

Feature Science and Technology

New Scientific Approach Needed for Development

by Dr Anwar Hossain

JUST at this moment, a satellite is circling round the globe to find out the extent of damage done to the ozone layer caused by the emission of ozone-unfriendly substances from industries and appliances as well as agricultural wastes.

We are also confronted with the greenhouse effect and acid rain from the evergrowing industries resulting in the increase in earth's temperature, one of the possible effects of which will be rise in sea-level affecting a large population living in low-lying areas along coastlines. We have polluted land, water and the atmosphere to such an extent that a definite change in climate is now being observed, threatening the existence of life on earth.

Life appeared on earth in microbial form millions of years ago and living species grew due to an optimum combination of temperature and some substances of the earth, especially air and water. It is possible that any slight disturbance of this marginal combination may draw an end to life, which is still a mystery to the biologists and philosophers.

Modern civilization is the result of the uncontrolled use of science and technology, resulting in establishing man's mastery over nature as well as the introduction of language and culture, which separates us from the rest of the living world. Thousands of years ago, a great discovery was made by the 'homo sapiens', which was fire. It was beneficial because men learnt to cook their raw food.

It was, however, not realised that although the same fire helped men to sharpen their tools against other animals, they gave rise to more and more dangerous weapons which was the starting point of in-fighting between tribes and later, war between nations. With the growth of agriculture and small-scale industries, based on empirical knowledge, people learnt to live together

at convenient locations giving rise to rural settlements and towns (market-places).

It is interesting to note that, with the growth of civilization, various forms of religion and philosophy grew in dependently in many parts of the earth, especially, China, India and the Middle East. What we call Western civilization, started after the 'Crusades'. The experimental sciences which grew during the Muslim renaissance was perfected by the West by putting theories in them and applying them in developing technology.

It is the fast development of science and technology, mainly in Europe, without associated progress of social sciences, that has led to the present impasse. There was another unfortunate factor. The world was divided into nations fighting

China, the Taj Mahal and developed religions and philosophies like Confucian philosophy, Vedanta (that led to Hinduism), Buddhism, Christianity and Islam.

The Present Crisis

The present problem of the world is not so much the competition between the developed and developing countries, but a crisis of confidence between them, where each nation considers itself more important, not realising the inner contractions within the nation itself due to economic, social, religious or cultural differences.

The gap between the rich and poor countries started growing a few hundred years ago when science gave rise to technology in the West and the Industrial Revolution took place, while the East brooded

came to act, and on one hand, resistance grew in the subject countries against colonialism and in the home countries of the West.

Both the origin of the cosmic universe and the interactions between fundamental particles constituting the atom became more and more mysterious. Concept of medical treatment changed and it was getting obvious that high standard of living does not necessarily lead to happiness. Technology that gave rise to industry and faster means of movement led to pollution.

Lack of social progress and mad rush for consumption gave rise to absence of ethics in determining values and absence of any relationship or connection between science and spirituality. The years after the forties gave birth to contemplation in Western Europe leading to a re-assessment of the values of life, while the Eastern Europe went through the violent phase of Communism. The latter is now over.

The developing countries gave birth to some great thinkers, but conditions of living failed to establish amity either between nations or the social pyramid within the nation, although most countries are now independent. And it is mainly due to lack of correct education that has given rise to faster growth of population in developing countries, and other problems, while production has not increased much and the inadequate natural resources are getting depleted.

Eastern philosophies are nice to hear, and could one day be very important, but for the moment, the basic necessities of life like food, clothing, shelter and medicine have to be given to all, before we talk of philosophy. What is now required is development without its ill consequences, especially in respect of environment and human ecology.

Nobel-prize winning scientist professor Abdus Salam

once said 'There are two types of diseases on earth - one is the disease of the rich and the other is the disease of the poor.' It is, therefore, obvious that we, poorer countries, do not have to blindly follow the West in matters of science, technology and education but blend our own philosophy of life and practices with western technology leading a new concept of science and culture which can lead to happiness in life.

It is also imperative that while western help can act as a catalytic agent in our road to progress, each country has to evolve its own course of development programmes, according to its problems and carrying capacity so that this does not cause disturbance to the ecosystem of the area, which may extend beyond the boundary of a country.

As for the special problems of a country Bangladesh, it is burdened with the pressure of population and frequented with floods, cyclones (along with storm surges) and nor-westers (a kind of tornado). The country is primarily flat, with the world's largest mangrove forest in the south eastern coast in which a diminishing number of Royal Bengal tigers roam between Bangladesh and India.

Strangely enough, with all the large rivers like the Ganges (called Padma), Brahmaputra (called Jamuna) and Meghna and many other smaller rivers, discharging enormous quantity of water in the Bay of Bengal, the northern part of the country is arid, especially in winter months, and the total tree-cover of the country, including the Sunderbans (mangrove area) and village homestead trees, a speciality of Bangladeshi rural settlements, is only about 10%, a dangerously low level, with such a high density of population (about 750/sq km). Yet Bangladesh has a good number of qualified persons, a huge but mostly smiling poor

population, a rich language, for which they fought to freedom, wide rivers, beautifully green countryside and old tradition and culture.

A large amount of aid came into the country but the development has been insignificant, primarily due to inadequate knowledge of its history and geography and non-involvement of the local community in development works. What is required is intensive functional education, development of initiative in school curriculum, greater participation of urban educated community (especially the professionals) in rural areas and initiation of the concept of self-reliance amongst the local community.

A number of NGOs are also spreading the message in selected areas. In spite of our problems, there are reasons to be hopeful because there is a

and more consumption, without pre-evaluating the moral consequences and they are now more worried about the values of life than environment, which can be controlled by new sciences. By this, it is not meant that modern technology should not be used for improved and increased production in both developed and developing countries, but they should be applied keeping in mind the social and ecological effects and the need for sustainable development.

Non renewable resources should be carefully used and more efficient means should be found in using renewable resources and replenishing them. Importance should be given to the social needs, especially health and education and participation of the local community is essential. The NGOs, the urban professionals,

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distinct possibility of not only discovering new non-renewable resources like natural gas, but we have many untapped renewable agricultural resources like jute whose large potential uses are yet to be explored.

A recent seminar held jointly by CHEC-Bangladesh and Bangladesh Agricultural Research Council found many other uses of jute, which would not only benefit the economy, but also improve the environment by conserving forest resources and reducing use of artificial fibre, which is injurious to health. The extensive use of jute could also protect us from the ultraviolet radiation and further improve the already fertile soil of Bangladesh.

We have to search for a new style of development where appropriate technology will be adopted and human values have also been taken into account. The Western countries have taken the path of more

local government and local population must be increasingly involved in the development work.

Somehow, the old administrative system (introduced primarily for maintaining law and order) has prevailed and there is a big credibility gap between the Government and the people (including professionals). This is not to say that Government should not be involved but they should only lay down the policy, based on consensus, and the implementation should be carried out by the private sector in consultation with the local people.

The point is that human ecology is more important than solving the problems of mere physical environment. We need a global and integrated approach to solve the environmental and social problems.

Commonwealth can strive to work out a solution and CHEC could give a lead in act-

ing not only as a catalytic agent to the professional bodies engaged in these efforts, but integrate the various concepts in a holistic approach to solve the socio-ecological problems of the world.

In fact, modern sciences have already brought humility to those who wanted to know more, but the danger is the application of incomplete knowledge to technology without realising its consequences. These should be made known to everyone through mass media. In fact, the situation is not so bad for developed countries.

It is in the case of developing countries that the situation is dispiriting. Population has largely increased giving enormous pressure to the limited resources. Per capita land has been reduced and its quality has been degraded. Forest and forest wealth is decreasing. Fresh water has become scarce and the unwanted waste is on the increase with the growth of industrialisation.

In any case, while drastic efforts have to be made to increase food production without affecting the soil and environment, creation of industries should be so planned that there is minimum of pollution and waste and target for production should be the people and not a small minority of those who are in advantageous positions.

The importance of quality of life and not standard of living is now gaining ground in many countries and a new concept, called the 'Human Development Index', has now emerged to determine the state of development of a country. To this, should be added moral values in human affairs and environmental consideration, to protect the nature. Let us look for a NEW WORLD HUMAN ECOLOGICAL ORDER, where man will not consider himself as separate from nature but a part of the biosphere we know.

Dr Anwar Hossain, Chairman, CHEC-Bangladesh presented a paper at the Pre-UNCED consultative conference, UK. This is an abridged version of the paper.

Upgrading Reactors with Local Know-How

by Javed A. Malik

PAKISTANI nuclear scientists have been successful in upgrading, redesigning and rebuilding a nuclear research reactor.

The 5 Megawatt US-supplied, Pakistan Atomic Research Reactor (PRR-1), which had outlived its designed life, has been upgraded to 10 MW capacity and is as good as a new one, with 25 more years of designed life.

The reactor started operations in October 1991. The achievement has given us confidence and valuable experience, which will be very useful when we undertake a major overhaul and rebuild of KANUP, the soft-spoken and publicity shy, Dr Ishfaq Ahmad, Chairman of the Pakistan Atomic Energy Commission (PAEC), told Depthnews in an interview.

KANUP, located in Karachi, is the only nuclear power reactor in the whole Muslim world

and will complete its designed life in 1998-99. This heavy-water reactor has a capacity to produce 137 MW of electricity and is expected to outlive its designed life because of excellent maintenance and upkeep. The reactor is wholly run by Pakistani scientists and technicians. Even its fuel is

technology before thinking of building nuclear power reactors. This is the path followed by all other countries and we, too, will have to follow it," Dr Ahmad said.

Pakistan's thermal power plants are all imported. But Dr Ahmad maintained Pakistan had made considerable pro-

Pakistan can certainly bring in a lot of foreign exchange if it provides Third World countries with its nuclear know-how and services

prepared in the country. The government does not plan to increase the power generation capacity of KANUP when it is overhauled by local engineers.

"Of course our aim is to acquire the capability to build nuclear power reactors ourselves but it will take time and resources," said Dr Ahmad.

He pointed out that Pakistan has to first master thermal power generation

gress on the nuclear research side which is a headway in the production of nuclear power plants.

The fuel for the upgraded Pakistan Atomic Research Reactor is being fabricated in China for economic reasons. But if resources are available it can be prepared in Pakistan, Dr Ahmad said.

The reactor is used as a versatile research and training tool and has been at times

used in the preparation of medical isotopes. It was initially designed to run on high-grade enriched uranium (HEU), which is 90 per cent enriched. But scientific requirements made it necessary to convert it to low enriched uranium (LEU) operation, which is 20 per cent enriched uranium. This task was also accomplished locally.

Later on in 1986 the entire instrumentation and control system of the reactor was renovated and a new transistorised console was put in place.

The redesigning of nuclear reactor and associated systems was taken up at Pakistan Institute of Nuclear Science and Technology. It covered the basic and engineering design, inspection of exciting systems to assess their reusability and selection of codes and standards.

When Dr Ahmad was asked about the prospects of Pakistan earning foreign exchange by exporting its nuclear know-how, he said, "If the government decides to undertake such jobs in other Third World countries we can certainly bring in a lot of foreign exchange by providing our services and technical know-how." — Depthnews Asia

Keeping an Accurate Check

ACCURACY and precision are vitally important to industries involved in the printing of electronic circuit boards.

This state-of-the-art machine, designed by a British company to interface with both upline and downline equipment in an automated production line, is now able to check printed circuit board alignment, removing the need to rely on mechanical registration methods.

A product and process development team at Dek, of Weymouth, south-west England, have devised a vision system for the machine that automatically checks screen alignment before every print.

Density of circuit designs can be greatly increased regardless of errors in the dimensions of the board or the size and positioning of registration holes.

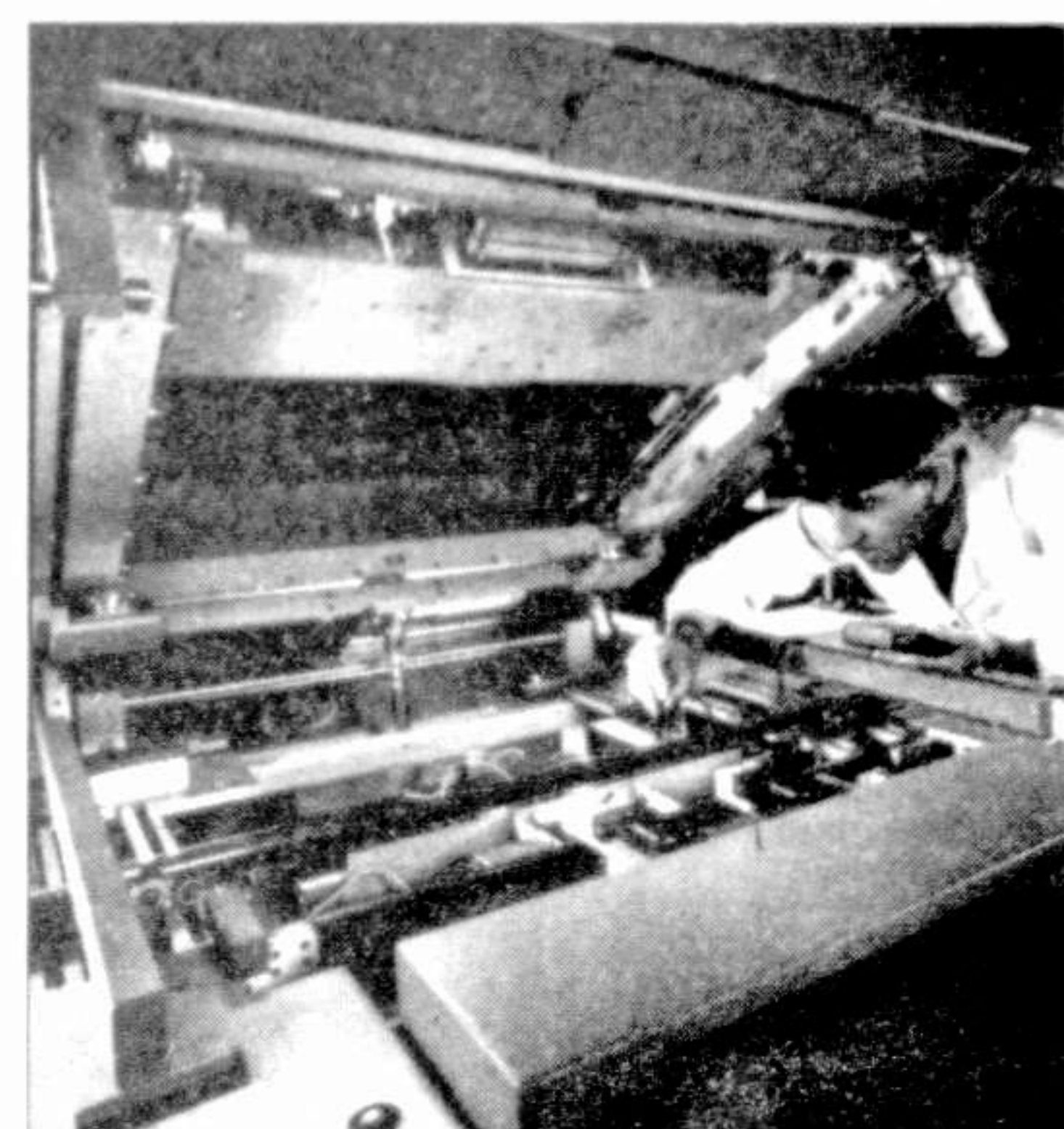
Here, the equipment is undergoing extensive pre-delivery inspection and quality control tests to ensure reliability of performance. Major advantages of the

screen process over other forms of printing are accuracy and repeatability of deposit thickness on relatively uneven surfaces, making it valuable in a wide range of electronics applications.

The vision system consists of a control console with keyboard and visual display unit, two video cameras with illumination system, and a screen which displays the output from the cameras. A series of simple menus displayed on the console screen allows the operator to control and monitor all set-up and operating procedures.

A world-leader in the design and manufacture of screen printing machines, automatic handling systems, dryers and ancillary equipment for high-precision applications, Dek has for 22 years been at the forefront of technical development in the field of screen printing.

A member of the International society for Hybrid Microelectronics, company researchers contribute regularly to seminars and technical publications around the world, and through



training courses has introduced people from many countries to the principles of screen printing in the electronics industry. — London Pictures Service

Big Bang and Big Crunch — or Big Flop?

by Geoffrey Hugh Lindop

THE new theory about how the universe was formed, monumental as it might be, does nothing to confirm that scientists are on the right track in thinking about the origin of everything.

Most scientists now believe that the universe was created in an enormous explosion — the Big Bang — some 15,000 million years ago. Astronomers

observe all the galaxies accelerating away from the scene and have monitored the residual energy from the explosion which bathes the sky in a uniform background radiation.

Now, new satellite data reveals how the transition may have occurred from the uniformity just after the Big Bang to the random distribution of matter now seen in the sky.

This data also shows more matter in the universe than had been known before to exist. The gravitational effect of the extra matter will be sufficient not only to halt the present expansion of the universe, but to cause its eventual collapse into a super massive black hole engulfing the entire universe, which scientists now call the Big Crunch.

Where did the matter that constitutes the Universe come from? When cosmology was in its infancy, the answer to that question was simply answered — God created the universe. Indeed anything that could not be answered was attributed to the Almighty. Cosmologists, not satisfied with such a response, sought out the facts of creation, with creditable results.

Yet science, in the Big Bang Theory, sees creation as a fall accompli. Cosmologists can describe the seconds after the Big Bang, but they cannot describe the seconds before the universe began, and what forces manifested themselves to bring about that creation.

Similarly, science has no answer to the question of the destiny of the universe after the Big Crunch. And there is no prospect of ever finding out because the laws of time and space must be re-written for before the Big Bang and after the Big Crunch.

The theory is very attractive simply because it limits our understanding; it is seemingly beyond human comprehension

to contemplate infinity. Therefore, if we limit our theories to the time span between Big Bang and Big Crunch, then however long that time interval may be, it is a finite period and capable of comprehension.

What is more disturbing is that because the Big Bang Theory is so widely accepted, anyone who disagrees with it is regarded with the same contempt as those who believe the Earth to be flat. This is surely the same mentality that persecuted Galileo, who questioned the Church's view that one

into the distance, so we look back in time. The most distant galaxies are found at about 8,000 million light years.

Quasars — star-like objects that emit copious amounts of radiation — are more farflung and can be found at 14,000 million light years. Clearly, the universe 14,000 million years ago was vastly different from the universe of 8,000 million years ago and so the Steady State Theory is in error.

Nobel Prize-winner Hannes Alfvén, of the Royal Institute of Technology is Sweden.

Cosmologists around the world have reached a peak of euphoria because of new evidence supporting the theory that an enormous explosion — the Big Bang — created the universe 15 million years ago. Is their elation justified? Gemini News Service's astronomy correspondent asks whether the astronomical community is heading for a Big Flop.

could not question its teachings.

Yet is there a viable theory to counter the Big Bang? In 1948 Thomas Gold, Hermann Bondi and Fred Hoyle proposed the Steady State Theory in which matter is continually being created in one part of the universe to balance the destruction of matter in another. They argued that the universe should look roughly the same today as it did millennia ago.

Modern observations do not support such a theory, since as we look further and further

thinks the answer lies in plasmas — electrically-charged clouds of gas. These are common in the universe. The largest known plasma sheet was discovered in 1989 and envelopes two super clusters of galaxies.

Anthony Peratt, of the Los Alamos National Laboratory, supports such a theory. Both the Big Bang and the Steady State theories depend on gravity to mould the universe, but gravity is a fairly weak force compared to electricity. In space, claims Peratt, plasma fields can be responsible for

moving vast quantities of matter.

Computer simulations have been conducted that prove that if the universe began as a huge uniform plasma field, then it would eventually develop into the irregular galactic structures that we see in the universe today without going through a Big Bang.

Certainly, the Big Bang theory does explain more cosmic phenomena than rival theories, but it is not perfect.

Millions of light years separate galaxies from quasars — yet astronomers have found a plume of plasma extending from a quasar and pointing to the quasar. In order for that to happen the two bodies must occupy neighbouring space.

The Big Bang boffins claim this to be pure chance — a random alignment of the quasar that just happens to coincide with a galaxy. Yet the number of galaxy-quasar pairs that have been discovered suggest that there is a real relationship between the two and not simply a chance alignment.

Big Bang, Steady State, and Plasma cosmologies all have their supporters and all seem mutually exclusive — if you believe in one theory you cannot believe in any of the others. Yet in reality the truth might lie in a hybrid theory. The genius who, in the future, brings all the strands together will have an open mind unfettered by the dogma of any one theory.

It might well encompass a spiritual dimension as well as time as space, whereby God's role in the creation scenario might be better understood. — Gemini News

Major Advance in Microtubers as Small Potatoes

AN American company claims it has developed technology that may finally make one type of seed potato, microtubers, economically viable, reports Biotechnology News.

Previously each microtuber produced only one or two microtuber seed potatoes, but Madison, Wisconsin-based company, Small Potatoes Inc., claims it can produce 30 seed potatoes from each starting microtuber.

Most growers use minitubers — small greenhouse produced potatoes weighing 3 to 4 grams — as seed potatoes. Minitubers are cheap, but they can be infested with pathogens from the greenhouse environment.

Microtubers, which are produced entirely in vitro, are pathogen-free, potentially smaller — 0.1 to 10 grams — yield more potatoes per plant, and are more resistant to environmental stresses such as drought.

But their high production costs have kept them from being commercially successful.

Small potatoes Inc. claims that its 30:1 multiplication of microtubers, instead of the usual 2:1 or 1:1, combined with an automated process will change that. In the company's system, the starting microtubers are placed in bioreactors, environmental variables such as media, lighting, and temperature are manipulated, and then the multiplied microtubers are harvested.

Biotechnology News

