The two figures at the top of the page illustrate the status of the WSRT upgrade (focussing on the DZB and computer/network infrastructure). At the same time as the new backend and operational environment are nearing completion, the first scientific results are being produced. It is good to realize that the present status could only be reached through the combined effort of many people. This involved NFRA staff providing the necessary hardware, software, infrastructure and operational support. As important were the astronomers (both NFRA and university based) that provided challenging proposals for the new instrument. Some of them spent a lot of time analyzing pre-production data, involving themselves in instrumental rather than astronomical research. Thanks to their patience and continuous requests for improvements, we are now producing data that is suitable for export.

DZB hardware

Presently available at the WSRT is one segment of the DZB correlator, with two A/D convotru cite units and a timing unit. The full DZB will have eight segments, with a total 256k complex channels. Even without recirculation this will produce an order of magnitude more data than the present line-backend (DLB/DXB), making quality control, data reduction and interpretation an interesting challenge. The hardware that is currently available now operates reliably, after a number of initial problems were solved. Only one of the ADC units is used. It is connected to the DLB IF system; typically measurements with the DZB run in parallel to DLB measurements. DZB configurations exist for 256, 128 and 64 spectral channels with all interferometers (including autocorrelations) and 4, 2 and 1 polarization combinations respectively. The most common
configuration however is one with 256 channels, 4 polarizations and 64 baselines between 12 telescopes. Telescope 0 and 7 are not being used in this configuration. With the system connected up in this way we can also observe in compound interferometer mode, with 8000 spectral channels in 4 effective interferometers. This mode is still being tested. According to the current planning, the remaining correlator segments will be installed in mid-1998, and will then have to undergo testing.

Computer/Network infrastructure

Correlator data is read-out from the correlator chips through a cascade of Digital Signal Processors (DSPs), VME based Real-Time Unix systems and a HP 730 workstation. All these systems are in a dedicated network, shielded from the other WSRT computers through a BRouter. This turned out to be a necessary precaution against collisions and broadcasts from far-away systems. Archiving of DZB data is done using a DAT unit connected to the 730. In the course of 1998 the number of Real-Time systems will increase substantially and so will the amount of data. Therefore the 730 will be replaced by a C200 and a C100 workstation. Switches will be used to route the data streams to these workstations, combining 10 MBit outputs from the RT systems in a 100 MBit datstream to the C200. A CD-Rom burner will be integrated in this part of the network for archiving.

Telescope Management System

During normal operations the DZB is controlled and read-out by two TMS Controller applications. Data are written directly in AIPS++ Measurement Sets. From there several routes for inspection and distribution exist. Data can be converted to Newstar SCfilles or to UVHFs (which are used for reduction in dmap or classic AIPS). At the moment Measurement Sets are archived directly on DAT tapes (one tape per day). The administration of DZB measurements and tapes is available on-line. Note that people outside NFRA get access to a shadow database that is not exactly up-to-date. The present read-out procedure suffers from the fact that the 730 is not a real-time system. Certain Unix kernel processes (syncer, for the insiders) cause significant delays in processing at more or less regular intervals. Workaround solutions to this problem exist, and a final version is being worked on. Current measurements do not have proper absolute calibration yet due to some known problems with the treatment of total power information. In the coming months the specification and administration of DZB measurements will be streamlined and tailored to user requirements. In the course of this process the present Scissor databases will be moved into TMS. Also the readout of the DCB continuum backend and the control of the DLB-IF will be integrated in TMS.

AIPS++

AIPS++ inspection tools exist for the local inspection of Measurement Sets. These tools run on a fast PC running Linux. Tools for system calibration (phase-zeros and delay offsets) exist and give results consistent with the DLB data. In the coming months the system calibration procedures will be tested, and calibration data will be fed back into TMS.

Conclusions

The DZB has been producing production quality data for some weeks now. First results are very promising. Loose ends in the integration and commissioning of the DZB minimum system (single segment) are gradually being tied together. In parallel with this the production of the remaining correlator hardware is continuing in Dwingeloo and pieces of infrastructure are being put in place. The nominal DZB, without recirculation and using a modified DLB-IF with 20 MHz maximum bandwidth, will become available in the course of 1998.

Message from the Director

Harvey Butcher

Featured world-wide in the press, selected by Science magazine as among the ten most important discoveries in all of science last year, the demonstration by Jan van Paradijs and his team of the cosmological nature of gamma ray bursters was far and away the highlight of the past year in Dutch astronomy. Heartfelt congratulations to Jan and team for their spectacular discovery! And then once more, to Jan individually for his winning of the Bruno Rossi Prize of the American Astronomical Society for his work. Success of this magnitude, of course, brings all sorts of folk out of the woodwork to claim some of the credit. NFRA's involvement in the discovery was only peripheral, through its enabling function in the Dutch astronomical enterprise. Even so, I cannot resist recording our satisfaction that it was through NFRA's direct support for the analysis of the data from the Beppo-SAX satellite, in the form of a substantial multi-year grant, and through our participation in the Isaac Newton Group of telescopes on La Palma, that the discovery was made possible.

Our enabling role in the community has also been important to the DOT (Dutch Open Telescope) project. This innovative instrument was conceived and built at the Astronomical Institute of the Utrecht University and is installed at the Roque de los Muchachos Observatory on the island of La Palma in the Canary Islands under a MoU signed by NFRA. As described more fully elsewhere in this Newsletter, the DOT began observing during the autumn and is now regularly achieving the promised diffraction limited imaging of the Sun (0.2 arcsec resolution with the current optics). Our congratulations are also very much in order here to Felix Betonville, Rob Hammerslag and Rutten for bringing the facility successfully into operation after a long and difficult birth. All the effort seemed worthwhile, of course, when on 30 October the telescope was formally opened by Dutch Crown Prince Willem Alexander in the presence of assorted dignitaries and to the accompaniment of a gratifying degree of press coverage. At NFRA we have now begun to plan for a role in designing and building instrumentation for the telescope.

Reorganization

As noted last Newsletter, NFRA's Board has decided to reorganize the staffing structure at its Institute in Dwingeloo, to meet the expected future demands of our program. On 24 September, the reorganization plan was formally adopted and on 29 September its implementation formally started. The plan calls for operation of the observatories (the Dwingeloo-Westerbork Radio Observatory, and participation in the Isaac Newton Group on La Palma and in the JCMT on Hawaii) and for financing the university grants program from structural funds, while technical R&D will increasingly have to be carried out using soft money and contracts.

NFRA will consist of four divisions in the new structure: (i) the Radio Observatory (Willem Baan, director); Technical Laboratory (Arnold van Ardenne); (ii) Facilities Management (Bou Schipper); and (iv) Administrative Affairs (Willfried Boland). Major changes include strengthening the staffing of the Radio Observatory, both technically and scientifically; new positions in the Technical Lab for our R&D on phased
array antennas (SKAI) and for supporting our engineering activities generally (e.g., quality control, reliability engineering, purchasing); integration of Dwingeloo and Westerbork under unified facilities management; and strengthening of administrative support.

Unfortunately, in order to make these changes possible without an increase in our budget, a reduction in the total number of permanent positions will be required. At least 17% of our current employees will either retire early or will be helped to find jobs elsewhere. And in the coming years we expect that about 30% of our staff at any given moment will have to be employed on temporary contracts.

As we move into this new situation, several changes in the way we interact with the community will become unavoidable. Principal of these will be the necessity to plan new technical projects carefully, identifying all required resources before we commit to starting work, and to obtain adequate commitments of time from the university researchers involved. At first sight this will make new projects look more expensive, and in some cases will require very significant commitments of time from the university-based colleagues, but in the long run it will make most efficient use of limited resources.

New instrumentation

Also noted in the last Newsletter, we have begun to plan for new technical projects, to follow completion of the WSRT Upgrade. During the last half year preparations have been made to proceed on four efforts.

First, Koen Kuijken (Groningen) has proposed a program to study the kinematics of planetary nebulae in the outskirts of nearby galaxies using a new spectrograph optimized for the purpose and going by the name of PNS (Planetary Nebula Spectrograph). The instrument is planned to be built together with groups at ESO, Mt Stromlo in Australia and at Naples in Italy. Funding for this work was agreed at NFRA's Board meeting on 11 February. A further description can be found elsewhere in this issue of the Newsletter.

Thijs van der Hulst, Frank Briggs and Ger de Bruyn (Groningen) have proposed to upgrade the IF system at the WSRT, among other things to make it possible to carry out large scale surveys in redshift space with the telescope. Principal scientific drivers include the study of protogalactic clumps and rotating gaseous disks in the progenitors of spiral galaxies, observations of OH mega-maser emission in merging galaxies during the quasar era, and a neutral hydrogen census of the local Universe for comparison with high redshift epochs. At the moment of writing, this proposal awaits final decision-making at the research council, NWO.

Rob Rutten (Utrecht) has proposed to develop advanced instrumentation for the Dutch Open Telescope on La Palma, to confront recent advances in the theory of magneto-convection with new high resolution observations of the solar surface. Funding for a feasibility study and complete project plan has been supported by NFRA's Board and now awaits final appropriation at NWO.

Finally, Jan van Paradijs and Lodie Völte (Amsterdam) have proposed to upgrade PuMa, the new Pulsar Machine backend for the WSRT that is currently under construction at the central physics workshop of the Utrecht University. The upgrade will make use of the capabilities provided by the new IF system and will set the stage for making accurate timing observations (for example via coherent de-dispersion during data acquisition). While separate from the new Westerbork IF, it is intimately connected with it operationally and rides piggy-back on the IF proposal to NWO.

SKAI news

Main event of the half year was the combined meeting of the URSI Large Telescope Working Group and 1kT/SKAI International Technical Workshop, held at CSIRO in Sydney Australia on 15-18 December. Nearly seventy participants from 10 countries enjoyed sun and harbor, in the process also managing to review technical progress since the Delft workshop in September 1996, and re-visiting the scientific arguments driving the telescope’s specifications.

Presentations of technical studies ranged from NFRA’s phased array research, to design studies in China for Arcrecio-like constructions, analyses in the US and in India of arrays of fully steerable paraboloids, to a progress report on construction of a prototype 16x16 array of 20-m paraboloids in Japan. Several groups have now concluded that up to about 10-m diameter, paraboloids capable of efficient operation to 20 GHz can be mass produced for essentially the cost of the aluminum used. Theoretical simulations of the behavior of InP HEMTs indicate that very broad band amplifiers with negligibly low noise at 77 K (substantially superior to the GaAs HEMTs available today; with exact noise figures depending on design bandwidth) and interestingly low noise even at room temperature should be within reach in the near future. Several speakers discussed techniques for suppressing man-made interference, although a presentation of signal processing in sonar applications showed that many possible algorithms remain to be investigated.

New theoretical studies of the development of the first galaxies and of large scale structure confirm that SKAI will be the premier instrument for empirical determination of the physics involved in these phases in the evolution of the Universe. The necessity of understanding the role of magnetic fields, possible empirically only at radio frequencies, was emphasized. But besides additional development of the science case at frequencies below 2 GHz, those present felt that it could be important to expand consideration of the science case to include frequencies from 30 MHz to 20 GHz.

While it is unlikely that a single telescope can cover this entire frequency range efficiently, the increasingly global interest in the project, together with the requirement for a globally coordinated solution to interference from telecom satellite downlinks (which will cover this whole frequency range) argues for broadening the discussions to cover the future of radio astronomy at cm-m wavelengths generally. It was agreed to perform an inventory of the science that could be made possible by a Square Kilometer telescope operating at up to 20 GHz, and to present the full case at a special meeting in Calgary in June of this year. Already, it seems clear that new kinds of sources would be discovered at the lowest frequencies, while at the higher frequencies a broad range of thermal, maser and molecular phenomena would be opened to study, especially in the very early Universe. Further information can be found through the SKAI pages on the NFRA Web site: http://www.nfra.nl/skai.

Those present felt that the existing consortium of 8 institutes in 6 countries should be expanded and formalized, and that a full-time secretariat should be set up to coordinate activities to promote the effort world-wide. Unless events dictate otherwise, NFRA will prepare to host this secretariat and its full-time secretary in Dwingeloo.

In addition to the science case meeting in Calgary in June, plans are being made for the next technical workshop, probably in connection with the special session on “Future large scale facilities - Progress and Prospects” foreseen for the URSI General Assembly in Toronto, August 14-21 1999.

LSA/MMA developments

Following the agreement between ESO and NRAO last June to investigate how the European Large Southern Array and the American Milli-Meter Array projects might be combined into a single collaborative effort, the ESO Science and Technical Committee in its meeting on 28-29 October considered the project formally. The resulting recommendation was that ESO should indeed begin to develop plans for such a project to follow completion of the VLT. The existing ESO consortium — consisting of the following institutes: ESO, IRAM, NFRA and OSO — decided in its meeting in Amsterdam on 10 November: (i) to expand participation in the consortium to include additional institutes in...
**Dutch Open Telescope: First Light and First Images**

Rob Rutten (Sterrekundig Instituut Utrecht)

The newly completed Dutch Open Telescope (DOT) on La Palma is an optical telescope of highly innovative design, suited to high-resolution mapping of solar magnetic fields. Its presence alters the Roque de los Muchachos skyline - as if a Martian invader out of the *War of the Worlds* has descended on the mountain (Figure 1). The DOT structure is novel to astronomy. The telescope and the support tower are both open and there is no dome, only a fold-away canopy. At La Palma, the best daytime seeing tends to occur when strong winds blow upslope from northern directions. They to neutral hydrogen and OH in galaxies and quasars. The line observations in particular offer a new perspective for WSRT observations, and it was striking how many new absorption lines were detected during the first observing period. The workshop concluded with a discussion which also looked to the future: UHF VLBI (the first observations were made just a few weeks after the workshop and are described in this Newsletter); and initiating a discussion group for WSRT users. To judge from the reactions, the day was a success. A summary of the presentations can be found on the NFRA Web pages at [http://www.nfra.nl/wsrt/gallery.htm](http://www.nfra.nl/wsrt/gallery.htm).

**NFRA Workshop: “Astronomy with the Westerbork UHF system”**

Richard Strom (NFRA)

This workshop was held on 12 November 1997 in Dwingeloo. The first three months of observing with the new wide band tunable receivers had yielded interesting results on several fronts, as well as valuable experience with the problems to be confronted when observing outside the protected frequency bands. Nearly twenty astronomers from Dutch universities and two foreign observatories, together with more than 35 NFRA and JIVE personnel attended. There were twelve speakers, with talks ranging from pulsars and gamma-ray bursts to neutral hydrogen and OH in galaxies and quasars. The line observations in particular offer a new perspective for WSRT observations, and it was striking how many new absorption lines were detected during the first observing period. The workshop concluded with a discussion which also looked to the future: UHF VLBI (the first observations were made just a few weeks after the workshop and are described in this Newsletter); and initiating a discussion group for WSRT users. To judge from the reactions, the day was a success. A summary of the presentations can be found on the NFRA Web pages at [http://www.nfra.nl/wsrt/gallery.htm](http://www.nfra.nl/wsrt/gallery.htm).
At 100 cm it will already become the largest solar telescope in Europe. The open principle of the DOT was defined by C. Zwaan and R.H. Hammerschlag during the seventies, at the heyday of the Europe-wide solar site testing campaigns that led to the identification of the Canary Islands as superior locations in terms of atmospheric seeing. The seeing quality is the limiting factor in most optical solar observing. Hence the quest for getting the best out of it. The DOT has largely been a one-man project (R.H. Hammerschlag assisted by workshops at Utrecht University and at Delft Technical University) during many years in which the emphasis was on the key requirement that the telescope must point stably while being buffeted by strong and variable winds, typically 5-15 m/s. Eventually, the innovative telescope drives that Hammerschlag developed to reach extreme pointing stability led the Dutch Technology Foundation STW to fund the DOT completion at the Central Workshop of Delft Technical University were the DOT was constructed and the installation at the Roque de los Muchachos Observatory on La Palma. The DOT was essentially complete by last fall. It had its official first light ceremony on October 31 (Figure 3).

The first images were also collected last fall. By early December the DOT obtained images of outstanding quality. An example is shown in Figure 4; more are available at http://www.fys.ruu.nl/~rutten/dot. They demonstrate that the telescope itself is already close to the theoretical diffraction limit and that the open principle seems to perform well. In addition, the mechanical stability is excellent and the (very tough) clamshell canopy has survived its first La Palma winters - including heavy icing and storms.

The DOT science utilization is now starting. The emphasis will be on high-resolution mapping of the magnetic fields in the solar photosphere and chromosphere. Such mapping is a key quest of solar astrophysics. At the solar surface, the field patterning is imposed by the subsurface dynamo and convective flows while, at the same time, it controls flows and wave motions to the outer atmosphere. The switch in field role between being dominated by gas motions and dominating gas motions occurs in the optically observable photosphere-chromosphere regime, so that optical imaging permits charting the solar field “footpoint” topology and at the same time trace their effects on the outer atmosphere. However, the footpoints consist of slender
flux tubes with tiny cross-sections in the photosphere (150 km on the sun, 0.2 arcsec on the sky) so that such identification and tracking requires the high angular resolution of the DOT. That enables studies of the internal control of field emergence and field dispersal, of the structure and evolution of active regions including sunspot umbrae and penumbrae, of the topology of chromospheric canopies and open-field structures, and of the anchor constraints to prominences and flare build-up.

NFRA has played only a modest role in the DOT project so far, but has recently selected the proposed initial DOT science utilization as prime candidate for funding by the Dutch Research Council NWO.

Figure 4: One of the images obtained with the DOT in its very first observing season, on December 5, 1997. It shows part of a small active region. The smallest bright grain-like features between the granules mark magnetic flux tubes. These are the basic building blocks of solar magnetism. They are only visible at subarcsecond resolution, so that their identification and tracking over the solar surface requires image sequences of this quality. This image was taken at 546 nm. The initial DOT science program is to add simultaneous imaging in the Fraunhofer G band (430.5 nm), the Ca II K line and the H-alpha line. The first provides the best window for flux tube imaging; the other two add the overlying chromosphere. The yet higher solar atmosphere is sampled by the UV and EUV telescopes on the SOHO mission with which the DOT observing will be coordinated through an EU-TMR network led by the Utrecht group (http://www.fys.ruu.nl/~rutten/tmr).
VLBI spectral imaging and the UHF receivers at the WSRT

René Vermeulen (NFRA)

In the winter '96/'97 season, the WSRT saw the successful debut of the UHF receivers, which cover the frequency ranges 250-460 MHz (UHF-low) and 700-1200 MHz (UHF-high). With this addition, the WSRT has become a world-class instrument for the detection and study of redshifted HI 21-cm lines, covering roughly 2.1-4.7 (UHF-high). To date, the score stands at a dozen newly discovered HI absorption lines. Some of these neutral hydrogen absorbers are so-called intervening systems; mostly Damped Lyman-alpha absorbers, at a completely different redshift than the background radio source. In several cases, the intervening object gravitationally lenses the background radio source; HI spectroscopy can then help to constrain the lensing potential. Other absorbers occur in association with (at the same redshift as) the background radio source; for example in so-called Compact Symmetric Objects (CSOs).

These are AGN with a radio structure extending over less than 1 kpc, which, in rival hypotheses, are either small because they are young, or because they remain confined (“frustrated”) by their environment; in either case they are evidently located in a dense (sub)galactic medium. While WSRT “single-site” spectroscopy is already producing many interesting constraints on the physical disposition of HI absorbers at high redshift, both intervening and associated systems typically have sizes ranging from tens of milli-arcseconds to a few arcseconds, so that they cannot be resolved with the WSRT alone.

The success of the WSRT UHF receivers, it is probably fair to say, provided enough momentum for a consortium of investigators to begin a campaign of VLBI spectral imaging work in the UHF-high band; pioneering observations at these frequencies were of course done a long time ago, but mostly with a single baseline, and the work never became routine. The leading investigators in the new campaign were F. Briggs (Groningen), I. Browne (Jodrell Bank), G. de Bruyn (NFRA), C. Carilli (NRAO), K. Menten (MPIfR) and R. Vermeulen (NFRA). In order to test both the technical and scientific potential of UHF VLBI, a total of ten known HI absorption lines were observed, both intervening, for example in a couple of gravitational lenses, and associated, for example in CSOs. The frequencies ranged from 750 MHz to 1150 MHz (z=0.25-0.9). In November 1997, a first 4-day observing session was held. Both the 100-m Effelsberg telescope (Germany) and the 70-m Lovell Telescope (Jodrell Bank, Britain) participated with receivers purpose-built only weeks before the VLBI session. The NRAO Green Bank 140-ft telescope also joined in. The WSRT was successfully used in Tied Array mode, which yields an effective collecting
Studying the outskirts of galaxies with the Planetary Nebula Spectrograph

Konrad Kuijken (Kapteyn Institute)

The outskirts of galaxies are important for a complete understanding of galaxy structure. There the influence of the dark halo is greatest, and hence issues such as dark matter fractions in elliptical galaxies can only be addressed unambiguously from measurement of the outermost stellar kinematics. (Current results point at the need for dark matter, but in the absence of outer rings of gas, we are unable to probe the region where the dark matter dominates.)

Also in disk galaxies knowledge of the outer stellar kinematics would be important: it can be used to test for the shape of dark matter halos through studies of the stellar disk flaring (analogous studies with gas disks are complicated by the uncertain support provided by magnetic fields and cosmic rays, and by the possibility that ionization hides the highest-scale height components from view).

Unfortunately, the stellar populations in the outer regions of galaxies are observationally very difficult to study. To date, the requisite optical spectral studies of galaxies reach no further than two effective radii in the case of ellipticals (e.g. Carollo et al 1995, Rix et al. 1997), or two exponential scale lengths in disk galaxies (e.g. Capaccioli et al 1993; Gerssen et al. 1997). At larger radii (from where a sizeable 30-40% of the galaxy light emanates) the starlight is simply too faint compared to the night sky level for deep spectral studies to be feasible.

One of the few stellar tracers that can be observed at large radii is provided by planetary nebulae (PN). These stars emit most of their light in a few strong emission lines, which may be detected at much higher contrast against the night sky than the continuum spectra of stars in other phases of evolution. Their simple spectra also make radial velocity measurement straightforward. They are also numerous, with a well-defined luminosity function which has been used with success as a tertiary distance indicator for elliptical and early-type disk galaxies. The luminosity function is characterized by a sharp cutoff at the bright end; the number of PN with brightness at least one tenth the cutoff is around 1 per 10^7 B-band luminosities.

PN have been used with success for studies of stellar dynamics in nearby galaxies.
The most detailed study is the work of Hui et al. (1995) on Cen A, whereas Arnaboldi et al. (1996) were able to measure radial velocities for 19 PN in the Virgo elliptical NGC 4406. Both find evidence for faster rotation at large radius, a result that may be related to merger origin (Hernquist 1993). Nevertheless, progress in this promising field has been rather slow because of the cumbersome observational techniques that are used. This involves first detection of the PN from deep narrow-band imaging, then careful astrometry and photometry of the emission-line sources found, followed by a new round of telescope time application for spectral follow-up for kinematic study. Telescope time pressure, bad weather etc. has frequently resulted in detected PN not having the kinematic follow-up carried out. At the Kapteyn Institute, Nigel Douglas and the author are involved in an international consortium also involving Naples, Mt Stromlo and ESO. (P.I. Ken Freeman) to build a dedicated instrument for planetary nebula work. It will allow PN to be exploited as a kinematic tracer without the inefficiencies of current instrumentation, by combining the detection and kinematic follow-up steps into a single observation. The instrument is basically a slitless narrow-band wide-field imaging spectrograph. Its basic principle is to obtain simultaneously two counterdispersed images of a galaxy through a narrow-band filter. This results in two images in which the PN are evident as point sources, and the position shifts between the images straightforwardly yield each PN’s radial velocity (see figure). Hence complete kinematic data can be obtained in one observing session. Furthermore, an instrument dedicated to work at a single wavelength can be made more efficient than the general-purpose spectrographs currently at our disposal. The expectation is that the Planetary Nebulae Spectrograph will be completed in Naples, Mt Stromlo and Dwingeloo in mid-1999. It is designed to be modular and transportable, for use on the [11 foci of the La Palma WHT and TNG telescopes. If the instrument proves to be a success a VLT successor may also be constructed.

More details can be found on the project’s www site: http://www.aao.gov.au/local/www/pns/pns.html

References

Willem Baan: New Director of the WSRT

Willem Baan has been appointed as the new Director of the WSRT, starting February 1 1998. Before returning to The Netherlands, after an absence of 26 years, he had been at The Arecibo Observatory in Puerto Rico for the past 14 years. Willem graduated from Delft University with a degree in Aerospace Engineering, before moving to MIT for an MSc and PhD in Plasma and Theoretical Astrophysics. After MIT, he went to the Institute for Advanced Study (Princeton) and then onto Pennsylvania State University before going to what is still the world’s largest radio telescope: the 305m Arecibo Telescope on the Island of Puerto Rico.

As a radio astronomer, Baan is best known for his work on the megamaser phenomenon, which occurs in a variety of active galaxies. OH megamasers are part of the population of (super) luminous FIR galaxies, many of which display intense starburst and AGN activity. The amplifying molecular gas lies either in a high excitation nuclear region but can also be part of the larger scale (torus) structure irradiated by some central FIR source. It appears as though H2O megamasers are part of this same population, whereas the H2O megamaser emission is thought to originate in compact disks surrounding massive nuclear sources (or black holes).

Willem is also very much involved in Spectrum Management issues relating to radio astronomy. He is currently Chairman of the Inter-Union Commission on the Allocation of Frequencies for Radio Astronomy and Space Research (IUCAF). He actively participates in ITU-R Study Group 1 (spectrum management) and 7 (science services) and has been one of the leaders of the radio astronomy efforts at recent ITU-R World Radiocommunication Conferences. He was also the principal player in the establishment of the Puerto Rico Coordination Zone by the USA Federal Communication Commission in November 1997. His arrival will strengthen the team of people in Dwingeloo.
and Westerbork who are involved in ensuring that radio astronomy continues to flourish, despite the ever increasing use of the spectrum by the telecommunications industry.

His first priority lies with bringing WSRT into full-time and full-capacity operation. The Westerbork Upgrade is progressing well and the new instrumentation and the refurbishment of the telescopes will greatly increase the WSRT capacity. Willem also wants to make WSRT a user friendly instrument that is part of the large family of European radio astronomy instruments that cover the resolution range and the frequency range required by modern astrophysics.

Report from the Isaac Newton Group of Telescopes on La Palma

René Rutten (IAC)

The next few months will see a number of minor and major improvements at the Isaac Newton Group of Telescopes. Most importantly, the Wide Field Camera (WFC) on the 2.5 meter INT will be upgraded with a set of 4 thinned EEV CCDs, each having 2000 x 4000 pixels. This will more than double the sky coverage over the existing mosaic of CCDs, and at the same time provide much better quality data. This upgrade of the WFC makes this instrument even more suitable for imaging surveys. An announcement of opportunity for extensive survey proposals using the WFC was sent out to the UK/NL community in December 1997.

The steep decline in funding for ING implies that the programme of enhancements and developments, as well as the service we deliver to observers has to be reduced. Examples of this are the reduced level of night time engineering support last year, the withdrawal of telescope operator support on the INT towards the end of 1998, and reduced flexibility in the choice of detectors and instruments. In spite of the very tight funding, ING will endeavour to deliver the best possible service within the available funding envelope.

One issue which affects the ING substantially is the recent decision by the Particle Physics and Astronomy Research Council in the UK to close the Royal Greenwich Observatory in Cambridge. Historically strong ties have existed between ING and the RGO as staff at RGO have been key in most aspects of the design, construction and first years of operation of the telescopes and instruments on La Palma. The demise of RGO further increases the pressure on ING staff as all telescope and instrument related work will now have to be carried out on the island. Even in these difficult times the ING remains a vibrant place with various exciting developments on the horizon. The instrument development programme, currently funded only by the UK, centers on the INGRID infra-red camera for the 4.2 meter William Herschel Telescope, and on the NAOMI adaptive optics programme. Both projects are progressing well. INGRID, with its 1024 x 1024 HgCdTe detector, is expected to see first light at the Cassegrain focus during semester 98B.

Apart from these UK-funded instruments, there are various other instruments under development for the WHT through independent funding lines. One of these developments is an integral field spectrograph, SAURON, for the Cassegrain focus of the WHT. This project is a collaboration between the universities of Durham, Leiden and Lyon, with NFRA providing finance and playing an organizational role on the Dutch side.

Another important issue for the observatory on La Palma is the construction of the Gran Telescopio Canario (GTC), a 10-meter telescope project lead by Spain. The construction and operation of this telescope will have a major impact on the observatory at La Palma, and this development could potentially be of great interest to astronomers in the Netherlands.

SEMESTER 98B

The following common-user instruments are currently offered on the 4.2-m William Herschel (WHT), 2.5-m Isaac Newton (INT) and 1.0-m Jacobus Kapteyn (JKT) telescopes. For the most up-to-date information, consult the ING web page on http://www.ing.iac.es.

Spectroscopy:

WHT ISIS medium-resolution (8 - 120 A/ mm) spectrograph, 4” slit length. Spectropolarimetry and imaging polarimetry also available. Default CCD: EEV10 (2k*4k) on blue arm, TEK2 (1k*1k) on red. The faint-object spectrograph, which functioned as a third arm of ISIS, has been withdrawn.

WHT UES echelle spectrograph (R = 54000), now available with a choice of derotators: old long-slit derotator, or new all-reflecting short-slit derotator with higher UV throughput. Default CCD: SIT1 (2k*2k).

WHT LDSS low-dispersion (multi-slit) survey spectrograph (100 - 470 A/mm), 11.5-arcmin field of view. Coordinates for cutting the aperture masks must be provided well in advance of the run. Default CCD: SIT1 (2k*2k).

WHT TAUROS Fabry-Perot spectrograph (R =10000 or 40000), field of view up to 9” (depending on order-sorting filters used). Default CCD: TEK2 (1k*1k).

WHT WYFFOS multi-object spectrograph, fed by up to 120 2.7” fibres from AUTOFIB2 at prime focus (40” field). Uses ISIS gratings, offering 30 - 500 A/mm dispersion. The detector is a TEK (1k*1k) CCD.

WHT INTEGRAL/WYFFOS, in which the multi-object spectrograph is fed by fibre bundles at the Nasmyth focus, to allow area spectroscopy of fields up to 30” square. Individual fibres 0.45 - 2.7” diameter.

INT IDS intermediate-dispersion spectrograph (7 - 270 A/mm). Default CCD is TEK3 on either the 235-mm or 500-mm cameras.

INT faint-object spectrograph (245, 486 A/mm), 25” slit. *INT MUSCOF fibre-fed echelle spectrograph (R = 40000). 1.5” fibres, with a choice of derotators: old long-slit derotator, or new all-reflecting short-slit derotator with higher UV throughput. Default CCD: TEK3 1k*1k.

(The JKT Richardson-Brealey Spectrograph has been decommissioned.)
News from the James Clerk Maxwell Telescope

Remo Tilanus (JAC, Hawaii)

General

At the time of writing (February 22) the JCMT has just started observing semester 98A and SCUBA literally is the focal point for most observations. Regular observations with SCUBA, JCMT's new submillimeter bolometer-array camera, started summer last year and in general have been quite successful. SCUBA has proven to be a reliable receiver, although it still needs a lot of 'tender loving care' and has been plagued by hiccups of 'high-noise' contamination for which either mini or full warm-ups are needed as a cure. While such warm-ups tend to wreak havoc on the schedule and require substantial staff effort, they have had little impact on the observing program as a whole.

Many exciting results from SCUBA have been submitted to the various journals and as a result most images are not yet available for general distribution. Figure 1, courtesy Israel, van der Werf & Tilanus, shows one of the earliest Dutch observations with SCUBA: an 850 micron image of NGC891 obtained during rather mediocre weather conditions using jiggle-map mode (scan-map was not yet available). The image consists of 3 fields of 40 minutes integration each (of which only half the time is actually spent on-source in jiggle mode).

Even the initial results using SCUBA's 'Emerson2' scan-map mode are rather spectacular; submm images are finally starting to actually look like pictures! Figure 2, courtesy of Jane Groves shows the Orion Molecular Cloud observed using a basket weave with the 'old' scan-map mode.

After years of substandard weather, the JCMT has enjoyed a long period of very good weather almost continuously since September caused by a shift of the tropical jet-stream as a result of El Nino. In January we experienced the driest month on record ever with less than 1% of the normal rainfall giving rise to emergency drought control regulations. Meanwhile some rain has returned to Hilo which is the wettest city of the US after all, but even now the record stands at only 2 cm since Jan. 1 compared to the normal 45 cm. The excellent observing conditions on Mauna Kea have been a fortunate by-product of the drought: about twice as many high-frequency nights as normal. The predictions are that the effects of El Nino will be declining but should in principle last to the summer.

What's next?

One of the more interesting features this semester will be SCUBA's new scan-map mode. Images as large as 50'x12' have been obtained during commissioning. Software to support the reduction of scan-map data is still under development. In principle, this semester a new 230 GHz-band receiver RxA3 should be delivered and somewhat later a new mixer for B3 (345 GHz) as well as RxW (490/690 GHz).

Also in April and May a concept-proofing run has been planned for the 'Dutch' Fast Data mode, a project of Rudolf LePoole (Leiden) and Hans van Someren-Greve (NFRA). This mode potentially can reduce the observations times of individual fields (jiggle-mode) by a factor of two.

Finally, this semester the whole observatory has switched to a flexible, serviced mode of operation with only a limited number of astronomers from the partner countries coming out for the observations. A major project has been started at the telescope in support of this with an emphasis on the SCUBA observations. SCUBA data reduction in its current form is still quite time consuming and often one is unable to get a good evaluation of the observations while at the telescope. This has proven to be a major handicap in the context of serviced observations since it prohibits adequate real-time feedback to the P.I.'s. The initiative we have just started will attempt address these issues and come up with solutions to remove the most severe bottlenecks.

On-line Documentation

The JAC WWW server provides access to a number of relevant documents i.e. the JCMT
WSRT - Programme Committee News

Thijs van der Hulst (Kapteyn Institute)

General

The WSRT is an East-West array, and one of its important modes consists of 12-hr imaging synthesis observations. However, an increasing fraction of time is spent in other modes. Thus, from now on the time requested should be in hours rather than in multiples of 12-hrs. In all cases, the total time request should be inclusive of a motivated overhead for setup and calibration (1-2 hrs will often be adequate for a complete 12-hr synthesis run).

Front Ends

In semester 98B (August-98-January 1999) only the new UHF high/low system and regular 21-cm observing will be available. Details for these systems can be found on the new WSRT web pages. The complete Multi Frequency Front Ends phase II (MFFE II), which have cooled receivers at 3.6, 6, 13, 18 and 21 cm and uncooled receivers at 49 and 92 cm in addition to the UHF high/low system, will not yet be available in 98B. They will be installed at a rate of approximately one per month starting March 1998. It is hoped that from October 1998 it will be possible to equip the array with 7 MFFE II’s plus 5 old 21 cm receivers to form a hybrid system with cooled 21-cm receivers on 12 telescopes. The frequency range is determined by the old 21 cm receivers and covers 1355 to 1425 MHz. The nominal system temperature should be around 35 K.

Correlator

The DSB continuum correlator will remain in operation. The first crate of the new line backend (DZB) is being commissioned and should be routinely available in semester 98B, supplanting the use of the DLB/DXB. The DZB will then support a full array configuration (all 91 possible baselines plus 14 autocorrelations) with either 4 polarisations and 64 complex spectral channels, or 2 polarisations and 128 complex channels. It is also possible to double the number of spectral channels by choosing a nearly complete 12-antenna configuration (64 baselines, no auto-correlations). All configurations have the full 2-bit sensitivity. Bandwidths of 10, 5, ... 0.078 MHz are offered. Configurations with more channels and for 20 MHz bandwidth, await arrival and thorough testing of additional correlator crates, which is expected to occur in the course of semesters 98A and B. Proposals which need 20 MHz instantaneous bandwidth will be accepted, but could be subject to deferral if the hardware is not operational. Also expected to be available in semester 98B are the new pulsar backend PuMa and the compound interferometer (CI) mode (see: WSRT News). CI provides a single “baseline” between two coherently added groups of telescopes, with 4096 complex spectral channels in each of 4 bands, which are each up to 10 MHz wide, and are each independently tunable within a total range of 80 MHz.

Interference

Observations in the UHF high/low regime can be affected by interference. After more than half a year of observing in this spectral domain the WSRT staff has been building up an inventory of the interference in the UHF bands. No frequency range appears to be free of interference all the time, but several projects have already been successfully executed. Because of telecommunication signals, observations at 420-430 MHz, 460-470 MHz, and 935-970 MHz are typically not productive. Because of TV transmissions, observations between 700 and 800 MHz will typically not be possible with bandwidths wider than 2.5 MHz, and observations at many specific frequencies are precluded. Intermodulation products between TV transmitters also cause interference at many specific frequencies between 700 and 800 MHz, which can sometimes be avoided if the programme will allow scheduling to avoid specific hour angles ranges (i.e. less than full 12-hr syntheses). New filters to suppress intermodulation are being designed. For more detailed information contact Rene Vermeulen at NFRA. PLEASE use the LATEST WSRT proposal form.

NFRA PC News

The latest news from the NFRA Programme Committee about submission of proposals for Semester 98B (which runs from September 1998 to February 1999) can be found on the NFRA PC web page: http://www.astro.rug.nl/~nfra_pc. The deadline for proposals for the ING-telescopes, JCMT and WSRT is midnight on 31 March 1998.

NFRA Newsletter

Is published twice a year in February and September. Available at: http://www.nfra.nl/nfrc/newsletter in html, pdf and postscript format. Please send us an e-mail if you want to receive notification of each issue.

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