ASTROCHEMISTRY:

Discoveries to Inform the Chemical Sciences & Engineering Communities

Speaker Biographies

Ted Bergin is a Professor and the Chair of the Astronomy Department at the University of Michigan. Bergin uses chemistry to probe the physics of star and planet formation and to trace the molecular origins of life. His current focus is the study of water and organics. He combines observation and theory to examine where and how molecules are formed, and how they interact with radiation. This aids in the understanding of chemistry but also increases the use of molecules as probes of the physics of star and planet formation. Bergin was part of a team that showed that ice on the comet Hartley 2 has the same chemical composition as our oceans, supporting the theory that Kuiper-belt comets may have delivered a significant portion of Earth's water. He also helped detect vast quantities of cold water vapor in the outer reaches of the star TW Hydrae's planet-forming disk, which further supports this theory.

Paola Caselli obtained her PhD in Astrophysics from the University of Bologna in 1994, after spending a large fraction of her PhD time at the Ohio State University, working on astrochemistry with Professor Eric Herbst, and at the Harvard-Smithsonian Center for Astrophysics (CfA), working on molecular cloud observations with Dr. Phil Myers. After a Postdoctoral position at CfA and one at the Max-Planck-Institute for Extraterrestrial Physics in Germany, in 1996 she became Researcher at the Arcetri Astrophysical Observatory (Florence, Italy), where she remained until the end of 2005. She then spent two years as Visiting Scholar and Lecturer at the Department of Astronomy, Harvard University. In 2007 she became Professor of Astronomy at the School of Physics and Astronomy at University of Leeds (UK). Since 2014, she is Director of the Center for Astrochemical Studies at the Max-Planck-Institute for Extraterrestrial Physics, where she has established a group working on observations, theory and laboratory experiments of topics related to astrochemistry as well as star and planet formation. She is also a Visiting Professor at the Department of Astronomy, University of Virginia, and Jubilee Professor at Chalmers University of Technology, Gothenburg, Sweden.

Ilse Cleeves is an Assistant Professor of Astronomy and an Assistant Professor of Chemistry at the University of Virginia. She studies the composition of molecule-rich disks around young stars that are potentially forming (or have recently formed) planetary systems. Through a combination of observations and simulations, she quantifies these disks' chemical properties to shed light on the diversity of potential planetary compositions. Moreover, this same compositional information provides a powerful tool to constrain key disk physics, including temperature, radiation field, etc, that may inform whether a disk can form planets efficiently or not.

Jamie Elsila is an astrochemist in the Astrobiology Analytical Laboratory at NASA's Goddard Space Flight Center. Her research emphasis is on stable isotopic signatures of extraterrestrial organic compounds, including amino acids in carbonaceous chondrites, lunar samples, and cometary material. She leads Goddard's Fundamental Laboratory Research (FLaRe) workgroup and is a scientific Co-Investigator for the NASA Astrobiology Institute at the Goddard Center for Astrobiology, as well as a Collaborator on the OSIRIS-REx asteroid sample return mission.

Jonathan Fortney is a Professor and the Director of the Other Worlds Laboratory in the Department of Astronomy and Astrophysics at the University of California, Santa Cruz. Fortney is a planetary scientist that works to understand planets as classes of astrophysical objects. His current research is on modeling planetary atmospheres, interiors, and thermal evolution, from rocky terrestrial planets to gas giants. Exciting exoplanet observations are happening on two fronts: the close-in transiting planets that can be studied with space-based and ground-based telescopes, and the young warm Jupiter-class planets far from their parent stars, which can be directly imaged. In his work on exoplanets he makes connections between these distant planets, which we are just beginning to understand, and our solar system's planets, for which we have abundant data and a long history of research.

Danny Glavin is the Associate Director for Strategic Science of the Solar System Exploration Division at NASA. He looks for the building blocks of life in extraterrestrial materials, including meteorites, asteroids, comets and other interplanetary dust particles. Dr. Glavin co-founded the Astrobiology Analytical Laboratory at NASA Goddard which specializes in the analysis of extraterrestrial amino acids and other organic compounds important to life in meteorites, lunar samples and samples returned from asteroids and comets. Dr. Glavin is a Co-Investigator on the OSIRIS-REx asteroid sample return mission. He was selected to be a Participating Scientist on the Mars Science Laboratory (MSL) mission in 2011 and was part of the team that discovered the first evidence of indigenous organic compounds on Mars using the Sample Analysis at Mars (SAM) instrument. In recognition of Dr. Glavin's meteorite research, the International Astronomical Union named an asteroid after him, asteroid (24480) Glavin. He was awarded the Antarctica Service Medal of the United States (2003), the Meteoritical Society's Nier Prize (2010), the NASA Goddard Internal Research and Development Innovator of the Year Award (2007), and the NASA Robert H. Goddard Exceptional Achievement Award for Science (2009 and 2014). Dr. Glavin's research was featured on National Public Radio, PBS NOVA and the Discovery Channel and in several books including Marc Kaufman's "First Contact: Scientific Breakthroughs in the Hunt for Life Beyond Earth" and "Mars Up Close." He earned a B.S in physics from the University of California at San Diego in 1996 and a Ph.D. in earth sciences from the Scripps Institution of Oceanography in 2001.

Sarah M. Horst is an assistant professor at Johns Hopkins University in the Department of Earth and Planetary Sciences. Her primary research interest is atmospheric chemistry, particularly the complex organic chemistry occurring in the atmosphere or on the surface of bodies in the solar system. Previously, Dr. Hörst was a National Science Foundation astronomy and astrophysics postdoctoral fellow at the University of Colorado. She is a recipient of the Gerard P. Kuiper Memorial Award from the Lunar and Planetary Laboratory at the University of Arizona. She earned a B.S. in planetary science and in literature from the California Institute of Technology and her Ph.D. in planetary science from The University of Arizona. Dr. Hörst's served as a member of the National Academies' Standing Committee on Astrobiology and Planetary Science.

Reggie Hudson is the Lead Scientist of the Cosmic Ice Laboratory at the NASA Goddard Space Flight Center. Hudson's research interests include the chemistry and physics of cosmic ices, especially those of Jupiter's and Saturn's satellites, TNOs, the Pluto-Charon system, Mars, comets, and the interstellar medium. His work also involves looking into the astrobiology of planetary systems, prebiotic chemistry, radiation chemistry, photochemistry, and thermal chemistry applied to astronomical problems, and Molecular spectroscopy applied to molecular structure, bonding, and reactions of astronomical solids. Hudson was previously a Professor of Chemistry at Eckerd College. Dr. Hudson received his PhD in Physical Chemistry from the University of Tennessee.

Mike McCarthy is the Associate Director of the CfA for the Atomic and Molecular Physics (AMP) division of the Harvard-Smithsonian Center for Astrophysics. He was previously a member of the scientist staff and was appointed to a position as the Yoram Avni Distinguished Research Astronomer. McCarthy has co-authored over 200 scientific papers. His research interests include the spectroscopy of known and postulated astronomical carbon chains, carbon rings, and carbon clusters; the chemistry and physics of the interstellar medium; and molecular radio astronomy. Dr. McCarthy received his BSc in Chemistry at the University of Alaska and his PhD in physical chemistry from MIT.

Els Peeters is an Associate Professor in the department of Physics and Astronomy at the University of Western Ontario and research scientist at the SETI Institute in California. Her research focuses on the physics and chemistry of interstellar carbonaceous molecules and dust with a prime emphasis on polycyclic aromatic hydrocarbons (PAHs). She is an observational astronomer and has worked extensively with infrared observations from space-based telescopes, such as the Infrared Space Observatory (ISO), NASA's Spitzer Space Telescope and the Herschel Infrared Space Observatory, the Stratospheric Observatory for Infrared Astronomy (SOFIA) and ground-based telescopes (e.g. VLT, Gemini). Dr. Peeters obtained her PhD from the University of Groningen (The Netherlands) and was a post-doc at the NASA Ames Research Center and the SETI Institute (US).

Amanda Stockton is an Assistant Professor in the School of Chemistry and Biochemistry in the Center for Space Technology and Research at Georgia Tech. Her group's research centers around three related astrobiological themes: the analysis of extraterrestrial organic molecules in the search for life beyond Earth, fingerprinting life at Earth's extremes, and exploring the origins of biomolecules and the emergence of life. A primary thrust of the first theme is the development of in situ instrumentation to go out and directly examine the organic chemical environment in the extraterrestrial environment itself through landed instruments (e.g. for Mars), fly-by instruments (e.g. for Enceladus), and impactor instruments (e.g. for Europa and small bodies). They also have a prong to look at organic molecules in extraterrestrial samples on Earth – including meteorites and interplanetary dust particles and cometary grains returned by missions like Stardust. The second theme involves field expeditions to volcanic and geothermal regions of Iceland and to the extremely acidic and saline Rio Tinto, in addition to analysis of samples obtained by colleagues from the Atacama desert and Antarctic ice shelves. In the final theme, they are working with the Center for Chemical Evolution to explore the emergence of life in warm, wet pools on the surface of the early Earth. Stockton's group also explores potential laboratory models of hydrothermal vent systems mimicking those now known to be present on the icy moons of the outer solar system including Enceladus and Europa.

Catherine Walsh is a University Academic Fellow at the University of Leeds, and based in the Astrophysics Group in the School of Physics and Astronomy. Walsh studies molecules in space across the spectrum of molecular sources: from interstellar clouds, the birth places of stars, through to protoplanetary disks and planetary atmospheres, and even on to circumstellar envelopes around dying stars. Molecules have huge prebiotic significance since they are the elementary building blocks of planetary systems. She is interested in fundamental astrochemical processes, i.e., how molecules are formed and destroyed in different environments, and how they can be used to probe the physical conditions in the diverse range of extreme environments in which they survive. Molecules are a unique and powerful tool in astronomy. She also makes use of high-spatial and high-spectral resolution observations with the Atacama Large Millimeter/Submillimeter Array which is currently revolutionizing the field of star and planet formation. Walsh is the Co Principal Investigator (Co-PI) of a 100-hour ALMA Large Programme to investigate the chemistry of planet formation on spatial scales similar to the size of the Solar System. She is also PI of four ALMA programs, two of which concern the investigation of the gas and dust structure of protoplanetary disks around intermediate-mass stars that also show signatures of embedded planets and ongoing planet formation. The second two programs are a deep search for the complex organic ice reservoir in disks around nearby Sun-like stars, to help answer questions regarding the origin of complex molecules in planetary systems.

Michael Wong is a PhD candidate at the California Institute of Technology studying astrobiology, habitability, and planetary atmospheres with Professor Yuk L. Yung and researchers at Caltech and the Jet Propulsion Laboratory. His other passions include photography, graphic design, journalism, writing, public speaking, and playing a variety of team sports. Wong hosts a podcast called Strange New Worlds, which examines science, technology, and culture through the lens of Star Trek.