LARGEST QSO REDSHIFT

Carswell and Strittmatter (C & S) have reported the discovery of a quasistellar object (QSO) with the redshift 3.4 (*cf. Nature*, **242**, 394, 1973). This value is not only a record as far as high redshifts are concerned, but it comfortably exceeds the previous record value of 2.877 held by the QSO associated with the radio source 4C 05.34.

The new record holder is a QSO identified with the radio source OH 471. The data on position and identification is based on accurate positional work at the Royal Radar Establishment at Malvern, and was communicated to C & S by Dr. Cyril Hazard. (It was Hazard's data on the accurate position of 3C 273 that led to the discovery of the first QSO.) C & S examined the optical object (a neutral, stellar object with estimated $m_B \sim 18$—18.5 mag) spectroscopically with the Cassegrain image tube spectrograph at the Steward Observatory 90 inch telescope. There are strong emission features at 4548 Å and 5351 Å, with a wavelength ratio 1 : 1.177. This agrees well with the rest wavelength ratio 1 : 1 . 176 of O VI 1033.8 and Lyman α. The corresponding identification of the lines leads to the redshift 3.4.

Apart from its observational interest, this high redshift presents fresh food for thought to theoreticians, especially to those who believed that redshifts beyond 2.2 would be hard to find for cosmological reasons. If many more objects with high redshifts ~ 3 or more are found, they will throw light on the present countroversies about the nature of QSO redshifts and about the origin of the universe.

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Note added in press by the Editor: The accurate radio and optical coordinates of OH471, as given by Crowther (*Nature*, **243**, 25, 1973), are

Radio : $\alpha\,(1950) = 06\text{ h }42\text{ min }53.3\text{ s} \pm 0.2\text{s}$
$\delta\,(1950) = 44^\circ\,54'\,33'' \pm 1''$

Optical : $\alpha\,(1950) = 06\text{ h }42\text{ min }53.1\text{ s} \pm 0.1\text{s}$
$\delta\,(1950) = 44^\circ\,54'\,31'' \pm 1''$

A second QSO with a redshift greater than 3 has been reported by Wampler, Robinson, Baldwin and Burbidge (*Nature*, **243**, 336, 1973). The radio coordinates of the OQ 172 with redshift of 3.53 are

$\alpha(1950) = 14\text{ h }42\text{ min }50.48\text{ s}$
$\delta\,(1950) = 10^\circ\,11'\,12.4''$.

The V magnitude of the continuum is about 17.9.

DEUTERIUM IN INTERSTELLAR SPACE

Similar to 21 cm line of hydrogen, Deuterium also has a hyperfine structure transition at a wavelength of 91.6 cm. The detection and the amount present of Deuterium in interstellar space is very important as it is directly related to the origin of elements and also to the origin of the universe itself. Recently this line seems to have been detected in absorption by Cesarsky, Moffet and Pasachoff (*Ap. J.* (*Letters*), **180**, L 1, 1973) from the galactic centre, in observations covering about 100 hours. The ratio of n_D/n_H ranges from 5×10^{-4} to 3×10^{-5}. In addition, lines from deuterated hydrocyanic acid (DCN) in the microwave region has also been detected by Jefferts, Penzian and Wilson (*Ap. J.* (*Letters*), **179**, L 57, 1973), and Wilson, Penzian, Jefferts and Solomon (*Ap. J.* (*Letters*) **179**, L 107, 1973) from the Orion nebula. By comparing with the observations of HCN, they obtain $n_D/n_H \simeq 6\times10^{-3}$, which is larger than the terrestrial value by about a factory of 40. The enrichment of the deuterated molecule has been attributed to chemical fractionation (Solomon and Woolf, *Ap. J.*, **180**, L 89, 1973).

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GAMMA RAY ASTRONOMY IN THE FOREFRONT AGAIN?

Way back in 1958, Astrophysicists had predicted a bright future for the then newly emerging field of Gamma Ray Astronomy. Amongst the various celestial objects, the Sun was nominated to be the most likely candidate to serve as a gamma ray source. Ever since this prediction was made, several experimenters have been involved in the futile search for this radiation.

The X-ray astronomers stole the limelight when the first X-ray source was discovered in 1962 and several new celestial sources began to appear in the sky. By now fairly detailed studies of X-ray sources are being carried out and serveral mechanisms for the production of X-rays are being proposed almost overshadowing the work on the more energetic photons viz. Gamma Rays.

Some recent observations, however, have given a fresh shot-in-the-arm to the gamma ray astronomers and it is hoped that they will clear up the attic and bring to light new information promised by this branch of astronomy.

The first break-through has been provided by the fairly recent measurements made by the University of

New Hampshire scientists (U. S. A.), who have detected for the first time, evidence of nuclear reactions on the surface of the Sun by observing the gamma ray lines associated with nuclear reactions occurring during solar flares. These observations were made from the orbiting solar observatory (OSO-7) using a special gamma ray spectrometer on board the satellite.

The much more recent results on the observations of several short bursts of gamma rays, reported by scientists from the University of California, Los Alamos, have further created new excitement for the gamma ray astronomers. These observations made over a period of two years, simultaneously from several spacecrafts in deep space report gamma ray bursts of duration ranging from less than 0.1 sec to about 30 sec. These bursts are however not associated with the Sun and are therefore considered to be of cosmic origin! (*Ap. J.* (*Letters*), **182**, L85, 1973).

With several gamma ray detectors now orbiting in space (and also high energy gamma ray detectors installed on ground) it may be possible to observe many more gamma ray events and bring the gamma ray astronomy to the forefront again!

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Solar research has been a principal forte of the Institute from the earliest days of solar physics. The expeditions from the Madras observatory to the celebrated eclipses of 1868 and thereafter have contributed much to the early discoveries on the physics of the solar atmosphere. Pogson's teams detected the hydrogen lines in emission in the prominences as well as the presence of a bright yellow line that was identified later as due to helium. Pogson was also the first to show that flash spectra of the chromosphere could be observed at annular eclipses of the sun. Eclipse teams have been supported by the Institute for the total eclipses of 1868, 1871, 1898, 1922, 1935, 1952, 1955, 1963 and 1970. In the most recent eclipse, in particular, emission lines signifying low temperature regions have been detected in the corona around 1.6 $R_\odot$, calling for the postulate of a hot and cold filamentary structure of the solar corona in coexistence.

Spectrographic and white light photography of the sun have been a continuous activity at Kodaikanal since 1901. The Institute thus possesses in its plate stacks a record of solar behaviour for over six solar cycles that is an inestimable storehouse of valuable data on the Sun.

By far the most important contribution made to solar physics from Kodaikanal is the discovery of a systematic outflow of gases in the penumbral regions of sunspots, that is now commonly known as the Evershed effect. This forerunner of subsequent studies on the interaction of magnetic fields and flow of ionized gase is a classic in solar observation that has called for combination of astute observer, good equipment and fine seeing.

Present resources at the Institute for solar research stress much on high image and spectral resolution. The tower telescope enables the spectral study of features as small as a second of arc or about 700 kms on the solar surface. The spectral resolution of 600,000 together with photographic plate, magnetometer and photoelectric photometer makes possible detailed line profile studies of single features on the solar surface. Recent efforts with this instrumentation and the battery of three spectroheliographs have been in the study of temporal and spatial characteriastics of photospheric and chromospheric features.

In an area of human endeavour which is at the forefront of the horizons of human knowledge, progress is rapid and depends considerably on the quick adaptation made of recent technological developments. Light gathering power, sites with a minimum of disturbance in the atmopshere, and the most efficient use of the photons of light obtained: these are the stringent requirements imposed on the astronomer willing to accept the challenge of the universe. The Institute has commenced work on a 90 inch telescope that will be operational by 1980. The first step towards a major optical instrument will, we hope, be the forerunner of developments of greater magnitude in the decades to follow.

Astronomical Events

Dedication ceremony of the 104 cm telescope of the Uttar Pradesh State Observatory, Nainital, made by V. Carl Zeiss of Jena, by Professor M.G.K. Menon, F.R.S., Director, Tata Institute of Fundamental Research, Chairman, Electronics Commission of India, and Secretary to Government of India, Department of Electronics, was held on Thursday, 7 June 1973. The Governor of Uttar Pradesh, His Excellency Shri Akbar Ali Khan presided over the function.

PSR 1831-04 is the hundredth pulsar to be discovered so far. It was discovered at Jodrell Bank, which has the distinction of discovering the largest number of pulsars so far, thirtyeight to be precise.