October 8. A funeral service will be held in Moscow on December 27, followed by a mathematical conference in honor of his work on December 28 at the Steklov Mathematical Institute of the Russian Academy of Sciences. The Institute will convene an international conference on Voevodsky's extraordinary and original work September 29–30, 2018. —Kelly Devine Thomas, Editorial Director

action at a distance” in his description of how two entangled particles mirror each other regardless of the distance separating them. At the heart of the confusion and debate is physicists’ evolving understanding of spacetime and gravity as described by Einstein’s general theory of relativity, which string theorists have long been trying to incorporate into a quantum mechanical explanation of our world. Current thinking suggests that spacetime and gravity are emergent rather than fundamental concepts within a more comprehensive quantum mechanical theory.

The AMPS paper introduced a concept called the black hole firewall paradox, in which the borders or horizons of black holes are not invisible and smooth as conjectured by Einstein’s equivalence principle but rather rife with high-energy particles that would disintegrate a hapless passerby upon contact. The AMPS idea is that the entanglement of infalling and outgoing particles would be broken and the released energy would create a firewall just inside the event horizon.

“The best way to understand something is to first start out confused,” said Almheiri, in a recent interview with the *Institute Letter*. “The prime example for where there is a lot of confusion is to understand what happens when you add quantum mechanics with gravity in the context of black holes. Stephen Hawking showed that when you do that, you get the information problem. We tried to address that, and we got the firewall paradox.”

If the firewall theory stands, as it has until now, it means that at least one or more of three long-standing concepts in theoretical physics must be wrong: unitarity, Einstein’s equivalence principle (a basic tenet of general relativity, this involves the idea that empty space is the same everywhere, meaning a person falling into a black hole would feel “no drama” when it crossed the horizon), or physicists’ current understanding of quantum field theory.

“It still keeps me up at night,” said Almheiri. “There are questions that need to be answered. For example, if there is a firewall, where is it coming from? What are its microscopics? What is it actually made of? When does it first start to appear? Does it set in at the very early parts of the black hole lifetime? Or does it happen after the black hole has evaporated most of its mass? It’s not clear.”

Almheiri, born and raised in Abu Dhabi, is the first United Arab Emirates (UAE) national—meaning he descends from one of the region’s original families, less than 12 percent of the country’s 9 million-plus population—to become a theoretical physicist and the first to become a Member at the Institute. “After the firewall paper came out, I received emails asking, ‘Are you really from the UAE?’”

Almheiri is the second youngest of nine sisters and three brothers. His mother never received any formal education. His father, who had earned a degree that enabled him to be one of the founders of the Red Crescent humanitarian organization in the UAE and to work as its first Chairman of Board of Directors, is now retired and tends to the family farm. On this land, outside the city’s perimeter, a young Almheiri would look at the stars during late-night family barbecues. “I would be very overwhelmed by the size of it all,” said Almheiri. “No matter where you look, it encompasses you.”

Early on, he was not a high performing student and even failed some of his classes, a pattern that changed when he felt ashamed as an older sister, whom he held in high regard, conveyed the news to his mother. In grade nine, he found that he liked Euclidian geometry, eventually rising to become a group leader in his class. “That’s when I started liking mathematics, because it was very organized, logical, and had definite answers,” said Almheiri. “I like that aspect of it.”

In grade ten, he started taking physics classes. By grade twelve, he was intrigued by special relativity and chemistry. He recalls his chemistry teacher pointing at the table and saying, “In this table, there are atoms, and around these atoms are electrons. But these electrons have a non-zero probability of being on the moon.”

While Almheiri had no idea what his teacher was saying at the time, he was fascinated by the crazy-sounding concept, and when he later studied quantum mechanics, he understood what she meant.

At the end of grade twelve, he read Stephen Hawking’s *A Brief History of Time* and wanted to understand all of it. “The aspect that I liked about physics and continue to like about physics is that it’s so weird,” said Almheiri. “The concepts become less strange the more you expose yourself to them. The advantage of research is that you keep finding new things to be surprised about.”

It was around this time that he decided that he wanted to become a physicist. But there was no track to becoming one in his country. The UAE was only established in 1971. Almheiri has photographs of his eldest sister as a baby in front of a house made of what looks like palm tree fronds.

“Everyone at the time was expected to be a businessman or an engineer,” said Almheiri. “I remember having discussions with some of my friends, and also family, and I would say I want to be a physicist. And they would reply, what are you going to do with physics? Where are you going to work? There was no place to work as a physicist in the Emirates, at least at the time.”

This meant that Almheiri would have to leave his family and his country, with the desire and intention of returning when his studies were complete. Growing up, Almheiri was fortunate to attend an international private school. In his private school, Almheiri had friends who came from Sudan, Pakistan, Lebanon, and

Armenia and who were looking to study abroad. “Mixing with other nationalities was extremely beneficial,” said Almheiri. “At the time, it was not very common for nationals to study abroad with the goal of continuing to a Ph.D. and to do research.”

Along with a few of his friends, Almheiri decided to apply to the University of Toronto. It was 2004 and the continuing tensions that arose after the 9/11 attacks persuaded him not to apply to schools in the United States. At each stage of his education, he was supported by generous scholarships from the UAE government for his undergraduate and graduate degrees, as well as two postdoc positions, one at Stanford University, the second now at the Institute.

At the University of California, Santa Barbara, where Almheiri earned his graduate degree, Polchinski was his adviser. “He is a very good mentor. He is also very, very patient,” said Almheiri. “I’m sure I would have driven any other professor mad.” Almheiri did not like his first few projects with Polchinski, which focused on trying to understand properties of condensed matter systems using the anti-de Sitter/conformal field theory (AdS/CFT) correspondence proposed in 1997 by Juan Maldacena, Carl P. Feinberg Professor in the Institute’s School of Natural Sciences. “I wanted to learn about quantum gravity, not about condensed matter systems,” said Almheiri, “so there was some conflict there.”

Maldacena’s AdS/CFT correspondence describes black holes holographically in terms of a theory living on the boundary of the spacetime. According to this theory, black holes behave like ordinary quantum mechanical objects—information about them is not lost, as previously thought, but retained on their horizons—leading physicists to look at black holes as laboratories for uniting the principles of quantum mechanics and general relativity, two bedrock theories of physics, previously considered incompatible due to the difficulty of incorporating gravity into a quantum world. The AdS/CFT conjecture addresses the incompatibility by equating a theory with gravity (the AdS gravitational system) to a theory without gravity (the CFT quantum field boundary).

The seed of the AMPS paper was planted at a 2012 conference that Almheiri attended at Santa Barbara’s Kavli Institute for Theoretical Physics, “Bits, Branes, and Black Holes,” which involved trying to understand how information is stored in gravitational systems. In addition to looking at Hawking’s black hole information paradox, the conference focused on a concept known as black hole complementarity proposed by Leonard Susskind. Because of something called the no-cloning theorem, Susskind conjectured that there must be a delay between when the information falls into the black hole and when it first appears in the Hawking radiation. “Susskind phrased the question as, ‘If nobody can witness the cloning, then did the cloning actually happen?’” said Almheiri. The AMPS paper started with trying to mesh the concept of complementarity with the quantum mechanical concept of monogamy of entanglement, which requires that a particle cannot be maximally entangled with more than one system.

One of the papers that appeared in response to the AMPS paper was “Cool Horizons for Entangled Black Holes,” published by Maldacena and Susskind in 2013, which proposes that the Hawking information paradox and the firewall paradox could both be resolved if outgoing and infalling particles are connected by wormholes. Often referred to as “ER=EPR,” the paper connects two works that Einstein authored at the Institute in 1935. “ER” refers to a paper written by Einstein and Nathan Rosen (an IAS Member at the time) that suggests that black holes could come in pairs connected by Einstein-Rosen bridges, or wormholes. “EPR” refers to a paper written by Einstein, Boris Podolsky (also a Member at the time), and Rosen, which points out the quantum mechanical property of entanglement. Maldacena and Susskind’s concept proposes that entanglement and wormholes create spacetime, which emerges from connected bits of quantum information.

Maldacena is one of the reasons Almheiri wanted to come to the Institute, along with the opportunity to interact with other Faculty, among them Edward Witten, Nathan Seiberg, and Nima Arkani-Hamed, fellow Members, and the Institute’s storied history. In addition to wanting to understand the physics of the interiors of black holes, Almheiri is interested in developing a better understanding of the AdS/CFT correspondence, particularly how information about the gravitational theory (AdS) is encoded in the quantum field theory (CFT) and how much and which subregion of AdS can be reconstructed from a subregion of CFT. With former Member Xi Dong and Daniel Harlow, Almheiri authored a 2014 paper, “Bulk Locality and Quantum Error Correction in AdS/CFT,” which suggests the AdS is being coded in the CFT using a quantum error-correcting scheme that distributes the information in a way that protects the quantum system. This may ultimately relate to how stable quantum computers can be protected against errors from the environment, one of the current challenges in successfully building one.

“Where are we now?” Almheiri replied, when asked to reflect on the current state of the black hole information paradox, the firewall paradox, and ER=EPR. “I’d say we are still confused. There is no completely satisfactory resolution. It might mean that we are not asking the right question, and we don’t know what the question is. We make progress in physics when we find the right question to answer.”—*Kelly Devine Thomas, Editorial Director*

professor, but it took me much longer to realize what it meant for me to “think independently” in China. In 1992, 1994, and 1998, respectively, some dissidents tried to found oppositional parties, and hundreds of them were thrown into prison and many were imprisoned for ten years or more. Hu Shigen, a university lecturer, was sentenced to twenty years.

The Sun Zhigang case raised the curtain on the rights defense movement. Sun Zhigang, a young designer, was taken to a “Custody and Repatriation Center” and tortured to death in 2003. With two other scholars, I wrote an open letter to the National Congress to challenge the constitutionality of the Custody and Repatriation system, which was obviously unconstitutional, and to push forward the establishment of a constitutional review system in China. It was a carefully considered “open conspiracy” on our part, and we were prepared for the potential risks in making such calls. A few months later, this unconstitutional system was abolished, a result of nationwide anger and pressure. To our wildest surprise, instead of being punished, we were selected by the government as “Ten People in Rule of Law in 2003.” Honestly, I’m a little embarrassed now that there was a time when I was not ashamed of being praised by the Chinese government.

My name appeared frequently in newspapers and on television and social media. I received countless letters from all over China, asking for help. They were victims of torture, forced abortion, forced eviction, religious persecution, miscarriages of justice, corruption, pollution, contaminated milk powder, poisonous vaccines, forced labor, so on and so on. It was not possible for individuals to represent them all, so I cofounded a non-governmental organization (NGO)—the Open Constitution Initiative (GongMeng)—and it became an important platform for early promoters of the rights defense movement. Lawyers, journalists, scholars, and bloggers played an active role in the rise of this movement, which uses existing laws and legal channels to defend human rights and promote rule of law in China. Why was the rights defense movement able to emerge under such a suppressive regime? The development of a legal system and legal profession after the Cultural Revolution, the new space enlarged by the rise of a market economy, the internet, and social media, the dissemination of liberalism’s ideas and expanded consciousness of civil rights, and the tough efforts of dissidents and democracy activists since the late 1970s, all contributed to the possibilities of a new human rights movement.

Still, China continues as a party-state system, and a meaningful political reform has not occurred. Chinese authorities brutally violate human rights and oppress freedom every day and everywhere. Unchecked power, corrupt officials, a flawed judicial system, and a huge wealth gap have produced immense injustice and grievance. The rights defense movement was shaped and developed through such a social context and political institutions, and over time, has shaped and changed the social context and political institutions.

With a doctorate degree in law, a bar certificate, a headful of ideas about freedom, democracy, and constitutionalism deemed “reactionary” by the party doctrines, a pen that could argue and incite, and an inflated sense of self due to hype from domestic and overseas media outlets, I became active and quickly known in China’s human rights movement. I went hither and thither to represent clients in all kinds of “sensitive” cases, networking human rights lawyers and activists.

Cai Zhuohua is the pastor of a Christian “house church.” He and his family were arrested for printing the Bible and distributing it to other Christians. In 2005, I defended him, along with other lawyers, including Gao Zhisheng, who was later detained and severely tortured. When the trial began, although we did everything we could, Cai’s mother was not allowed to enter the court as a bystander. During the trial, the judge bluntly interrupted the defendant and his lawyers dozens of times. In 2006, Wang Bo and her parents were sentenced to four and five years in prison, respectively, because they were Falun Gong believers, and they disclosed their torture on the internet. Falun Gong is the most persecuted religion in China. Defending a Falun Gong case was very dangerous and few lawyers were willing to do so. But we organized a defense team of six lawyers, and in our statement of defense, we challenged the entire legal basis of suppressing Falun Gong. After the trial, four enraged court workers lifted me up by my arms and legs, carried me across the high steps, and threw me out of the court building. Since 1999, there have been more than four thousand Falun Gong practitioners who have been tortured to death in prison or secret detention centers known as “black jails.”

Chen Guangcheng is a blind activist in Shandong Province. He wanted to sue local authorities for performing brutal forced abortions and forced sterilizations. The media was prohibited to report this so he came to GongMeng to ask for help. After hearing his story, I decided to investigate the incidents and represent the victims. I documented many shocking atrocities and when I published my sixty-page report online, it aroused the attention of Chinese citizens and international media. Chen was soon detained and received an imprisonment sentence of four years and three months. I then organized a team of human rights lawyers to defend him. Nearly every lawyer connected with his defense experienced being followed, robbed, and beaten.

In addition to GongMeng, I founded China Against the Death Penalty, which was the first and only NGO dedicated to abolishing the death penalty in China.

China carries out more than 80 percent of all executions in the world every year. Since a small group of human rights lawyers could not pay attention to all death penalty cases, our strategy was to focus only on the wrongful conviction cases—under China’s judiciary, many people have been sentenced to death and even executed based on fabricated evidence or coerced confessions by torture. We took more than thirty such cases, and it was extremely difficult to redress the injustice. Thanks to our persistent efforts of many years, around a dozen citizens were released from death row.

Since 2003, together with other human rights activists, I defended prisoners of conscience, owners of “nail



Protestors outside the courthouse where blind activist Chen Guangcheng was on trial in 2006

households” who refused to sell their homes to developers, victims of torture, and victims of melamine-tainted milk formula; initiated and participated in waves of citizen signature campaigns; took part in street demonstrations and protests; and gate-crashed black jails and brainwashing classes sponsored covertly by local governments. In 2008, 303 prominent Chinese intellectuals initiated Charter 08, which was inspired by Charter 77 of Czechoslovakia, demanding human rights protections. I helped Liu Xiaobo draft the Charter and collect signatures. In the open letter, we demanded a meaningful democracy and rule of law, and the end of one-party rule. Liu was charged with “incitement of state subversion” and sentenced to eleven years. He was awarded the Nobel Peace Prize in 2010 while in prison and died of cancer on July 13 in state custody.

After the Tibetan unrest in Lhasa in 2008, I organized an open letter, signed by twenty Chinese rights lawyers, expressing our concerns about the arrested Tibetans and offering to provide legal aid to them. GongMeng conducted an investigation in Tibetan communities and published a report the following year, providing an analysis of social reasons for the unrest. This was likely the last straw leading to my disbarment in 2008 and GongMeng’s shutdown in 2009.

Still we didn’t stop and went even further. We promoted the New Citizens’ Movement in 2012 when Xu Zhiyong published his article calling for a nationwide movement of active citizenship. He outlined the tactics to be employed: “repost messages, file lawsuits, photograph everyday injustices, wear t-shirts with slogans, witness everyday events, participate or openly refuse to participate in elections, hold gatherings or marches or demonstrations, do performance art, and use other methods in order to jointly promote citizens’ rights movements and citizens’ non-cooperation campaigns—such as assets reporting, openness of information, opposition to corruption, opposition to housing registration stratification, freedom of beliefs, freedom of speech, and the right of election.” “Practice the New Citizen Spirit in action. Citizens’ power grows in the citizens’ movement.” The New Citizens’ Movement included such activities as demanding the disclosure of official wealth, equal rights for education, and joint citizen meals (or same-city dinner gatherings). The article, with its clear political message advocating for transregional organization and street activism, brought the rights defense movement to a new level. Xu, my coauthor of the open petition in Sun Zhigang’s case, a cofounder of GongMeng and an unstoppable activist, was recently released from a four-year imprisonment in a Beijing prison.

It was amazing that the human rights movement developed vigorously and became more and more powerful in a tight corner of the repressive regime. Unsurprisingly, not long after the emergence of the rights defense movement, the Chinese government saw it as a real threat to the political system and never stopped its harassment and crackdown on rights activists and NGOs. The government adopted a flexible and comprehensive strategy, from oral warnings, disbarments, house arrests, travel bans, criminal charges, labor camps, and public humiliation to abduction, torture, and collective punishment. Every day reports

(Continued on page 19)

came from all over China that human rights defenders were disappearing or jailed.

Because of my human rights work, I was disbarred, banned from teaching, fired, kidnapped, disappeared, and detained and tortured by secret police. I once briefly described the “badge of honor” I earned bit by bit:

*First, they came to me speaking softly: “Look, you have knowledge, fame, and opportunities. Why mix with those people? You will enjoy many benefits if you side with the party.” I didn’t listen. I continued.*

*Then came the warnings: “It’s very dangerous if you continue. Take our advice, you’ll have a full belly. There will be consequences for giving trouble to the government. Don’t you see? Professional promotions, research funding, awards, you get none.” I didn’t listen. I kept going.*

*Then they began to dress me down. They confiscated my passport, so that I wouldn’t have a chance to experience the sufferings of life overseas. I didn’t listen. I kept going.*

*Then they disbarred me. The Chairman of the Beijing Lawyers’ Association Li Dajin and the chiefs at the Beijing Bureau of Justice hissed: “We must find ways to smash the rice bowls of these lawyers.” I didn’t listen. I kept going.*

*Then they closed down my blogs, my Weibo accounts, and my reincarnated Weibo accounts. I was barred from media interviews and college lectures. Upon swiping my ID, the screen would display “key stability maintenance target.” Some of the people who knew me wouldn’t dare to dine with me or even call me anymore. I didn’t care. I kept going.*

*Then they used thugs to follow me and attack me when I was away from home working on cases. Around the country’s sensitive dates, regular or circumstantial, I would be placed under house arrest by the domestic security police, or taken to travel in their company as they attempted patiently to give me their political persuasions. I was obstinate, sinking only further and deeper.*

*Then, to save me, they used kidnapping. In the middle of the night, they covered me in a black hood, handcuffed me, and threw me in a little black car, took me to a black jail, and locked me in a little black room for two days and two nights. They threatened to throw me in jail for inciting subversion of state power. I didn’t repent. Instead, I wrote articles, acted as a citizen deputy in case after case, and organized NGOs to assault the socialist rule of law with Chinese characteristics. If I stopped at any given point, repented, reinvented myself, I could still have had a great future.*

*The jasmine flowers blossomed quietly in the early spring of 2011, and the troublemakers were all rounded up. (During the Jasmine Revolution of the Arab Spring, an anonymous call for a “jasmine demonstration in China” was posted and spread on Twitter and other social media. Hundreds of lawyers, activists, and bloggers were kidnapped and disappeared.) Their education of me also escalated. Again, in a black night, with a black hood, handcuffed, in a black car, thugs kidnapped me and threw me in a black jail, this time adding fists and face slapping. No communications with the outside world, no sleeping, no receiving information, no freedom to stretch my arms or legs. During my seventy days in detention, I wore handcuffs twenty-four hours a day for thirty-six days and was forced to stay in one position, facing a wall, for eighteen hours straight for fifty-seven days. Physically and mentally tortured, I began to write statements of repentance and statements of guarantee. I had to rewrite them over and over to improve my sincerity. Never so profoundly did I experience the superpower of “the people’s democratic dictatorship.”*

*They had known all along, it turned out, the thing that I feared under the surface of bravery. They knew it from the very beginning and I should have known.*

*I feared for the people I love. Once my wife and daughter were hurt and faced with more threats, I was immediately caught in a dilemma. “Are you a responsible man or not?” In an irresponsible system, for a person wanting to be responsible, family responsibilities and social (historic) responsibilities are in direct conflict with one another. If you end up in prison, you will not be able to take care of your family; but to walk this path that I do, you will inevitably end up in jail or alternatives to jail. Away from this path, you may fulfill your family obligations, but you not only have to abandon your ideals, your children will continue to live in the same irresponsible system, and they too in the future will face the choice between family obligations and social responsibilities. Not to mention that it’s irresponsible to leave what we ought to be doing to the next generation.*

Lawyers, dissidents, citizen journalists, NGO activists, and rights defenders have been continuously subjected to harassment and persecution. Some activists have even lost their lives. Liu Xiaobo, Li Wangyang, Cao Shunli, Zhang Liumao, Xue Jinbo, among other human rights defenders, have died in custody because of proven or believed torture and ill treatment. But for various reasons, activists have not been silenced by harassment and slight punishment, like warnings, disbarment, house arrest, or even abduction and short-term detention. For many, the more persecution they encounter, the more solidarity they feel with like-minded people and the more valuable they believe their work to be.

Since Xi Jinping assumed power in late 2012, he has been trying to change the methods used for cracking down on the rights defense movement, seemingly from “stability maintenance” to “wiping out.” Before, the goal was primarily to punish those who crossed the line and to retain the advantages of

strong stability maintenance. However, the goal of Xi is simultaneously to eliminate the nodes of civil mobilization, eradicate emerging civil leaders, and disperse the capacity for civil resistance. At a minimum, the authorities want to curb the momentum in which the rights defense movement has been steadily growing and flourishing.

The well-known “709 crackdown” shocked the Chinese and the world. It was the worst crackdown on human rights lawyers since the recovery of the judicial system in the late 1970s. At around 3 a.m. on July 9, 2015, the human rights lawyer Wang Yu was abducted from her home in Beijing. Her husband, rights defender Bao Longjun, also disappeared. Wang is renowned in China. She represented Cao Shunli, who died after being denied medical treatment while in custody for her human rights activism; Ilham Tohti, a Uighur scholar unjustly sentenced to life in prison; and well-known protest organizer Wu Gan. In the days after Wang’s arrest, dozens of human rights lawyers were abducted, arrested, and disappeared; as of May 2017, in twenty-four provinces in China, at least 320 lawyers, law firm staff, human right activists, and family members have been questioned, summoned, forbidden to leave the country, held under house arrest and residential surveillance, criminally detained, arrested, or gone missing. All activists detained in the 709 crackdown were brutally tortured; in

custody, most were forced to take unidentified medicines that are mentally and physically harmful.

But isn’t there a profound dread lurking behind this barbarism?

On the one hand, the Communist Party is not as confident as it seems to be. It is facing deep crisis politically, economically, socially, and ideologically. It has an exaggerated fear of opposition, resistance, and social-political movement. On the other hand, the development of the rights defense movement has experienced at least four trends since its rising, namely, organization, street activism, politicization, and internationalization. These trends can be seen as the amazing achievements of the rights defense movement, as well as the deep reason for the government crackdown on this movement.

Before and even since the rise of the rights defense movement, people have not abandoned efforts toward organized protest, as illustrated by the creation of political parties such as the Chinese Liberal Democratic Party and the China Democracy Party, and groups such as the Tiananmen Mothers, the Pan-Blue Alliance, the Guizhou Human Rights Forum, Charter 08, various house-churches, and rights NGOs. Mobilization and organization in the internet age have allowed for collective action and social movements without organizational structure, charters, leaders, or fixed membership. “Organizing without organization” obviously reduced the costs and the risks of setting up an underground political organization or a formal organization.

With the understanding that judicial independence does not exist, especially in human rights cases (sensitive cases), rights lawyers have had to resort to activism outside the courtroom and in the street, aiming to pressure the court, the government, and decision makers behind the scenes.

The rights defense movement is the practice of the theory of human rights and liberalism and democracy. As liberal democracy became a political-social aim of some influential intellectuals and as more and more people moved out of the shadow of brainwashing propaganda and into civil consciousness, there has been a tremendous momentum to bring human rights, liberalism, and democratic ideas into practice. The struggle for the right to vote and freedom of speech, assembly, demonstration, and association should be an intrinsic part of a human rights movement, and it has been so in China. The initial idea of the rights defense movement was to use existing laws to defend human rights and freedom; however, the more rights lawyers use these laws, the more they feel the need to go beneath the surface and change the underlying policies, institutions, and system.

I am optimistic that Chinese people will in the future enjoy a liberal democracy and rule of law because the pursuit of human dignity and freedom is undefeatable. I was tortured every day during my detention in an unknown black jail in 2011—the guards were ordered not to open the windows and curtains. But a guard opened the windows for me a couple of times. Once he even took me out of my cell, letting me breathe fresh air. Wherever or whenever human dignity prevails, tyranny is defeated. The Chinese Communist Party has been acting against human nature and that is why we have sacrificed so much to fight against the Communist Party. I am honored that my courage, my struggle, my suffering have been a small part of that great cause. ■

*Teng Biao, Visitor (2016–17) in the School of Social Science, taught constitutional law and jurisprudence in Beijing for twelve years. He left China for the United States in 2014 as part of Scholars at Risk, an international network that arranges temporary academic positions for scholars facing grave threats in their home countries. During his stay at the Institute, he began to write a book on the human rights movement in China from 2003 to 2016. His research interests include criminal justice, political transition, social movement, and political philosophy.*

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Fall 2017

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