# IVS Newsletter

Issue 35, April 2013

## Get Shanghaied

*– Fengchun Shu, SHAO and Dirk Behrend, NVI, Inc./GSFC*

In the first week of March 2014, the Shanghai Astronomical Observatory (SHAO) of the Chinese Academy of Sciences will host the 8th IVS General Meeting (GM2014) in Shanghai, China. The General Meeting proper will be 3.5 days long. However, when counting in the various splinter meetings as well as the planned field trip, the activities are expected to fill the entire week from 2–8 March 2014. The side meetings will include an IVS Analysis Workshop, a mini-TOW, a Directing Board meeting, and probably an ICRF3 meeting.

*(top) Modern skyline of Shanghai. (below) Headquarters of SHAO at Xujiahui.*

Shanghai sits on the Yangtze River Delta on China's eastern coast. The vast majority of Shanghai's land area is flat, besides a few hills in the southwest corner, with an average elevation of 4 m. It is one of the four province-level municipalities of China, with a total population of over 23 million as of 2010. It is a major financial center and the busiest container port in the world. Shanghai is also a popular tourist destination, renowned for its historical landmarks such as The Bund, City God Temple, and Yu Garden, as well as the extensive and growing Lujiazui skyline. Shanghai has a humid subtropical climate and experiences four distinct seasons. The city averages approximately 8°C in early March.

SHAO was formally established in 1962 following the merger of the former Xujiahui and Sheshan observatories, which were founded by the French Mission Catholique in 1872 and 1900, respectively. Since the middle 1970s, SHAO has been developing the VLBI technique for astrometric and geodetic research. As the result of a long effort, the Chinese VLBI Network was formed to support the navigation of the Chinese Lunar probes and to monitor the Chinese mainland crustal movement. SHAO currently contributes to the IVS with a network station, an analysis center, and a correlator. With the emergence of the new VLBI2010 antennas, SHAO is ready to play a leading role in putting China on the VGOS (VLBI2010 Global Observing System) map.

The content of the GM2014 will be of interest to the broad spectrum of IVS members as well as to the wider VLBI and Earth science communities. All IVS Members and individuals who have interests in the various applications and research fields of VLBI such as geodesy, astrometry, Earth sciences, and related fields are encouraged to attend the meeting and to make an oral or poster presentation. Non-IVS members are cordially invited to attend the meeting and to make a presentation.

We plan on arranging a visit to the facilities of Sheshan Observatory. The visit will include stops at the 25-meter radio telescope, which regularly takes part in the IVS observing program, the new 65-meter antenna, which is currently in the commissioning phase, a new VLBI data processing center, and the SLR station.

We look forward to welcoming many of you next March!

*New 65-m telescope at Sheshan.*

*Bird's eye view of Sheshan station and surroundings. The 25-m telescope is visible in the foreground.*

# Feature

## Nothnagel Nailed It

*At the IVS Directing Board meeting in Helsinki on 8 March 2013, Axel Nothnagel from the University of Bonn was elected the new IVS Chair. Axel took over the reins from former chair Harald Schuh, who had led the IVS over the previous six years, for initially a four-year period. Newsletter editor Hayo Hase interviewed Axel to get a glimpse of what may lie ahead in the next four years under the new leadership.*

*Axel, you have been working in VLBI for many years. How did you get involved with VLBI?*

*Axel & wife at a social event after an IVS Directing Board meeting in Shanghai in 2010.*

After a short update course in VLBI in Bonn by James Campbell and Harald Schuh at the Geodetic Institute and by some of the old colleagues of the Max Planck Institute for Radio Astronomy, I started my employment at Hartebeesthoek, South Africa, in early 1983. I was hired by George Nicolson who said that geodesy is another valuable application for the Hartebeesthoek 26-m radio telescope. The equipment at that time consisted of a working radio telescope for various radio astronomical applications, an HP1000 mini-computer, and a Mark II VLBI video cassette recorder. An S/X receiver, a hydrogen maser, or a Mark III terminal were much too expensive at that time to be obtained for the emerging geodesy applications. Email was non-existent, and we mostly wrote letters and sometimes a telex if the urgency of the matter justified the expense. Therefore, the first geodetic VLBI sessions (Mark II) were rather low level for today's standards, but they were innovative and exciting for that time.

It took three years to make another major breakthrough. Getting in contact with Bill Carter of NGS and Tom Clark of GSFC/NASA, we organized that a Mark III terminal with electronics rack and tape drive together with a prime-focus S/X receiver box were sent to Hartebeesthoek on loan for a six-week observing campaign in January/February 1986. A hydrogen maser had been bought a year earlier and, fortunately, the HP 1000 (well maintained by Mike Gaylard at that time) was the standard control computer of the Mark III rack. This was all we needed for the first centimeter-accuracy VLBI measurements with a radio telescope in the southern hemisphere. Observing sessions were hard work, because we had to change the 5-kg video tapes about every hour and had to ship about 120 kg of air freight in five boxes for every session.

*After having been in Hartebeesthoek in South Africa for five years, you came back to Bonn, Germany. What did you miss about South Africa when back in Germany?*

South Africa was, and probably still is, a world in one country with an enormous variety of landscapes. During our time there, we did a lot of traveling with our home-made VW camper van and explored many nice spots in the country. Compared to Germany, traffic was really thin and driving overland was mostly relaxing. So, spending a weekend at a nice lake with only a few people around was easy compared to weekend journeys in Europe.

*When you started in Bonn again, where you are still employed today, which tasks were given to you and what were your contributions to VLBI?*

Back in Bonn in 1988, I was hired by James Campbell to join the geodetic VLBI group at the Geodetic Institute of the University of Bonn. At the university, research positions always have a good deal of educational obligations from giving practical courses to all levels of students to taking over responsibility for the computers, especially the students' PC pool. The latter task was hated by the entire scientific staff at that time. I should mention that only one diploma student loved this job very much: Hayo Hase, who later wrote his diploma thesis about gravitational effects near Jupiter under the supervision of Harald Schuh. Hayo once created the saying: "If I were a nanosecond, I would have passed already."

But back to VLBI investigations. First of all, I wrote my Ph.D. thesis which dealt with "Intensive"-type single-baseline observations for polar motion determinations. If GPS would not have been launched, this would have been another major application of geodetic VLBI. Besides this, there was a large number of individual research topics in VLBI that my colleagues and I addressed. Harald Schuh, Hayo Hase, Rüdiger Haas, and Leonid Petrov should be mentioned for having been employed at our institute for some time in the past. Bonn has always been the center of the European VLBI efforts, and we spent a lot of energy to prepare, correlate, analyze, and interpret the EURO sessions, a series which is still part of the IVS master schedule today. My interests included the 100-m radio telescope at Effelsberg with its gravitational deformations, globally collecting antenna dimensions for thermal expansion modeling, and looking after the axis offset determinations.

*Being a teaching professor at the University of Bonn, you have to supervise study and thesis works of students. Can you name a few subjects which have been investigated under your guidance?*

My first Ph.D. student was Dorothee Fischer, now Dorothee Schnell, who worked on the "Quality Aspects of Short Duration VLBI Observations for UT1 Determinations," dealing in particular with the INT2 sessions. Markus Vennebusch wrote his thesis about "Singular Value Decomposition and Cluster Analysis as Regression Diagnostics Tools

in Geodetic VLBI." Alessandra Bertarini made a major contribution to the "Effects on the Geodetic VLBI Observables Due to Polarization Leakage in the Receivers." Sarah Böckmann, now Sarah Tesmer, supported the IVS combination activities by her thesis "Robust Determination of Station Positions and Earth Orientation Parameters by VLBI Intra-technique Combination." "Determination of Sub-daily Earth Rotation Parameters from VLBI Observations" was the topic of Thomas Artz, and Jungho Cho worked on the "Wet Path Delay Corrections from Line-of-Sight Observations of Effelsberg's Water Vapor Radiometer for Geodetic VLBI Sessions."

*Today you are the head of the Bonn VLBI Group. Could you tell us who the group members are and what different research subjects they are working on?*

Based on quite different funding schemes, the staff of the Bonn VLBI Group today consists of Thomas Artz (data analysis), Simone Bernhart (correlation), Alessandra Bertarini (correlation), Judith Leek (Twin telescope scheduling for Intensives), Sebastian Halsig (atmospheric refraction), Andreas Iddink (ICRF3 combination), Laura LaPorta (correlation), and Arno Müskens (correlation).

*You served as the IVS Analysis Coordinator for more than 13 years. Recently you handed this function over to John Gipson. What do you consider your major achievements in this important function and what shall be the main focus for your successor?*

The position of the IVS Analysis Coordinator has always been very demanding, because it is the main liaison between the individual analysis centers and the IERS. The analysis centers strive for the best results in their analyses, while in the IERS compromises have to be found for consistency questions. This sometimes leads to contradicting views for which the IVS Analysis Coordinator has to find a good solution.

An important cornerstone of my activities as IVS Analysis Coordinator was the decision to go to datum-free normal equations in the combination process. This has been and always will guarantee that the input to a combination step—intra-VLBI-technique or inter-technique, e.g., for ITRF—will be clean of any datum effect. This is particularly important if the full set of parameters of station coordinates, Earth orientation parameters, and source positions will be combined. The IVS input to ITRF2005 and ITRF2008 was generated in this way, and the very good results have proven the validity of the concept.

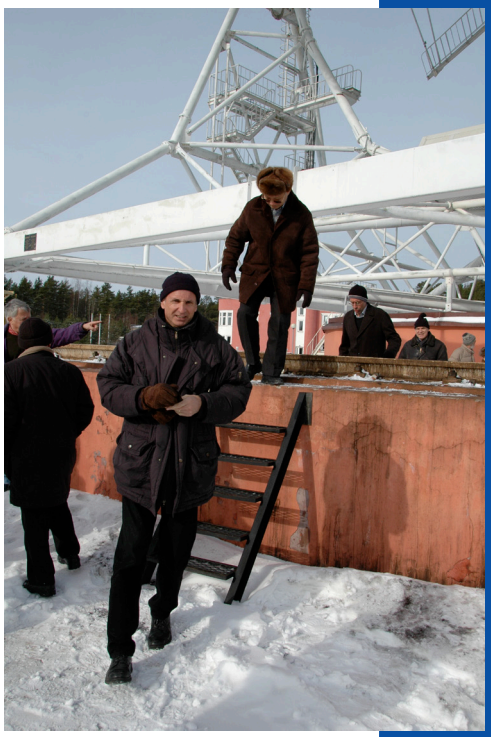
I don't think that I can speak for John, because he will have his own ideas of what should be addressed in the near future. New ideas are very important for progress. A bleak spot certainly is that the Intensive solutions are not combined before they are handed over to the IERS. This should have a high priority on the to-do list, but this may not necessarily be John's top priority.

*As the new IVS Chair, what do you think about the IVS? What are the most challenging tasks ahead?*

I could use this opportunity to elaborate extensively on the scientific or technique-specific issues which have to be pushed forward; but instead I prefer to dwell on the human side. VLBI is a discipline that cannot be made to work or be employed successfully by a few individuals or a single group alone. We always need enthusiastic colleagues all over the world who take care of extending the network and the service. The challenge is that we have to move forward with the strong ones pulling the weaker ones and with sufficient tasks at hand for everyone. At the same time, there are so many issues not being addressed for whatever reason. It will need quite some diplomacy to motivate our colleagues to tackle them in a concerted effort.

*Do you have new ideas about the fields in which the IVS could evolve in the near and far future?*

There are always components to be improved in the technological sector to maintain and improve the quality of what we are doing already. Developing and introducing global standards has helped tremendously to bring together different "worlds" to a unified IVS network where we don't have to ask anymore whether the recording systems are compatible. There are many more areas where the standardization process has to be pushed further, e.g., in data analysis or in the publication of results. On the technical R&D side, we should also look into the issue of satellite/spacecraft observations and analysis for better linking the individual reference systems.



*Axel during a visit of Svetloe in 2008.*

Another issue is that the contribution of the IVS to many other global activities has to become more visible to the users. Telescope coordinates, radio source positions, or UT1−UTC time series are used for navigation in space and on Earth, while only few people know that the IVS is working hard for it in the background.

*How do you judge the role of the IVS in the Global Geodetic Observing System (GGOS)?*

With the International Association of Geodesy (IAG) being one of the parent organizations of the IVS, the con-

# Feature Cont'd

tributions of the IVS have been an integral part of the ideas for GGOS from the very beginning. Keeping in mind that GGOS does not supersede the services, the IVS activities towards VGOS are designed already for any new station to also contribute to GGOS in the very meaning of the name. Besides, in the synergy with the other geometric space-geodetic techniques, we have to see that our results match the quality of the others or even outperform them slightly.

*It seems that the IVS will continue to keep you busy. In your leisure time, what do you do if ever you need a break from VLBI?*

Playing tennis is certainly very high on my priority list together with many other sports activities including running—although I don't have as many kilometers on my clock as my predecessor, Harald, has. And beyond that, I love to travel and explore other countries.

*Thank you, Axel, for this interview. We wish you a lot of success in your new function!*

*Harald Schuh congratulating Axel as the newly elected IVS chair.*

*Axel repairing his Volkswagen Bus in 1986.*

**Upcoming Meetings...**

7th IVS TOW Meeting
Haystack Observatory
Westford, MA, USA
May 6-9, 2013

AOGS 2013
Brisbane, Australia
June 24-28, 2013

IAG Scientific Assembly
Potsdam, Germany
September 1-6, 2013

Journées 2013
Paris, France
September 16-18, 2013

AGU Fall Meeting
San Francisco, USA
December 9-13, 2013

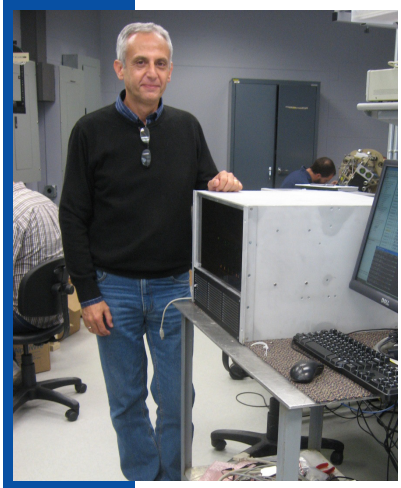
8th IVS General Meeting
Shanghai, China
March 2-7, 2014

http://ivscc.gsfc.nasa.gov/meetings

## VLBI Digital Backend Testing and Intercomparison

*– Alan Whitney and Arthur Niell, Haystack Observatory*

As VLBI moves to expand the scope of digital signal-processing in VLBI systems, it is important that each sub-system be validated for proper function and interoperability. While every VLBI developer strives to ensure that these criteria are met, it is often only by comparison that problems can be uncovered. One area of particular interest is digital-backend (DBE) systems, where some issues are difficult to evaluate in either local tests or actual VLBI experiments. The 2nd DBE intercomparison workshop at Haystack Observatory on 25-26 October 2012 provided a forum to explicitly address validation and interoperability issues among independent global developers of DBE equipment, and builds on the work of the first such workshop held at Haystack Observatory in May 2009. The 2012 workshop took advantage of the completion of a new Instrumentation Lab at Haystack Observatory that provided the space and signal connections needed to efficiently support the comparison exercise.



*Gino Tuccari with the DBBC.*

Five independently developed DBE systems were assembled at Haystack for testing, which occurred at the end of the week following the 1st International VLBI Technology Workshop (IVTW). This was a convenient time since all of the developers of the systems were present for the IVTW. The four DBEs were:

- ADS3000+ developed by NICT (Japan)
- CDAS (DDC and PFB personalities) developed by Shanghai Astronomical Observatory (China)
- DBBC developed by INAF (Italy)
- RDBE-H developed by Haystack Observatory and NRAO (USA)

One other system was expected but, due to the vagaries of international bureaucratic procedures, was not able to make

it to Haystack.

To test the DBEs, the signal from a broadband noise source was split and fed into all four DBEs (below), and a cross-correlation was done between the DBEs pairwise in what is called a zero-baseline test, i.e. it looks like a VLBI observation except that both sites are at the same location. An auto-correlation was also done for each system to check for spurious signals. On the first day of testing the RDBE-H (PFB mode, output over 10 GigE in Mark5B format to Mark5C recorder) was used as a reference, and a cross-correlation was done with each of the following DBE systems and modes:

1. CDAS-DDC: DDC mode, output over VSI-H in Mark5B format to a Mark 5B+ recorder
2. CDAS-PFB: PFB mode, output over VSI-H in Mark5B format to a Mark 5B+ recorder
3. DBBC: DDC mode, output over VSI-H in Mark5B format to a Mark 5B+ recorder (first day)
4. DBBC: DDC mode, output via fila10G over 10GigE in Mark 5B format to a Mark 5C recorder (second day)
5. ADS3000+: DDC mode, output in K5 format to a K5 recorder, then software-translated to Mark 5B format

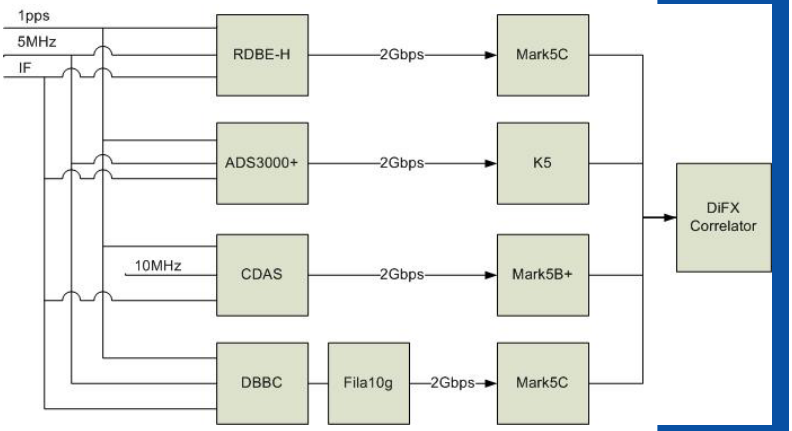
Thirty seconds of data were recorded at 2Gbps for each station, followed by e-transfer to standard Linux files and correlation on the Haystack DiFX correlator. This step served to verify the connections from noise source to recorder as well as the proper formatting of the recorded data. As a tribute to the careful preparations by the developers, all systems produced fringes with only one system showing some unexpected results, which are being investigated.

On the second day a simultaneous recording was made with four systems (CDAS-DDC was not included in this test), as shown in the accompanying diagram. The cross-correlation results were nominal for all six baselines, which provided considerable confidence that all four units function properly.

*Chet Ruszczyk controlling the recording while Arthur Niell (nominal test director) looks on. In the background Kazuhiro Takefuji explains the ADS3000+ system.*

After several weeks of preparation and two long days of testing, including correcting various misunderstandings, fixing some hardware, and overcoming some internal networking problems, the tests were very successful. The complete report on the results of the DBE inter-comparison testing is available at http://www.haystack.mit.edu/workshop/ivtw/#dbed.

It was gratifying to see all four DBE units working at the same time. We thank everyone who participated. Although all of these systems will eventually be included in VLBI observations; a future dedicated observing session incorporating all these DBE systems, plus others that were not tested this time, would be a further confirmation of proper operation of all the DBE types.




*Setup for the 4-station zero-baseline inter-comparison test. The IF comes from a broadband noise source.*

The IVS Newsletter is published three times annually, in April, August, and December. Contributed articles, pictures, cartoons, and feedback are welcome at any time.

Please send contributions to ivs-news@ivscc.gsfc.nasa.gov.
The editors reserve the right to edit contributions. The deadline for contributions is one month before the publication date.

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The newsletter is published in color with live links on the IVS web site at

http://ivscc.gsfc.nasa.gov/.

## VLBI Training School Held in Finland

*– Minghui Xu, SHAO*

Early March saw the first geodetic VLBI school being organized by the IVS in Espoo (Helsinki), Finland. With heavy snow outside, a warm lecture hall at Aalto University welcomed around 50 participants in the EGU and IVS Training School on VLBI for Geodesy and Astrometry. Among them were PhD and master students from around the world who are interested in and involved with VLBI. There was also a teaching team consisting of members of the international components of the IVS. The VLBI training school was part of the activities of IVS Working Group 6. Its aim was to convey knowledge to the next generation researchers who will work with the next generation VLBI system for geodesy and astrometry.

*Bill Petrachenko giving instructions to Xavier Collilieux and others.*

The training school took place from 2–5 March 2013. Most lectures were given at Aalto University; however, the classes of the second day were held at the premises of the Finnish Geodetic Institute at Masala, which gave us the opportunity to visit this quiet institution in the beautiful forests. The lectures covered general issues as well as detailed aspects of VLBI and the next generation VLBI system. A broad range of technical aspects were discussed, including observations, correlation, data analysis, and the interpretation of results. Every individual lecture was a brilliant report and contained both the fundamental theory and the cutting-edge development.

*Alessandra Bertarini giving instructions during the correlator class.*

In addition to the classroom-style lectures, several interesting exercises were arranged which allowed us to solidify the information learned in the lectures and to practice the processing of VLBI data. On March 3, an ice-breaker dinner was provided at the Finnish Geodetic Institute at Masala in an easy and relaxed atmosphere. The event gave us the opportunity to communicate with other attendees and to get to know what other research groups are working on. Finally, on March 5, an IVS Analysis Workshop rounded out these eventful four days.

During the training school, I was impressed to see that the teachers, who are experts in certain fields of VLBI, listened attentively to the other lectures and actively participated in the exercises, although they may have been quite familiar with the material. By talking with other attendees, I learned that we all found this training school to be informative and very beneficial. This is due to the successful organization done by the hosts, the program committee, and the teachers. A big thank-you to all of them and to the organizations that sponsored the school! I hope that this was only the first of a long series of VLBI schools in the future.

*View of Helsinki Harbor.*

## Aalto Hosts EVGA

*– Dirk Behrend, NVI, Inc./GSFC*

Following the VLBI School, Aalto University was also the venue for the 21st EVGA Working Meeting, which was held March 6−8, 2013. About 75 participants registered for this 2.5-day event. While the majority of the participants came from Europe, there was a big contingent from other parts of the world as well. Approximately one third of the people flew in from Africa, Asia, Australia, and North and South America; it clearly was an international gathering.

The first two days were dedicated to scientific talks and posters about geodetic and astrometric VLBI. All oral presentations as well as most poster presentations are available on the meeting Web site at http://evga.fgi.fi/node/14#overlay-context=node/14. The last day was reserved for a half-day excursion to the Metsähovi Radio Observatory. The local hosts—Markku, Minttu, Nataliya, and many more—made sure that we had a smooth and very successful meeting. Kudos to them for their excellent job!

Finally, at the EVGA Business Meeting a new chair and secretary were determined. The new EVGA Chair is Rüdiger Haas; he will be assisted by the new EVGA Secretary Susana García-Espada. Congratulations to both of them.

## Preventing Data Loss

*– Rich Strand, NVI, Inc. and Mike Poirier, MIT Haystack Observatory*

Data loss is a recurring theme for this column, as every decision by the operators—good or bad—impacts everyone else downstream the data flow towards the end user. The better the data yield at your station, the better the product. A high data yield allows for better science, which, in turn, means continued funding for maintaining and improving the radio observatories around the world.

The biennial Technical Operations Workshop (TOW), the most recent ending in early May, hopefully provided the participants with useful and interesting classes to take. The TOW organizational team, which prepares and teaches the material for all the classes and presentations, has a vested interest in training the technical staff of each station to produce high data yields. Only a training program like TOW is able to achieve this.

The TOW class material is available on the IVS Web site at http://ivscc.gsfc.nasa.gov/meetings/tow2013/#Notebook. Each TOW student also received the documents on a thumb drive. Consider this a reference for all VLBI observing and a good study guide for all station staff. The actual classes often move along quickly and the written documents are a good way to review the material.

Recommended reading for everyone at your observatory is the class on Radio Frequency Interference. RFI is and will continue to be a problem for VLBI in the S-band spectrum. TOW class room instruction, of course, is nice, but everyone can review the material and get a better understanding of the data impact and techniques possible to prevent, reduce, or even eliminate RFI.

The Mark 5 system is another item to review. There are very detailed tests that can be conducted for this recording system, and doing them gives the operator a good insight into the overall data flow and possible future troubleshooting. It is always a good idea to run these tests on a working system at your own pace and to take your own notes on how and what to expect. The IVS has experts available to help you at any time, but it is always a good thing to be able to answer their questions quickly and to do any additional tests that they may require you to do in order to diagnose the problem.

Phase Calibration and RF System Testing is the most popular course and for all the right reasons. It all starts with Phase Cal. This signal is injected early into the system at the feed and is usually the first indicator of a problem in the RF flow by being missing. The TOW class notes have the flow charts and detailed explanations; a review of these notes, while testing with a good working system, adds value especially when you have to find and repair a problem quickly during a failure.

Many of the stations today do not require the operators to be specifically trained in electronics as in the early years. With surface mount technology and very sophisticated designs now in use at the observatories, the troubleshooting and repair at the component level is somewhat rare. Nevertheless, we still have hardware maintenance issues. TOW offers the Hardware Maintenance class that is good for operators at the stations to review, even for those that will never touch a soldering iron. Just recognizing when a power supply is having problems is important to prevent data loss. The class notes for this course also have a lot of tips and tricks for general overall maintenance of any electronics used in data acquisition (gleamed from years of experience maintaining such systems).

*Brian Corey during a TOW class.*

The Science Overview lecture was added to TOW years ago, when it was recognized that a better understanding by the operators of the overall geodetic project would help prevent data loss—by having an outline and priority of what happens to the data from beginning to end and, even more important, by recognizing how many people actually depend on our workmanship. This presentation is changed each TOW and usually given by different guest speakers to keep it fresh and interesting. It is included in the TOW notebook with the slides.

The average overall network data loss for 2012 was around 12%, which can be caused by a lot of observing issues. The data loss is described in the Network Coordinator report of the IVS 2012 Annual Report. It is clear that stations that do the normal pre-checks—such as confirm the Phase Cal rail in all channels, verify the telescope pointing is correct which also confirms the time, run software such as "ONOFF" to confirm station sensitivity, and use a good preconditioned module with a recording check—have the best chance to provide the IVS with 100% data yields. All this and more was explained in detail at TOW.

*Students taking notes during a TOW lecture.*

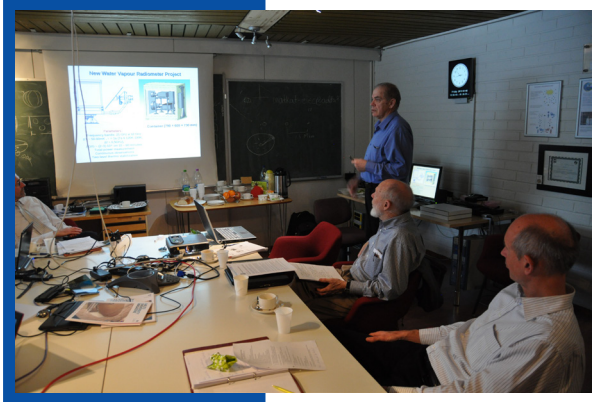
Station operators can access most information in the TOW notebook either via the TOW Web page or on the individual thumb drives handed out at the meeting. If you could not make it to this year's TOW, you are more than welcome to attend the next one in about two years.

# News...

## Board Meets at Metsähovi, Determines New Officers

*– Dirk Behrend, NVI, Inc./GSFC*

Yksi, kaksi, kolme…three is a charm. This could have been the motto of the latest Directing Board meeting held in Finland on March 8. The meeting was held in the wintry environment of Metsähovi Observatory, roughly a 45-minute drive from Helsinki. It was a very pleasant and cozy setting, conducive to making big decisions. We would like to thank the hosts from Aalto University and the Finnish Geodetic Institute for the warm welcome and the excellent organization.



*Alexander Ipatov informing the Board about recent activities at IAA and in Russia.*

The Board meeting was the third major IVS event in the Helsinki region following the VLBI School and the EVGA meeting (not counting splinter meetings such as the Analysis Workshop or the ICRF3 meeting). Also, three high-ranking officer positions needed to be reoccupied. The most prominent topic, of course, was the election of the third IVS chair: who would be the successor to Wolfgang Schlüter and Harald Schuh? The Board unanimously elected Axel Nothnagel from the University of Bonn to be the chair for the next four-year period. You can find more information about Axel and his views in the feature of this Newsletter. Then, Bill Petrachenko officially started his time as new Technology Coordinator. At the meeting, the Board approved a proposal from the Goddard group for John Gipson to become the new Analysis Coordinator. We are very grateful that both Bill and John took on these important tasks in order to move the IVS forward.

Beyond the usual reports from the Coordinators and the Committee and Working Group chairs, at this meeting Per Erik Opseth and Line Langkaas from the Norwegian Mapping Authority (NMA) informed about a Norwegian proposal for a UN resolution. The initiative was triggered by the experience NMA had when making the case for establishing a fundamental station at Ny Ålesund. While it is difficult to explain geodesy in general terms, it is much more intuitive to explain the effects of sea level rise and the need for its monitoring. Then the need for geodetic infrastructure and a sustained terrestrial reference frame becomes apparent. At the Second High Level Forum on Global Geospatial Information Management in February in Doha, Qatar a declaration was adopted that supports "a sustained operational global geodetic reference frame and infrastructure," among other things; see the UN Doha Declaration on Advancing Global Geospatial Information Management at http://ggim.un.org/docs/meetings/2ndHighLevelForum/Doha%20Declaration%20of%206-2-13%20Final.pdf. A final UN resolution can help Norway and other countries to serve as a reference for the decision makers.

The next Board meeting will be held in September in conjunction with the IAG Scientific Assembly in Potsdam, Germany.

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