

ventionally used as a potential biochronostratigraphic tool in the Precambrian/Cambrian sequences need to be reassessed and supported by isotope geochronological data.

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Rajesh K. Vishwakarma is in the Department of Geology, Banaras Hindu University, Varanasi 221 005, India.

COMMENTARY

National science summit

C. Subramaniam

All of us are aware of the fact that our Nation is facing a critical situation in its history. We have gone in for a planned economy and have implemented eight five-year plans and a few spells of annual plans with reasonable success. We have certainly made great strides in development in many areas. Nevertheless we realize much to our dismay, that notwithstanding the gains we have made over half a century, we remain the poorest and most illiterate country in the Asian region barring our adjacent neighbours, but we rank high in corruption among the countries of the world. Massive problems of environmental degradation, gender discrimination, joblessness and population which continues to grow at a fast rate, stare at us rather menacingly.

The twentieth century has seen many radical changes. The emergence of many colonial countries into freedom, growing awareness of, and emphasis on, human rights and social justice and most importantly the developments in S & T have far-reaching effects on the life system of the planet. But among them all the dominant role of science and

technology and consequently that of education which promotes S & T, have come to occupy the centre stage in the development of every society.

The scientists and technologists of this country have a record of performance and reputation that whenever a task has been assigned to them with a clear definition of the goals and given the autonomy as well as the resources, they have acquitted themselves extremely well and proved their competence beyond expectation. However, it has so happened that the scientists and technologists were not associated in any significant measure with the policy formulation or preparation and implementation of developmental plans. On the other hand, the bureaucratic system that was entrusted with the task over these years has not been found adequate to usher in the social and economic development contemplated. I am therefore inclined to think that scientists of India - I use the term scientists in a broad sense - may have to address themselves to the challenges facing the country and consider evolving a developmental approach and strategy for im-

plementation which may measure up to the dimensions of the task we face.

If we take education, illiteracy is still high at the basic level. In the realm of higher education, we have over 220 universities, 9000 colleges and 6 million students. They seem to work in isolation among themselves and also from the society. Co-ordination between institutions as well as interaction with the community in general and the productive processes in particular is lacking. A complaint that is long standing and universally expressed is about the mismatch between the preparation of our graduates and the competence needed by the employers and society.

Coming to research, there appears to be a slackening of efforts as evidenced by the decreasing allocation of funds in terms of per cent of GNP and also in terms of growth in publications receiving peer attention at the international level.

Universities have been the birth place of research. I am informed that the allocation for research to the universities remains poor. On a long term basis it is important to ensure that our universities

become strong centres of research since they alone are privileged to have a continuous stream of young and creative minds passing through their gates and even if one among many has a flash of genius, a breakthrough might occur.

A major case for concern is the administration and management of both education and research. We have to realize that the administration of the Government departments constitutes a culture by itself and is not necessarily applicable to other domains of activity. We seem to have devised a system in which the smallest cog in the wheel can bring the biggest of juggernauts to a grinding halt and the highest of authority could neither remove nor repair it quickly. When we come to industry, we need a different value system, rules, procedures and means of recognition of talent. Again education constitutes a substantially different category of activity. Students and academics cannot be governed by the same concepts of hierarchy and precedents for decision making. Research is yet another field where merit and talent have to receive the highest priority and procedures for recognition and promotion have to be vastly different from those in Government or industry.

Creative mind constitutes a class by itself and our management system must be capable of quickly identifying individuals with spark and ensuring that neither procedures nor considerations of seniority come in the way of ensuring that their talent is extended to the maximum.

It appears that the system of administration and management now in vogue at all levels of activity, including the departments of Government require a new look. Management science is relevant not only to the industries, but to every department of the Government, and more so to education and research. One aspect that is consistently stressed is the need for transparency in the administration of Government departments. I wonder whether the developments in information technology could help in ensuring transparency consistent with such confidentiality as may be needed in the larger interests of the society.

We have witnessed and are witnessing an explosion in information technology. It seems to render most of the conven-

tional tools and knowledge – obsolete at an increasingly accelerated pace and one stands bewildered at the pace of progress. One wonders as to how to cope with this development since its impact is global and all are drawn into a stream that appears to be in floods.

In the modern world, information is a resource by itself and should be disseminated. In our present system, the percolation of information down to different strata of the society is slow and there are blocks at every level.

We have a large population; a sizable population is illiterate. Men and women both literate and illiterate are untrained. We have massive unemployment. It is truly a bewildering spectacle. Unless we find new employment opportunities and also increase the productivity of the large numbers in the unorganized sector and thereby improve their purchasing power, industrial development itself cannot progress very far. Industries in India have to depend substantially on local consumption.

I have been pleading for long that we should turn to strengthening our agricultural base. In our present stage of development, land is our major resource and it offers still vast scope for creation of wealth both by way of agricultural production and agro-based industries. While there is still scope for considerably increasing the productivity of irrigated land, vast areas remain as dry land/waste land and their potential has hardly been tapped. Science and technology provide to-day means of finding crops and crop pattern that could turn these areas into productive assets. Such a development would create scope for numerous small and medium size agro-industries. These two efforts together can generate vast employment opportunities. We have to decide as to where to begin and how to go about achieving these objectives.

I do not want to elaborate, but would like to conclude with one observation. I am of the firm conviction that the scientists and technologists of this country will, if given the mandate, be able to find viable and meaningful developmental path and solve many of the problems that have remained intractable. It is based on this confidence and hope that I have decided to call for a science summit on behalf of Bharatiya Vidya Bhavan. We have to consider how best

we can achieve some of the objectives mentioned in the foregoing, through more intensive as well as widespread application of the achievements in science and technology. Briefly stated:

i) We have to consider early achievement of Universal Primary Education. It is an area where more effective use of communication technology than hitherto is possible.

ii) The higher education system, though one of the largest in the world, remains isolated from the community and the productive processes of the society. Both its quality and relevance to the needs of the developmental programmes, leave much to be desired. We may have to look into the basic deficiencies – organizational as well as academic – and consider possible modern methods that may help us to improve the situation.

iii) Coming to Science and Technology, we have a number of issues that deserve attention.

(a) We must decisively deviate from the present administrative structure and usher in, without much delay, a management system that will effectively promote creativity, encourage talent and seek out candidates with sparks of merit.

(b) We have to substantially increase the outlay for R and D in science and technology in terms of per cent of GNP; We may have to set a realistic target.

(c) Though we may claim that we have to-day the second largest S & T manpower, the picture is far from satisfactory if we consider the manpower position in terms of numbers per million of population. We have to attract larger number of talented individuals to science.

(d) The recent developments following our atomic tests have cast on our shoulders a greater responsibility for self-reliance in S & T. We may have to take stock of our potential and consider means of pooling our infrastructural as well as manpower resources to meet the new challenges.

iv) We inherited an administrative system devised by the British for maintenance of law and order. We have not only continued it, but extended and applied it to industry, education and

research. People also observe and complain about a veil of secrecy in the government administrative culture. We have to consider a series of steps to bring about professionalism and transparency in the management of every sector.

v) In policy formulation, decision making, preparation of developmental plans and implementation, scientists and technologists must be enabled to play an

important role. We may consider how this can be achieved. The vision 2020 documents may be examined for providing a basis for future planning.

vi) We must bring to bear upon our agricultural practices all modern developments in S and T and substantially increase the output from unit area of land and unit volume of water and promote large-scale employment, improving the purchasing power of the people

is a prerequisite for industrial development.

vii) Information technology is advancing at incredible speed. Information is resource by itself. We have to take the information revolution to the people. To-day, information does not percolate beyond the few top layers of the society.

C. Subramaniam lives at 'Riverview', Kotturpuram, Chennai 600 085, India.

SCIENTIFIC CORRESPONDENCE

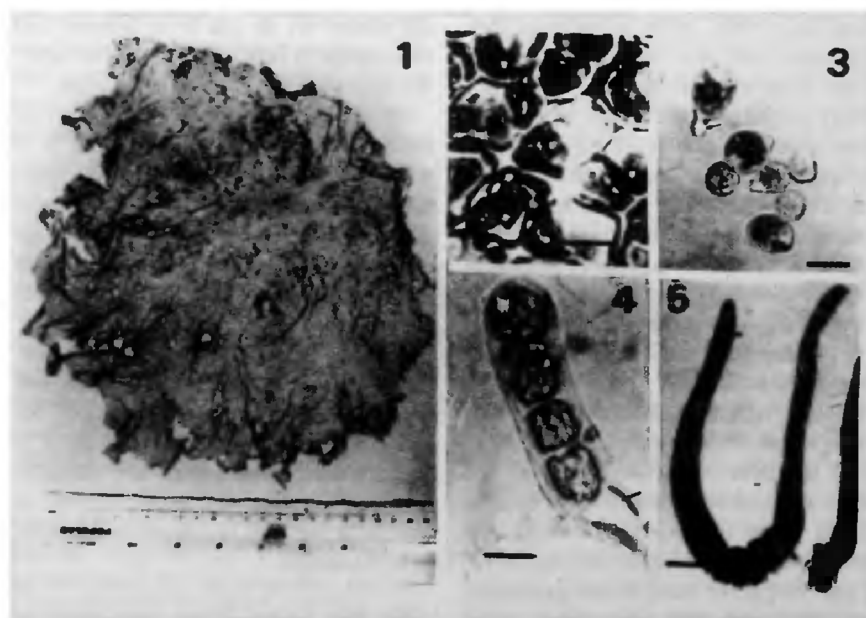
Life history and culture studies of *Monostroma oxyspermum* (Kütz.) Doty (Monostromataceae, Chlorophyceae) growing in estuarine conditions along the central west coast of India

Monostroma (Chlorophyceae) specimens collected specially from mangrove ecosystem of Shirgao creek (Ratnagiri, Maharashtra), Terekhol creek (Goa) and Kali estuary (Karwar, Karnataka) were found to be *M. oxyspermum* (Kütz.) Doty on the basis of the following observations: thallus prostrate, forming

mats in muddy substrata, 20–40 × 15–20 cm in size (Figure 1), monostromatic with frill margins, 20–24 µm thick, outer margin yellowish at maturity, thallus cells polygonal, 10–15 × 18–20 µm (Figure 2) in surface view with single parietal chloroplast and one pyrenoid. The zoospores (swarms) are

liberated, biflagellate, 5–7 × 2–4 µm in size, flagella of the same length. In culture swarms become round, losing flagella and subsequently develop a germination tube (Figure 3). Fusion does not take place among the zoospores. Division of cell in swarms takes place after 4–5 days, the upper cell forming the uniseriate filament and the lower rhizoidal development (Figure 4). Cyst formation does not take place at any stage. Further divisions in the filament are in vertical and transverse plane, resulting in about 1–2 months, in a sachet-like thallus (Figure 5), which becomes monostromatic (Figure 6). On reaching a size of 3–4 cm in about 3–4 months, sporangia develop on the surface (Figure 7) and liberate the swarms. Cytological studies of the thallus and swarm cells revealed the chromosome number to be 8–10 (Figure 8). There is no alternation of generation. The species contain high level of carbohydrates and can be recommended for economic exploitation, as it can be easily cultivated on a large scale, the growth rate being 0.32 g per day.

The species has earlier been reported from swamps and brackish waters in subtropics by Boergessen¹ and Abbott and Hollenberg². Life history of different species of *Monostroma* has been described by Tatewaki³. Another species of *Monostroma* occurring in Okha coast,



Figures 1–5. 1, Macroscopic thallus of *Monostroma oxyspermum* in natural habitat. 2, Vegetative cells (scale bar = 10 µm). 3, Settling zoospores (scale bar = 5 µm). 4, 10-day-old culture spore germination (scale bar = 20 µm). 5, 20-day-old culture showing tube-like thallus (scale bar = 50 µm).