Deciphering gene regulation using single-cell transcriptomics  
Professor Rickard Sandberg  
Department of Cell and Molecular Biology (CMB), Karolinska Institutet

Characterising stars and their planets from the Earth and from space  
Dr. Ulrike Heiter  
Department of Physics and Astronomy, Uppsala University

Comparative genomics and genetics: deciphering evolution and disease  
Professor Kerstin Lindblad Toh  
SciLifeLab, Uppsala University and Broad Institute of MIT and Harvard

Searching for the Solar System 2.0  
Professor Dr. Jorge Meléndez  
Department of Astronomy, Institute of Astronomy, Geophysics and Atmospheric Sciences  
University of São Paulo, Brazil

Functional consequences of mosaic loss of chromosome Y (LOY) in blood cells - transcriptomic studies in single cells using the 10X Chromium system  
Associate Professor Lars A. Forsberg  
Department of Immunology, Genetics and Pathology, Uppsala University

Analysis of transcriptomes and genomes as a service at the National Genomics Infrastructure (NGI) SciLifeLab  
Dr. Jessica Nordlund  
Department of Medical Sciences, SNP&SEQ Technology Platform and Molecular Medicine, Uppsala University

---

The Celsius and Linné Honorary Lectures are arranged annually by the Faculty of Science and Technology in memory of Anders Celsius and Carl von Linné (Linnaeus), world-renowned professors of Uppsala University.

Anders Celsius was appointed professor of Astronomy at Uppsala University in 1730 at the age of 28. He established the first professional astronomical observatory in Uppsala around 1740. His scientific activities included work on celestial mechanics, studies on comets and satellites, pioneering contributions to stellar photometry, to geodesy and to geophysics. He discovered that aurorae caused magnetic disturbances and he invented the temperature scale that bears his name. Anders Celsius died in 1744.

Carl von Linné was appointed professor of Medicine at Uppsala University in 1741 at the age of 34. Linnaeus had already in 1735 declared that the two most important tasks in natural history were “classification and naming” (divisio et denominatio). His Systema naturæ was published in 1735 at Leiden. Here we meet his permanent contribution to science, the naming practice, the binary nomenclature or binomial system. Linnaeus founded the Royal Academy of Sciences, now responsible for the Nobel Prize awards, and of which he became the first president. He died in 1778.
On the eve of Kepler’s launch in 2009, astronomers knew of a few hundred planets orbiting other stars in the Milky Way. Today, the discoveries spill into the thousands, and the sensitivity boundaries continue to expand. NASA’s Kepler Mission unveiled a galaxy replete with small planets and revealed populations that don’t exist in our own solar system. The final discovery catalogue was delivered in the autumn of 2017 together with the survey completeness and reliability metrics required for studying exoplanet demographics as a function of size, orbital period, and host star properties. To date, we’ve learned that every late-type star has at least one planet, that terrestrial-sized planets are more common than larger planets within 1 AU, and that the nearest, potentially habitable earth-sized planet is likely within 5 pc (i.e. light-years).

After four years of continuous observations, Kepler prime ceased observations of Cygnus/Lyra in May 2013 when a second reaction wheel failed. Thanks to innovative engineering, the spacecraft gained a second lease on life and emerged into the ecliptic surveyor, K2. To date, the mission has executed 15 observing campaigns lasting ~80 days each and has achieved a 6-hour photometric precision of 30 ppm. Nearly 150 new planets have been confirmed, including nearby (~50 pc) systems on the watch-list for future observing campaigns with the James Webb Space Telescope.

In 2011 of Kepler-10b — the mission’s first confirmation of a rocky planet outside our solar system. Batalha also serves on the Users Committee and as a member of the NASA Advisory Council’s Astrophysics Subcommittee. More recently, Batalha has turned her efforts toward the soon-to-be-launched James Webb Space Telescope, bringing the transiting exoplanet community together to decide which targets will be observed by the JWST’s Early Release Science Program. In 2017, Batalha was named one of the 100 Most Influential People of the World by TIME Magazine.

Natalie Batalha is an astrophysicist at NASA Ames Research Center and served as the science lead for NASA’s Kepler Mission from 2013 to 2017. She led Kepler’s first efforts to generate high-confidence catalogues of planet detections. She also led the analysis that yielded the discovery in 2011 of Kepler-10b—the mission’s first confirmation of a rocky planet outside our solar system. In 2013, she joined the leadership team of a new NASA initiative dedicated to the search for evidence of life beyond the Solar System. Batalha also serves on the James Webb Space Telescope Users Committee and as a member of the NASA Advisory Council’s Astrophysics Subcommittee. Most recently, Batalha has turned her efforts toward the team-to-be-launched James Webb Space Telescope, bring the transiting exoplanet community together to decide which targets will be the first to be observed with the JWST’s Early Release Science Program. In 2017, Batalha was named one of the 100 Most Influential People of the World by TIME Magazine.

Avi Regev
Core Member of the Broad Institute, Professor of Biology (MIT, USA), HHMI Investigator

The Regev lab uses techniques such as single-cell genomics, with a particular focus on single cell RNA-seq, to dissect the molecular networks that regulate gene expression, cells and tissues, and influence health and disease. The internal environment of the cell undergoes a wide range of regulatory changes on many timescales: Transcriptional modifications occur within hours when cells respond to changing growth conditions, cells differentiate over hours to days, and species evolve over millions of years. We have developed an extensive experimental and computational toolbox to understand these changes and their implications for biology and disease. We apply the tools in a range of cells, with a recent focus on mammalian cells, the immune system, and cancer. I am also co-chair of the international Human Cell Atlas consortium—a global effort to build a collection of reference maps to describe every cell type in the human body. Cells take exceedingly diverse forms with respect to shape, location, function, neighboring relationships, and internal environments. The HCA aims to be a systematic and comprehensive classification of cells based on these characteristics.

Avi Regev, Ph.D. is Chair of the Faculty and a Core Member at the Broad Institute of MIT and Harvard, where he directs the Cell Circuits Program, Professor of Biology at Massachusetts Institute of Technology, and an HHMI Investigator. She received her M.S. from Tel Aviv University, studying biology computing science, and mathematics, and went on to receive her Ph.D. in computational biology from Tel Aviv University. She is a recipient of the NIH Director’s Pioneer Award, a Sloan fellowship from the Sloan Foundation, the Eleanor and Miles Tanenbaum Award from the American Society of Biochemistry and Molecular Biology, and the Outstanding Biologist Award from the Israeli Association for Biochemistry and Molecular Biology.

Dr. Ulrike Heiter
Department of Physics and Astronomy, Uppsala University

Comparative genomics and genetics, deciphering evolution and disease

In the past twenty years, genome sequences from humans as well as ~1100 model and model organisms has been generated to associate the genetic landscape and its understanding of phenotypes traits and their inheritance. Comparative genomics provides a basis to investigate the processes of genomic function, evolution, speciation, selection and disease. In particular, the disease landscapes have been highly conserved between species, which provides opportunities to understand new post-transcriptional regulatory networks. In this symposium, we will combine these perspectives to address several key questions. Firstly, are there unique or conserved regulatory networks in disease that could be important for new therapeutic intervention? Secondly, do species-specific regulatory networks contribute to disease? Thirdly, is the conservation of regulatory networks unique to cancer or is it an important feature of disease across species?

Professor Dr. Jorge Melendez
Department of Astronomy, Institute of Astronomy, Geophysics and Atmospheric Sciences, University of São Paulo, Brazil

Searching for the Solar System 2.0

Our solar system is unique. In September 2012, using data from NASA’s Kepler mission, Batalha and colleagues detected the first Earth-sized planet outside our solar system. Further detection followed as the exoplanet community concentrated on finding terrestrial planets. More recently, Batalha has turned her efforts toward the soon-to-be-launched James Webb Space Telescope, bringing the transiting exoplanet community together to decide which targets will be observed by the JWST’s Early Release Science Program. In 2017, Batalha was named one of the 100 Most Influential People of the World by TIME Magazine.

On the eve of Kepler’s launch in 2009, astronomers knew of a few hundred planets orbiting other stars in the Milky Way. Today, the discoveries spill into the thousands, and the sensitivity boundaries continue to expand. NASA’s Kepler Mission unveiled a galaxy replete with small planets and revealed populations that don’t exist in our own solar system. The final discovery catalogue was delivered in the autumn of 2017 together with the survey completeness and reliability metrics required for studying exoplanet demographics as a function of size, orbital period, and host star properties. To date, we’ve learned that every late-type star has at least one planet, that terrestrial-sized planets are more common than larger planets within 1 AU, and that the nearest, potentially habitable earth-sized planet is likely within 5 pc (i.e. light-years).

After four years of continuous observations, Kepler prime ceased observations of Cygnus/Lyra in May 2013 when a second reaction wheel failed. Thanks to innovative engineering, the spacecraft gained a second lease on life and emerged into the ecliptic surveyor, K2. To date, the mission has executed 15 observing campaigns lasting ~80 days each and has achieved a 6-hour photometric precision of 30 ppm. Nearly 150 new planets have been confirmed, including nearby (~50 pc) systems on the watch-list for future observing campaigns with the James Webb Space Telescope.

In 2011 of Kepler-10b — the mission’s first confirmation of a rocky planet outside our solar system. Batalha also serves on the Users Committee and as a member of the NASA Advisory Council’s Astrophysics Subcommittee. More recently, Batalha has turned her efforts toward the soon-to-be-launched James Webb Space Telescope, bringing the transiting exoplanet community together to decide which targets will be observed by the JWST’s Early Release Science Program. In 2017, Batalha was named one of the 100 Most Influential People of the World by TIME Magazine.