Figure 3. Collected samples at archaeological site (photocredit: NIOT, Chennai). ***a***, Fossilised jaw bone and human tooth; ***b***, Wooden block used for carbon dating; ***c***, Beads and ***d***, Objects with neat circular holes on them.

Fused articles having a flat surface over which a cylindrical or flat object appeared to be stuck, were also obtained. Startling was what seemed like 'drilled' holes, both circular and rectangular found on some holed stone pieces. These perfectly-shaped holes were from about 1 cm to less than 1 mm in diameter. Among the collection was a fossilised jaw bone and a human tooth. NIOT scientists note that 'the materials collected are significant signs of past human activity in the area'. S. N. Rajaguru, geo-archaeologist associated with the Deccan College, Pune, described these collections as 'an exciting breakthrough'.

Also displayed were 'river conglomerates', pebbles that are found in the riverbed and which get cemented. According to scientists at NIOT, 'a detailed examination of the area has revealed riverine conglomerate at a water depth of 30–40 m between 20 and 40 km west of Hazira near Surat in Gujarat'. A piece of wood was also found at the site dating back to 7500 BC.

Further investigations of the adjoining site could throw more light on early human settlements that might have existed within this area.

This important finding has raised key questions about the status of marine archaeology in India. If we are keen to discover what possibly lies buried under the seas off an approximately 7000 km coastline, more facilities in the area of marine archaeology would need to be developed in the country. India has to equip itself with tools to conduct work on marine archeology.

Nirupa Sen

Update on space: Launch of INSAT-3C

K. Kasturirangan, Department of Space spoke to the press about various aspects of the Indian Space programme. At the time, final preparations for the launch of the INSAT-3C satellite by Indian Space Research Organization (ISRO) were underway.

The Indian National Satellite (INSAT) system is multipurpose, being used for communication, broadcasting and meteorology. INSAT-3C was successfully launched by Ariane-42L Launch vehicle of Arianespace into a Geo-synchronous Transfer Orbit (GTO). The 2750 kg INSAT-3C lifted off from Kourou, French Guyana on 24 January 2002. The launch of INSAT-3C was a continuation of the INSAT-3 series. It was the second satellite in the 3-series, after the INSAT-3B launched on 22 March 2000. Since its injection into orbit, INSAT-3C has been successfully maneuvered from the Master Control Facility (MCF) at Hassan in Karnataka. INSAT-3C would be finally positioned at 74°E Longitude and co-located with INSAT-1D.

INSAT-3C has on board the following payload systems. There are 24 Normal C-band transponders, 6 Extended C-band transponders, 2 S-band transponders and a Mobile Satellite Service transponder operating in S-band up-link and C-band down-link. This communication satellite is powered by a solar array, generating 2765 W during equinox and 2535 W during summer solstice and with a mission life of approximately twelve years. INSAT-3C like all of its predecessors in the INSAT series has a 3-axis body stabilized spacecraft using momentum/reaction wheels, earth sensors, sun sensors, inertial reference unit and magnetic torquers. It is equipped with unified bi-propellant thrusters. The satellite has two deployable antennas and three fixed antennas that carry out various transmit and receive functions. INSAT-3C is expected to strengthen the present INSAT capacity for communication and broadcasting. It would also provide continuity of services of INSAT-2C when it is scheduled to reach the end of mission life later this year.

ISRO Satellite Center (ISAC), Bangalore has been the lead Centre for realizing the INSAT-3C. Other major contributions for the project have come from Space Applications Center (SAC), Ahmedabad, Liquid Propulsion Systems Center (LPSC) at Valiamala and Bangalore, Vikram Sarabhai Space Center (VSSC) and ISRO Inertial Systems Unit (IISU), Thiruvananthapuram. MCF is in charge of initial and in-orbit operation of the satellite. Industries, both public and private have also contributed to the project and the realization of INSAT-3C.

Kasturirangan informed the press that INSAT-3A is in the process of getting ready to be launched in the third quarter of this year. This satellite would have a meteorological payload comprising of Very High Resolution Radiometer and a Charge

Coupled Device (CCD) camera. He added that work on the design of INSAT-3E, the last of the third generation satellites had begun and would be launched next year. The INSAT-3D was also in the developmental stage, he stated.

Other space news

The METSAT, geostationary meteorological satellite is also set for launching by India's PSLV, around mid 2002, said Kasturirangan. A cartographic satellite, CARTOSAT would carry high-resolution cameras having a 2.5 m spatial resolution for mapping digitally the elevation model for the ground. The launch is slated for 2002–2003.

The North Eastern-Space Applications Centre (NE-SAC) at Shillong was created in December 2000 in collaboration with the North Eastern Council. This Centre would render necessary support for natural resources management and developmental communication in the North Eastern States of India, according to Kasturirangan. Groundwater prospect maps on a 1 : 50,000 scale is currently underway in five States, namely Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh and Rajasthan. This is being conducted along with the Ministry of Rural Development under the National Drinking Water Mission. The use of telemedicine to bridge the urban–rural divide in health care would be initiated in Karnataka to begin with and then extended to address the needs of the Andaman and Nicobar islands, etc.

A future mission with ASTROSAT – a multiwavelength satellite to look at celestial phenomena and to understand features of active galactic nuclei, etc. is planned. The project team involves scientists from several Institutes such as Tata Institute of Fundamental Research (TIFR), Mumbai, Indian Institute of Astrophysics (IIA), Bangalore, Inter-University Consortium for Astronomy and Astrophysics (IUCAA), Pune, Raman Research Institute (RRI), Bangalore, Indian Space Research Organization (ISRO) and several Universities, said Kasturirangan. The instrumentation such as X-ray payloads and UV/optical telescope system, etc. to be carried on ASTROSAT would be developed.

On the international front, India recently signed up the International Charter on space and major disasters. This is in collaboration with Canadian, European and French space agencies. Signatories are committed to share remote sensing expertise for early warning in disaster management such as for cyclones, etc.

Would the Indian Space Programme sell space for commercial uses e.g. such as on PSLV to other countries? It is premature but DOS is exploring avenues, informed Kasturirangan. 'We are not pushing into the commercial domain as our objectives in India's space programme are for national socio-economic development', he emphasized. Adding that the cost benefits that accrue from national development that space can provide through satellites such as INSAT, etc. 'fully justify space systems pay for themselves'.

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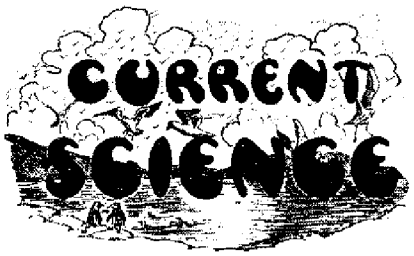
FROM THE ARCHIVES



Vol. V] APRIL 1937 [NO. 10

The Problem of Reality in Physics

By Professor R. Ortvay

Nowadays we often hear the assertion that science is passing through a crisis. Popular works and newspapers speak of a 'Bankruptcy' of science, and even some excellent representatives of science express the opinion that science is developing in a wrong direction. Others declare that the very aim of science, namely, the search for truth, is wrong, or, at least, fruitless; they only attribute a value to purposes of immediate utility. Others, again, fix their attention upon the radical change of the circumstances of life under the influence of technical sciences, and, regarding the numerous effects of industrialization which have destroyed the equilibrium of social forces, often arrive at sceptical conclusions. And one of the strictest critics of our civilization, the recently deceased Oswald Spengler, is, according to his great work *Decline of Western Civilization*, inclined to detect certain signs of decadence in some of the most glorious achievements of modern science.

While we cannot deny that there exists a crisis in our civilization, manifesting itself in political and social restlessness, we also cannot doubt that in science, too, there is a certain crisis. This may give a justification for devoting a few words to the nature and importance of this crisis.

Many of you may be inclined to reject at once any doubt about the value of science. And I think, to the same group would belong everybody who has merely objectively witnessed the scientific development during the last decades, as well as the majority of those who take part in scientific movements. Science has passed from one triumph to another, succeeded in observing an immense multitude of facts and in explaining them from a unitary point of view; thus we are fully justified in calling the present time a golden age of science. And, if we consider the innumerable effects of science on practical life, the part steam and electricity play in it, or even the most recent inventions such as broadcasting, the applications of various radiations, aerial traffic, and so on, we likewise arrive at the conclusion that something causing such effects must certainly possess a deep-rooted intrinsic importance. For, even if we do not agree that the value of science is given by its practical availability, we must acknowledge that practical effects are, though rather external, yet the more easily discernible signs of its importance.

Man is inclined to consider the stage he has just arrived at as the revelation of the absolute final truth; this illusion is almost a matter of course. It is good therefore to remember Newton's words: 'I do not know what I may appear to the world, to myself I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me'.