tudes of the order of 400 m/s.

Clearly, these variations do not manifest the presence of a single mode frequency. A Fourier analysis of this data shows a large number of peaks, each one of which exhibits lots of sidelobes, due to periodicity of the data set. A CLEAN algorithm has been performed in order to try to identify the different frequencies. Most are harmonics of one day. At the present level of this analysis (unfinished), no confirmation of a previously reported frequency has been possible. It can be said, however, that individual periods will probably not be identified with this data set because they are so close to one day.

What's Next

Two different types of stars are now being investigated by asteroseismologists: α Centauri, Procyon, and ε Eridani on one hand, and Arcturus on the other.

For both stars, we think it is time now to organize joint effort observations. For the short period stars, the instrument used by Brown, our 'Cacciani cell' and the sodium cell developed by Cacciani himself, at least, can do the job with similar sensitivities. On Arcturus, with larger amplitudes, all optical resonance instruments could be used including the potassium cell of Isaak. Our present instrument has to be made more 'absolute' by an optical modulation in order to use the same detector on the two channels. This can be made without losing photons, and will be the next improvement implemented during the coming year.

Before going to space where very precise broadband photometry will be feasible, the future of asteroseismology on the ground will certainly include a few joint campaigns of a few teams on a few bright stars. Several other projects of promising instruments have been presented in several recent international conferences. We all sincerely hope that they will soon provide comparable sensitivities and may be then asteroseismologists working on the observing side will be able to give many eigonmode frequencies to asteroseismologists working on the theoretical side.

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DIRECTORS' CORNER

IR Working Group — *Summary of the Report*

As described in the previous issue of the Bulletin, an IR Working Group was established by the Scientific Advisory Council to prepare a report on:

1. status of IR array development and use in our three communities and elsewhere,
2. improvements needed to CFHT facilities to better exploit IR cameras, and
3. a possible facility camera for CFHT.

The group presented its final report at the User Meeting in Meudon. The highlights are summarized below. A copy of the complete report can be obtained by writing to CFHT headquarters in Waimea c/o the Director.

The first part of the report described three IR cameras that are either currently in use or soon will be in use as visitor instruments at CFHT. The first of these is CIRCUS, which employs a 32x32 InSb CID array for imaging in the 1-5 μm region. CIRCUS is described in much more detail in Info Bulletin No. 19 and in its User Manual which is available from Daniel Rouan at Meudon. Although originally a purely visitor instrument, CIRCUS is now available on a limited basis to anyone who applies to use it. So far, we have not turned anyone down for non-scientific reasons. The second camera discussed is the 10-μm cousin of CIRCUS, which has been funded by INSU and developed as a joint effort of CEN-Saclay and Obs. de Lyon. It employs a 32x32 Si:Ga array designed for ground-based (high-background) work in the 10-μm window. The camera will have its first run at CFHT in November. It is planned to replace the array with a 64x64 version in 1990. The third camera is a project of Daniel Nadeau and co-workers at Université de Montréal. Construction is just getting underway. A Rockwell 128^2 HgCdTe chip will be used, sensitive from 1-2.5 μm. A read noise of 60-80 e^- is expected — 20 times lower than that of CIRCUS. Daniel has designed the system to be compatible with CFHT's new HP9000-based data acquisition environment. He hopes to be operational in 1990.

The second part of the report assesses array development in France and the U.S.A. In France, a consortium known as SOFRADIR is producing HgCdTe arrays bonded to CCD readouts. The prospects appear good for a 128^2 device in the near future and 256^2 later. LETI/LIR has developed the 32x32 Si:Ga array mentioned above, and this will be followed by a 64x64 version. In the U.S.A., both Santa Barbara Research Center (SBRC) and Rockwell are producing arrays suitable for astronomy in the near IR. SBRC uses InSb and Rockwell concentrates on HgCdTe. In both cases direct readout (DRO) multiplexors are used. We can expect to have 256^2 arrays available within the next couple years with read noise below 100 e^-.

The third section of the report addresses the issue of the IR secondary mirror. The current f/36 mirror has two principal defects: a turned down edge which produces a halo component in the point spread function comprising ~15% of the total light, and a diameter somewhat smaller than ideal. The latter derives from the original requirement of an 8-arcminute background-free field, which is much larger than needed. As a result, the illuminated primary diameter is only 3.36 m. The Working Group wrestled with the question of whether to retain the chopping capability. The strongest potential need is for 10 μm work, and it is still too soon to know for certain whether chopping is required at this wavelength. After considering all the aspects, the group recommends that a new mirror be obtained which is slightly larger than the current one (4 arcminute field) and which has optical quality at least as good as the primary. The new mirror will be mounted on the existing chopper mechanics and used in the clamped mode most of the time. This will eliminate the major defects of the current secondary and will provide an 8% increase in collecting area.

The Working Group concluded its report by suggesting specifications for a CFHT facility IR Camera:

Wavelength Range	1-5 µm
Format	256^2
Pixel sizes	0.″1 up to 0.″5
Basic Features	Broadband Imaging J,H,K,L,M Narrowband Imaging (~ 1% bandwidth)
Additional Features	Polarimetry Fabry-Pérot Coronography

With regard to wavelength coverage, it was felt that a facility instrument should cover the entire 1-5 µm range. This might require two cameras. It seems that we should aim for 256^2 format and fall back to 128^2 only if absolutely necessary. The array(s) should not be classified or subject to export restrictions.

The issue of pixel size is somewhat complex. Considerations of seeing and diffraction indicate that CFHT should achieve its highest spatial resolution around 3µm wavelength. Here one can expect FWHM ~0.″25 under good conditions. Proper sampling implies pixels of ~0.″1. Many observing programs would prefer a larger field that the 25 arcseconds afforded by a 256^2 array of 0.″1 pixels. In going to larger pixels, one must keep in mind that unlike optical CCD's, IR arrays are comprised of discrete diodes with dead space in between. Undersampling in this situation is especially undesirable particularly when photometric accuracy is required. It is felt that 0.″5 is an upper limit on pixel size.

The technical capability to develop such a camera exists in all three CFHT communities. The cost would be between $500K and $1M depending on the specifications. Development time would be approximately three years.

I would like to take this oportunity to thank the other members of the Working Group — Donald Hall, Daniel Nadeau, and Daniel Rouan — for their invaluable advice and assistance in producing this report.

Bob McLaren

F/8 Cassegrain Focus Not Available in Mid-1990

Those readers familiar with CFHT's f/8 Cassegrain secondary mirror will know that its axial support (support parallel to the optic axis) is provided by vacuum. Specifically, there is a seal between the edge of the mirror and the wall of the cell, and behind this seal a negative pressure is maintained sufficient to balance the axial component of gravity. The radial (sideways) support is provided by a mercury-filled tube which encircles the mirror and transmits the radial forces to the inner wall of the cell. In the original design, the mercury tube also served as the vacuum seal. This never worked — it leaked air past the seal. Very early on a rubber gasket was added below the mercury bag (i.e closer to the reflecting surface) to serve as a more reliable vacuum seal. This was a distinct improvement but still far from perfect. The vacuum now extended below where it was originally intended to be and into areas where there were various screw holes which now had to be sealed. Furthermore, the addition of the new seal itself necessitated even more holes. As a result, vacuum leaks and failures of the support were frequent, as early users of the f/8 will no doubt recall.

During the past few years we have learned how to seal up the various potential leaks, but his involves several days of extra work by a number of people each time the mirror is removed from the cell (e.g. for realuminizing). The time required to do this is excessive and not predictable, and the result is not sufficiently reliable. In short, the situation is unacceptable. The mirror is due for realuminizing next summer, and this time we must fix the seal before the f/8 is restored to service.

The good news is that we are confident that we can fix the problem reliably and permanently. The bad news is that the f/8 must be taken out of service for about 14 weeks to accomplish the task. The principal reason for the duration of the down time is that the entire cell must be machined, and the nearest place with the necessary equipment is Los Angeles.

Consequently the f/8 will be taken out of service either at the beginning of April or the beginning of May next year, and returned to service about 14 weeks later. In other words, it will be out of service for four bright runs and three dark runs. Traditionally the pressure for dark time in April is greater than that for dark time in July. We will therefore try for the later schedule , but this may not be feasible because of a conflict with the realuminizing of the primary mirror intended for August (too much work in too short a period for the same group of people).

Observers preparing proposals for first semester 1990 should therefore be aware that the f/8 focus will not be available for the May and June dark runs. It may also not be available for the April dark run. By the fall of next year, we will have a realuminized f/8 which is not only more reliable but also much easier to maintain

Bob McLaren

Observing Time Requests — *A Word to the Wise*

Applicants for observing time are reminded that it is very important to use the **current version** of the Observing Time Request Form, in particular the insert pages 5/6, which change each semester. The current form can be obtained by contacting any of the three agencies at the addresses given on page 8. The Corporation makes a bulk shipment of the forms to the agencies about three months before each submission deadline.

It is equally important that you carefully complete the entire form. If you fail to do so, you run the risk of omitting information which is important to appreciating and evaluating your proposal. Moreover you create the impression that you are not as careful in your work as others with whom you are competing for telescope time. Just a word to the wise....

Bob McLaren