

IVS Newsletter

Issue 60, August 2021



Helsinki to Host the General Meeting in 2022

– Niko Kareinen and Nataliya Zubko, Finnish Geospatial Research Institute

The 12th IVS General Meeting (GM2022) will be held during the week of March 27 – April 1, 2022, in Helsinki, Finland. All IVS Associate Members and individuals who have interests in the application of VLBI in the fields of geodesy, Earth sciences, and astrometry are invited to attend the meeting. The meeting will be hosted by the Finnish Geospatial Research Institute

(FGI), National Land Survey of Finland.

Prior to the General Meeting, a VLBI Training School is planned to be held from March 24-26, 2022.

Additional splinter meetings include an IVS Analysis Workshop, an IVS Directing Board meeting, and a Correlator meeting, among others.

The meeting is planned to be held in the Hakaniemi area of Helsinki downtown. Hakaniemi is located at the southern edge of the Kallio district, which is known for its vibrant culture and a home for non-conformists, bohemian souls, artists, designers, and students. It has numerous cafes, restaurants, bars, record stores, second hand shops, and plenty of other things. Helsinki has several market halls, one of which

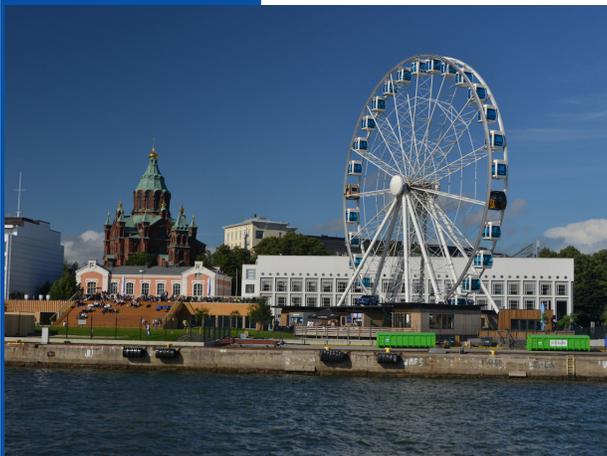
is located right at the Hakaniemi market square. In these indoor markets, independent merchants sell everything from art, clothes, and traditional Finnish food.

Due west from the conference site, one can take a popular walking route along the three inland bays of Helsinki to the Helsinki Winter Garden, a botanical garden open to the public since 1893. Heading south, just under two kilometers from the conference center and towards the coast, are the definitive Helsinki skyline landmarks such as Helsinki Cathedral, Orthodox Uspenski Cathedral, and the Presidential Palace. The latter is located right at the Helsinki Market Square where the ferries to Suomenlinna sail from. Suomenlinna is a sea fortress built in 1748 for Helsinki's defense. It has been under civilian control since 1973 and became a UNESCO World Heritage Site in 1993. The island is still inhabited and serves as a place for history, restaurants, and picnics.

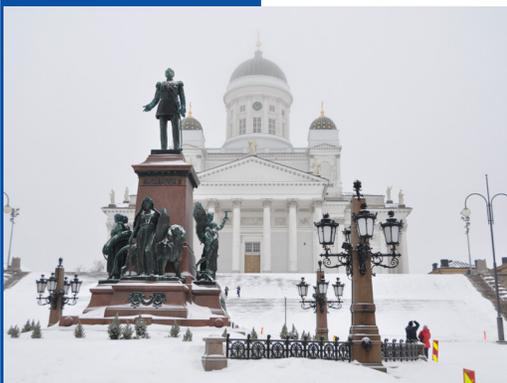
A short trip from Helsinki Market Square along the coast is the largest park in Southern Helsinki, Kaivopuisto, where the historical Helsinki University Observatory is located. Now it serves as a museum and is home to Ursa, the largest astronomical association of Finland. Nearby, on the park's highest point, Tähtitornin vuori ("Observatory Mountain") is the historical optical telescope of the observatory.

If the weather in early April in Helsinki proves too cold, continuing from Kaivopuisto due west one can find the definitive example of Finnish culture—the Finnish sauna. 'Löyly', the largest Sauna complex in Finland, was listed in 2018 in Time Magazine as one of the World's 100 Greatest Places. There you can try all the sauna variations imaginable.

We hope that all of us will be able to meet finally face-to-face again in Helsinki for GM2022—after the long break due to the world pandemic—and have a successful, productive, and friendly meeting.



Katajanokka Harbor with SkyWheel Helsinki (note the two wood-paneled gondolas are sauna cabins) and the Uspenski Cathedral (left background).



Helsinki Cathedral with Alexander II Statue in the foreground.



Helsinki Market Square (Kauppatori) sporting outdoor market stalls year-round.

I Am Number Four

At the IVS Directing Board meeting on March 25, 2021, Rüdiger Haas from Onsala Space Observatory (Chalmers University of Technology, Sweden) succeeded Axel Nothnagel as the fourth IVS Chair. On the Board, Rüdiger holds the position of the IERS Representative and he will be at the helm of the IVS for the next four years. Newsletter editor Hayo Hase caught up with Rüdiger via email for an interview about his background as well as plans and vision for the future.

Rüdiger, congratulations for the unanimous election to become our IVS chair. Please tell us about your educational and professional career? How did you become involved in VLBI?

I received my education in geodesy at the University of Bonn, Germany. At that time the Geodetic Institute of the University of Bonn was the center of geodetic VLBI in Europe. Prof. James Campbell led the research group on geodetic VLBI, and I luckily got involved rather early in VLBI as a student assistant. I worked for Axel Nothnagel and was responsible for, e.g., database creation and analysis of the IRIS-S sessions. These were VLBI sessions with long north-south baselines to increase sensitivity for polar motion.

VLBI was fascinating for me and eventually I also did my MSc thesis work on VLBI analysis. After my MSc in geodesy, I was lucky to get a PhD position in VLBI at the institute. So, I had the privilege to continue working in the VLBI group, together with James Campbell, Harald Schuh (who at that time was still visiting the institute), and Axel Nothnagel. After my PhD I applied for an EU-funded post-doc position in Sweden and was lucky to get the position. That meant I could do my post-doc at the Onsala Space Observatory and was later able to continue an academic career at Chalmers University of Technology, where I qualified to docent (equivalent to habilitation) and eventually became a full professor.

Your move from Germany to Sweden was a long time ago. Do you remember how it was for you arriving in a foreign country with a lot of nice people but a “strange” language?

When I moved to Sweden as a post-doc, my intention from the beginning was to try to learn the language and to integrate into society as much as possible. After all, I was planning to spend a four-year post-doc position in Sweden. In the end I stayed much longer, and now more than 24 years have passed. Luckily both Swedish and German belong to the same language family, and thus it was rather easy for me to learn the new language. Actually, the Swedish grammar is easier than the German one. The pronunciation is a bit difficult though when your mother tongue is German, since



Rüdiger Haas

some sounds in the Swedish language simply do not exist in German. Even after more than 24 years there are some difficult words for me to pronounce perfectly. When I arrived in Sweden, I took a few language courses that were offered by Chalmers and I tried to communicate as much as possible in Swedish. And when I then met my Swedish wife things became much easier of course, and Swedish is our home language.

You work at Onsala Space Observatory and at Chalmers University of Technology in Gothenburg. What are your positions and duties at these places?

The Onsala Space Observatory belongs to Chalmers University of Technology. Chalmers is hosting the observatory, and the observatory is one of the divisions of the Department for Space, Earth and Environment (SEE). I am employed at Chalmers as a full professor, and as part of my job I have also the responsibility for the geoscience activities at the Onsala Space Observatory. So, when I am not busy teaching at Chalmers in Gothenburg, or have other managing duties in town, I spend my time at Onsala where I have my primary office.

What are your favorite interests to investigate in VLBI and geodesy, and why? Is there something pending you would like to research (before retirement)?

The interplays between geodynamical processes and variations in earth orientation always have fascinated me. EOP variations are an integrated measure of all kinds of geodynamical phenomena taking place in the various layers of our planet. So EOP variations are an indicator of what is ongoing with our planet in terms of geodynamics, and there are still a number of open questions to understand. For example, it is rather mysterious and not completely understood why earth rotation has accelerated during the last five years.

Another point is that according to theory, abrupt changes in the earth's inertia tensor should be visible in changes in earth rotation, too. However, this has, to my knowledge, so far not been shown really convincingly. Therefore, I am looking forward to see whether we can verify this in the future with VGOS, and also find more interesting subtle geodynamical interactions.

Then there are, of course, a number of other VGOS-related issues that I would like to have a look at, including atmospheric turbulence, intercontinental clock-comparisons, links to satellite systems, artificial senders on other objects in the solar system, et cetera. I hope there will still be some time to look at all these fascinating topics before I have to retire.

You are holding the position of chairman of the European VLBI Group for Geodesy and Astrometry (EVGA) and now in addition also the IVS Chair. There is quite an overlap of member stations, associates, and friends among both organizations. What are the differences and commonalities between them?

The EVGA is one of the regional groups of the IVS and is focusing on VLBI for geodesy and astrometry in Europe. Here the idea is to foster the regional collaboration and cooperation, to work together, to support each other, and to have regular working meetings where we exchange ideas of new technical development and new scientific results. Of course, all of this is for the benefit of the IVS collaboration. VLBI by definition is a global activity, and we have to think globally and work internationally and take our responsibility for the global society. Nevertheless, the regional activities can pave the way for the global IVS collaboration and inspire the entire IVS.

Training and education in VLBI are important subjects in order to assure having sufficient experts in VLBI also in the future. You organized outstanding VLBI schools in the past. What are the plans to continue training and education?

So far as I see it, the focus needs to be on the next generation, both in terms of people and technology. This means a continued education of young researchers to bring in young and fresh minds into the IVS, and an education on VGOS, IVS' new VLBI system that is still in the build-up phase. Both aspects need to go hand-in-hand, i.e., the next generation of people—all the bright young minds—need to get educated to work with and to develop further the next-generation VLBI system that they will take over eventually.

Do you have objectives you would like to reach with the IVS? What is your agenda with the IVS?

My primary objective is that the IVS continues providing high-quality results for CRF, EOP, and TRF, as the IVS has been doing throughout the last decades, and works on improving the quality of the IVS products even further. This involves of course VGOS. VGOS is doing well, but still has some technical issues that need to be addressed, such as the frequency selection and protection as well as quick data transfer to the correlators. So, these need to be worked on to

enable VGOS to reach its full potential and to contribute with data and scientific results to the goals of IAG and IAU, including GGOS, GGRF, and UN-GGIM.

Where do you see the strengths and weaknesses of the IVS?

A strength of the IVS is that we are a group of very nice and enthusiastic people working together on a best-effort basis. These fantastic people involved are the real treasure of the IVS. On the other side, a weakness of the IVS is actually that it is a best-effort organization and that long-term funding for its various components is

difficult to achieve. All the IVS components in one way or another struggle continually with searching for long-term support, which in the end also impacts the IVS by making it difficult to offer long-term employments for the amazing people contributing to the IVS. Also funding of major investments that are necessary, for example, to achieve access to high-speed Internet to be able to e-transfer VGOS data, are difficult to acquire. However, my hope and wish are that the IVS components can work together and support each other to apply for necessary funding, for the benefit of the entire IVS community.



Rüdiger on a bummock overlooking the radio telescopes of Onsala Space Observatory and the local fjord.



Rüdiger Haas—the zoom view.

During this decade mankind will choose whether climate change will end in disaster or whether we will be able to reverse course by reducing the emission of CO₂ by 50% in all sectors of activity. How could the IVS community contribute to achieving the climate goals and reduce its CO₂ footprint?

This is a very difficult but very valid question. I am not entirely sure how much energy the IVS is consuming, and we probably should investigate this. Radio telescopes are operated with electrical power, as well as all the electronic equipment, the data transfer, correlation, and post-processing. All of these activities consume quite some energy, and it would be very good if we used exclusively renewable energy sources so that the CO₂ footprint is reduced. So, I think each individual IVS component should make an attempt to use electricity from renewable sources. Maybe we should highlight this issue at future IVS General Meetings and ask the IVS components to think about saving energy, using renewable energy, and report on their efforts. Of course, reducing the number of national and international travels is another way of reducing our CO₂ footprint.

On the ice in winter, a favorite pastime when it's possible—like in the winter of 2021.

How do you fresh up your mind? What are your favorite leisure activities?

I enjoy living close to the sea. From our house we have a view of the Kungsbacka fjord, which serves me as a possibility for leisure both in winter and in summer. During the winter of 2021, the fjord was frozen for a couple of weeks; so I could enjoy skating on the fjord. During summer the water in the fjord gets above 20°C, thus I can enjoy swimming. Besides this, during summer there is also quite a lot of gardening work at home that I enjoy. And sitting in the garden and reading is very relaxing, too.

Thank you, Rüdiger, for this interview.



News from the Board

– Nancy Kotary, MIT Haystack Observatory

On July 7, 2021, the IVS Directing Board met via Zoom for its first full meeting with Rüdiger Haas at the helm as IVS Chair (see also the feature interview on page 2). The Board addressed a number of items in the discussions; in the following, let me outline a few of the highlights.

The IVS contribution to the ITRF2020 was submitted to the ITRS Center of the IERS and was under evaluation. There are still some issues with small network sessions in the IVS combined solution which need to be worked out. The Board supports the idea of recognizing the contributions from the participating stations, correlators, and analysis centers, for instance, by giving certificates to the VLBI solution contributors. A small team was tasked with looking into this.

The IVS website has a couple of new pages under the Network Stations tab: the Local VLBI-derived Vector Ties (https://ivsc.gsfc.nasa.gov/stations/vector_ties.html) compile information on interferometric connections between two or more radio telescopes at the same site (VLBI tie) such as papers and presentations. Currently, materials are available for local VLBI ties at Onsala and Kokee Park. A companion page on Local Tie Surveys (https://ivsc.gsfc.nasa.gov/stations/survey_ties.html) provides reports about local geodetic surveys made available by Network Stations (initial

report by Warkworth). Please contact Dirk Behrend if you have information that can be added to either page.

The IVS Data Centers (BKG, CDDIS, OPAR) are implementing a new ingest procedure using stricter quality control for the file name, compression type, and file format. The new process will go into effect on August 2, 2021. For more information on the details of the convention requirements, please see https://ivsc.gsfc.nasa.gov/products-data/DataCenter_File_Conventions.pdf.

Board members discussed recent VTC activities and topics, including amplitude calibration, scheduling plans, compatibility tables for the stations, along with how official membership of this committee is determined and kept up-to-date and several other relevant issues.

Some details of the next IVS General Meeting (March 2022, Finland) were reviewed, along with the associated VLBI Training School. A final decision on whether the meeting will be in person, online, or a hybrid format has not yet been made. The First Announcement was slated to be distributed in mid-July (and, in fact, went out on July 15).

The next Board meeting is planned for 30 September 2021 and will also be held online.

One Thousand and One R1s (and R4s)

– Cynthia Thomas, NVI, Inc./NASA GSFC

Yes, it is true and not a fairy tale. We have reached the count of 1001 for the IVS-R1 and IVS-R4 sessions on May 31 (R11001) and June 3 (R41001), respectively. This milestone was accomplished with all components of the IVS working together. Kudos IVS! The R series are “rapid” sessions that are observed weekly on the first weekday (“1”, i.e., Mondays) and the fourth weekday (“4”, i.e., Thursdays) of the week, with the goal of turning around these sessions in 15 days. We started with a pool of 15 stations participating in either five-station or six-station networks back in 2002, whereas today there are some 25 stations participating in up to 15-station networks.

The original 15 stations from 2002 were: Algonquin Park, Fortaleza, Ny Ålesund, Wettzell, Onsala, Medicina, Seshan, HartRAO, Tsukuba, Hobart-26m, Matera, TIGO (Concepción), Kokee Park, Gilmore Creek, and Westford. Do you know how many of these 15 stations are still participating after almost 20 years of observing? The answer is eight. That’s right, we have eight Rockstar Stations!!

Before the eight Rockstar Stations are revealed, let’s first discuss the other seven original stations. Three of them are unfortunately no longer observing: Gilmore Creek, Algonquin Park, and Tsukuba. Gilmore Creek stopped observing at the end of 2005. Algonquin Park ceased operations in 2006. And Tsukuba terminated observing at the end of 2016 before being dismantled in 2017; VLBI operations, however, were continued with a new antenna at the Ishioka site.

The other four original stations are TIGO, Fortaleza, HartRAO, and Westford. TIGO stopped observing in Concepción, Chile, at the end of 2014 and was moved to La Plata, Argentina, where it resumed operations as AGGO and successfully participated in its first R session on July 2, 2018 (R1849). Fortaleza has been participating in most of the IVS-R4 and over half of the IVS-R1 sessions until November 2020 when the main bearing of the antenna was damaged. After a major repair in 2012, HartRAO-26m handed off its geodetic VLBI workload to the HART15M antenna which became available for geodetic observing; HartRAO-26m continues to observe CRF-type sessions. The Westford antenna was converted to a VGOS station in

2015 and no longer participates in the S/X sessions.

By now you should have guessed who our Rockstar Stations are. Yes, that’s correct! Kokee Park, Ny Ålesund, Wettzell, Onsala, Medicina, Seshan, Hobart-26m, and Matera stood the test of time in our twice weekly sessions. Please give them a round of applause!! The chart shows their participation from 2002 through 2021.

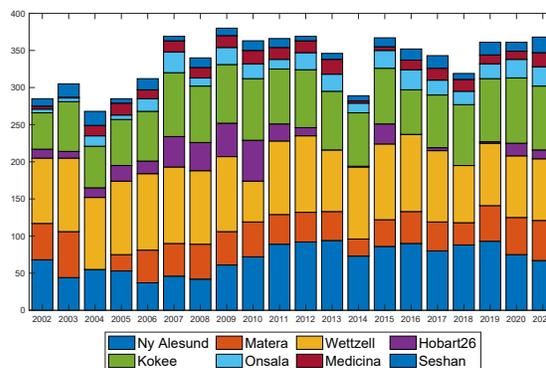
Of course, there are other stations that did not start in the R sessions in 2002 but have contributed to and improved the data set significantly, in particular by improving network geometry. The AuScope antennas at Hobart-12m, Katherine,

and Yarragadee along with Warkworth helped by adding much needed coverage in the Southern Hemisphere. Other major contributors to the R series include Sejong, Badary, Svetloe, Zelenchukskaya, Noto, Yebes, and Urumqi. Santa Maria started participating in these sessions this year.

All R1/R4 data was processed by three correlators. The IVS-R4 sessions have only been processed at the Washington correlator since 2002. The IVS-R1 sessions were

processed by the Bonn, Haystack, and Washington correlators from 2002 through 2005, while from 2006 through 2008 they were correlated by Bonn and Washington. Starting in 2009, the IVS-R1s have been correlated at Bonn only. As far as schedulers are concerned, there have only been two schedulers: Cynthia Thomas for the IVS-R1 and Merri Sue Carter for the IVS-R4. Over the years, there have been many changes to the sessions in addition to the network geometry. For instance, in terms of scheduling parameters the data rate changed from 256 Mbps in 2002 to 512 Mbps at the end of 2015 (for the even numbered R1 sessions). Starting in 2022, all the R1 sessions will observe with the 512-Mbps data rate. The R4s started with a data rate of 56 Mbps in 2002. The data rate was increased in steps of 112 Mbps and 128 Mbps to eventually go to 256 Mbps in 2010.

It’s incredible how long this operational series has been observing. But are there further changes planned for 2022, you may ask. Well, during 2020 and 2021 we scheduled some (26) large network R1 sessions with 15 stations and with the 512-Mbps data rate, while the other 26 sessions



Participation level (annual number of sessions) of the eight Rockstar Stations in the IVS-R1 and IVS-R4 sessions from 2002 to 2021. (Credit: Karine Le Bail)

NEWS...

were scheduled with less stations and a data rate of 256 Mbps. Unfortunately, due to COVID-19, we did not get as many 15-station sessions as were scheduled. Still, with the data achieved, it was determined that the 15-station networks performed somewhat better than the R1 networks in 2019 observing at 512 Mbps but at the expense of significantly smaller networks for the other 26 sessions. So, in 2022 all the IVS-R1 sessions will have no more than 12 stations and will be scheduled with the 512-Mbps data rate. The size of 11 to 12 stations is an operational compromise that provides reasonable robustness against quality falloff in the event of station dropouts while still furnishing high-quality EOP results.

TOW2021: A Virtual Success

– Dirk Behrend, NVI, Inc./NASA GSFC



From May 3–5, 2021, we held the eleventh installment of the IVS Technical Operations Workshop (TOW2021) as an online event for the first time in its history. It was a challenge to translate the hands-on training of the technical staff of the stations into a virtual format; in the end, the only actual two-way interaction was the Q&A part of each class. Despite this obvious limitation, however, we can overall look back at a successful event.

For starters, we were able to reach a larger audience than usual; with over 115 registered participants we had a 50–60% increase compared to an average in-person TOW. The participants hailed from 20 different countries, meaning we also had the most diverse audience ever and reached places that typically are not able to send operators to a venue that is half way around the world. Further, not considering the work time, it was a lot cheaper and there wasn't any travel stress involved.

Of course, other aspects fell a bit short. We were not able to cover as much material as during a regular TOW. Combining the live sessions and recorded presentations, we got to slightly over 60% of the normal class load. We did not have an ice-breaker, an operators' feedback class, nor a teachers' dinner. And, of course, little chats during the break times were hardly possible.

In all, it was absolutely worthwhile to organize this TOW and I would like to thank all teachers and students for their fair share in the success. For a more personal view from the teacher's and student's side, please peruse the following two reports. They give an excellent view of what TOW is all about.

The teaching material of TOW2021 is available online in PDF format at <https://www.haystack.mit.edu/conference-2/past-conferences/tow2021/>.

Upcoming Meetings...

Unified Analysis Workshop
Munich, Germany
October 5 – 8, 2021

AGU Fall Meeting
New Orleans, LA, USA
December 13 – 17, 2021

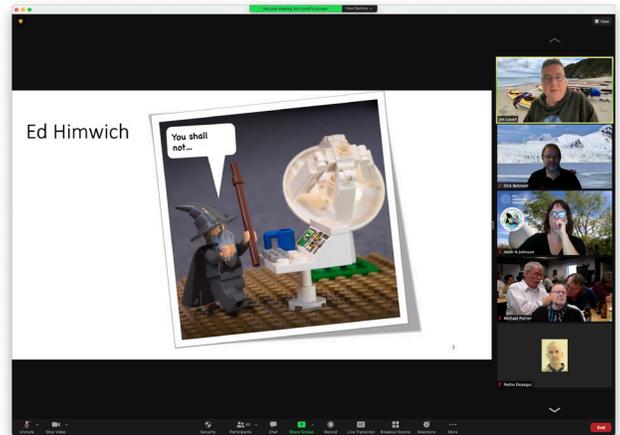
GGOS Days 2021
Munich, Germany
October 11 – 15, 2021

4th VLBI Training School
Helsinki, Finland
March 24 – 26, 2022

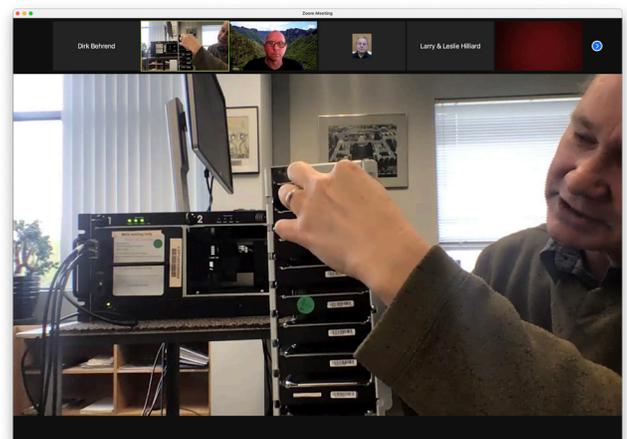
International Data Week 2021
Seoul, South Korea
November 8 – 11, 2021

12th IVS General Meeting
Helsinki, Finland
March 27 – April 1, 2022

<https://ivsc.nasa.gov/meetings>



Jim Lovell introducing the next-generation Field System calling Ed Himwich the Wizard of FS.



Chet Ruszczyk explaining details of the Mark 6 system.

TOW: A Teacher's Perspective

– Mike Poirier (with contributions from Alex Burns), MIT Haystack Observatory

From the beginning, this VLBI adventure—we have come to know as TOW—has been a very successful and enlightening experience. As operations personnel and site manager of a radio telescope, there are many times during my career that I look back upon and just smile. Most of those involve my association with the TOW week, which has been hosted by Haystack since its inception.



Mike Poirier (left) at Westford with the late Rich Strand.

For weeks before the TOW we spend time organizing the class material and preparing the lab and office space for every class. For the class itself I have been lucky enough to have always been teamed up with and received advice from many of our more experienced operations people: Clyde Cox, Chuck Kodak, Rich Strand, Mario Bérubé, Tom Clark, Nancy Vandenberg, Ed Himwich, Roger Hammargren, Chris Coughlin, and Brian Corey—just to name a few. My apologies to those that were missed. As teachers you never know how well you are prepared until you start the classes.

Before the classes start on Monday morning, there is the “Ice-breaker,” normally held on the preceding Sunday night at the meeting hotel. Every year you walk in and are greeted by smiling faces handing out name tags. These name tags are the ultimate life saver for me and most others with social apprehension in meeting others. I still remember talking with fellow operations people from around the world attempting to get a glimpse of their name tags to confirm their identity. Only after that point do I try to relax and enjoy the night. My only advice is to avoid having a nightcap with representatives from other sites (Fairbanks, Kokee Park, NVI, and others) when you are not staying at the hotel and have to drive home.

The first morning of the classes is the most stressful, knowing you have ten students from five different countries for two hours straight. Rich Strand taught me great lessons as a teaching partner. He would say: “We all know the operations like the back of our hands, so just relax.” He also reminded me that people who are not native English speakers are not deaf, because I did tend to talk louder during these classes. Sorry!

We make it through the first day and then went into the evening and enjoyed a nice dinner with everyone at Haystack. This allowed us great social interaction and time to talk about technical issues with the always-available experts. One piece

of advice is to “never refuse to have another beverage with a Norwegian,” as you may suddenly find yourself flying from a standing position into a chair next to them.

The comfort level improved each day, and the classes were filled with an amazing amount of interaction, which gave us a very positive feeling about the information and advice that was exchanged.

Next came the open forum of criticisms and frustrations with the operations only discussion. This was the time where only operations people

were allowed into the conference room, and each operator and/or station was allowed to air out some frustration with their own operations. I was usually the one who took the notes and over the years softened them for Ed Himwich to review and present. We need spare parts!

Then, finally, was the teachers’ dinner. We would all go to a local restaurant and have a nice dinner discussing the happenings during the week of TOW. Each teacher was required to get up and self-review their classes and successes of the week, while comments and laughter rose from the others.

During the TOW a comradery was formed between people, stations, and countries within the VLBI community. The TOW was a key building block in its foundation of successful science. I hope that NASA continues to see the value in this exchange, as I do not think we would be in the position we are if it was not for this interaction.

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 the General Editors (see below).

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

<https://ivscc.gsfc.nasa.gov/>.

TOW2021 from UTC+7

– Nattaporn Thoonsaenggam, NARIT

Because of the COVID-19 pandemic, it feels like the world is transitioning into virtual societies. But online social networking is not so straightforward when we have to study, work, meet, and share even hands-on experiences virtually. At NARIT (National Astronomical Research Institute of Thailand), our researchers and engineers are not allowed to travel for the purpose of a training event or for continuing our work with collaborating institutes and vice versa, as outside experts are also not allowed to come to or stay at our facilities. This has caused the building of our 40-meter radio telescope at Chiang Mai to slow down; and the same holds for our planned VGOS stations (at Chiang Mai and Songkhla).

However, to be prepared for operating the upcoming VLBI and VGOS stations, our team did not hesitate to register for TOW2021, the biennial station operators' workshop that has been held online last May. An online event may not be as convenient as a face-to-face one, but it allows people from far-away countries to join the meeting. So that possibility was a great opportunity for many of us. We regularly have to prepare documents and get through lots of steps which usually takes months before and after traveling. And because we are at the location that is almost the furthest from the TOW venue, not everyone who wants to go is allowed to go because of budget constraints. This becomes irrelevant when it is an online TOW. It was such an advantage for our new operators and engineers that were recruited this year. They got the chance to learn what good stations are like and what operators need to do to observe

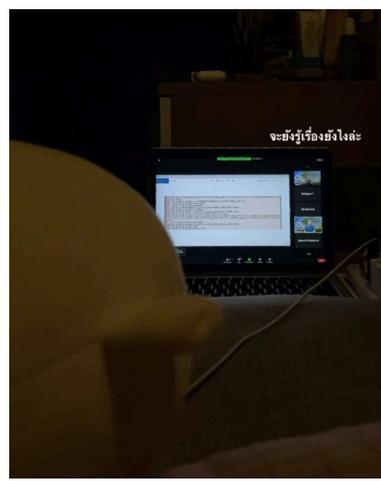
successfully. The workshop taught them the proper sequences and, since our first telescope is not finished yet, the actual instructions helped to show how to operate the telescope (seeing is believing). We thank all the teachers and the organizers for not canceling this fruitful workshop.

For me, having attended the TOW in 2019 and 2021, even though they were VLBI workshops in the same series, they were held differently and created very different feelings. In 2019, it took me more than 30 hours to travel from Chiang Mai International Airport in Thailand to MIT Haystack Observatory, MA, USA. But for this event in 2021, I just had to rush back home after work to be prepared for the workshop from 12:00 to 16:00 UTC which is 19:00 to 23:00 at my local time. It was hard to tell what affected the enthusiasm more: the jetlag or the nighttime.

Apart from the time, there are fewer topics than expected that stand out. There were some dropped signals, but nothing that caused big problems; in fact, the live sessions went quite smoothly. Although not as extensive as with the face-to-face event, we could still ask questions and save contacts for further discussions (just like normal). This is one of the most important advantages when attending international events: you can talk to experts, have an experience exchange with others, and share ideas and/or expertise. This makes the overall experience great. The concept of getting feedback from operators and stations back to correlators and developers continued. We can call this a new-normal, successful event.

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Studying with a glass of wine at around 20:00 ICT (UTC+7). At 23:00 ICT, having moved the laptop to the bedside table. The surtitle in Thai roughly states: "How can I actually understand all this" (at this late hour).