Sonderkolloquium

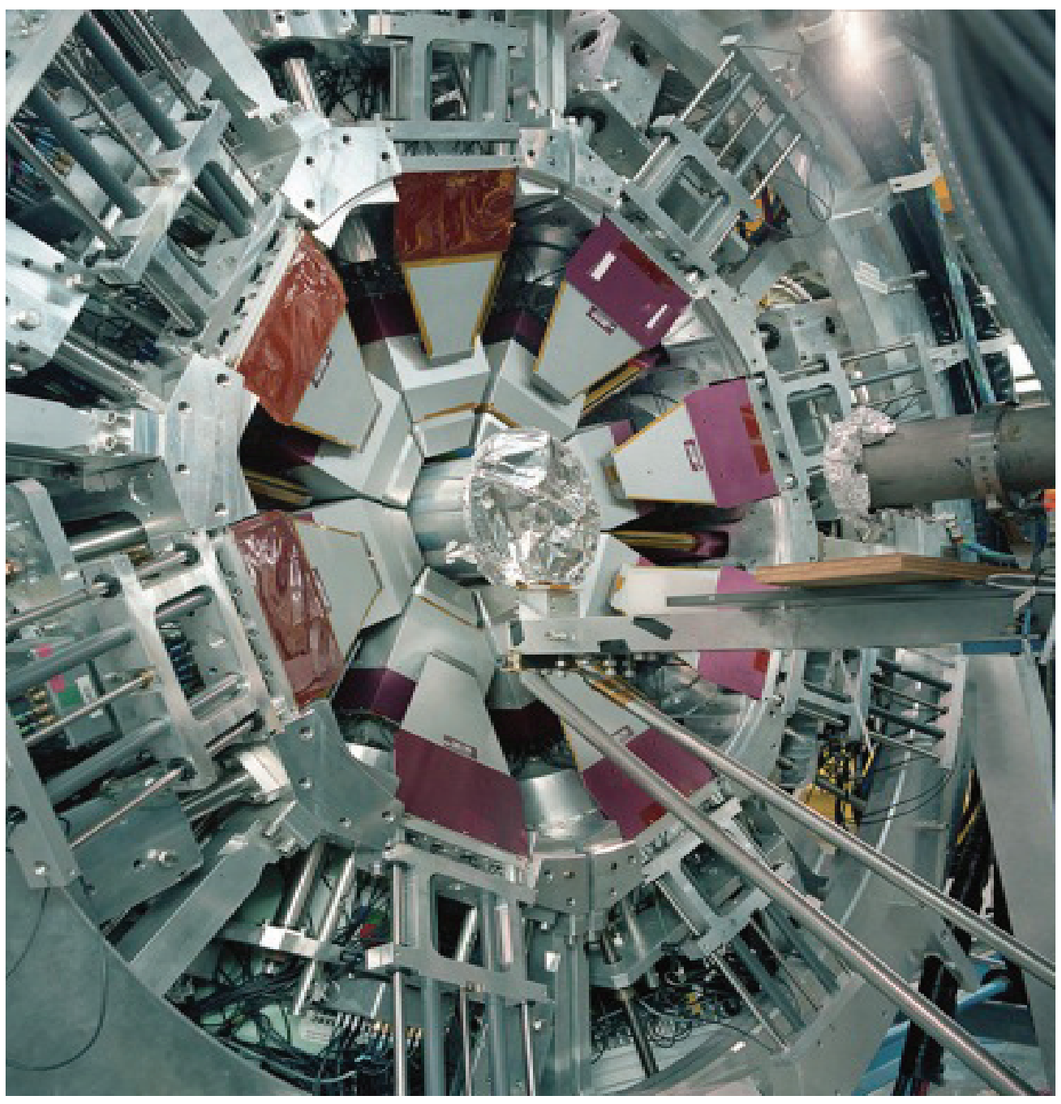
Großes Physikalisches Kolloquium an der Universität zu Köln

Prof. Dr. Reiner Krücken
TRIUMF, Vancouver BC, Canada

26.11.2013
16[45] Uhr / HS III

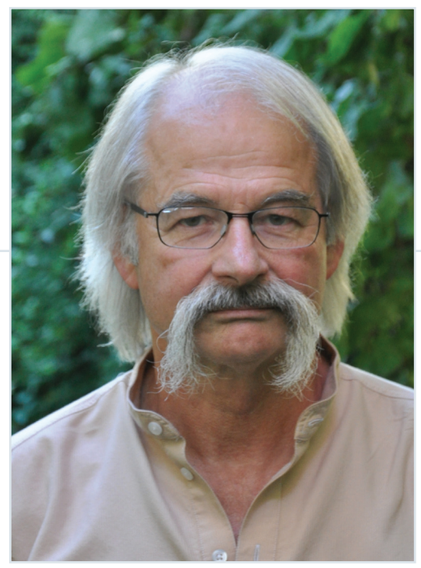
Understanding the Universe using rare isotopes

Exotic nuclei far from stability, so called rare isotopes, play an essential role in the quest to understand some of the most fundamental questions about our Universe from describing the inner workings of atomic nuclei from first principle to understanding the origin of the heavy elements and their role in various astrophysical environments. Also, rare isotopes offer unique opportunities to search for physics beyond the standard model or particle physics by precision measurements of their electro-weak decay. The ISAC facility at TRIUMF is one of the world leading rare isotope beam facilities pursuing these questions in nuclear structure, nuclear astrophysics and electro-weak interaction studies. The Advanced Rare Isotope Laboratory (ARIEL) currently under construction at TRIUMF will vastly expand the scope of this research program.



Großes Physikalisches Kolloquium an der Universität zu Köln

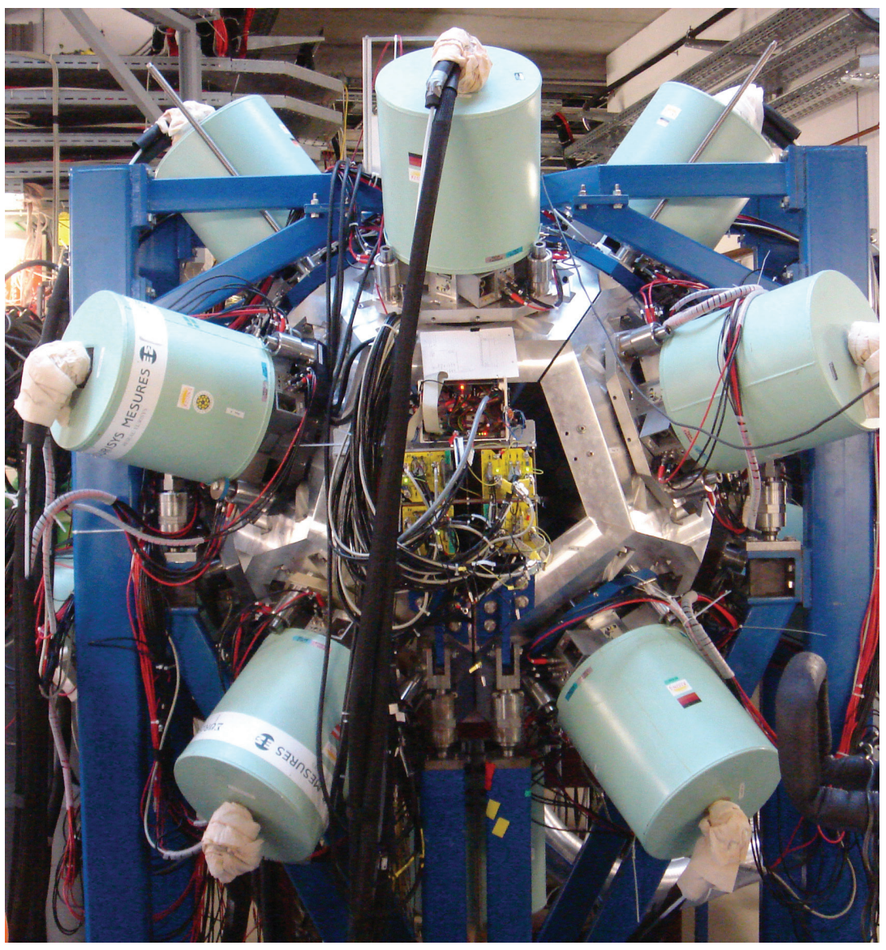
Dr. Thomas Faestermann
Technische Universität München



3.12.2013
16[45] Uhr / HS III

The atomic nucleus ^{100}Sn: doubly magic and extremely exotic

Nuclei have – like atoms – a shell structure, and nuclei with closed shells of protons and neutrons have special properties: they are inert against internal excitations, however their beta decay may show particularly large strength. 100Sn is such a doubly magic nucleus, with 50 protons and 50 neutrons. It has a large excess of protons – stable nuclei with 100 nucleons have only 42 or 44 protons. Due to the strong Coulomb repulsion it is only marginally bound against one-proton or two-proton emission and the production cross section is very small. We succeeded in producing and identifying 259 such nuclei at the accelerators of GSI in Darmstadt. The nuclei were stopped in a detector system and beta-decays at the same position as well as gamma rays were detected. Thus we could determine the halflife, the beta-decay energy and the energies of the succeeding gamma transitions. It turns out that 100Sn has the largest beta-decay strength of all nuclei (after dividing out the trivial energy dependence). This proves the pure shell model character of this nucleus.



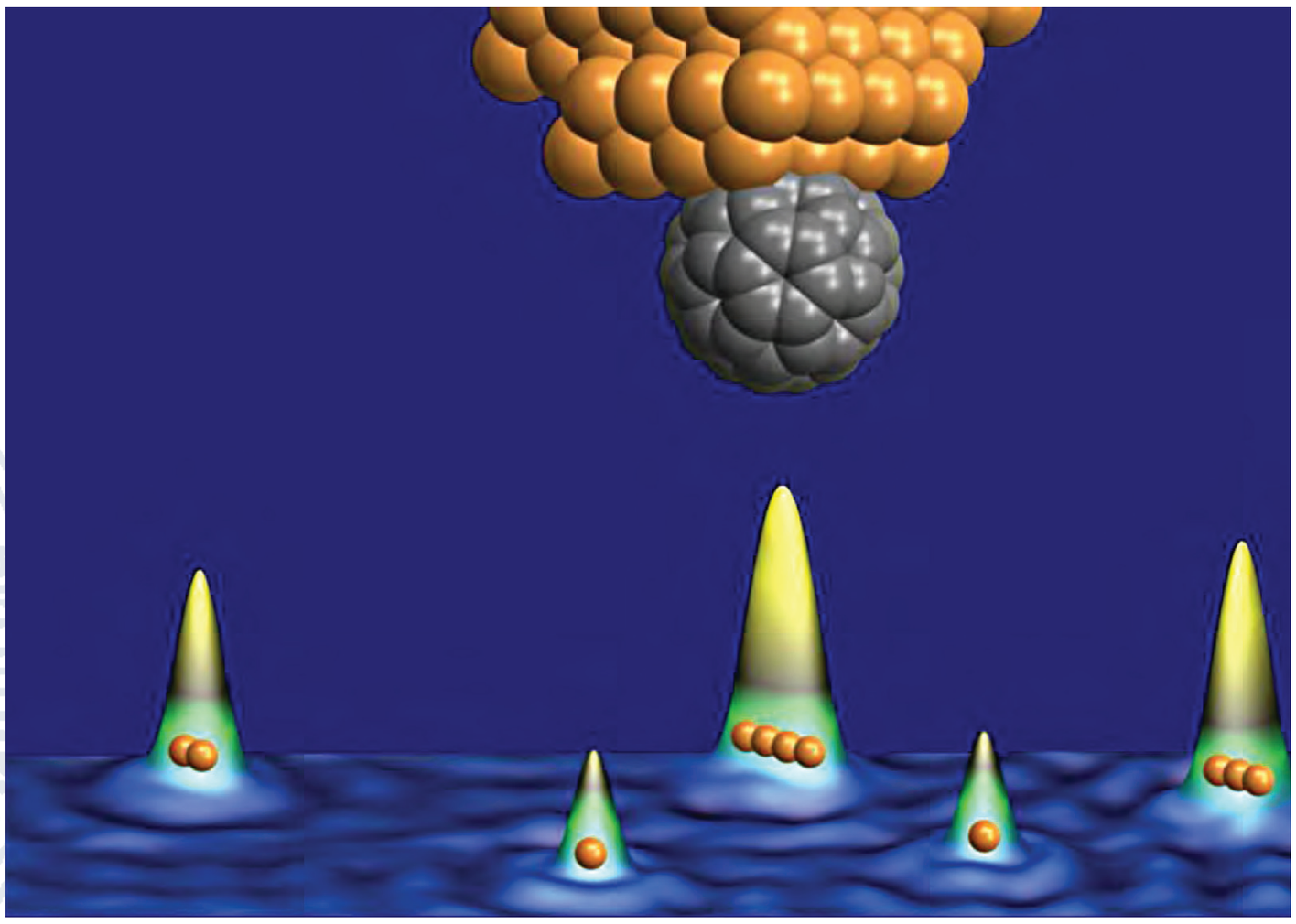
Großes Physikalisches Kolloquium an der Universität zu Köln

Prof. Dr. Richard Berndt
Christian-Albrechts-Universität zu Kiel

17.12.2013
16[45] Uhr / HS III

Strom, Kräfte und Licht in atomaren und molekularen Kontakten

Wir untersuchen den Elektronentransport durch einzelne Atome und Moleküle mittels Tieftemperatur-Rastertunnelmikroskopie. In Experimenten, die auf eine maximale Kontrolle der Struktur der Kontakte abzielen, werden Leitwerte, Kräfte und die Emission von Licht gemessen. Die Messergebnisse waren Anlass für etliche theoretische Arbeiten, so dass sich insgesamt viele neue Einsichten, z. B. zu magnetischen Kontakten, zu molekularen Schaltern und zum Stromrauschen in kleinsten Kontakten ergeben.



Großes Physikalisches Kolloquium an der Universität zu Köln

Prof. Dr. Dieter Braun
Ludwig-Maximilians-Universität München

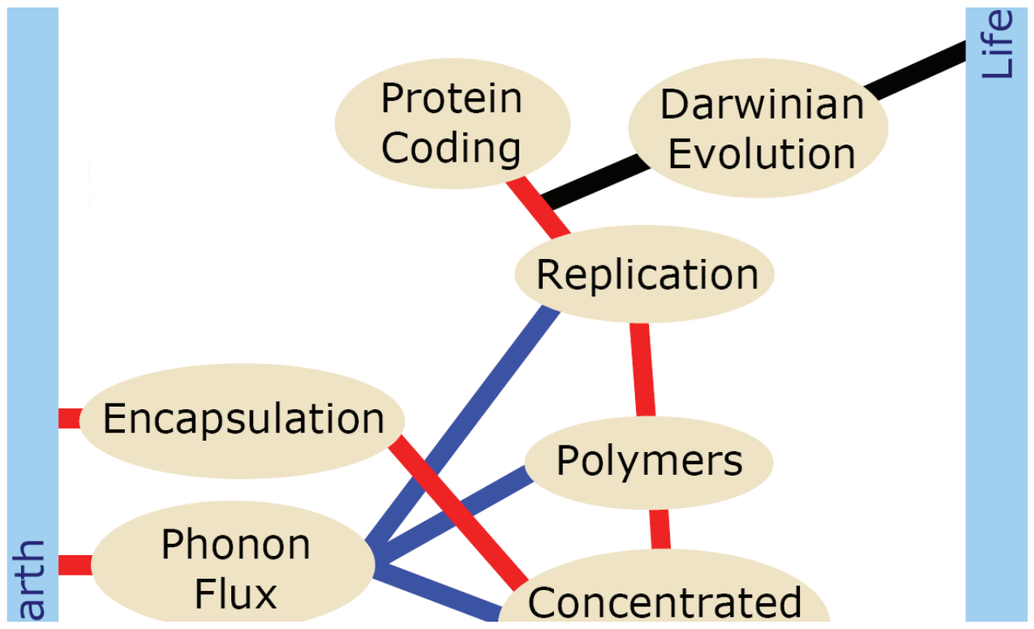
7.1.2014
16[45] Uhr / HS III

Living Nonequilibrium? Towards a thermally driven Darwin Process

The origin of life is one of the fundamental, unsolved riddles of modern science. Life as we know it is a stunningly complex non-equilibrium process, keeping its entropy low against the second law of thermodynamics. Therefore it is straightforward to argue that first living systems had to start in a natural non-equilibrium settings.

Recent experiments with non-equilibrium microsystems suggest that geological conditions should be able to drive molecular evolution, i.e. the combined replication and selection of genetic molecules towards ever increasing complexity.

To be successful, an effort on the origin of life has to be embedded in a strong and very active interdisciplinary background of biology, biochemistry, chemistry, astrogeology and not the least, theoretical modeling at various levels of abstraction.



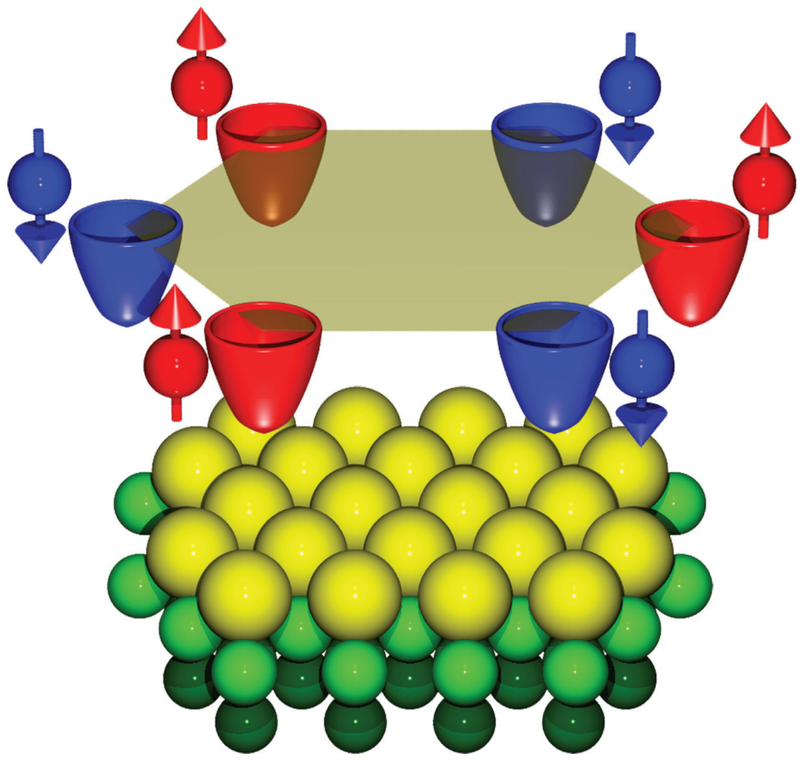
Großes Physikalisches Kolloquium an der Universität zu Köln

Prof. Markus Donath
Westfälische Wilhelms-Universität Münster

21.1.2014
16[45] Uhr / HS III

Spin-Bahn-Wechselwirkung an Oberflächen: Rashba-artige Spinstrukturen in besetzten und unbesetzten Bändern

Spin-Bahn-induzierte Spinaufspaltungen in der elektronischen Struktur von Oberflächen schwerer Elemente und topologischer Isolatoren sind derzeit ein „Hot Topic“ der Festkörperphysik-Forschung. Das große Interesse gründet sich auf mögliche Anwendungen dieser Materialien in Bauteilen der Spintronik, in denen der Elektronenspin zusätzlich zur Elektronenladung als Informationsträger genutzt werden soll. Während die besetzten Elektronenzustände intensiv mit Photoelektronenspektroskopie untersucht werden, gibt es oberhalb der Fermi-Energie noch „weiße Flecken auf der Landkarte“ der Elektronenzustände. Im Vortrag werde ich über spinabhängige Untersuchungen zu besetzten und unbesetzten Elektronenzuständen ausgewählter Rashba-Systeme berichten. Letztere werden mit inverser Photoemission durchgeführt, wobei eine kürzlich entwickelte drehbare Quelle für spinpolarisierte Elektronen zum Einsatz kommt, die Zugang zu zwei Spinpolarisationsrichtungen ermöglicht.



Eröffnungsvortrag

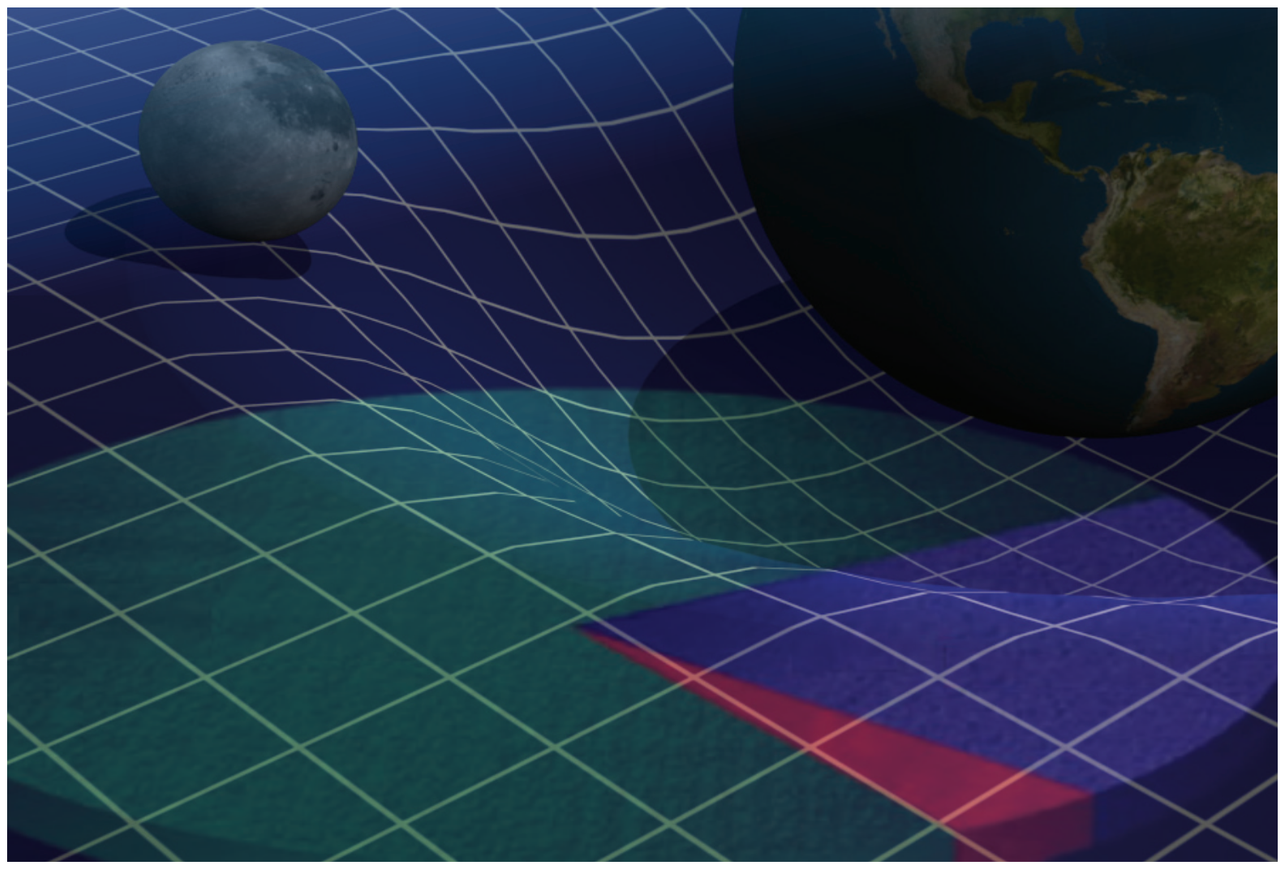
Großes Physikalisches Kolloquium an der Universität zu Köln

Prof. Erik Verlinde
University of Amsterdam

22.10.2013
16^{45} Uhr / HS II

Towards an Entropic Theory for Gravity, Dark Energy and Dark Matter

Developments in string theory and black hole physics indicate that gravity should be viewed as an emergent phenomenon that is derived from an underlying microscopic description. Following these insights I illuminate the basic mechanisms responsible for the emergence of gravity. I will argue that space time, matter and gravity originate from a highly entangled quantum mechanical system, whose energy contains the dark energy. Gravity, or rather inertia, appears as an adiabatic reaction force, while non-adiabatic corrections due to slow relaxation processes lead to the phenomena attributed to dark matter. These considerations lead to a universal formula for the dark matter distribution, which explains the observed velocity profiles for all types of galaxies and galaxy clusters and also agrees with the cosmic dark matter density obtained from the WMAP and Planck-data.



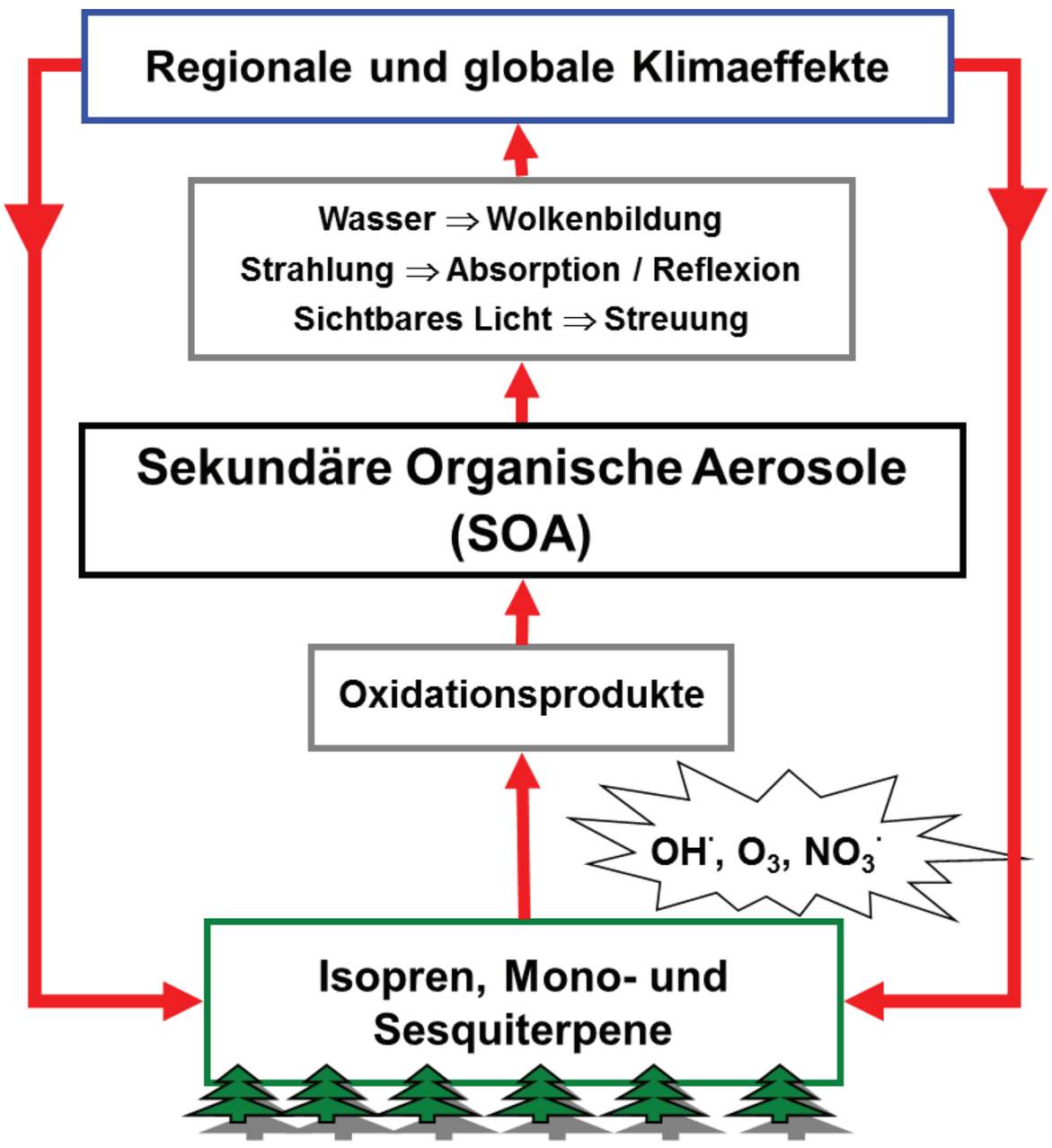
Großes Physikalisches Kolloquium an der Universität zu Köln

Prof. Dr. Astrid Kiendler-Scharr
Forschungszentrum Jülich

5.11.2013
16[45] Uhr / HS III

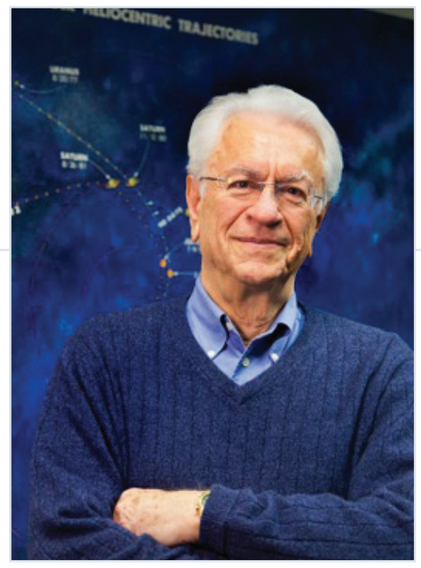
Aerosole, Atmosphärische Chemie und Klima

Etwa 90% der globalen Kohlenwasserstoffemissionen werden von Pflanzen emittiert. In der Atmosphäre werden Kohlenwasserstoffe oxidiert, und tragen damit zur Bildung von Aerosolpartikeln bei. Aerosole sind durch ihre direkten und indirekten Klimaeffekte eine der zentralen Unsicherheiten in aktuellen Klimaprognosen. Der Vortrag fasst den aktuellen Stand der Forschung zusammen und erläutert an Beispielen wie experimentelle Labor- und Feldstudien zu einem besseren Verständnis des biogenen Anteiles der Aerosole beitragen.



Großes Physikalisches Kolloquium an der Universität zu Köln

Dr. Stamatios M. Krimigis
Johns Hopkins Applied Physics Laboratory &
Academy of Athens, Athens, Greece



19.11.2013
16[45] Uhr / HS III

Thirty-six years in space and counting: Voyager 1 at the Border with the Galaxy

Joint seminar with the Institute for Geophysics and Meteorology

Two Mariner-Jupiter–Saturn (MJS-77) spacecraft were launched in 1977 on a four-year mission to encounter the planets Jupiter and Saturn. Renamed Voyager 1, and 2 after commissioning, the Science Steering Group began to plan for a much longer-lasting mission that envisioned flybys of Uranus and Neptune, executing the so-called Grand Tour of the outer planets that took advantage of a particular planetary alignment occurring every 176 years. Following the Neptune encounter in 1989 a new mission was established-the Voyager Interstellar Mission-with the principal objective of investigating the interaction of the solar system with nearby interstellar space. Much has been accomplished so far, including crossing of the heliospheric termination shock , investigating the source of anomalous cosmic rays, discovering a region where the solar wind no longer expands radially or meridionally, and that the spacecraft has entered a new region where heliosheath particles have disappeared and galactic cosmic rays have increased to apparent interstellar intensities. The Voyager science team now agrees that the heliopause was crossed at 121.6 AU on August 25, 2012, but that the spacecraft is not yet in «pristine» interstellar space. The author has been Principal Investigator of the Low Energy Charged Particle (LECP) experiment since 1971, will review some of the project's history and accomplishments, and provide an update on the latest observations.