UPPSALA
UNIVERSITET

CELSIUS–LINNÉ
LECTURES 2015

Thursday 26 February,

the traditional Celsius-Linné lectures will be held at

THE SVEDBERG HALL,
BIOMEDICAL CENTRE (BMC)

14.00 – CELSIUS LECTURE

Plate Tectonics, Earthquakes and Seismic Risk

DAN MCKENZIE

15.30 – LINNÉ LECTURE

CRISPR-Cas Genome Surveillance: From Basic Biology to Transformative Technology

JENNIFER A DOUDNA

CELSIUS LECTURE
Plate Tectonics, Earthquakes and Seismic Risk

Dan McKenzie
Emeritus Professor of Earth Sciences, Cambridge University

In the 1960s a small group of people interested in marine geology and geophysics put together a set of ideas, now know as the theory of plate tectonics, which has affected our views about all aspects of the Earth's evolution. The paper that started this change, written by Harry Hess in 1960, contained the key suggestion, that new sea floor is forming along the mid-oceanic ridges. Interestingly, by 1970 all his other proposals in this paper had been abandoned. The other key proposal, made by Fred Vine and Drum Matthews in 1963, was that the new sea floor is magnetised in the present direction of the Earth's magnetic field. Confirmation of this idea has allowed us to see how the ocean basins of the world were produced by sea floor spreading. In turn, in 1967, this lead to the ideas of plate tectonics. These were rapidly accepted, and (sadly!) have not required any changes since the 1960s. What was at once clear is that continental plate boundaries are much more complicated than are those in the oceans, and this explains why geologists working on the continents did not construct the theory in the Nineteenth Century. Plate motions are responsible for most earthquakes, and our ability to measure plate velocities using satellite geodesy has had a major impact on our understanding of seismic risk. I will discuss the motions in several recent large earthquakes, and explain why we are so frightened about what is likely to happen, especially in Asia.

Dan McKenzie is the Emeritus Professor of Earth Sciences at Cambridge. He received his Ph.D. in Geophysics from Cambridge in 1966, where he was supervised by Teddy Bullard. In 1967 he and Jason Morgan independently put together the theory of Plate Tectonics, which incorporated the earlier ideas of continental drift and sea floor spreading. He then became interested in continental tectonics, melt generation, and how mantle convection acts as a heat engine to maintain plate motions. In 1997 he became involved in setting up the BP Institute in Cambridge, with the aim of bringing together scientists working in BP and the University, and spent the next ten years on BP's Technology Advisory Council. He retired in 2012, but continues his research, especially on the Earth's gravity field and the structure of the continental lithosphere. He was awarded the Balzan Prize in 1981 (with Fred Vine and Drum Matthews), the Japan Prize in 1990 (with Jason Morgan and Xavier Le Pichon), and the Crafoord Prize in 2002.

LINNÉ LECTURE
CRISPR-Cas Genome Surveillance: From Basic Biology to Transformative Technology

Jennifer A. Doudna
Professor, University of California, Berkeley

The advent of facile genome engineering using the bacterial RNA-guided CRISPR-Cas9 system in animals and plants is transforming biology. I will present a brief history of CRISPR biology from its initial discovery through the elucidation of the CRISPR-Cas9 enzyme mechanism, providing the foundation for remarkable developments using this technology to modify, regulate or mark genomic loci in a wide variety of cells and organisms. These results highlight a new era in which genomic manipulation is no longer a bottleneck to experiments, paving the way to both fundamental discoveries in biology, with applications in all branches of biotechnology, and strategies for human therapeutics. Recent results regarding the molecular mechanism of Cas9 and its use for targeted cell-based therapies will be discussed.

Jennifer Doudna studies the "secrets of RNA", the molecules that carry out the work of DNA. Her groundbreaking research has yielded the Clustered Regularly Interspaces Short Palindromic Repeats (CRISPR) technology, which uses RNA like genetic "scissors" to precisely cut DNA so that mutations in cells and tissues can be repaired in ways previously impossible. In 2014, the Foundation for the NIH awarded Dr. Doudna with the Lurie Prize in Biomedical Sciences, and she was also a co-recipient of the Dr. Paul Janssen Award in Biomedical Science.

Raised in Hawaii, she did her graduate work at Harvard University. She also worked at the University of Colorado with Dr. Thomas R. Cech, who shared the 1989 Nobel Prize in Chemistry for his work with RNA. Doudna's other accomplishments include determining the three-dimensional structure of a large ribozyme domain, revealing the principles of RNA structure formation.

Dr. Jennifer Doudna is a member of the Departments of Molecular and Cell Biology and Chemistry at UC Berkeley, the Howard Hughes Medical Institute, and Lawrence Berkeley National Lab, along with the National Academy of Sciences, the Institute of Medicine and the American Academy of Arts and Sciences.

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 auroræ 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. Linné 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. Linné 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.