Pulsating White dwarfs, (ii) Rotating Ap stars, (iii) δ Scuti stars. Although the aforementioned objects already marginally qualify for asteroseismology (in the eyes of some at least), there is a tremendous interest to see oscillations of solar-like stars. One of the highlights of this meeting was therefore the report on the first firm evidence for the detection of such oscillations (Kieldsen & Bedding, section 12).

2. Observations (E.J. Rhodes, Jr.)

The field of observational helioseismology began in 1960 when Leighton, Noyes, and Simon (1962) discovered the so-called solar "5-minute" oscillations at the Mt. Wilson Observatory. However, it was not until roughly two decades ago, when these 5-minute oscillations were demonstrated to be sound, or acoustic waves, which were trapped within the solar interior (Deubner, 1975), that observational helioseismology began to grow in earnest. In the nearly two decades which have elapsed since its infancy, observational helioseismology has been the source of many surprising new results concerning the solar interior – far more results than there is space to list here. These past two decades have also been a time of great intellectual ferment which has led to the development of new instrumental tools and new analysis techniques at an astounding rate, with many of these tools and techniques not even being contemplated two decades ago.

Today, however, helioseismology has outgrown its infancy. It has largely (although not entirely, as we shall see in a moment) moved from its early discovery stage, in which major new results concerning the solar interior were presented at nearly every international meeting in the field, into an extended period of consolidation in which some of its earliest successes are being only marginally refined, in which at some meetings more new analysis techniques are being announced than are new results, and in which the ever-lengthening temporal baseline of existing helioseismic observations is allowing unmistakable discoveries to be made of the first solar cycle dependencies of some of the Sun's helioseismic properties.

On the other hand, observational helioseismology has also reached the point where it is now being carried out by so many different teams of observers with so many different instruments that contradictory results have begun to appear in the literature in some areas within the field. And finally, with several new ground-based networks of imaging instruments soon to go into regular operation, and with several new space-based helioseismic instruments set to be launched on what is hoped to be an extended study of solar oscillations from space, observational helioseismology is also a field in which basic observational data will soon be multiplying much more rapidly than will the number of its available practitioners.

The following will concentrate only on some selected observational areas. Most of the results (and much more) were recently presented at the GONG '94 Conference. The most recent measurements of the Sun's *internal rotation* cover modes having a wide range of degrees. An extremely interesting observational result is the measurement of the frequency splittings of the low-l p modes (l=1,2,3). These splitting measurements are important because they provide us with our only estimate of the angular velocity of the solar core.

Recently, five different groups have published measurements of the low-degree splittings. (1) Fossat *et al.* (1995) employed a 115-day-long string of IRIS network observations which had an average duty cycle of slightly less than 60 percent and they obtained an overall splitting from 17 different p-modes (from $l = 1$ through $l = 3$), of 488 nHz, or a value somewhat above the observed equatorial surface splitting of the photospheric gas which is 452 nHz. (2) Toutain (1995) used 160-day-long uninterrupted IPHIR spacecraft observations, and he obtained a weighted mean splitting of 563 $\pm$ 17 nHz. With an alternative analysis he obtained a weighted average splitting of 452 $\pm$ 20nHz. Both results differ by more than their internal uncertainties. (3) Eff-Darwich *et al.* (1995) employed a single potassium resonant scattering device built by the University of Birmingham and located at the Observatory de Izana. They obtained a mean splitting of 493 $\pm$ 45 nHz. (4) Jimenez *et al.* (1995) employed data taken between 1984-1991 at the Observatorio del Teide. At solar minimum Jimenez *et al.* (1994, 1995) their result was 477 $\pm$ 10 nHz through 498 $\pm$ 30 nHz, while at times of solar maximum values ranging from 510 $\pm$ 22nHz through 529 $\pm$ 12nHz. They suggested that the differences between the two sets of splittings were indicative of a variation of the solar core rotation rate with the solar cycle. (5) Results of the Birmingham group are reported by Elsworth in section 10 (but see also Elsworth *et al.*, 1995a,b). Their reported value was 440 $\pm$ 10nHz, somewhat below the observed equatorial surface splitting. Clearly, not all of the above splitting measurements can be correct.

In an attempt to spatially resolve low-degree modes without some of the noise sources which are associated with previous imaging instruments Tomczyk *et al.* (1995a) have developed a new instrument called the LOWL. A few spectra, an l–ν diagram, and some observational widths and amplitudes were presented by Schou and Tomczyk (1995), and Tomczyk *et al.* (1995b) presented internal angular velocity results.

Woodard and Libbrecht (1993a,b) employed four years of intermediate-degree splitting observations of the Big Bear Solar Observatory to place, among other, an upper limit of 1.9 m/s to changes in the solar equatorial near surface rotational velocity between solar minimum and solar maximum conditions.

Combining both intermediate- and high-degree ($10 < l < 332$) p-mode splitting observations taken at the Mt. Wilson 60-foot Tower during a 140-day subset of the 1990 observing campaign there, Korzennik *et al.* (1995) presented angular velocity profiles for the equator and the four other latitudes for $0.6 < r/R_{\odot} < 0.96$, as well as presenting a contour plot of their entire angular velocity surface. Korzennik *et al.*'s (1995) equatorial angular velocity profile shows a pronounced maximum near $r/R_{\odot} = 0.90$ which is located at a similar depth to that obtained by Korzennik *et al.* (1990) from 1988 MWO data.

Genovese *et al.* (1995) cautioned in a statistical analysis against the treatment of point-wise confidence limits. This should stimulate a healthy discussion of the more careful application of statistical techniques in the presentation and interpretation of the results from the applications of inverse methods. One somewhat surprising observational result is the apparent discovery of helical flow patterns in the shallow, sub-photospheric layers of the outer solar interior by Patron *et al.* (1995), using the so-called "ring and trumpet" analysis pioneered by Hill (1995 and the references therein).

Turning from the splitting analyses to the measurements of the mean modal frequencies, it is important to note that frequencies measured by the BISON group were employed by Elsworth *et al.* (1995b) to slow a possible agreement between their observed l=0, l=2 frequency spacings and similar spacings computed from a solar model in which helium settling had been included. On the other hand, some substantial differences between l=1 and l=2 frequencies as measured by IPHIR and by BISON do exist as presented by Gough *et al.* (1995). These differences are significant and hamper, for the time being, our conclusions about the solar core.

Another new observational result is the set of high-degree modal frequencies by Bachmann *et al.* (1995). While they show close agreement up through l=600 with Korzennik's (1990) MWO frequencies, they also exhibit some systematic frequency dependent differences which need to be explored. As far as frequency variations with the solar cycle are concerned, a recent review is that by Palle (1995) for low-degree ($0 < l < 3$) modes. This topic is also addressed in the papers by Regulo *et al.* (1994) and Elsworth *et al.* (1994), Rhodes *et al.* (1993). Woodard *et al.* (1991) and Bachmann and Brown (1993) also published analyses of the solar cycle dependence of the intermediate-degree frequencies, and an interesting discrepancy exist between their findings and those of Bachmann and Brown (1993). The very first frequency shift observations for the high degree ($140 < l < 600$) p-modes have recently been resented by Rhodes *et al.* (1995). Their initial frequency shift observations suggest that the high-degree frequencies may be affected in a different manner than are the low-and-intermediate-degree frequencies.