The Adolph C. and Mary Sprague
MILLER INSTITUTE
for Basic Research in Science

Newsletter
Fall 2019

The Circumgalactic Medium

Miller Fellow Focus: Yong Zheng

Just like Earth has an atmosphere and the Sun has a corona, galaxies are embedded in gaseous halos called circumgalactic medium (CGM; see **Figure 1**). Gases in the CGM are very thin, much thinner than air in Earth's atmosphere or any condition in interstellar space. In the CGM, one often finds a number density much less than 0.01 cm^{-3}. That means, for a volume as big as a normal-size refrigerator in space, there are less than ten thousand atoms in it! For a galaxy like our own Milky Way, its CGM has a volume thousands times bigger than the visible portion of the galaxy itself -- imagine a coin (galaxy) inside a basketball (CGM).

As illustrated in **Figure 1**, galaxies that are forming stars interact with their CGM via dynamical processes such as outflows, inflows, and gas recycling. Outflows rush out of galaxies powered by star formation or black hole activities at speeds of hundreds to thousands of kilometers per second. Inflows transport fresh gases from outside of the CGM into galaxies to replenish star-forming fuel. While the CGM is stirred and mixed by inflows and outflows, gases may condense into cooler phases (i.e., lower temperature and higher density) and rain back down to galaxies to sustain future star-forming activities, the so-called "gas recycling". As a Miller Fellow, I aim to observe and characterize how galaxies interact with their CGM via these dynamical processes using telescopes such as the Hubble Space Telescope (ultraviolet), the Arecibo Observatory (radio), and the Keck Observatory (optical).

Because of the low density, CGM does not shine as brightly as stars or galaxies. To observe such a thin medium, one of the methods often used is the "transverse absorption-line technique" as illustrated in **Figure 2**. CGM is a plasma soup that mainly consists of hydrogen (H) and helium (He). Elements heavier than H and He, conventionally referred to as "metals" by astronomers, are sprinkled in the soup like salt and pepper by outflows, inflows, and gas recycling. De-

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Miller Research Fellowship Nominations
Deadline: September 10, 2019

Miller Research Professorship Applications
Deadline: September 12, 2019

Visiting Miller Professorship Departmental Nominations
Deadline: September 13, 2019

See page 5 for more details.

For more information on all our programs:
miller.berkeley.edu

"Having been active in all facets of the Miller Institute (as a Miller Fellow, a Miller Professor, a Miller Senior Fellow, and a host of several Fellows and Visiting Miller Professors), my own career has been greatly enhanced; indeed, I probably would not be where I am today were it not for the Institute."

Alex Filippenko
Astrophysicist, Miller Fellow 1984-86, Miller Professor Spring 1996 & Spring 2005, Miller Senior Fellow 2017-, Carnegie/CASA 2006 National Professor of the Year, Richtmyer Memorial Award

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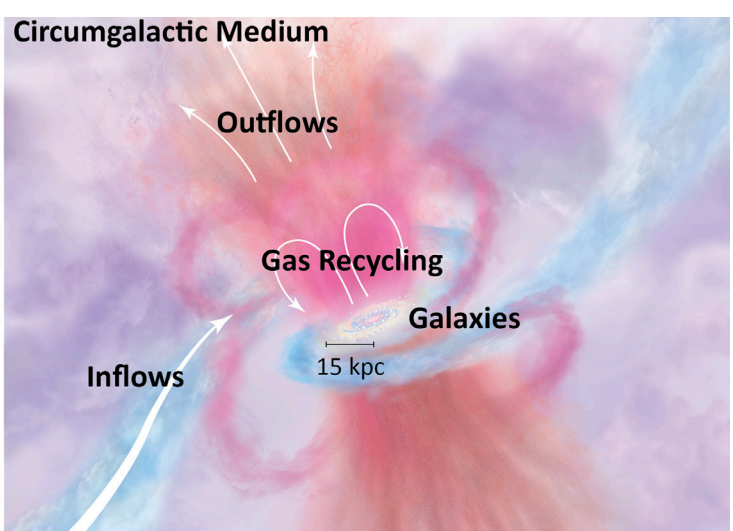

Figure 1. Schematic illustration of galaxies, their CGM, and dynamical processes in the CGM. CGM often exhibits a volume thousands times bigger than the visible extent of galaxies themselves. Gases, mostly hydrogen and helium, are circulated between galaxies and their CGM through outflows, inflows, and gas recycling. This figure is reproduced with permission from an annual review article, "The Circumgalactic Medium", Tumlinson, Peeples, & Werk, 2017, Annual Review of Astronomy and Astrophysics.

spite their little cosmic abundance (less than 1% by mass), these metals can absorb photons from bright background objects and give rise to important detectable absorption lines at specific wavelengths. For example, the ionization of a doubly-ionized silicon atom *(Si^{2+})* to a triply-ionized silicon atom *(Si^{3+})* produces two absorption lines at wavelengths of 1393 (Angstrom; Å) and 1402Å called "*Si^{3+}* doublet" (see **Figure 2**). By analyzing the line shapes, astronomers can extract information on CGM's physical properties such as temperature, density, chemical abundance, and kinematics. To observe such absorption lines in the CGM, one can select lines of sight going through the CGM toward stars in galaxies as well as quasars in the distant universe; quasars are brilliant star-like point sources on the sky which are caused by massive black holes engulfing surrounding gases in the center of galaxies.

Part of my PhD thesis with Prof. Mary Putman and Dr. Joshua Peek at Columbia University focused on gas inflows in a nearby galaxy called the Triangulum Galaxy (M33). Using the Cosmic Origins Spectrograph on board the Hubble Space Telescope, I observed metal absorption lines caused by *Si^{3+}* doublet toward lines of sight pointing at stars at different locations of the galaxy. Several pieces of information can be inferred from the spectra displayed in **Figure 2**. First, the absorption lines show at least three distinguishable components, indicating that there are three different gas sources bearing *Si^{3+}* along the line of sight. Based on the Doppler shift of each component relative to M33's velocity, I find that **"A"** is caused by the interstellar medium inside M33, **"B"** is from inflowing gas at the interface of M33 and its CGM, whereas **"C"** arises from the interstellar medium of our own Milky Way. Second, because silicon is produced through nucleosynthesis processes by stars and stars are born inside galaxies, the detection of inflowing *Si^{3+}* in **"B"** indicates that M33's CGM has been enriched with metals by past outflow events. Moreover, since only 33.5 electron volts are needed to ionize *Si^{2+}* to *Si^{3+}*, the detection of *Si^{3+}* suggests a temperature of tens of thousand kelvin degrees in the ambient plasma - we CGM researchers are feeling "cool" about that temperature! Conventionally, a "warm" CGM has temperatures of a few hundred thousand kelvin degrees in which *O^{5+}* resides, and a "hot" CGM is a few million kelvin degrees or higher that is detectable in X-rays.

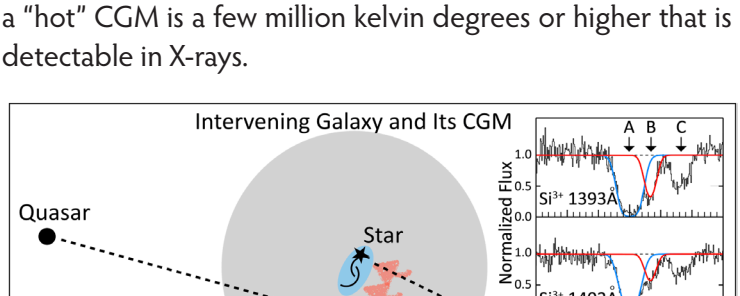

Figure 2. Schematic illustration of the transverse absorption-line technique. An observer's line of sight toward a bright background object, a star or a quasar, intervenes the CGM of a galaxy, giving rise to absorption lines in the galaxy's rest frame. Here I show an example of a *Si^{3+}* doublet observed toward a bright star in the Triangulum Galaxy. The wavelength has been converted into velocity as: $v=c\,(\lambda_{obs}-\lambda_0)/\lambda_0$, where c is the speed of light, λ_{obs} is the observed wavelength displaced from the line' rest wavelength λ_0 because of Doppler shifts caused by *Si^{3+}* absorbers' motions. The 1393 Å and 1402Å lines show identical line profiles with strength ratio of 2:1 as regulated by their oscillator strengths, which can be interpreted as the probability of a line transition. For the *Si^{3+}* doublet, the 1393 Å line is twice as likely (thus stronger) to occur than the 1402Å line. See text for explanation of the three components "A", "B", and "C". The *Si^{3+}* doublet spectra are reproduced with permission from an article *"HST/COS Observations of Ionized Gas Accretion at the Disk-Halo Interface of M33", Zheng, Peek, Werk, & Putman, Astrophysical Journal, 834, 179, (2017).*

As a Miller Fellow, I am focusing on the CGM of dwarf irregular galaxies in the Local Group. The Local Group is a group of galaxies bound together by gravity in the local universe, including our Milky Way, the Andromeda Galaxy, and about 100 smaller galaxies called "dwarf" galaxies. Dwarf irregular galaxies, as the name implies, are dwarf galaxies with

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undefinable shapes. The masses of dwarf irregular galaxies are 10^3 - 10^9 less than that of our Milky Way. Because of their lower masses, the gravitational potential well of dwarf irregular galaxies is so shallow that metals synthesized in stars can be thrown into the CGM by stellar winds more easily than those in higher-mass galaxies. Moreover, dwarf irregular galaxies in the Local Group are particularly valuable because metal properties in their CGM can be tied to the galaxies' star-formation histories. The star-formation histories mean the rates of stars being born as functions of stars' ages. Because galaxies are lit up by stars inside them and stars at different evolutionary stages shine in different colors, one can study the star-formation histories by disintegrating galaxies' starlight into different photometric colors and relating them to stars in various age groups. My Miller host, Prof. Daniel Weisz, has assembled the star-formation histories for a large sample of dwarf galaxies in the Local Group. Using the derived star-formation history, I am studying the CGM of a nearby dwarf irregular galaxy, WLM, with a quasar spectrum from the Hubble data archive. I find that roughly 90% of the metals ever synthesized by stars in WLM are likely to have been lost to its CGM or beyond. Going further, I am leading a Hubble observing program (HST GO 15156; PI Zheng) to investigate the CGM of IC1613, an isolated dwarf irregular galaxy on the outskirts of the Local Group. With multiple sightlines through the galaxy and its CGM at different locations, I am aiming to map the metal properties in the CGM and link them to current-day inflow/outflow phenomena in IC1613.

Being trained as an ultraviolet/radio observer during my PhD, I am also developing new skills to understand the CGM with optical emission-line observations and synthetic spectroscopy with cosmological hydrodynamical simulations. Together with Prof. Daniel Weisz and our collaborators from multiple institutes, I initiated a pilot program with the multi-slit spectrograph DEIMOS mounted on the Keck II Telescope to track gas inflows and outflows at the interface of the Triangulum Galaxy and its CGM. I am also collaborating with the FOGGIE team (Figuring Out Gas and Galaxies in Enzo; PI Dr. Molly Peeples) to perform synthetic spectroscopic analyses of simulated Milky Way-mass galaxies. Because our solar system is located inside the Milky Way, our lines of sight are inevitably biased by overwhelmingly thick gas in the foreground of the Milky Way's thin CGM -- imagine that fog looms over San Francisco but never dissipates! With FOGGIE, I aim to statistically quantify the bias due to foreground thick gas via large samples of synthetic spectra and study the multi-phase structures of the CGM.

Ever since Lyman Spitzer proposed the Milky Way is surrounded by a Galactic corona -- an analogy borrowed from that of the Sun, our understanding of galaxies' CGM has been rapidly evolving thanks to the development of ground-based/space telescopes and numerical simulations. But we have just begun to see the tip of the iceberg. As part of the CGM community, I am working on and looking forward to gaining deeper insights into the details of how galaxies and their CGM mutualistically exist and evolve.

Yong Zheng grew up in a beautiful village called Liaoyan, in Fuzhou City, Fujian Province, China. She began her astronomy research journey in Peking University guided by Prof. Richard de Grijs and Prof. Xiao-Wei Liu. She completed her bachelor's degree in Astronomy in 2012. During the following six years, Yong lived in New York City and pursued her Ph.D. degree at Columbia University. She was advised by Prof. Mary Putman and Dr. Joshua Peek, studying the diffuse neutral and ionized gas that fills the vast majority of galactic and circumgalactic space using radio observations and ultraviolet spectroscopy. Yong moved to Berkeley in Fall 2018, and continues her CGM research as a Miller Fellow hosted by Prof. Daniel Weisz. Since her move to California, Yong has cultivated a new hobby of rock climbing, while other activities such as running and drawing delightfully fill her spare time.

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Miller Fellows Video Presentations

Please check us out on our website, Facebook and Twitter! Watch and subscribe to our YouTube channel!

From the Executive Director

Marla Feller, Miller Institute Executive Director & Professor of Neurobiology

If your time to you is worth savin'
Then you better start swimmin'
or you'll sink like a stone
For the times they are a-changin'

- Bob Dylan, 1964

There are two reasons for starting this year's letter with a Dylan quote: 1) I have always wanted to quote Bob Dylan on the printed page and 2) summer 2019 marks a significant change for the Miller Institute. Kathy Day, the Chief Administrative Officer for the Miller Institute for Basic Research in Science, has retired after 30 years of dedicated service. We made sure that her contributions to the Miller community were well celebrated. In May 2019, we held a reception to honor Kathy and the innumerable ways she has enriched the Miller Institute. It was a lovely event, marked by heartfelt speeches, excellent wine and food, and many shared stories. Kathy is enjoying her retirement by traveling across Europe, including couch surfing with several former Miller Fellows. We all wish her the best. Stay tuned for an announcement in the near future of an exciting new effort to honor Kathy's legacy at the Miller Institute! Though we are sad to see Kathy go, we are excited to welcome the new Chief Administrative Officer, Hilary Jacobsen. Please read about Hilary below.

Summer represents a big change for the membership of the Miller Community. Several Miller Fellows are off to new adventures while we welcome 11 new Fellows this Fall. We have two new Senior Miller Fellows – Professors Susan Marqusee (Chemistry/Molecular and Cell Biology) and Michael Jordan (Electrical Engineering and Computer Sciences/Statistics) who will be accompanying current Senior Miller Fellow Alex Filippenko (Astronomy). We want to give a special thanks to Barbara Meyer who completed her 5-year term as a Miller Senior Fellow. Miller Senior Fellows are a wonderful source of information for Fellows and faculty alike, offering great insights into many aspects of the world of science. The rest of the Executive committee -- Stephen Leone from Chemistry/Physics, Yun Song from Math/Statistics, and Roland Burgmann from Earth and Planetary Science -- have remained constant as have the members of the Advisory Board, including Steve Block, (Stanford), Feryal Ozel who has renewed her appointment (University of Arizona), Luis Caffarelli (University of Texas – Austin) and Tim Stearns (Stanford). As always, we are grateful for the wisdom they provide to our program. To keep up with the great successes of the members of the Miller community, check out the announcements on the Miller website (http://miller.berkeley.edu).

Under the guidance of faculty leader Michael Manga and the rest of the Spring Symposium Committee, we had another unforgettable Spring Symposium this June. Tomales Bay offered up its most beautiful weather – lovely sunny days and clear enough nights for excellent planet viewing in the evening. This year we were enthralled by incredible lectures from all areas of science. We learned about the hunt for black holes from Jessica Lu (who shared a video from a night at Mauna Kea that many of us will never forget), followed by Nobel Laureate Frances Arnold who shared strategies for creating enzymes with new biological functions. Libby Barnes explained the use of machine learning algorithms for gaining insight into the underpinnings of climate variability and the utility of climate models. Saturday continued with a mathematical description of emergent properties of biological systems from Corina Tarnita, and concluded with Terry Plank's talk about the development of physics-based models that can help forecast volcano behavior, during which we learned that there are 15-25 volcanoes erupting at any given time! Former Miller Fellow Yi Cui kicked off Sunday's talks by discussing successful strategies for reinventing battery technology. We finished strong with Sabeeha Merchant who described how living organisms utilize just the right amount of higher mass elements of the periodic table to sustain life from. One aspect that stood out to me this year was how much of the research conducted by these leaders influenced policy and how much policy influences science. I was extremely impressed by how informed the scientists were about these interactions. A message to myself and perhaps the more senior members of the community that *we better start swimmin'!*

Other highlights to the year included a Fall Dinner presentation by UC Berkeley biophysicist Carlos Bustamante. The work from the Bustamante lab focuses on developing and applying single-molecule manipulation and detection to understand what happens inside cells with exquisite detail. One fascinating example he described was in transferring viral DNA into a host cell, which is not a passive process but rather requires little motor proteins to do work. At the Spring Dinner, we heard from Eric Cornell. In his highly entertaining lecture, Eric convinced us all of the beauty and importance of precision measurements to address a fundamental mystery about the Universe -- while theories of elementary physics seem to support a sort of symmetry where matter and anti-matter mirror each other, we cannot seem to find our anti-matter partners. The Cornell lab is hunting for a small asymmetry in the shape of electrons that might get us out of this predicament. We now know that if this asymmetry exists, it is really, really, really small. The mystery continues!

In addition to these highlights, the year was filled with fascinating weekly lunch talks by Fellows, Miller Visiting Professors and Miller Professors. Every week I am reminded what a privilege it is to be a scientist and to be associated with the Miller Institute. To close, another Dylan quote; to me it evokes the safe haven and stability the Miller Institute brings to our otherwise chaotic and every changing lives:

Well, I'm livin' in a foreign country but I'm bound to cross the line
Beauty walks a razor's edge, someday I'll make it mine
If I could only turn back the clock to when God and her were born
Come in, she said, I'll give ya shelter from the storm

- Bob Dylan, 1975

Welcome Hilary!

It is with great pleasure that we welcome our new Chief Administrative Officer, Hilary Jacobsen! Hilary joined the Miller family in May, coming most recently from the nonprofit sector, where she held roles in administration, learning and development and grant writing. From 2013-2015, Hilary served in the US Peace Corps in rural El Salvador as part of the Masters International program, working with local people on community projects and improving economic livelihoods. Since returning from the Peace Corps, she has gotten involved with the Northern California Returned Peace Corps Volunteer Association, through which she met Kathy! Hilary holds a BA in French and International Affairs from the University of Puget Sound in Tacoma, WA and a Masters in Public Administration from the Middlebury Institute of International Studies in Monterey, CA. In her spare time, she enjoys cooking, traveling and making crafts from beeswax with her beekeeping husband Noah.

Call For Nominations: Miller Research Competitions

Miller Research Fellowship 2020-2023
Online Nomination Deadline: September 10, 2019

The Miller Institute for Basic Research in Science invites department chairs, faculty advisors, professors and research scientists at institutions around the world to submit online nominations for Miller Research Fellowships in the basic sciences. The Miller Institute seeks to discover and encourage individuals of outstanding talent, and to provide them with the opportunity to pursue their research on the Berkeley campus. Fellows are selected on the basis of their academic achievement and the promise of their scientific research. Miller Fellows also have a keen curiosity about all science and share an appreciation for an interdisciplinary experience. The Miller Institute is the sponsor and the administrative home department for each Miller Fellow who is hosted by an academic department on the Berkeley campus. All research is performed in the facilities provided by the host UC Berkeley academic department(s). A list of current and former Miller Research Fellows is available on our website.

Miller Research Fellowships are intended for exceptional young scientists of great promise who have recently been awarded, or who are about to be awarded, the doctoral degree. Normally, Miller Fellows are expected to begin their Fellowship shortly after being awarded their Ph.D. Applicants who have already completed substantial postdoctoral training are unlikely to be successful except in unusual circumstances. **A nominee cannot hold a paid or unpaid position on the Berkeley campus at the time of nomination or throughout the competition and award cycle**. Nominees who are non-US citizens must be eligible for obtaining J-1 Scholar visa status for the duration of the Miller Fellowship. The Miller Institute does not support H1B visa status. The Fellowship term must commence between July 1 and September 1, 2020. Eligible nominees will be invited by the Institute to apply for the Fellowship. Direct applications and self-nominations are not accepted.

*All nominations must be submitted using the Online Nomination System at: http://**miller.berkeley.edu**

Nominators will need the following required information to complete the online nomination process:
+ Nominee's complete full and legal name (do not use nicknames)
+ Nominee's current institution
+ Nominee's complete, current, and active E-mail address, current mailing address with postal code and telephone number
+ Nominee's Ph.D. Institution and (expected) Date of Ph.D. (month & year required)
+ Letter of recommendation and judgment of nominee's promise by the nominator. Letter must be specific to the Miller Fellowship, have a current date, and be on institutional letterhead. The Executive Committee finds it helpful in the recommendation letter to have the candidate compared with others at a similar stage in their development.
+ Nominator's current active E-mail address, title, and professional mailing address (include zip code/campus mail code)

The Institute provides a stipend of $65,000 with annual increases on subsequent anniversary dates and an annual research fund of $10,000, for total initial compensation of $75,000. There is provision for travel to Berkeley for Miller Fellows and their immediate families and a maximum allowance of $3,000 for moving personal belongings. Benefits, including medical, dental, vision and life insurance are provided with a modest contribution from the Miller Fellow. All University of California postdocs are represented by the UAW. Fellowships are awarded for three years, generally beginning August 1, 2020 and ending July 31, 2023. Approximately eight to ten Fellowships are awarded each year. Candidates will be notified of the results of the competition starting in mid-December, and a general announcement of the awards will be made in the spring.

Miller Research Professorship AY 2020 - 2021
Online Application Deadline: September 12, 2019

The Miller Professorship program is pleased to announce the call for applications for terms in AY 2020-2021. The goal is to accommodate a greater range of Berkeley campus faculty to participate in the vibrant Miller community. The objective of the Miller Professorship program is to provide opportunities for faculty to pursue new research directions on the Berkeley campus. For some, this may best be enabled by taking time off from teaching. For others, the teaching obligations are critical to maintaining campus academic programs. Thus the option for Miller Professors to continue campus service and teaching. Funds will be distributed differently depending upon the choice selected. Details of the terms and the application procedure are posted on the Miller Institute website. The primary purpose of the Miller Professorship program and the evaluation criteria continues to be research excellence. Applicants are encouraged to describe their interest in participating in the Miller Institute community.

Applications from UC Berkeley faculty for Miller Research Professorship terms in the 2020-21 academic year are being accepted online now. Appointees are encouraged to follow promising leads that may develop in the course of their research.

Applications are judged competitively and are due by Thursday, September 12, 2019. It is anticipated that between five to eight awards will be made.

Visiting Miller Research Professorship AY 2020
Online Nomination Deadline: September 13, 2019

The Advisory Board of the Miller Institute for Basic Research in Science invites Berkeley faculty to submit online nominations for Visiting Miller Research Professorships and the Gabor A. and Judith K. Somorjai Visiting Miller Professorship Award for terms in Fall 2020 or Spring 2021. The purpose of these Visiting Miller Professorships is to bring promising or eminent scientists to the Berkeley campus on a short-term basis for collaborative research interactions. It is required that awardees are in residence at Berkeley during their appointment term. Faculty members or research scientists from any place in the world are eligible to be considered for sponsorship. Non-US citizens must be eligible for J-1 Scholar visa status. Faculty members at other UC campuses are eligible to be nominated for this program. The Miller Institute, as the sponsor and administrative department, will extend the invitation to the nominee after advising the nominator of its selection.

Nomination & Application details: miller.berkeley.edu

Questions? 510-642-4088 | millerinstitute@berkeley.edu

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In the News

(see more past & current Miller Institute News: **miller.berkeley.edu/news**)

Miller Members Among Newly Elected **2019 AAAS Fellows:**

- **Eugene Chiang** (Miller Professor 2013) was honored for his research in theoretical astrophysics, with an emphasis on understanding the origin of planetary systems.
- **Jeffrey Long** (Miller Professor 2011) was honored for his advanced research in chemical and biomolecular engineering.
- **Kam-Biu Luk** (Miller Professor 2001) was recognized for his research of the nature of elementary particles and their fundamental interactions, especially of the neutrinos and nucleon decay.
- **Alex Meyer** (Visiting Miller Professor 1996) was honored for his advanced contributions in zoology and evolutionary biology.
- **Chris Shannon (**Miller Professor 2001-2002) was recognized for her contributions in Applied Mathematics and Mathematical Economics.

Barbara Romanowicz (Miller Professor 2010) was awarded **Marcus Milling Medal** in recognition of her consistent contributions of high-quality scientific achievements and service to the Earth Sciences having lasting, historic value.

Lewis Feldman (Miller Fellow 1976-1978) was appointed as Director of the University of California Botanical Garden.

Robert Littlejohn (Miller Professor 1992) has been selected as a recipient of the **2019 Distinguished Teaching Award**, the campus's most prestigious honor for teaching.

Miller Members Among Newly Elected **2019 NAS Fellows:**

- **Chris Greene** (Visiting Miller Professor 2007) was recognized for his distinguished contributions to Theoretical Atomic, Molecular, and Optical Physics.
- **Rebecca Heald** (Miller Professor 2009-2010) was honored for her advanced research that explores two fundamental areas of biology: cell division and size control.
- **Marc Kamionkowski** (Visiting Miller Professor 2010) was recognized for his research in particle physics, dark matter, inflation, the cosmic microwave background and gravitational waves.
- **Omar Yaghi** (Visiting Miller Professor 2009) was honored for having pioneered reticular chemistry, which is a new field of chemistry that is concerned with stitching molecular building blocks together by strong bonds to make open frameworks.

Sarah Keller (Somorjai Visiting Miller Professor 2015-2016) was recognized with the **Cottrell Plus STAR Award** for her outstanding research and educational accomplishments.

Ehud Isacoff (Miller Professor 2013) and a team of researchers designed the gene therapy to regain sight, delivered via an inactivated virus targeted to retinal ganglion cells and loaded it with the gene for a light-sensitive receptor, the green (medium-wavelength) cone opsin.

Ambika Kamath (Miller Fellow 2018-2021) won the **2019 Jasper Loftus-Hills Young Investigator Award.**

Shirshendu Ganguly (Miller Fellow 2016-18) is among 126 early-career scholars named **2019 Sloan Research Fellow in Mathematics**, who represent the most promising scientific researchers working today.

Stephen Leone (Visiting Miller Professor 1990, Miller Professor 2010, Executive Committee & Advisory Board Member 2015-2019) & **Norman Yao** (Miller Fellow 2014-2017) were awarded the **Keck Foundation Funding** to utilize a new technique, ultrafast X-ray spectroscopy, to address important unanswered questions about the formation of non-equilibrium topological phases.

Selected from a pool of exceptional colleagues, **Britt Glaunsinger** (Miller Professor 2015), **Arash Komeili** (Miller Professor 2016-2017) and **Simonetta Gribaldo** (Visiting Miller Professor 2019) were elected into the **American Academy of Microbiology** based on their records of scientific achievement and original contributions that have advanced microbiology.

Miller Members Named Winners of the **2019 American Chemical Society Awards:**

- **Matthew Francis** (Miller Fellow 1999-2001) was honored with the **Arthur C. Cope Scholar Award**, sponsored by Arthur C. Cope Fund.
- **Harry Gray** (Visiting Miller Professor 1985) was honored with the **Nobel Laureate Signature Award** for Graduate Education in Chemistry, sponsored by Avantor Performance Materials.
- **Jeffrey Long** (Miller Professor 2011) was recognized with the **F. Albert Cotton Award in Synthetic Inorganic Chemistry,** sponsored by the F. Albert Cotton Endowment Fund.
- **Manos Mavrikakis** (Visiting Miller Professor 2019) was presented with the **Gabor A. Somorjai Award for Creative Research in Catalysis,** sponsored by the Gabor A. & Judith K. Somorjai Endowment Fund**.**
- **Daniel Neumark** (Miller Professor 1999-2000) was presented with the **Peter Debye Award in Physical Chemistry,** sponsored by DuPont.
- **Gregory Voth** (Visiting Miller Professor 2003) was presented with the **Joel Henry Hildebrand Award in the Theoretical & Experimental Chemistry of Liquids,** sponsored by the ExxonMobil Research & Engineering.

We've Moved!

New Address: 468 Donner Lab
Berkeley CA 94720-5190

23rd Annual Interdisciplinary Symposium

Miller Fellows Xiaojing "Ruby" Fu , Cara Brook, Miller Fellow Alumna Cassandra Hunt, Rob Pringle & Symposium Speaker Corina Tarnita

Miller Fellow Soonwon Choi & Miller Professor Dan Stamper-Kurn

Miller Fellows Sam Hopkins & Alex Turner

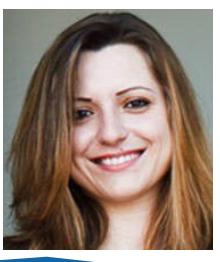
Miller Fellow Alumnus Ryan Dalton, Miller Fellows Thibault de Poyferre, Becca Tarvin, Ambika Kamath & Louis Kang

2019 Symposium Participants

Chief Administrative Officer Kathy Day & Symposium Speaker Frances Arnold

Speakers: Frances Arnold, Elizabeth Barnes, Yi Cui, Jessica Lu, Sabeeha Merchant, Terry Plank & Corina Tarnita

Miller Fellow Chris Lemon, Executive Director Marla Feller & Miller Fellow Sho Takatori



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Miller Institute News - Fall 2019
Please send address corrections to:
miller_adm@berkeley.edu

Birth Announcements

Rebecca Duncan (Miller Fellow 2016-2019) & her husband Michael welcomed a baby boy, Wystan Guadalupe on March 29th.

Ryan Trainor (Miller Fellow 2014-2017) & his wife Lauren welcomed new daughter, Juniper Day Mieke on April 13th.

Brooke Gardner (Miller Fellow 2013-2016) & her husband Chris welcomed their daughter, Vivian Catherine on June 2nd.

Next Steps

The Miller Institute congratulates the Miller Fellows on their next endeavors:

Ben Good (Assistant Professor in the Applied Physics Dept. @ Stanford)

Chris Lemon (Postdoc @ UC Berkeley, Marletta Lab)

Kelly Nguyen (Group Leader @ the MRC - Laboratory of Molecular Biology, Cambridge , UK)

Alejandro Rico-Guevara (Walt Halperin Endowed Professor in the Department of Biology & Curator of Ornithology in the Burke Museum, as well as a Washington Research Foundation Distinguished Investigator - starting 2020)

Sarah Slotznick (Assistant Professor @ Dartmouth College)

Becca Tarvin (Assistant Professor @ UC Berkeley / Asst. Curator @ Museum of Verterbrate Zoology)

Make a Gift

Donations can be made by going to:
Give to CAL for the Miller Institute: **miller.berkeley.edu/gift**

The Miller Institute is "dedicated to the encouragement of creative thought and the conduct of research and investigation in the field of pure science and investigation in the field of applied science in so far as such research and investigation are deemed by the Advisory Board to offer a promising approach to fundamental problems.

For More Information:

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