DR. JEAN LILENSTEN

Institut de Planétologie et d'Astrophysique de Grenoble, CNRS, Université Joseph Fourier, France

Dr. Lilensten is Science Director at Institut de Planétologie et d'Astrophysique de Grenoble.

His scientific work can be identified under the general title of research on planetary space environments. In the early 1990s, the scientific community working on solar-terrestrial relations had a relatively limited field of study. Two major developments made it greatly evolve. The first is the emergence of space weather, to extend the scientific knowledge for quantifying the solar activity and its impact on our planets environment and near space. The second is the comparative planetology. It became clear that the space environments of the planets play a major role in their history.

In terms of space weather Dr. Lilensten's main contributions are:

- The discovery of thermospheric vortices, real cyclones at 250 km altitude.
- The discovery of the polarization of the auroral red line emission of the atomic oxygen.
- The development of several methods of reconstruction of the solar spectrum resulting in a space instrument.
- The determination of the best proxies for the solar flux intensity
- Established the structure of space weather research and cooperation in Europe
- Founded the Journal of Space Weather and Space Climate, where he is Editor in Chief.

In Planetology his main contributions include:

- Participation in the discovery of the Martian aurora.
- Discovery of new species in the ionospheres of the Earth, Venus , Mars, Titan.
- Completion of the scenario that explains how Mars lost its atmosphere.
- Calculation of emissions of several planetary bodies

He has invented the "Planeterrella", an outreach experiment based on Kristian Birkeland's Terrella. 17 copies are found in 7 countries around the world. (One copy is in use in Tromsø.)

He was honoured with the Europlanet prize for excellence in public engagement with planetary science in 2010, and in 2012 the French ministry of Universities and Science awarded him their annual prize for outstanding works in the category "scientists communicate with the public". This was given for his invention and use of the Planeterrella in bringing science to the public.

Organizing committee:

Professor Jan A. Holtet, Department of Physics, University of Oslo
Professor Alv Egeland, Department of Physics, University of Oslo
Øyvind Sørensen, Chief Executive, the Norwegian Academy of Science and Letters
Svein Flatebø, Senior Adviser, Yara International ASA
Pål Brekke, Senior Advisor, Norwegian Space Centre

The Birkeland Lecture is open for everybody. There is no registration. Free admission.

For more information about the Birkeland Lecture 2014:
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UiO : Universitetet i Oslo

Det Norske Videnskaps-Akademi

Norsk Romsenter
Norwegian Space Centre

YARA

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THE NORWEGIAN ACADEMY OF SCIENCE AND LETTERS

DRAMMENSVEIEN 78, OSLO
THURSDAY, SEPTEMBER 25, 17:30

THE BIRKELAND LECTURE 2014

Dr. JEAN LILENSTEN,

Institut de Planétologie et d'Astrophysique de Grenoble,
CNRS, Université Joseph Fourier, France

– A new window on our space environment: The polarization of the auroral emissions.

A French – Norwegian discovery

No registration necessary. Free admission

This portrait of Professor Kristian Birkeland was painted by Asta Nørregaard in 1906.

A list of former Birkeland lecturers is found on http://www.dnva.no/artikkel/vis.html?tid=44857

Yara's Birkeland Prize in Physics and Chemistry

In 1905, Kristian Birkeland's research formed an important basis for the foundation of the world's first company to manufacture fertilizer on an industrial scale, Norsk Hydro.

Birkeland was a visionary scientist with the ability and commitment to carry out large scale projects in the laboratory and the field, to follow up with theoretical studies, and to see the application of his results. Today Yara carries this heritage forward and takes great pride in being part of the effort to improve food security. A company's continued success depends upon its ability to innovate. To honor the innovative spirit of its cofounder, Yara established the Birkeland Prize in Physics and Chemistry in 2009.

Yara's Birkeland Prize will be awarded to a Ph. D. candidate from a Norwegian university who has carried out a scientific study that is in accordance with the innovative mind of Kristian Birkeland. The prize has an emphasis on the environment and technology, and encourage research across traditional borders. The prize will alternate between physics and chemistry, with chemistry in odd-numbered years and physics in even-numbered years. The award ceremony will take place in connection with the Birkeland lecture.

The Birkeland Lecture

The first Birkeland Lecture was given in Oslo in 1987 by the Nobel Laureate Hannes Alfvén. The lecture was a joint venture by the University of Oslo, the Norwegian Academy of Science and Letters and the Norwegian company Norsk Hydro. In 2004 Yara ASA took the place of Norsk Hydro and since 2005 the Norwegian Space Centre has been a partner in this cooperation. The Birkeland Lecture is above all an endeavor to honor the great Norwegian scientist and entrepreneur Kristian Birkeland. However, it has also given the organizers an opportunity to invite to Oslo many outstanding scientists within the field of geophysical and space research, areas which were central in Kristian Birkeland's own research.

Except for the year 1993, when the lecture was presented in Tokyo, and in 1998, when a mini-seminar was organized at the Norwegian Embassy in Tokyo, the lectures have been given in Norway, most of them at the Academy's premises in Oslo. Some years seminars have been arranged in connection with the lectures, e.g. in 1993 when the lecture was a part of a "Joint Japanese – Norwegian Workshop on Arctic Research", in 1995 when the lecture was a part of a seminar on Norwegian environmental research, and in 2001 when the lecture was given in connection with a workshop on Norwegian space research, with emphasis on the Cluster satellite programme.

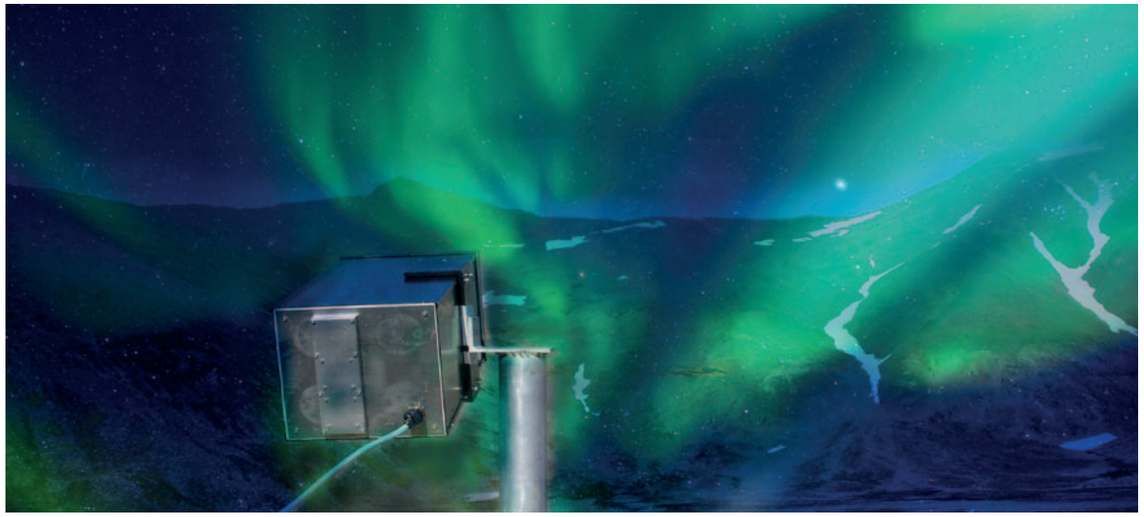
Science and Innovation

In 2012 a new section was added to the traditional Birkeland Lecture: an introductory lecture under the thematic umbrella "Science and Innovation". This was a success, and it is in Kristian Birkeland's spirit. It is now made a regular part of the Birkeland Lecture program. This year's introductory lecture will be given by ***Rune Ingels***, CEO, N2 Applied AS.

N2 Applied AS is a company for developing technologies in the nitrogen and protein food chain, applying modern process technology to Kristian Birkeland's electric arc to improve energy efficiency in direct nitrogen fixation from air.

Rune Ingels has experience from leading positions in Hydro Agri and Yara, including Director of research and technology development in Hydro Agri, Vice President, Research and Technology Development in Yara International, COO and Dy. CEO for Lifeco, "Norwegian Libyan Fertiliser Company".
The topic of the talk is:
Innovation and nitrogen technology development.

The nature of leading companies in mature industry does not favor technology development and structural change innovation. The lecture is focusing on the both generic and specific mechanisms and examples from the nitrogen fertilizer industry. The nitrogen industry has passed through several paradigm shifts since the establishment of Norsk Hydro in 1904 until today, and the future will continue to change the basis for competition in the food chain.



The Spectro Photo Polarimeter observing an aurora

Dr. Jean Lilensten
Institut de Planétologie et d'Astrophysique de Grenoble, CNRS, Université Joseph Fourier, France

– A new window on our space environment: The polarization of the auroral emissions. A French – Norwegian discovery

Auroras are not only one of the most munificent shows at the Earth. They are also the most spectacular effect of the relations between the solar wind and our space environment. Looking at auroras, one may feel astonished. Understanding them gives an additional feeling: that of the physical connection to the cosmos. Measuring the auroras is therefore a fantastic way to access parameters that are almost impossible to monitor in space. The stratospheric balloons do not go high enough while the satellites fly above this atmospheric layer.

Why should we measure the upper atmosphere? First of all because mankind thirsts for knowledge. But it turns out that this is also important for our modern societies: telecommunications between the Earth and spacecraft, and even between the spacecraft themselves, cross this layer. There are also many other applications, all gathered in a new discipline called "Space Weather".

A few years ago, we realized that the intensities of the red and green auroral lights are not sufficient to know the upper atmosphere parameters. The idea came up: could these emissions be polarized?

Polarized? We are all used to polarization of waves nowadays because it is the technique for making us see 3D movies. We wear glasses that are polarized and the screen has two images with different polarization. Our brain reconstructs a 3D image.

In the case of the auroras, the source of the polarization, which is the solar wind entering the atmosphere along the magnetic field, is quite different, but the result is the same. In cooperation with colleagues at the University of Oslo, an instrument able to perform polarization measurement of auroral emissions, the "Spectro Photo Polarimeter", was built.

For physical reasons, we knew that the green light should not be polarized. However, the conditions to observe it could be present in Svalbard. This is where we discovered it: we published the article in 2008.

The polarization not only helps us understanding the upper atmosphere. It also allows us to actually "see" the magnetic configuration. This is a way to figure out how the magnetic field of the Sun wraps Venus or Mars, for example. We also realized that measurements of the polarization of such large scale features as an aurora allow to retrieve microscopic atomic parameters that otherwise are impossible to measure. Polarization could be a main feature of the Universe. We already discovered it in the upper atmosphere of Jupiter…