both in rocket and the balloon-borne instruments and its size was measured to be ~ 100". In 1968, an X-ray pulsar was also discovered in Crab nebula but its position with respect to the X-ray sourcewas not well established.

The following table gives the successful experiments and their results conducted during the present series of occultation events :

It can be seen from the table that the position of the X-ray pulsar does not coincide with the centriod of the X-ray source distribution in the nebula. Thus the Crab pulsar may be a candidate for a run away pulsar, if the X-ray source represents the core of the supernova explosion. The observations also show the expected behaviour of the decrease in size with the increasing energy.

Date of occultation	P.A. (degrees)	Size (arc sec)	Off set from the pulsar (arc sec)	Energy range keV	Group name
Aug. 13, 1974	130	24 ± 7	10 ± 4 NW	20 — 150	M. I. T.
	244	49 ± 7			
Oct. 7, 1974	83	37 ± 7	11 ± 2 NW	20 — 150	Max-Planck (Munich)
Oct. 7, 1974	255	2×36(2)	N.I. (1)	1.5 — 20	Columbia University
Jan. 14, 1973	N.I (1)	89^{+14}_{-10}	6 ± 11 (Pitch)	0.6 — 1.8	Copernicus Satellite, (Mullard Space Science Laboratory)
			-29 ± 8 (Yaw)		
		66^{+32}_{-27}	7 ± 12 (Pitch)	1.0 — 3.1	
			31 ± 9 (Yaw)		
Oct. 7, 1974	236	73 ± 38	20 ± 8	2.5 — 75	Mullard Space Science Laborator y
	275	71 ± 15			
Jan. 24, 1975	103	40(3)	N. I.	20 — 100	TIFR–Nagoya–ISAS collaboration

(1) N. I. : No information.
(2) The Columbia University Group measured 1/2 of the emersion.
(3) Possibility of a structure in the source.

However, there are indications that the high energy nebular X-ray emission is associated with the " wisps ". Some more features may come forth when the detailed analysis of these observations becomes available.

These observations clearly provide a test for all the eixsting models for the source distribution and the X-ray generation in the nebular region.

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JUPITER'S MAGNETIC FIELD

Long before the exploration of the planet by space crafts, the observations of radio waves from Jupiter have been attributed to the possible presence of a magnetic field and a consequent charged particle radiation belt similar to the earth's van Allen belt.

The presence of magnetic field in Jupiter has been confirmed by Pioneer 10 magnetometer measurements. As expected, the interaction of solar wind with Jovian magnetic field results in a bow shock. The bow shock was however detected at a comparatively large distance of 108 R_j (R_j = radius of Jupiter). Magnetic field in the outer region is highly complex and variable due to the interaction with solar wind. The position of bow shock also was highly variable. Infact, even during the passage of Pioneer 10, the bow shock position changed to a lower distance so that the space craft intercepted the bow shock once again.

The field, as observed by Pioneer 10 below about 25 R_j, was found to be nearly dipolar and the field measurements gave an estimated dipole moment value of 4.0 gauss R_j^3. The dipole tilt was about 15° and displaced from the centre of the planet by about 0.2 R_j. The field has been found to be anti-parallel with respect to the earth.

Pioneer 11 went still nearer to Jupiter upto a distance of 0.6 R_j from the surface and the magnetic field measurements point to a more complex field even nearer

to the planet. Acuna and Hess (*Nature*, **253**, 327, 1975) have reported on the preliminary analysis of the data and they conclude that Jupiter's main magnetic field is not dipolar, but is nearer to an octupole.

The field measurements were carried out by a high field magnetometer whose range extended upto 17 gauss. The Pionear 11 field measurements point out that the offset tilted dipole (OTD) model based on radio Astronomical and Pioneer 10 measurements do not represent the observed data. Higher harmonic multipoles are needed to explain the observed distribution of the magnetic field.

A comparison of the expected field distribution from the OTD model and the actual field observation show a good agreement for distances greater than 3 R_j. Closer to the planet, the magnetic field increases more rapidly than the inverse cube law for a dipole implying the existence of higher order multipoles.

Based on the field distribution for the octupole model and the consequent behaviour of particles with asymmetrical mirror points, the authors conclude that the source of decametric radio emission from Jupiter is the sporadic precipitation of particles in the Jovian auroral regions. This model also is consistent with the 10 hour periodicity (Jupiter's rotation period) in charged particle observations made by Pioneer 10. Because of the azimuthally asymmetric magnetospheric configuration, a particular field geometry occurs only once every Jovian rotation rather than twice, as is trul for nearly axiall symmetry (such as an OTD with small offset).

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FIFTH SEMINAR ON GENERAL RELATIVITY AND GRAVITATION

The fifth seminar conducted by the Indian Association for General Relativity and Gravitation was held at the Indian Institute of Technology, Powai, Bombay, between December 27-29, 1974, concurrently with the Fortieth Annual Conference of the Indian Mathematical Society. The seminar was inaugurated by Professor V. V. Narlikar, who outlined some of the highlights of the developments of general relativity with historical anecdotes. Professor P. C. Vaidya, President of the Association, spoke about electromagnetic waves with shearing rays in the context of special relativity. He was followed by Professor A. K. Raychaudhuri from Presidency College, Calcutta, who discussed cosmology within the Einstein Cartan framework and the problem of preventing gravitational collapse when magnetic fields are present. In the evening, Professor J. V. Narlikar gave a general talk (common to GRG-5 and the Indian Mathematical Society) on gravitational implosions and explosions in which he described some of the recent work on black and white holes.

On the second day, Professor Nagaraj from Bangalore University discussed the problem of creation of massive scalar fields and the geometry of the underlying space-time. Dr. Eric Lord outlined a generalization of Einstein's gravitation theory, which is conformally invariant by introducing two scalar fields, leading to two gauges (the Einstein gauge and the atomic gauge) with the help of which he could account for Dirac's large-number hypothesis. Dr. S. M. Chitre spoke about equilibrium structures of dense matter in which general relativity played a prominent part.

Apart from these invited lectures, there were about 30 contributed talks on subjects like exact solutions of Einstein Maxwell equations, gravitational wave solutions, gravitational collapse problems, central redshifts of massive objects, white hole ejection of high energy particles, relativistic magnetofluids, etc.

One highlight of the seminar was a panel discussion on relevant problems of General Relativity and Gravitation. The speakers emphasized the need to tackle either physically realistic problems or problems which yielded new and elegant mathematical techniques.

Nearly 70 participants attended the seminar. The next seminar (GRG-6) will be held at Bose Institute, Calcutta, in the following year. It was also decided to organize a summer or winter school on problems of GRG.

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OBITUARY

We regret to announce the sudden demise of Shri R. S. Srikantan, Secretary of the Madras Astronomical Association, on January 18, 1975.