

Obituary

KAREL HAMAL, 1932 - 2007

Professor, Czech Technical University in Prague

Passed away suddenly, 8 February 2007



Karel Hamal joined the Czech Technical University in Prague in 1962 after spending some time working for the Tesla radio communication company. His primary interests at that time were in microwaves and radar. At the university he founded the study of a newly emerging technology – solid state lasers. He established a world class laboratory and formed a team of international collaborators. This lab became world famous both for its scientific and educational results.

In the nineteen seventies and eighties he formed international ties between the Czech Technical University and scientists and labs in other countries and he headed the international network of satellite laser ranging stations under the roof of INTERKOSMOS. Satellite laser ranging was his main interest for more than three decades. He was one of the initiators of the international workshops on laser ranging and was involved in the organization of all the workshops for 35 years. The International Laser Ranging Service represented by its Central Bureau awarded Karel Hamal with the “SLR Pioneer Award” in 2002, for his longstanding contributions the subject, in particular, for his early technical leadership in developing and deploying the INTERKOSMOS systems, which helped to create a truly global satellite laser ranging network. Recently Karel Hamal was involved in research and development of solid state photon counters and their applications in laser ranging and space science, in millimeter precision laser ranging and new trends in information technology. Two deep space probes carried his laser ranging and photon counting devices toward the planet Mars late nineties, another two space mission are under completion in Europe and in China to be launched on Earth orbit soon.

Along with the science, Karel Hamal taught several generations of students Physics, ranging from MSc students, PhDs up to research scientists. In the early nineties, he was the driving force behind the reorganization of education at the university.

The passing of Karel Hamal is a significant loss for the University and to the world scientific community. Education and science are losing an expert and unparalleled organizer, the students are losing an excellent teacher and his colleagues are losing a man, who always erupted with new ideas and human energy.

We all will miss him.

Ivan Prochazka

PREFACE

These Proceedings are dedicated to the memory of Karel Hamal, a veritable stalwart of the laser ranging community and one of its prime movers over many years. He attended every International Workshop on Laser Ranging (Instrumentation) since the first at Lagonissi, Greece in 1973. Only Mike Pearlman remains who can match that record. Karel was a great believer in these Workshops and was dynamic on many of their Program Committees. As well as being a brilliant and innovative scientist, he was also a thorough gentleman and a friend to many. Vale Karel.

This volume is being published in three forms:

1. A CD;
2. A book (paper) containing all received papers and some details of the Workshop;
3. On the Internet, most likely on:

<http://ilrs.gsfc.nasa.gov/reports/workshop/>

All papers received are included. Where authors have withdrawn their full papers, or not responded, their abstracts have been included when available.

Nearly all the PowerPoint presentations at the Workshop are available at:

<http://ilrscanberraworkshop2006.com.au>

and are useful adjuncts to the full manuscripts.

Originally, the deadline for submission of papers was set at mid-December 2006, i.e. about six weeks after the Workshop. This was hopelessly idealistic! About 60% of papers were in by the end of February, although not many from the Science Products session. It was felt that this was insufficient to proceed at that time. By 24th August, 113 papers had been received including session summaries, 6 were withdrawn by the authors and 6 were not received at all. I would like to thank the authors, especially those who submitted by the end of February, and the Session Chairs who harassed authors to submit. I also heartily thank Chris Moore, Peter Wilson, Nathan White, Ron Thompson and Jen Mullaney (and her successor, Sarah-Louise McHugh), all of EOS, for their great assistance in the production process.

A “Golden Gong” award was instituted for the last paper to be received and accepted. Several candidates were notified of their eligibility, and competition was fierce. The winner will be formally announced on a suitably sauspicious occasion. Finally, I profusely apologize to all previous editors for my own tardiness in submitting manuscripts. I can now feel that I have been adequately punished!



John Luck
Editor

Foreword

It is my pleasure to be involved in the 15th International Laser Ranging Service (ILRS) Workshop in Canberra from 15 to 20 October 2006.

This will be the second time in 30 years that Australia has hosted this prestigious meeting of space scientists. This is an honour for Canberra and for Australia, due to the leading role that Australian scientists and technologists play in this field.

I would like to thank all of you who have travelled to our shores to participate in this event, and also those who have made contributions but were not able to be here.

I would particularly like to acknowledge our sponsors whose generosity has made this Workshop possible:

ACT Government
Geoscience Australia
Electro Optic Systems Pty Limited

Welcome to our beautiful city. We hope you enjoy your stay and find great benefit in the Workshop discussions.



Ron Thompson
Chair, Local Organising Committee

15th International Laser Ranging Workshop
16-20 October 2006-10-13

Welcome Note

Werner Gurtner
Chairman of the ILRS Governing Board

Dear Dr Ben Greene, dear Dr. Williams,
ladies and gentlemen, dear colleagues,

this is the second time that I have the honor to welcome you to an international laser ranging workshop, and it is also the second time that I attend a laser workshop here in Canberra.

For me it is a special honor to attend this meeting in the country and continent with the top two laser tracking stations of our service: Yarragadee has been leading the chart for years, without danger of ever being relegated to a lower position by any other station. The most recent chart, prepared a few days ago by our Central Bureau, awards Mount Stromlo the silver medal for the number of passes collected during the previous 12 months. All our analysts are extremely pleased with this performance of the Australian stations, because it significantly attenuates the well-known weakness of our tracking network in the southern hemisphere.

We have seen several remarkable achievements since the last workshop in San Fernando, four of which I would like to address:

- With Icesat and Alos we have demonstrated that we can successfully track satellites with vulnerable sensors
- Within a year we have introduced a new orbit prediction system with significant improvements in the satellite acquisition
- We are tracking the first Galileo test satellite, Giove-A, although I think that we have to study how to improve our performance for such weak targets
- I was especially pleased to see the very efficient and fast installation and consolidation of the new Chinese station in San Juan in South America. It will further and significantly improve our coverage of the southern hemisphere.

The two space-geodetic techniques VLBI and SLR still form the basis and nucleus of any research in need of high-precision global positions, especially with regard to the referencing to the center of the earth and the height components or the scale of the earth. It is very disturbing that due to budgetary reasons major contributors to the infrastructure needed to maintain these fundamental activities decide to withdraw their support, as we have learned a few days ago from our Canadian VLBI network, and we also had such experiences in our own ranks.

It is extremely important that we can demonstrate the high quality of our products to our parent organizations to convince them of the necessity of space geodesy for modern research in earth sciences. And we have to carefully avoid any activities or statements that could send wrong signals to the external community. There has to be a

healthy competition among the different space-geodetic techniques, internally, in our groups. However, to publicly play one technique off against the another would be disastrous. We will support our sister service, the International VLBI Service, in its activities to convince the Canadian government to re-evaluate these unfavorable decisions.

I would like to thank the local organizing committee for the excellent preparations for this workshop and the sponsors without which it would not be possible to organize and hold such an event.

I wish you all a fruitful and successful workshop. Please enjoy the various activities prepared for the evenings by our hosts. Some of you may even take the opportunity to append a few days to the workshop to see more of this fascinating country.

15th International Workshop on Laser Ranging; Canberra, Australia

Workshop Summary

Michael Pearlman

Electro Optic Systems Pty. Ltd, Geoscience Australia, the Australian Capital Territory Government, and the ILRS sponsored the 15th International Workshop on Laser Ranging in Canberra, Australia during the week of October 16 – 20, 2006. About 111 people from 19 countries participated in the workshop, which included oral and poster presentations on scientific achievements, applications and future requirements, system hardware and software, operations, advanced systems, and analysis.

After the Opening Ceremony, which featured an Aboriginal father-and-son duo welcoming delegates and distinguished guests on didgeridoos, sessions were organized around the following topics:

- Science Achievements, Applications, and Products
- Network Performance and Results
- Lasers and Detectors Session Summary
- Laser Altimetry
- Kilohertz Systems
- Timing Systems
- Multiple Wavelength and Refraction
- Telescopes, Stations, and Upgrades
- Advanced Concepts
- Eye safe Systems
- Laser Transponders
- Uncooperative Targets
- Software and Automation
- Lunar Laser Ranging
- Targets and Return Signal Strength

Some of the key items of interest were:

- Geophysical results through long-term monitoring of SLR data supporting work in gravity field, reference frame, Earth rotation, non-conservative forces on satellites, calibration of GNSS, ocean and ice surface altimetry, lunar science, relativity, and planetary science;
- New event timing systems including the new PICO event timer and control system from TU in Prague;
- Impressive performance (including spin and atmospheric measurements) of the 2 KHz laser at Graz;
- The operation of the new San Juan SLR;
- The SLR progress at Arequipa and Maui;
- Transponder developments for interplanetary ranging;
- Laser altimetry technology and its future application in satellites;

- Automated operations at Stromlo and Zimmerwald;
- Web Application for data engineering files;
- The new climatic facility at INFN for retroreflector array testing;
- Very impressive Lunar Ranging results from the Apollo Station; and
- Systematic time biases in the SR620 counters

Abstracts, most PowerPoint presentations and other information on the workshop can be found at: <http://www.ilrscanberraworkshop2006.com.au/>. Proceedings from the workshop will be available in mid-2007 on CD with selections in hardcopy, and on the web at that address and at <http://ilrs.gsfc.nasa.gov/>.

Workshop participants also had the opportunity to visit the SLR station at Mt. Stromlo which has had an extremely impressive recovery after the devastating forest fire in 2003.

The 16th International Workshop on Laser Ranging will be held in Poznan, Poland in the fall of 2008. A specialized SLR workshop similar to those held in Eastbourne and Koetzing will be held in Grasse, France on 24-28 September 2007.