

A Time of Great Growth



Heartfelt greetings from the UC Riverside Department of Physics and Astronomy. This is our annual newsletter, sent out each Spring to stay connected with our former students, retired faculty, and friends in the wider community. The Department continues to grow, not merely in size but also in stature and reputation. For the 2018-2019 academic year, we were pleased to welcome two new faculty: Professors Thomas Kuhlman and Barry Barish. Professor Kuhlman was previously on the faculty at the University of Illinois at Urbana-Champaign. He joins our efforts in the emerging field of biophysics. His research lies in the quantitative imaging and theoretical modeling of biological systems. He works on genome dynamics, quantification of the activity of transposable elements in living cells, and applications to the engineering of genome editing.

Professor Barry Barish, who joins us from Caltech, is the winner of the 2017 Nobel Prize in Physics. He brings great prestige to our Department. Along with Professor Richard Schrock of the Department of Chemistry, who also joined UCR in 2018, UCR now has two Nobel Prize winners on its faculty. Professor Barish is an expert on the detection and physics of gravitational waves. He has been one of the key figures in the conception, construction, and operation of the LIGO detector, where gravitational waves were first discovered in 2015, and which led to his Nobel Prize. He is a member of the National Academy of Sciences and the winner of many other prestigious awards. The discovery of gravitational waves is one of the most exciting developments in physics so far this century. It has led to further confirmation of Einstein's theory of general relativity and opens up an exciting new window to explore the universe and peer back to the beginning of time. With Professor Barry Barish on board, and under his direction, the Department anticipates expanding in the next few years in areas such as the experimental investigation of dark matter, dark energy, neutrino physics, and possibly gravitational waves.

Our undergraduate and graduate student enrollments continue to grow. This past year has seen a strong increase in undergraduate transfers from California community colleges. Similarly, we are receiving record numbers of applicants for our graduate program, especially from domestic students. Our innovative 8 unit (double the normal load) Physics 41 series, required for first year undergraduate physics majors, has been very successful at accelerating student learning, better

preparing students for upper division work and thereby reducing their time to graduation. We are especially proud that over 80% of our undergraduate physics students engage in research, and we strongly encourage them to do so.

We cordially invite you to attend this year's Physics and Astronomy graduation ceremony, to be held on campus Saturday June 15, 2019. Nobel Prize laureate Professor Barry Barish will be the keynote speaker. Information about the event is included at the end of this newsletter. We hope to see you all June 15!

With best wishes to all!

Ken Barish

Chair and Professor, UCR Physics and Astronomy

UCR Physics and Astronomy by the numbers:

Number of faculty: 44

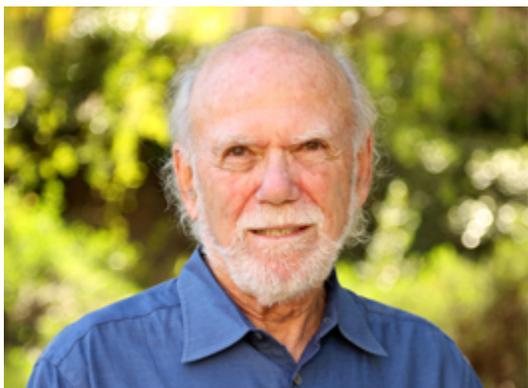
Number of undergraduate students: 183

Number of graduate students: 144

Number of bachelor degrees awarded in June 2018: 24

Number of Ph.D degrees awarded in June 2018: 15

NEWS



UCR Distinguished Professor Barry Barish elected a Fellow of the Royal Society

The honor recognizes his decisive contributions to the LIGO detector and the observation of gravitational waves.

[Read more](#)



Four Students Win NSF Scholarships

The NSF Graduate Research Fellowship Program (GRFP) recognizes and supports outstanding graduate students in NSF-supported science. The UCR Physics and Astronomy Department had four winners this year. The three graduate student winners are Martin Fernandez, Holly Christenson, and Lexi Costantino. Senior Cindy Yanez was the undergraduate winner. She will be able to use her award once she begins graduate study next year.

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UCR Professor Igor Barsukov named an outstanding reviewer

Professor Barsukov, who specializes in experimental condensed matter physics, was honored by the journal Communications Physics as an outstanding reviewer of manuscripts.

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UCR physics undergraduate Sergio Garcia heads to CERN

Sergio Garcia, a first generation college student, was accepted into the University of Michigan's semester abroad program to perform research at the CERN laboratory near Geneva Switzerland.

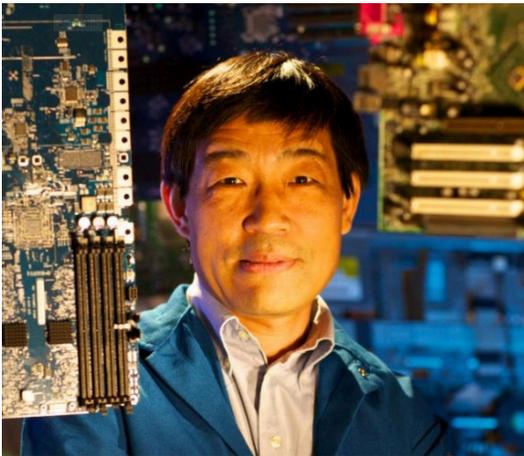
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UCR professor Boerge Hemmerling receives 5 year grant to study basic properties of solid-state materials

The research traps molecules using light in order to create assemblages in which parameters such as the molecular spacing, degree of order, and orientation can be tuned by external fields.

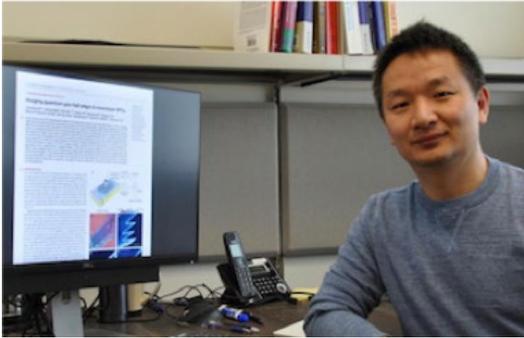
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SHINES research center receives additional funding from the US Department of Energy

The Spins and Heat in Nanoscale Electronic Systems (SHINES) center, headed by Professor Jing Shi, investigates issues of relevance to energy science such as new ultrathin films, heterostructures of quantum materials, and phenomena that can lead to high-efficiency nanoscale electronic devices.

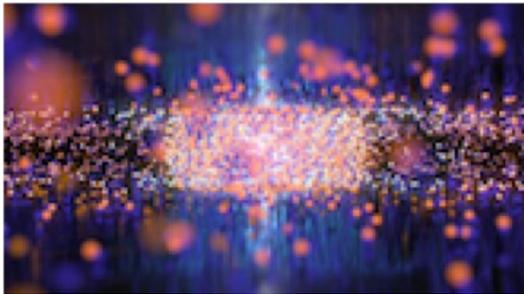
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UCR professor Yongtao Cui images edge conduction in a 2-D topological insulator

The research might make it possible to develop electronic devices that have greater energy efficiency.

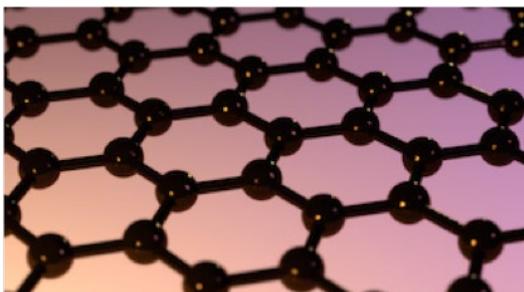
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UCR physicists create exotic electron liquid

The achievement, by Professors Nathaniel Gabor and Vivek Aji, opens a pathway for applications as diverse as communications in outer space, cancer detection, and scanning for concealed weapons.

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New property observed in graphene could lead to better performing solar panels

An international research team, co-led by Professor Nathaniel Gabor, has discovered a new mechanism for ultra-efficient charge and energy flow in graphene, opening up the possibility for new types of light-harvesting devices.

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Study deepens understanding about how advanced life might have emerged

Professor Thomas Kuhlman is the lead author of a study on how advanced life might have emerged billions of years ago.

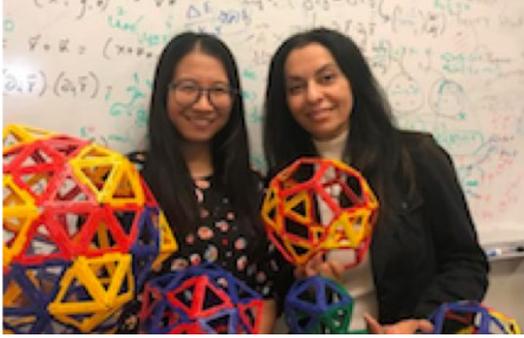
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HIV study explains how latent and rebound viruses are related

Professor John Barton, an expert in statistical physics and evolutionary dynamics, is coauthor of a study about the relationship between latent and “rebound” HIV viruses, where rebound viruses are those that restart active infection once a patient ceases drug treatment.

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UCR-led study deciphers key elements in the assembly of a large virus

Professor Roya Zandi led the study explaining how large virus shells are formed. The results may help researchers to better understand the formation of viruses and how to contain the spread of viral diseases.

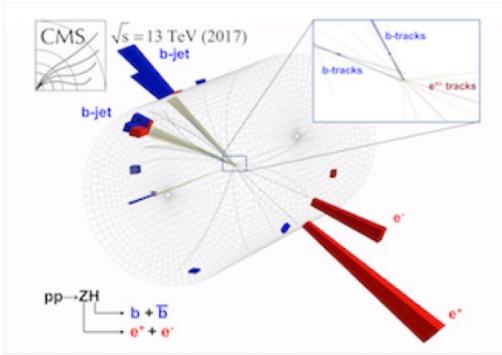
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Study provides new insight into why star formation stops in galaxies

Research led by Professor Gillian Wilson measures the time scale required to quench star formation in galaxy clusters, allowing different models for galaxy evolution to be tested.

[Read more](#)

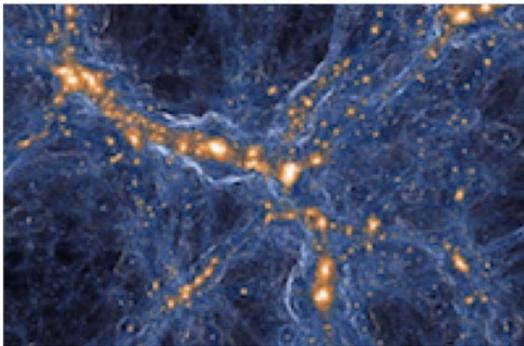


Example event recorded in the CMS detector for a Higgs boson decaying to a bottom (b) quark-antiquark pair

UCR physicists contribute to major Higgs boson observation

Observation of the coupling of Higgs bosons to bottom-flavored quarks had long been sought and is of significant theoretical importance.

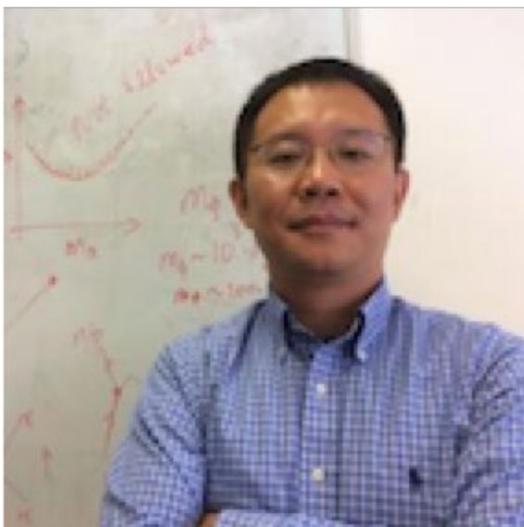
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Early opaque universe linked to galaxy scarcity

A team led by Professor George Becker made the discovery.

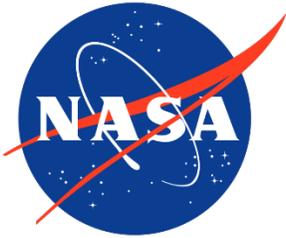
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Team co-led by UCR Professor Hai-Bo Yu sets stringent limits on models of self-interacting dark matter

Professor Yu is one of the world's leading experts on models of self-interacting dark matter, which can explain variations observed from one galaxy to the next in the speeds at which the galaxies rotate as a function of the distance from the galaxy center. The conventional models of dark matter, based on the WIMP paradigm, are unable to explain these data.

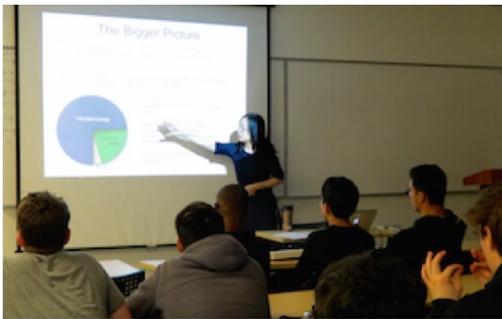
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NASA-funded program to train K-12 students in STEM fields

NASA has awarded UCR a grant of \$320,000 to launch a research and training program in STEM fields aimed at enhancing K-12 students' experiences outside school hours.

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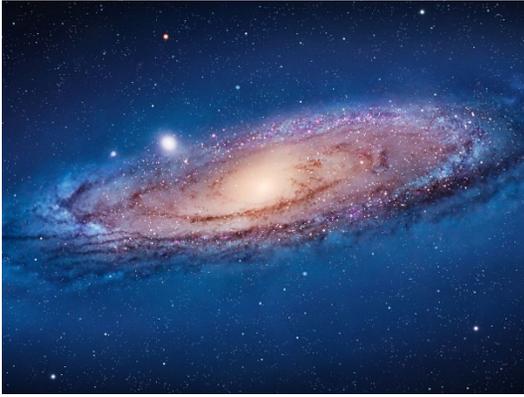


UCR Professor Yanou Cui lecturing at the 2019 Physics Masterclass

UCR Professors lead local high school students in an International Particle Physics Masterclass

Students from Hemet High School and Centennial High School (Corona) came to campus in March 2019 to participate in the International Masterclass, under the tutelage of Professors Bill Gary, Owen Long, Steve Wimpenny, and Yanou Cui.

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Making astronomy accessible to the deaf

Professor Gillian Wilson and UCR postdoctoral researcher Mario De Leo-Winkler developed an astronomy workshop for students with hearing loss.

[Read more](#)



Weeklong Summer Physics Teacher Academy at UCR

The department hosts the academy annually, attended this year by nearly 30 teachers from local high schools.

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UCR Physics and Astronomy runs science fair aimed at Spanish speaking families

The event, labeled “exploring the five senses” and open to both Spanish and non-Spanish speakers, allowed students to visit campus and meet with UCR faculty.

[Read more](#)



*The Department of
Physics and Astronomy*
at the
University of California, Riverside

*Graduation Recognition
Ceremony*

Brunch, 11:00: Barkas Lounge, PHY 3049
Ceremony, 12:30 p.m.: CHUNG Hall 138

June 15, 2019

Dear Parents, Students, Faculty, Alumni, and Friends:

On behalf of the Department of Physics and Astronomy at UCR, I would like to cordially invite you and your family to our 2019 Department Recognition Day on Saturday, June 15th. Undergraduates, graduate students, and their families are invited to attend a late morning Brunch in the Physics Reading Room at 11:00 a.m. Our awards recognition ceremony will be in Winston

Chung Hall 138 from 12:30-2 p.m., and a reception will immediately follow the ceremony. I hope that you and your family can join us and celebrate this joyous occasion.

Our special keynote speaker is Nobel Laureate, Barry Barish, Distinguished Professor of Physics. Our recognition day will feature short research talks by our Ph.D. candidates, departmental awards, recognition of other awards, and individual recognition of all degree recipients (BA, BS, MSc, Ph.D.). This is a wonderful event for students and their parents to be recognized and to meet the faculty.

Please send an RSVP to physics@ucr.edu and let us know the total number of guests you will be bringing.

Best wishes,

Kenneth Barish, Ph.D.
Professor and Chair
Department of Physics and Astronomy
University of California, Riverside



[See Photos from Last Year's Physics and Astronomy graduation \(June 16, 2018\)](#)

[See the photos](#)

IN MEMORIAM

Emeritus Professor Fred Cummings, UCR Professor of Physics from 1963 to 1993, passed away January 31, 2019. He was 87 years old and had retired to Marin County, CA. Those of us who knew Fred will always remember his kind nature, quiet and persistent charm, intense inquisitiveness, concern for students, and great versatility as a physicist. He was a very distinguished scientist who made significant contributions in the very diverse areas of quantum optics and

developmental biology. He was very concerned with social and environmental issues and remained active in research up until the time of his passing. He will be greatly missed. An obituary can be found here:

<https://www.aspentimes.com/news/obituaries/frederick-w-cummings/>

Emeritus Professor Michael Pollak passed away March 22, 2019 at the age of 93. Mike was a member of the UCR Department of Physics faculty from 1966 until 1993 but, because the Department was short of condensed matter theorists following his nominal retirement, he was recalled for teaching each subsequent year until 1998. He eventually retired to San Luis Obispo. Mike never retired from research, however. His final research paper, entitled “Electrons in Anderson-Mott Insulators”, was published in January 2019. Mike’s research covered a broad area of condensed-matter physics. The central theme was the electrical behavior of disordered materials, and he was highly distinguished in this field. He was named a Fellow or Visiting Professor at many universities and institutes around the world. His kind demeanor, wry humor, and keen insights into physics and life will be greatly missed.

[Read the full obituary](#)



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