På Kroppedal Museum den 6. Maj 2010 kl. 19:30

Dansk Datahistorisk Forening og Kroppedal Museum inviterer til en foredragsaften med titlen:

Hipparcos og Gaia - to satellitter med dansk og svensk indsats gennem 85 år

Astrometriske og databehandlingsmæssige udfordringer gennem tiderne belyses gennem to foredrag af førende forskere på området (se http://www.kroppedal.dk/astronomi/astrometri.html og http://www.astro.lu.se/~lennart/Astrometry/). Tankevækkende at GIER blev konstrueret for 50 år siden med henblik på at løse 104 lineære ligninger med lige så mange ubekendte – nu handler det om med dagens computerteknologi at løse ulineære ligninger med en milliard ubekendte !

Associate prof. Erik Høg, Niels Bohr Institutet, Københavns Universitet

(www.astro.ku.dk/~erik)

From an experiment in 1925 to the Hipparcos and Gaia space missions (indlæg evt. på dansk)

A teenager, Bengt Strömgren, made an astrometric experiment in 1925 which had wide-reaching consequences. The direct connection from Strömgren's photoelectric recording of stellar transits on the old meridian circle in Copenhagen to the Hipparcos and Gaia space missions is presented in the lecture. Peter Naur was astronomer and I was his student and collaborator 1953-58 and very interested in techniques. Working in the Hamburg Observatory from 1958-73 I invented and developed a semi-automatic meridian circle for an expedition to Perth in Western Australia and a GIER computer went with it. With this experience I could make a new design of an astrometric space mission in 1975 which developed into the Hipparcos mission.

In 1973 I found Lennart Lindegren as a young student in Lund and from 1976 he was the key person in the Hipparcos data reduction. - This must be seen on the astronomical background of the past century. Astrophysics flourished, but this brought astrometry almost to extinction because it was considered to be dull and old-fashioned, especially by young astronomers. Astrometry is the old branch of astronomy, in fact 2000 years of age, which performs accurate measurements of positions, motions and distances of stars and other celestial bodies, and astrometric data are of great scientific and practical importance for investigation of celestial phenomena and also for control of telescopes and satellites and for monitoring of Earth rotation.

Prof. Lennart Lindegren, Lund Observatory, Lund University

(http://www.astro.lu.se/Staff/staff/lennartl.html)

Gaia - solving non-linear equations with a billion unknowns (indlæg på engelsk)

Gaia builds on the extremely successful Hipparcos mission, launched in 1989 by the European Space Agency, in order to map the sky with unprecedented accuracy and detail. Taking advantage of the latest detector technology, manufacturing methods, and high-power computing, Gaia will outperform Hipparcos by many orders of magnitude in terms of accuracy, number of objects, and volume of space surveyed.

Gaia is to be launched in September 2012, and will after a few months take up its observing position at the Lagrange point L2, 1.5 million km away from the Earth. During five or six years it will continuously scan the whole sky, registering the exact positions and motions of a billion stars, and dispatch an enormous quantity of data back to the Earth. The processing of this data, converting it to a star catalogue eagerly awaited by astronomers around the world, is by itself a great challenge, perhaps as large and difficult as the making of the satellite. It is estimated that the data analysis effort to produce the Gaia catalogue is about one sextillion (10^21) floating point operations. A significant part of this is the simultaneous determination of the positions, proper motions and parallaxes of more than one billion stars, which requires the solution of a non-linear least-squares problem with several billion unknowns.

In this talk I will give a general overview of Gaia and its current status, and explain why the data analysis must involve the solution of extremely large systems of equations. In fact, it is only thanks to the steady increase in computing power, following Moore's law, that this problem can practically be solved in time for the launch of Gaia.