

decays before hadronization. The Geneva, US and Japanese collaborative experiment has led to a mass value of 173 GeV for the top quark. He referred to the New Megascience facilities which are still to take shape like LHC at CERN to look for Higg's particle, top quarks in abundance and relativistic heavy ion beams. Sinha made an important observation, namely, that by the time the LHC and RHIC came up, if India were to take part in this endeavour, the current research scientists in the 25–30 years of age group have to take up leadership in this endeavour.

The evening lecture on the third day was on 'Hundred years after the discovery of X-rays and fifty years after the discovery of nuclear magnetic resonance' by R. Chidambaram (Chairman, AEC). Condensed matter physics had its beginnings in the determination of crystal structure by Bragg, Bragg and Laue in 1912 by X-ray diffraction. 1995 happens to be the centenary year of the discovery of X-rays. While locating the positions of heavy elements in a crystal lattice was possible by X-ray diffraction, location of the ubiquitous hydrogen and other light elements was not possible till the advent of neutron diffraction. Nuclear magnetic resonance technique developed 50 years ago could throw light on location of

hydrogen and its environs. Chidambaram covered a very wide canvas going back to the days of Roentgen in 1895 to the present day of use of high brilliance synchrotrons.

With the advent of X-ray beam from synchrotrons during the past 20 years, it is observed that the brilliance on samples at these sources has doubled almost every two years and hence this has increased a trillion times over these 20 years. It is believed that the next century will have as many applications of synchrotrons as the conventional source in the past 100 years.

Chidambaram also referred to the very wide range of use of X-rays in the three major fields, namely, diffraction, spectroscopy and imaging. The applications that have emerged in microscopy, tomography, holography and medical fields were briefly touched upon. He also referred to the role of X-ray telescopes in understanding cosmological aspects as well as the role of X-rays in radiation therapy. Chidambaram emphasized the need for increased collaboration and sharing of each other's facilities and even the compulsions that dictate the need for international collaboration in fields like high energy physics or elementary particle physics.

The proceedings of the symposium have shown that the border line between 'solid

state physics' and 'materials science' is very thin and may disappear in the near future, thanks to the prevailing winds of change, emphasizing the role of applied work. Till recently we were preoccupied with 'ideal' systems occasionally touching on effect of variation of thermodynamic parameters, chemical composition or stoichiometry. Emergence of hi- T_c materials brought this very much as a part and parcel of solid state investigation. But now, it appears, we are encroaching on other aspects like effect of particle size variation or effect of disorder both qualitatively and quantitatively. Simple analytical and computational schemes are inadequate, making it essential to resort to Monte Carlo and other simulational studies. Another aspect that emerged was the need to go for multidisciplinary approaches like enzyme or polymer chemistry, band structure and microelectronics to design and fabricate today's sensors.

In conclusion, the symposium'95 was an enjoyable meet technically and otherwise, thanks to the extraordinary efforts put in by the hosts.

K. R. Rao, Bhabha Atomic Research Centre, Bombay.

SCIENTIFIC CORRESPONDENCE

Enechelon faults

I have a few observations to make about Sm. Ramasamy's article 'Enechelon faults along west coast of India and their geological significance' (*Curr. Sci.*, 1995, 69, 811–814).

1. The statement 'Laccadives and Maldives is separated by 9° channel is incorrect, and it should be 8° channel instead'. This 8° channel used for international navigation (route) between Africa/Gulf countries and Colombo and far east is also very close to the line separating the Exclusive Economic Zone of Lakshadweep (India) and Maldives.
2. The Chagos–Laccadive Plateau extends for a length of approximately 2250 km

(between 8°S and 14°N latitude) and is geographically divided into Chagos-archipelago at the southern portion, Maldivian islands up to 8°N and Minicoy–Lakshadweep group of islands and banks in the northern parts. In Figure 2 of the article the location of the islands is shown wrongly. Lakshadweep islands are shown as Maldives and vice versa.

3. The Precambrian NE–SW trending regional dextral strike slip faults of the continental part have been transformed into Pleistocene sinistral faults in the West Coast and are extending up to the Lakshadweep/Maldivian Ridge; this observation by the author is based mainly on IRS satellite imagery. The offshore ex-

tension of these faults and lineaments up to Lakshadweep Ridge should be confirmed only after extensive study by magnetic, gravity and deep seismic surveys of the marine domains represented by continental shelf, slope and Lakshadweep trough between Mangalore and Trivandrum, which is carpeted by a thick pile of Pleistocene to recent sediments and the basement is very complicated.

V. K. K. KALLURAYA

*Geological Survey of India,
Marine Wing,
PKV Bhandarkar's Complex,
Mannagudda, Mangalore 575 003, India*

Sm. Ramasamy replies:

1. The Laccadives and Maldives may be separated by 8° channel as observed by V. K. K. Kalluraya. The Laccadives and Maldives form N-S trending independent clusters of islands with Laccadives in the North of Maldives in the South. In the centre of these two chains of islands, i.e. in between the southern 8° channel and the northern 9° channel there is a small tiny island which I have grouped into Maldives instead of Laccadives and hence I have written that Laccadives and Maldives are separated by 9°. However, the fault nos. 5 and 6

are found to extend along 9° channel in the southern end of Laccadives and just north of the tiny island referred to above. Jacob and Narayanaswami have also observed that Palghat extends up to 9° channel.

2. In the present analysis, all the tiny islands were plotted first and all of them were finally welded into two clusters by drawing an envelope. So, no mistake has been committed in the location of islands as only the envelope of islands is shown in Figure 2. However, as only the envelope of the islands is shown, it has been mentioned in the legend that Laccadives and Maldives are not to scale.

3. The Precambrian NE-SW trending dextral faults show unquestionable sinistral drag along west coast in satellite imagery as shown in Figure 1. However, I also agree with Kalluraya that the extension of faults/model suggested by me need deeper studies, a point mentioned in the last paragraph of my original work.

SM. RAMASAMY

Centre for Remote Sensing,
Bharathidasan University,
Khajamalai Campus,
Tiruchirapalli 620 023, India

Tapioca – a potential substitute for agar in tissue culture media

The commercial plant tissue culture industry is expanding rapidly in India, but the cost of tissue-cultured plants is high. One of the contributing factors is high price of purified agar. Recently, we identified small-grained tapioca pearls (marketed as *motidana*), obtained from tubers of cassava (*Manihot esculenta* Crantz), as a cheaper substitute for agar in culture media for fungi and bacteria¹. Growth of several fungi was better on medium with tapioca pearls (*motidana* no. 2 quality) than on agar medium¹. Therefore, we explored the possibility of using tapioca pearls as a gelling agent instead of agar to reduce the cost of tissue culture media.

After initial screening of *motidana* no. 1 quality and *motidana* no. 2 quality, defined by the suppliers (Sri Lakshmi Sago Manufacturing Company, Vetlapalem, Andhra Pradesh), it was found that no. 1 quality gave results comparable with that of agar.

The protocol reported by Flick and Evans² was used for regeneration of tobacco. Explants from young leaves of one month old greenhouse-grown tobacco plants were placed on Murashige and Skoog (MS) medium³ containing 1.5 mg/l benzyl aminopurine and agar (7 g/l) or tapioca pearls (100 g/l). Three replications with four explants in each were tested in each medium and the experiment was carried out twice. All cultures were incu-

bated at $24 \pm 1^\circ\text{C}$ under 16 h fluorescent light. Callus was induced in seven days on agar medium and in ten days on tapioca medium. Shoot differentiation

occurred in 21 days on agar medium and 24 days on tapioca medium. Extensive shoot proliferation occurred in tapioca and agar media in 4 weeks (Figure 1 a).

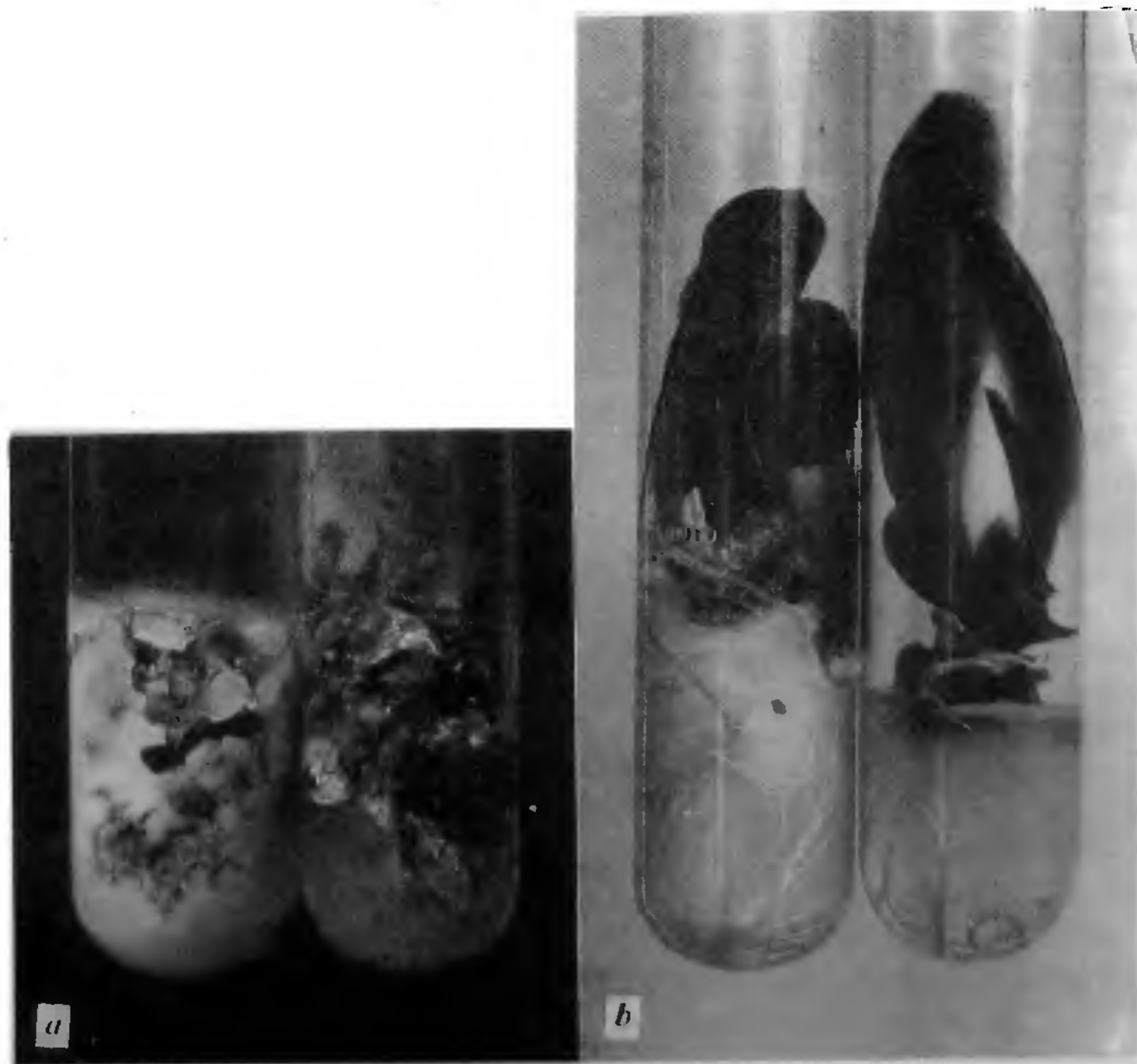


Figure 1. Regeneration of tobacco: (a), callus and shoot differentiation on (left) tapioca medium and (right) agar medium; and (b), shoots rooted in (left) tapioca medium and (right) agar medium.