



Prof. Dr. Franz-Josef Lübken
LEIBNIZ-INSTITUT FÜR ATMOSPÄRENPHYSIK (IAP)
KÜHLUNGSBORN, GERMANY

Franz-Josef Lübken has, since September 1, 1999, been Professor of Physics at the Rostock University and Director of the Institute of Atmospheric Physics (IAP) in Kühlungsborn, Germany. He has also been professor of Physics at the 'Physikalisches Institut der Universität Bonn'.

Professor Lübken's scientific interests include thermal and dynamical structure of the middle atmosphere; turbulence in the mesosphere; ice layers at the summer mesopause; temperature measurements with rockets and lidars; gravity waves; trends in the upper atmosphere; trace gas measurements from rockets. He has been Project Scientist of several sounding rocket projects, and is author or coauthor of more than 150 scientific publications on atmospheric physics.

Professor Lübken is Co-Editor of *Geophysical Research Letters*, *Atmospheric Chemistry and Physics*, and *Journal of Atmospheric and Solar-Terrestrial Physics*, and member of the Advisory Board of the German Space Administration and of the Council for Atmospheric Science of the German Science Foundation and, furthermore, Chairman of the "Atmospheric Coupling" theme of the SCOSTEP Program CAWSES (Climate and Weather of the Sun-Earth System).

He has his Ph.D in physics from the 'Physikalisches Institut der Universität Bonn' (1985), and his 'Habilitation' in Physics at the 'Physikalisches Institut der Universität Bonn' (1993). In the 1988 – 1989 he worked at the York University in Toronto, Canada, as post doc., doing research on tunable diode laser.

Organizing committee:

- Professor Tore Amundsen, Department of Physics, University of Oslo
- Professor Alv Egeland, Department of Physics, University of Oslo
- Professor Jan A. Holtet, Department of Physics, University of Oslo
- Professor Reidun Sirevåg, Secretary General, the Norwegian Academy of Science and Letters
- Rune Ingels, Vice President, Yara International ASA
- Bo Andersen, Director General, Norwegian Space Centre

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

For more information about the Birkeland Lecture 2008:

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THE NORWEGIAN ACADEMY OF SCIENCE AND LETTERS

DRAMMENSVEIEN 78, OSLO
THURSDAY, SEPTEMBER 25, 18:00

THE BIRKELAND LECTURE 2008

PROF. DR. FRANZ-JOSEF LÜBKEN
Leibniz-Institut für Atmosphärenphysik,
Kühlungsborn, Germany,
the Birkeland Lecturer 2008:

“Dramatic climate changes in the upper atmosphere”

No registration necessary. Free admission

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



The Birkeland Lecture 1987-2008

The University of Oslo has since 1987 arranged a "Birkeland Lecture" in cooperation with the Norwegian Academy of Science and Letters and the Norwegian company Norsk Hydro ASA (from 2004: YARA ASA). Except for 1993 – when the lecture was given in Tokyo - the lectures have been given in Norway, most of them at the Academy in Oslo. Some years seminars have been arranged in connection with the lectures, e.g. in 1993 when the lecture was part of a "Joint Japanese-Norwegian Workshop on Arctic Research", and in 1995 when the lecture was part of a seminar on Norwegian environmental research. Also in 2001, when professor D. Southwood from ESA gave the Birkeland Lecture, a workshop on Norwegian space research with emphasis on the Cluster programme was arranged at the University of Oslo. This cooperation with the Academy and Norsk Hydro and YARA has given the University of Oslo the opportunity to invite many outstanding scientists within the area of geophysical and space research to Oslo, areas which were central in Kristian Birkeland's own research:

- 1987: Hannes Alfvén, Kungliga Tekniska Högskolan, Stockholm, Sverige, and University of California, San Diego, USA:
"The Auroral Research in Scandinavia"
(University of Oslo, 03. 09 1987)
- 1988: Alex J. Dessler, Rice University, Houston, USA:
"I have it" - Birkeland's quest for research funding"
(University of Oslo, 16. 09 1988)
- 1989: T.A. Potemra, The John Hopkins University, Laurel, USA:
"Satellite measurements of Birkeland currents"
and
Naoshi Fukushima, Tokyo University, Japan:
"Birkeland's work with the geomagnetic disturbances in relation to modern research"
(The Norwegian Science Museum, Oslo, 24. 10 1989)
- 1990: James van Allen, University of Iowa, USA:
"On the future of space science and applications"
(The Norwegian Academy of Science and Letters, Oslo, 10. 10 1990)
- 1991: Syun-Ichi Akasofu, Geophysical Institute, Fairbanks, Alaska:
"Helio-magnetism"
(University of Oslo, 24. 10 1991)
- 1992: W. Ian Axford, Max-Planck Institut, Lindau, Tyskland:
"The origin of cosmic rays"
(University of Oslo, 24. 09 1992)
- 1993: Takasi Oguti, Solar-Terrestrial Environment Laboratory, Tokyo, Japan:
"Sun-earth energy transfer"
(Tokyo University, Japan, 07. 10 1993)
- 1994: Stanley W.H. Cowley, Imperial College, UK:
"The Solar wind – Magnetosphere-Ionosphere connection"
(The Norwegian Academy of Science and Letters, Oslo, 22. 09 1994)
- 1995: Anthony L. Peratt, Los Alamos National Laboratory, USA:
"The legacy of Birkeland's plasma torch"
(University College, Notodden, Norway, 21. 09 1995)

- 1996: Gerard Haerendel, Max Planck Institute, Garching, Tyskland:
"Physics along auroral magnetic field lines"
(University of Oslo, Norway, 19. 09 1996)
- 1998: No lecture, but a **"Birkeland event"** at Tokyo University 30. 09 with presentation of a Birkeland bust to Tokyo University, and a mini-seminar at the Norwegian Embassy.
- 2001: David Southwood, Imperial College, London / Director of Research ESA, Paris:
"Kristian Birkeland, Science Forever, Lessons for Today"
(The Norwegian Academy of Science and Letters, 20. 09 2001)
- 2002: Alain F. Roux, Centre d'Étude des Env. Terrestres et Planétaires, CETP, Paris:
"Role of Kristian Birkeland currents in the dynamics of the geomagnetic tail"
(The Norwegian Academy of Science and Letters, Oslo, 19. 09 2002)
- 2003: Lev M Zelenyi, Space Research Institute, IKI, Moscow, Russia:
"Space Weather"
(The Norwegian Academy of Science and Letters, Oslo, 19. 09 2003)
- 2004: Catherine G. Coleman, NASA, Houston, USA:
"Our Earth seen from Space"
(University of Oslo, 23. 09 2004)
- 2005: William J. Burke, Air Force Geophysics Laboratory, USA:
"Kristian Birkeland's Message from the Sun – Its meaning then and now"
(University of Oslo, 22. 09 2004)
- 2006: Margaret Kivelson, University of California, Los Angeles (UCLA), USA:
"A century after Birkeland: Auroras and related phenomena at moons and planets"
(The Norwegian Academy of Science and Letters, Oslo, 21. 09 2006)
- 2007: Dr. Eigil Friis-Christensen, Danish National Space Center (DTU)
"Unrest on the Sun – storms on the Earth. The magnetic connection"
(The Norwegian Academy of Science and Letters, Oslo, 27.09 2006)

The ALOMAR observatory with the laser beam from one of the Lidars and a flaming aurora as a background.



Prof. Dr. F.-J. Lübken, Leibniz-Institut für Atmosphärenphysik, Kühlungsborn, Germany

"Dramatic climate changes in the upper atmosphere"

Observations suggest that some parts of the upper atmosphere have cooled by up to 20 degrees since the measurements started 40 years ago. This is a factor of 40 larger than the warming at the Earth's surface, and also much larger than expected from models. It has therefore been suggested to consider the upper atmosphere as an "early warning system" for climate change.

Since the neutral air density in the upper atmosphere is orders of magnitude smaller than that at the ground some physical processes appear fundamentally different to what we are used

to in the troposphere. Surprisingly, the mesosphere (50-100 km) at middle and polar latitudes is substantially colder(!) in summer compared to winter, which leads to a spectacular optical phenomenon known as "noctilucent clouds" (NLC). These clouds which appear at the edge to space, are sensitive indicators for low temperatures and perhaps to climate change. Measurements of NLC are reviewed with special emphasis on long term changes. A complete understanding of our atmosphere must include the upper atmosphere, which is experimentally and theoretically challenging and poorly understood.

FRONT PAGE: The picture on the front page shows "noctiluculent clouds" (or "shining night clouds") taken at the IAP in Kühlungsborn at 00:23, 25. June in 2006. The sun is situated under the horizon and illuminates the ice crystals at the height of around 83km.