PROTO STAR

The NEWSLETTER of the

JAMES CLERK MAXWELL

TELESCOPE

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KULIA I KA NU'U

CANADA JOINS THE PARTNERSHIP

At a ceremony in Hilo, Hawaii on April 26, 1987 an agreement was signed that resulted in the National Research Council of Canada becoming a partner in the JCMT. The photograph shows, left to right (seated) Dr Don Hall (University of Hawaii), Dr Bernard Gingras (NRC, Canada), Professor Bill Mitchell (SERC, United Kingdom), Dr Albert Mulder (ZWO, Netherlands) (standing) Dr Don Morton (NRC) Dr Harry Atkinson (SERC) and Professor van der Molen (ZWO).

On the day after the signing of the agreement the four principals involved were together again, this time on Mauna Kea for the formal opening of the JCMT by Prince Philip.

In this group photograph Prince Philip is standing between Mrs Waihee and Sir John Clerk, a direct descendant of James Clerk Maxwell. (Photographs by Peter Hicks, RAL.)

FOREWORD

Two events on consecutive days in April, 1987 were important milestones in the JCMT project. The formal dedication of the telescope on April 27 had been preceded by the signing of an agreement by representatives of the UK, Netherlands and Canada on the future use of the JCMT; brief reports of each event appear elsewhere in this newsletter. While the agreement with Canada will bring new resources, including people, to the JCMT the "opening" ceremony was largely a celebration of the achievements of a group of people whose involvement with the project was coming to an end. It is appropriate, therefore, that we include in the newsletter a contribution by Dr Ron Newport, Project Leader for the construction phase of the telescope, in which he reflects on the decision that was to take him and his team to the top of an extinct (he hopes) volcano in the Pacific.

One consequence of the agreement with Canada is that additional funds are now available to improve the level of instrumentation at the telescope and to this end an Announcement of Opportunity for JCMT Instrumentation has recently been issued to groups with instrumentation interests. Part of that AO is reproduced in this newsletter with the aims of keeping the wider astronomical community informed and of inviting comments from potential users.

The contribution by Dr Wesselius draws attention to important work in the Netherlands on the processing of IRAS data, work that is relevant to the planning or analysis of JCMT observations.

In the latest issue of the Ottawa Astronomer Canadian astronomers were given good advice on how to prepare PATT proposals and that advice is repeated here, with the agreement of the authors, for the benefit of the wider JCMT User community.

CANADIAN PARTICIPATION IN THE JCMT

Under the agreement the National Research Council of Canada (NRCC) will contribute $10 million over 10 years to reimburse the UK for 25% of the capital costs. The NRCC will also provide 25%, or approximately $700,000 in annual operating costs as well as its share of a $1 million annual development fund to keep the telescope equipment up-to-date.

In return, Canada will get a quarter of the telescope's available observing time as well as representation on the facility's board of management. Four NRCC employees will be stationed at the Hawaii site and twelve staff members in Ottawa will provide developmental support.

The distribution of observing time among the four partners in the JCMT is now as follows:- the University of Hawaii receives 10% for providing the site; the UK's share is 49.5%, Canada has 22.5% and the Netherlands' share remains at 18%.

THE OPENING OF THE JCMT BY HRH THE PRINCE PHILIP, DUKE OF EDINBURGH

On April 27 the Canadian negotiators were among the invited guests at the opening ceremony on Mauna Kea and at the celebration dinner that evening in Hilo. About 100 people were present at the ceremony at which Dr Ron Newport (Project Leader) introduced the speakers. Speeches of welcome were made by Professor Bill Mitchell (SERC Chairman) and Mrs Lynne Waihee deputising for her husband the Governor of Hawaii. The observatory facility was handed over formally by Dr Paul Williams (Director of the Rutherford Appleton Laboratory) to Professor Malcolm Longair (Astronomer Royal for Scotland and Director of the Royal Observatory Edinburgh).

Following the blessing of the telescope by Father George da Costa, Prince Philip unveiled a commemorative plaque. The proceedings ended with a tour of the facility and a demonstration by Dr Richard Hills (Project Scientist) of the telescope and carousel in motion.

The serious business having been dealt with on the mountain the dinner at the Naniloa Hotel in Hilo was held in a party atmosphere that was helped by the Aloha attire of the 300 guests. There were after-dinner speeches by representatives of the Hawaiian, Canadian, Dutch and UK partners in the JCMT facility. An item of information disclosed by Dr Albert Mulder (ZWO Chairman) partly explains the Dutch presence in Hawaii; the tallest mountain in the Netherlands is 40,000 millimetres high. Professor Bill Mitchell presented the guest of honour, HRH The Prince Philip, with an antique print depicting Captain Cook in the Sandwich Islands. In an entertaining speech Prince Philip, who had chosen not to speak at the ceremony on Mauna Kea, commented on the physical discomforts of working at altitude and expressed a preference to be in a pressurised plane when at 14,000 feet. The final speaker was Mayor Dante Carpenter (Mayor of the Island of Hawaii) and the festivities ended with a programme of traditional hula dances by a local group.

LOOKING BACK AT THE CONSTRUCTION PHASE

When I was asked to write about some of the highlights from the construction phase of the project, I considered the many events that might fit into this category. I remember discussions of technical and financial problems, which had to be, and were, resolved. I remember too, various firsts, the first visit to Mauna Kea, the first sight of the foundations, the first panels to exceed specification, the first assembly of the enclosure in Bolton, the first movements of the structures in IJmuiden, the first sight of the enclosure in Hawaii, the completed telescope, the movement of the membrane and, of course, 'first light'.

Important and exciting though these were, nothing stands out more than the decision to change the site from La Roque de Los Muchachos on La Palma to Mauna Kea on Hawaii. For me, and many others will agree, this change was the most important event of the construction phase.

The question "why not Mauna Kea?" was raised during the discussions with the Dutch which began in the second half of 1980, and culminated in an agreement being signed by SERC and ZWO in June 1981. The decision to change the site took many months.

The qualities of the Observatory of Mauna Kea had been recognised by British astronomers when it had been decided to build the telescope in the Canary Islands, the main advantage being the lower atmospheric water vapour which absorbs strongly in the sub-millimetre part of the spectrum. There were however, several counter arguments. The opposition of local environmentalists, the plans of NRAO to build a 25 metre diameter millimetre wave telescope there and the extra cost (even at \$2.0/£1!!!) were cumulative deterrents to choosing Mauna Kea as the site. With the specification calling for optimum performance down to 0.8 mm wavelength and with a paucity of site data it was hard to make a conclusive case to move from the site in the Canary Islands. However, the arguments of some Dutch astronomers, Thys de Graauw and Herman van der Stadt in particular, echoed by many British astronomers, made it clear that Mauna Kea was the preferable site. Richard Hills wrote in October 1981 "At the shortest wavelengths, 0.7 to 0.3 mm, where the attenuation is very strong, it makes the difference between having only occasional observing opportunities on La Palma and getting usable transmission in the windows for about a third of the time on Mauna Kea".

While the scientific case was being discussed, Dr John Jeffries, the then Director of the Institute for Astronomy, Honolulu, which operates the Observatory of Mauna Kea was successfully establishing a Complex Development Plan for expanding the Observatory and NRAO was facing funding difficulties for its 25 metre telescope. So everything was moving in favour of building the telescope on Mauna Kea, well almost everything. There was still the problem of the cost. The project team had been advised that, while a change of site could be considered, there should be no increase in the cost. The first serious cost estimate for siting the facility in Hawaii showed an extra £1,800K to be needed. This put us under considerable pressure to abandon the enclosure and adopt an outdoor design, such as that of IRAM for its 15 metre telescopes. Even the IRAM design however, includes the use of an assembly hall into which its telescopes can be moved in the worst weather.

Throughout a series of discussions on what could be done to reduce the cost it was clear that to build such an accurate telescope for outdoor use in the sometimes harsh environment on Mauna Kea would be extremely risky and would need a substantially different approach from that which we had been pursuing. Some form of protection from ice, snow and high winds was certain to be needed.

Should the telescope be smaller? Should the building be a roll-on, roll-off protection? These were among the options which we examined. In the limit we decided there could be no compromise on the telescope specification, if we were to benefit fully from a change of site, so the size remained at 15 metres diameter. The cost of a roll-on, roll-off building turned out to be similar to that for a simple co-rotating enclosure so we prepared a new building design without insulation and thermal control, without laboratories, workshops and offices, and smaller! Smaller by reducing the swept volume of the telescope and by reducing clearances.

We had, of course, to consider the effect of these changes on the telescope performance, particularly with respect to the thermal aspects. Extensive thermal modelling was carried out. This showed that the performance could be maintained, maybe even improved, provided that certain detailed changes were made. What is more, these changes, such as choosing suitable finishes for the inside of the building and the telescope structures, were not expensive.

We re-estimated the cost - it was still too much! We could see no significant further savings on the enclosure or the telescope and so we had no choice but to reduce the allocation for the receiving systems. This has given problems to the Receiver Working Group ever since, but was justified in the circumstances. We even left out the chopping feature of the secondary. This did not receive the approval of the Users' Committee and was later restored when we had better cost estimates for this item.

Gradually the many committees, the Users' Committee, the Joint Steering Committee, the Management Committee, the AI Committee of the ASRB, the ASR Board of the SERC and its equivalent ZWO Committee approved the change of site and the revised design concept despite scepticism from some sources concerning our revised estimates.

In anticipation of these approvals being given and to avoid wasting a year or more before starting the construction in Hawaii, we initiated the Environmental Impact Statement early in 1981 and, despite an eleventh hour hiccup when John Jeffries telephoned me after the public hearing of our application in January 1983 to say that the official reaction was negative, approval was given at the final hearing in February 1983.

The facility is now, as you know, there on Mauna Kea, and has begun scientific observing. We have already experienced the ice, the snow and the high winds. None of the predictions about the environment have been wrong. Soon we shall see whether the performance of the telescope and the transparency of the atmosphere above Mauna Kea reach our expectations too.

R W Newport

ANNOUNCEMENT OF OPPORTUNITY

TO PARTICIPATE IN THE INSTRUMENTATION PROGRAMME OF THE

JAMES CLERK MAXWELL TELESCOPE

This Announcement of Opportunity is an invitation to the UK, Netherlands and Canadian astronomical communities to contribute to the instrumentation programme for the James Clerk Maxwell Telescope. With the full involvement of the Canadian astronomers in the enhanced programme for the telescope, an Instrumentation Fund has been set up against which bids for proposals are now sought. The present documents describe the background to the instrumentation programme and the opportunities which are now available. At the end of the main document, instructions are given about the form proposals should take.

BACKGROUND

It has always been recognised that a key component in the success of the JCMT project will be the provision of state-of-the-art instrumentation in an astronomical discipline in which astrophysical advances are strongly related to advances in instrumentation. The recent agreement with the National Research Council of Canada for Canadian participation in the JCMT project has led to the creation of a Development Fund to provide a base for common-user instrumentation.

The approach taken to the procurement of common-user instrumentation for the JCMT was outlined in the previous Announcement of Opportunity which was issued to the community on 29 September 1986. It is useful to recall the context within which that AO was issued and to describe the revised arrangements approved by the JCMT Board which will apply from now on.

Up till the time of the final approval of the JCMT programme, the development of receivers for millimetre and sub-millimetre astronomy had proceeded very much in an R and D context in which receivers were built by individual groups for their own scientific research programmes. It was realised that the JCMT would require suites of instruments built to common-user standards so that they could be operated by support teams in Hawaii with the help of visiting astronomers but without the presence of the instrument builders on site. The receiver systems for all types of millimetre and sub-millimetre receivers are complex and it was clear that the common-user instrumentation would have to be built to an agreed set of standards by major groups which have experience of building common-user instrumentation. At the same time, it was regarded as very important to ensure that the smaller instrumental groups have opportunities to participate in the research and development activities which will be essential for the production of state-of-the-art components which can be incorporated into the common-user receiver packages. A distinction can be made between the groups which are primarily interested in R and D work and those which play the role of major Construction Groups. The major construction groups have been identified as the MRAO Cambridge and the Royal Observatory Edinburgh in the UK, the Dwingeloo Laboratories of the Netherlands Foundation for Radioastronomy and the Herzberg Institute of Astrophysics in Ottawa, Canada.

The ROE has overall managerial responsibility for the project and therefore the construction groups formally stand in a customer-contractor relation with the ROE which has the responsibility for placing contracts with these groups following approval of the construction packages by the JCMT Board. These groups are all subject to detailed annual reviews of performance, finance and time schedules. Once major receiver systems are provided to Hawaii, the construction groups will use their best endeavours to ensure that one of the personnel seconded to Hawaii on a tour of duty has the expertise to operate that system *after* any personnel present just for the commissioning period have returned to their home institution.

THE IMPLEMENTATION OF THE INSTRUMENTATION PROGRAMME

The Instrumentation Programme and the Development Fund will be managed in the following way.

(i) The **JCMT Users' Committee (JCMTUC)** is the principal scientific advisory body for all aspects of operations and instrumentation of the facility. Its prime concern is the scientific well-being of the facility with respect to operations, instrumentation and all aspects of future plans and developments. It will receive all reports from the Technical Advisory Panel (TAP) and will make scientific judgements on the technical information which it receives from the TAP.

(ii) The **Technical Advisory Panel (TAP)** provides technical advice on all aspects of the instrumentation programme and other technical matters. This panel reports to the Director ROE but all the papers it generates and its recommendations are automatically made available to the JCMT Users Committee. This panel should not make scientific judgements but has the responsibility of maintaining awareness of all aspects of advances in millimetre and sub-millimetre wave technology, and of advising on technical aspects of proposals made to the project and on areas in which initiatives should be taken. It will monitor progress on the instrumentation programme from the technical point of view.

(iii) The **JCMT Board** considers the proposals put to it by the Director ROE for the use of the Development Fund. These proposals will have been made following detailed scientific and technical considerations by the JCMT Users' Committee. The Board then takes its decisions about the proposals and modifications to them taking account of the requirement for a balanced programme of instrumentation between R and D and construction activities in the UK, Netherlands and Canada.

Announcements of Opportunity will be issued at periodic intervals reminding the community of the opportunities available to them to participate in R and D activities and in the construction of common-user instruments within the framework described above. All proposals will be reviewed in depth by the JCMTUC. ROE management will provide the JCMTUC with TAP's recommendations as well as various options for the development and implementation of the programme. The recommendations of the JCMTUC will then be communicated to the JCMT Board along with a proposed programme of implementation from ROE management. In constructing this programme, ROE management will attempt to produce a balanced programme which simultaneously ensures that the construction groups and the University R and D groups have appropriate opportunities and that an appropriate balance between activities in the three countries is maintained.

The monitoring of the programme is the responsibility of the ROE. This will be carried out in a number of ways. All contracts will have specific reporting requirements and these will be monitored in the usual way. Each major development will have a project scientist and project engineer within the construction group but there will also be an associated ROE project scientist or manager who maintains liaison with the construction group. Progress on all programmes will be communicated to the TAP who will undertake regular reviews of these programmes. On occasion, the TAP will wish to make on-site visits to the Construction and R and D groups.

GUIDELINES FOR THE USE OF THE DEVELOPMENT FUND

The JCMT Board agreed the following guidelines for the use of the Development Fund.

(i) The Fund is to be used primarily for the provision of common-user instrumentation and its associated R and D activities. Only in exceptional circumstances should personnel be employed through the Development Fund. The Board has strongly recommended that manpower effort should be provided by the University groups and from the effort available in the Construction groups. Groups are encouraged to apply for manpower effort through other channels if this is essential for the proposed programme.

(ii) Fundamental research and development can only be supported if it is of direct relevance to a common-user instrument. Applications may be made to grant awarding bodies in the UK, Canada and the Netherlands to support these aspects of fundamental research.

Editor's Note:

Copies of the full document can be obtained from the JCMT office at ROE. Groups interested in receiving future AO's and not on the current mailing list should also contact ROE.

THE JAMES CLERK MAXWELL TELESCOPE BOARD

The membership of the Board is as follows:-

Dr H.H. Atkinson (UK)
Professor R.D. Davies (UK)
Professor P.P. Kronberg (Canada)
Dr B.R. Martin (UK)
Dr D.C. Morton (Canada)
Professor van der Kruit (NL)
Professor van der Laan (NL)
Professor R. Wilson (UK) - Chairman
a representative of the University of Hawaii

THE JAMES CLERK MAXWELL TELESCOPE USERS' COMMITTEE

The membership of the JCMTUC is as follows:-

Professor R.D. Davies, NRAL (Chairman)
Professor E.I. Robson, Lancashire Polytechnic
Dr L.T. Little, Kent University
Dr P.F. Scott, MRAO
Dr T.J. Millar, UMIST
Dr D. Nadeau, Montreal
Dr E. Seaquist, Toronto
Professor Dr W.B. Burton, Leiden
Dr ir H. van de Stadt, Groningen
Dr G. Wynn-Williams, Hawaii

IRAS RAW DATA PROCESSING (GEISHA)

GEISHA, the Groningen Exportable Infrared Survey High-resolution Analysis system, has been funded from end 1983 on to improve the IRAS calibration and to develop high-resolution algorithms. The main aim is to make (software) tools and the raw data base available that allow an astronomical user to create infrared IRAS sky maps to his own specifications. The user can subsequently analyze such specially made sky maps using an image processing system.

The basic material for the GEISHA project is the raw IRAS data, containing all telemetry data from the survey instrument detectors. Magnetic tapes with "sky plates" have been constructed where each tape is a self-contained data set for a certain region of the sky. A single sky plate tape contains several files in FITS format:

- raw detector data, for each partial survey scan (snip) crossing that area;
- one file with pointing information for all scans;
- flux calibration files, one file for each calibration method provided in the software system;
- a (calibration) flash response file;
- auxiliary data files, e.g. extracts of the IPSC and SSS for the region.

The main procedure for the IRAS raw data calibration consists of flatfielding. For each detector scan a linear baseline drift plus a constant gain is extracted by fitting the lower envelopes of the detectors of all scans to each other. In the same process a zodiacal emission model (ZEM) is established as the common lower envelope of all scaled detector scans.

The ZEM model obtained can be subtracted to obtain ZEM-free detector scan outputs. At 12 and 25 μm, zodiacal emission contributes often more than 99%; therefore the ZEM has to be known better than 1% at any time of the year.

In collaboration with groups in the USA we develop high-resolution algorithms both linear and non-linear (MEM) that will enable the astronomical user to make maps having a much higher spatial resolution than the present IPAC-produced Sky Flux maps, for regions with a typical size of $1^{\circ} \times 1^{\circ}$.

P.R. Wesselius

Editor's Note:

The GEISHA project is described in more detail in SRON Internal Report 86-02 of May, 1986 by A.R.W. de Jonge and P.R. Wesselius. Enquiries regarding the use of GEISHA should be directed to:

Dr P.R. Wesselius
Laboratory for Space Research Groningen
University of Groningen
Landleven 12
PO Box 800
9700 AV Groningen
The Netherlands

STARLINK NEWS

As an interim solution to the data reduction problem, Starlink intend to release a version of SPECX, Rachael Padman's spectral reduction package. This will be compatible with the version in use at the JCMT, but will allow the use of the Canon laser printer as a hard copy device. It should be available towards the end of September.

In the longer term, it is intended that a package more compatible with the Starlink environment should be developed. This will produce HDS data files, which will allow their use with existing reduction packages (e.g. Figaro) and other Starlink software.

Richard Prestage

APPLICATIONS FOR TELESCOPE TIME

For Semester N (March–August 1988): the closing date for applications will be October 31, 1987. Postal applications should be sent to:–

The Executive Secretary, PATT
SERC
Polaris House
North Star Avenue
SWINDON SN2 1ET

Enquiries may be made by telephone (0793–26222) or Telex (449466). Application forms may be obtained from the above address, as also may sets of Notes for the Guidance of Applicants. Those who have not previously applied for telescope time on SERC telescopes are strongly advised to obtain copies of these Notes.

In Canada copies of the application forms can also be obtained from the Radio Astronomy Section of the Herzberg Institute of Astrophysics.

SERVICE OBSERVING

PATT judged that it was still too soon to start service observing on the JCMT, so there will be none in semester M. Those interested in this form of observing should watch for a computer network news announcement (probably a STARLINK news item in the UK, a Bulletin Board in Canada, and by a method still to be decided in the Netherlands).

Jocelyn Burnell

RECEIVERS AVAILABLE IN SEMESTER N

A. Heterodyne systems

1) *Front end A.* At present this has receiver noise temperatures of about 600K in one channel and 900K in the other, at 230 GHz. It is due to be upgraded before semester N to cover approximately 218 to 235 GHz and 256 to 270 GHz, but the receiver noise temperatures at frequencies other than 230 GHz is not yet known.

2) *Front end B.* It is expected that this system will be available with a tuning range of 320 to 370 GHz. The noise temperature expected is 800K SSB at 345 GHz and 1000K near the band edges.

3) *Front end C.* This system is still under construction and those interested in using it are advised to contact JCMT staff in Hilo or Edinburgh for up-to-date information. It is designed to cover the 461 GHz CO line and the 492 GHz CI line, and the noise temperature is expected to be around 500K.

B. Bolometric system UKT14

This has been successfully used on JCMT at 1100 microns and 800 microns. At 1100 microns the sensitivity is currently 0.5–0.6 Jy per root Hz, and at 800 microns it is 2–3 Jy per root Hz. A polarimeter for use with UKT14 is still under construction. Those interested in using it should contact JCMT staff in Edinburgh for up-to-date information on its performance and availability.

C. Backends

1) *Digital auto-correlation spectrometer.* 512 channels which can be grouped in various ways; e.g. with a dual-polarisation front end (Rx.A) giving 2 sets of 256 channels covering 40, 80 or 160 MHz; or with a single input the 512 channels covering 320 MHz. 1-bit digitisation.

2, *Acousto-optical spectrometer.* Two channels operating simultaneously, each sampling 1024 spectral points. Broad channel – 500 MHz bandwidth, 1MHz resolution. Narrow channel – 50 MHz bandwidth, 100 kHz resolution. The two outputs of receiver A can be multiplexed into the 500 MHz band.

Jocelyn Burnell

TIPS FOR YOUR JCMT PROPOSALS

There is little doubt that, as a world class telescope, the JCMT will continue to be oversubscribed, but, for succeeding semesters, the amount of observing time available should increase so that sound, well-thought-out proposals will stand good chances for telescope time.

It might be useful to include in this report a few subjective suggestions, based on our observations of the TAG (Time Allocation Group) discussions, to keep in mind when preparing your future JCMT proposals. There is no magic in what follows, and most of you know these principles already. Our purpose is simply to remind you of some of the questions which you should address in your proposal – the answers can make the difference between success and failure.

1. What is the context for the observations you are proposing? What is the current state of knowledge and observations? Are you building on your own work? On somebody elses? What has been done before? In what way will your observations transcend previous work?

2. If the JCMT is the best or only telescope for the project you want to do, say so and say why.

3. Why is it important to make the observations you propose? What physical hypothesis, model prediction, or question will be addressed by your data? Try to be specific here. A statement to the effect, "These observations are likely to greatly improve our understanding of molecular clouds" doesn't cut much ice if your competitor is suggesting that his/her proposal will "... permit a precise determination of the shock velocity at the interface with the ionized gas, thereby establishing whether magnetic precursors are responsible for the remarkably high HCO^+ abundance observed..."

4. How will you analyze and interpret your data? Hard-pressed time allocation committees look for evidence that you will produce a meaningful physical model, not just a table of numbers or a map. For example, if you are proposing to observe CO lines, do you expect them to be optically thick? If so, how will you deal with the radiative transfer problem? Are you aware there <u>is</u> a radiative transfer problem?

5. A balanced proposal team is one of those factors which can be helpful, both in improving the grade awarded to the proposal and in subsequent analysis of the data.

   This point is related to the preceeding one. If you are a hot-shot observer and you want to search for evidence of shock waves in Jupiter's atmosphere due to lightning bolts, consider calling up a theoretician whose speciality is shocks (or planetary atmospheres) and asking him/her to collaborate. If said theoretician has some model predictions which your proposal can test – great! Again, be specific as to what the predictions are.

6. Justify such things as your source list, the number of frequencies or molecular lines you ask to observe. Why have you requested observations of 6 lines of HNCO instead of 4 or 2? Do you really need to observe NGC262 at 4 continuum frequencies? If so, explain why 4 frequencies are better than 2.

7. Provide sensitivity calculations. Use system temperature rather than receiver temperature. In calculating system temperature, use an average atmosphere, rather than the best atmosphere. Give expected line or continuum strengths and tell how you estimate them. Include an estimate of the time required on each source for meaningful observations. If you are proposing to do continuum observations, specify your calibration sources.

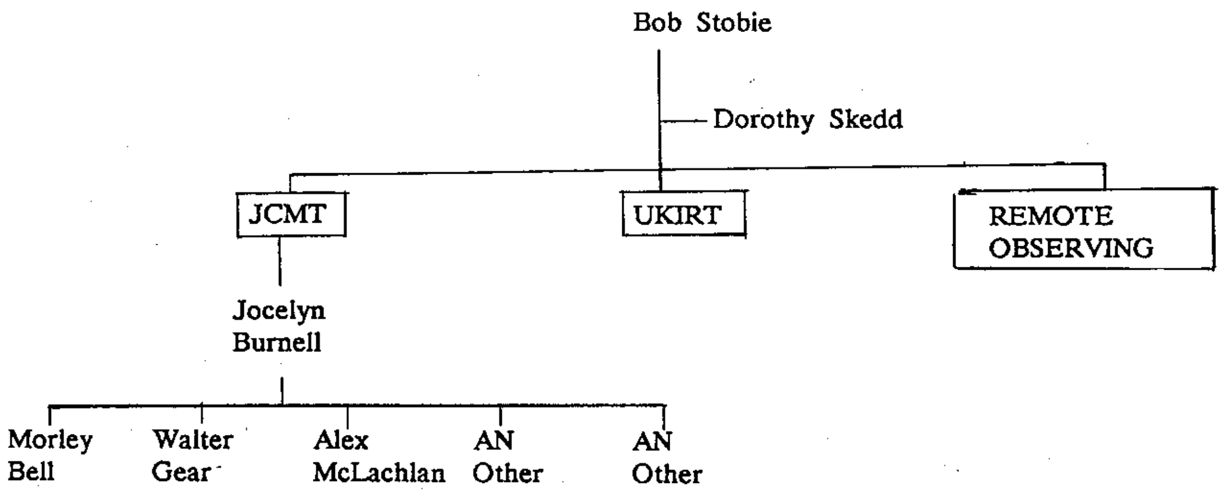
8. If you have room, provide good photos of previous spectra, maps, etc.

Lorne Avery and
John MacLeod
HIA

THE JCMT TEAM AT ROE

Following a re-organisation of the management structure of ROE, the JCMT Section is now part of Division S which is headed by Dr R.S. Stobie; Bob is also Deputy Director of ROE. His secretary, Mrs Dorothy Skedd will also take over from Mrs Maureen McLean as secretary to the JCMT Section. This group is about to double in size with the imminent recruitment of two scientists plus the secondment to ROE from the Herzberg Institute of Astrophysics of Dr Morley Bell. We expect Morley to arrive in Edinburgh in October and to be with us for about a year.

The relevant section of the Division S organogram will then be as follows:-



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