

Feature

Science and Technology

Wind Energy Prospects and Potentialities in Bangladesh

Prospect of Wind Energy in our Hilly Regions:

As is well known, it is advantageous to place wind turbines at the top of a hill where the wind is stronger. A well selected site, may result in more than 100% increase in the yearly energy production compared with other sites in the immediate vicinity. In this connection the European Community performed some experiments which revealed a very bright prospect of wind energy above the hills. On this regard "Riso" staff participated in an international meteorological experiment under the auspices of the International Energy Agency (IEA) that took place in the years 1982-83.

The heights and the locations of our hills and hillocks near the regions of good winds (near the sea) shows a good probability of a stronger wind energy resource. To be sure about the strength of the winds on the hills, we are to perform detailed experiments as the European Community and the IEA performed.

Economics of wind turbines

The correct method of evaluating the financial benefit from a wind turbine source is to assess it in terms of the saving of conventional fuels, instead of terms of hypothetical unit generation cost. Fuel saving stands as soon as the first machines were commissioned which would minimize the period of time for which capital be required for the construction of a large plant.

A Danish medium size wind turbine of 250 KW capacity has been considered. The life of the turbine is considered to be 20 years. The total energy produced by the plant per annum is considered to be 490000 KWh. So the total amount of energy produced by the wind turbine is 9.8 GWh. In our local currency the cost of which is about 20 million taka. From the economical

point of view the amount of gas or the amount of petroleum fuel to produce this amount of energy is saved. So the pressure on the gas sector or on our foreign currency, spent for importing crude oil is relaxed.

A journal named "Wind Energy Data for India" by Anna Mani and D A Mooley shows that a wind farm of 4 MW capacity saves 1700 tons of fuel oil per year.

Application of Wind Energy in Shrimp Cultivation:

There is a great prospect of wind energy in the field of shrimp cultivation. Recently in some national dailies shrimp is designated as "The White Gold" of our country, by exporting which we can earn about 1250 billion taka in foreign currency per year. Our coastal areas are blessed by God with the brightest prospect of shrimp cultivation. The golden prospect region has been enriched with good winds.

The coupling of these two prospective resources may contribute substantially to achieve the goal of poverty alleviation, the main target of the present Govt. We have energetic winds in our coastal regions from which we can harness energy. In shrimp cultivation we need electrical power for driving aerators, pumps, blowers etc. By wind turbines we can replace the electrical power since the expansion of this very prospective field is great hindered by the limitations of electrical power.

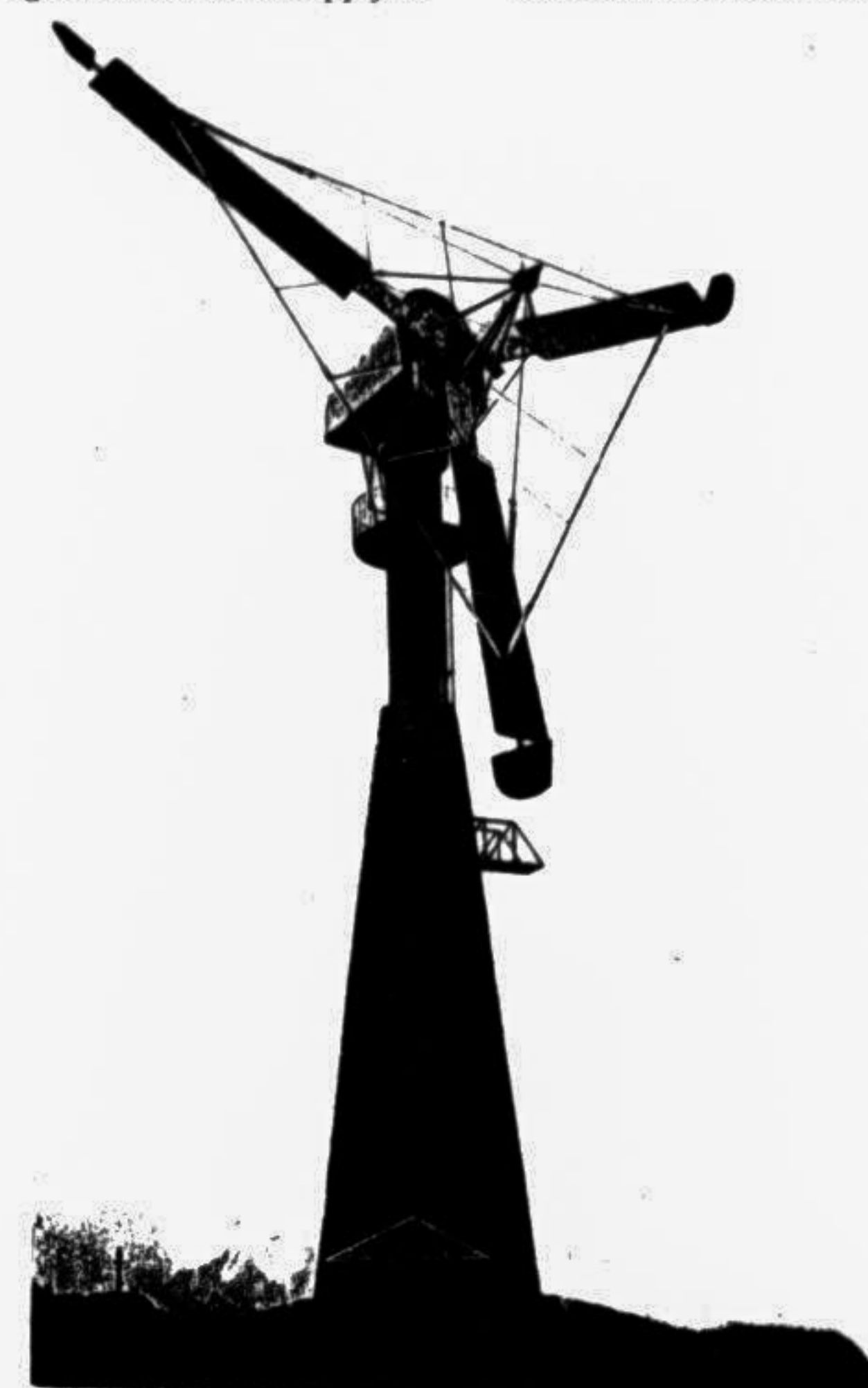
The replacement of electrical power by wind energy may help largely to achieve the goal of shrimp cultivation. We can install different sizes of wind turbines according to the sizes of power requirements of the shrimp cultivation farms. A single wind turbine installed in a shrimp farm may serve all the purposes if we use a vertical axis wind turbine with a flexible

shaft. This type of turbines may be locally produced using local technology and materials.

Application of Wind Energy in Agriculture:

Bangladesh is an agricultural country. Our national economy mainly depends on the agricultural sector. The agriculture needs supply of

A recent study conducted by the BADC shows that more than 36730 low lift pumps of about 40 feet head and 2 ft 3 discharge were in operation through out the country. It is claimed that there is a surface water potential for a total of 54700 LLPS of 2 cussed capacity. Additional surface water sources have been created



electricity for irrigation purposes for better yielding. Our national economy depends largely on the improvement of the agricultural sector. The government has undertaken many irrigation and canal digging projects to supply water. Many power pumps and hand pumps have been distributed to the farmers.

by excavation and re-excavation works. Recently man powered pumps have become popular for irrigation and every year its supply is increasing. Considering the terrain of the country about 50% of the pumps require to be operated at a total head of 20 feet or less. Most of these pumps along with a number of deep and shal-

low tube wells are to be run in most cases by diesel engines and in other cases by electric motors. The non-availability of electricity and irregular supply of diesel fuel in remote rural areas affect the existing irrigation schemes adversely. To run these pumps power of the order of 2 KW to 5 KW is required. We can also see from wind power calculation that it is possible to harness 5 KW to 10 KW of power from 100m² of swept area of the wind turbine at the height of 10 metres above the ground. It is therefore, believed that wind turbines may be used for pumping water. As the wind turbines will have low and variable speeds, centrifugal type pumps will not be suitable. Positive displacement type pumps like Gear pumps, Diaphragm pumps, Cylinder pumps, Jet pumps and Reciprocating pumps are suggested.

Grid Connection:

During the hottest and the driest months of March, April, May and June we have good winds through out the country specially in the coastal regions. During that dry periods water head for total utilization of all the generators of the Capita-hydra-electric plant remains considerably low. So all the generators are not used.

The wind power of that season can be incorporated in the electricity grid on a substantial basis, by installing the wind turbine farms in the most convenient areas of Chittagong, Patenga and Cox's Bazar. According to the wind data analysis in this paper we can see that we have energy enriched winds in those regions from which we can extract several MWs of electricity.

Thus we can add reliability and consistency to the electricity generated by the hydro-electric plant during those hottest periods.

Other Important Applications:

1) Due to the adverse effect of the Farakka barrage drought or late raining is our com-

mon feature specially in the northern parts of our country. The entire order of the seasons has been disordered and our environment has become unbalanced. We don't get rains when we need. But during those periods we have energetic winds through out the whole country. We can harness substantial amount of energy from those good winds for irrigation purposes which is a must of those periods. We can utilize that winds to drive low lift pumps and shallow tube wells to satisfy the demands of agricultural irrigation.

2) Building heating: The energy produced by the wind mills may be used for heating purposes. A wind mill can generate heat directly by water brake, or the electricity produced by a wind turbine may be used for heat generation or by driving heat pumps.

3) Refrigeration purpose: Wind mills may be used to drive refrigerating machineries directly or by generating electricity.

4) Battery charging: Wind mills for charging batteries have been common since the beginning of this century and are still produced in large numbers in many countries.

5) Domestic application: The domestic applications of the wind mills have been shown in the following figure.

Research and Development on Wind energy in Bangladesh:

Research and development works on wind energy through out the world has advanced a long way. The technology in this field has improved remarkably in the west and also in the Asian countries. Latest and very sophisticated technologies are being employed in this field. But in Bangladesh R&D works in this field is almost non-existent.

Our government does not have any active policy for extracting power from this everlasting and pollution free energy resource. It has been shown that the poten-

tialities of our wind resource is sufficient for operating pumps and generating electrical energy. The wind energy thus can contribute substantially to the socio-economic development of our country. Wind energy should be an area of high priority in the energy research and development programmes of the ministries and sectors concerned with the energy production, distribution and utilization for attaining the goal of obtaining a substantial amount of electricity from this renewable sources of energy.

We should also assess the off-shore regions for determining the strength of our off-shore wind from which we can harness several hundreds of MW of power by installing off-shore wind turbine farms.

Advantages of wind energy over other energy resources:

- The application of wind energy may result in significant improvement of the quality of life in rural areas. It may have a clear social and political effect which may result dynamism and mobility in the remote rural areas of our country.
- Small maintenance cost.
- Supply of power in remote areas where public grid power is not available.
- Easy maintenance, operation and overhauling.
- Savings of natural gas and imported fuels.
- No air pollution.
- Low land occupation by the wind plants.

Conclusion:

In an energy starved country like ours, it is highly important to focus our attention to other resources of energy as well as alternative energy resources. Sure enough on the immediate count the import of fuel may prove cheaper than exploration of domestic sources, but in the long run, the reverse is true.

Then it is foolish to rely on the natural bounty or on the imported fuels.

Considering the wind characteristics of our country from the preliminary studies, it is clearly understood that there are reasonably good prospects of wind energy in the coastal areas of Bangladesh which may contribute significantly towards the solutions of energy crisis in the country.

WHAT IS SCIENCE TO BE, ASKS UNESCO — A TOOL OR A WEAPON?

by Daya Kishan Thussu

no sustainable development if there is no transfer of science.

More than 80 per cent of research in science is undertaken by the rich Northern countries. While the North spends nearly three per cent of its annual income on scientific research, developing countries manage only one-tenth of this level.

Japan has the highest spending on scientific research as a percentage of gross domestic product (GDP) as well as the world's highest ratio of scientists to population.

hugle leap from an agrarian to a manufacturing economy. Investment in scientific research grew from 0.24 per cent of GNP to 2.1 per cent in the same period.

The Korean case, writes Thomas Odhiambo, president of the African Academy of Sciences, "should constitute a beacon to Africa — whose development ship is still drifting in the economic backwaters a generation after independence from colonial rule."

In India, the birthplace of mathematics, science has achieved many successes, but

Billions of dollars have been spent on the nuclear programme, though it accounts for merely two per cent of the country's energy needs.

Such misdirected research, critics say, has contributed to the failure to eradicate hunger and disease: India is still home to the world's largest number of poor people.

And poverty hampers progress in science in the developing world. The relative isolation of researchers and limited educational programmes and job prospects have led to what the report calls "researcher migration."

When scientist Har Gobind Khurana returned to India after completing his PhD in the US, he could not find even a lecturer's job. He returned to the US and went on to win a Nobel Prize.

Recalls another Nobel prize-winner, Pakistani physicist Abdus Salam: "As the only theoretical physicist in the country, I had no-one in my vicinity to talk to, to discuss or to share ideas with. The academic climate was not stimulating at all. After three years, I realised that staying longer would not make sense, my work would deteriorate... I reluctantly decided to return to Cambridge."

Salam turned his own sense of isolation to the profit of those who followed in his footsteps. He helped create, in 1983, the Third World Academy of Sciences.

With the sudden switch to a market economy, the "brain drain" is now also affecting Russia, according to the report.

Sergei Kapitza of the Russian Academy of Sciences says that "key members of the academic community are leaving, books on science are ceasing to be published and the continuity of research and teaching is being lost."

International centres for scientific research — known as "brain parks" — are planned as an antidote.

The end of the Cold War, however, should mean cuts in military spending, which has been a major application of science. The so-called "peace dividend," says the report, should be used to redirect scientific endeavour into civilian purposes.

Comments Mayor: "Like a hammer, you can use science correctly (as a tool), or incorrectly (as a weapon)." — GEMINI NEWS

Planets Outside Solar System !

A US scientist says he has confirmed the existence of the first known planets outside the Earth's solar system.

Alexander Wolszczan, an astronomer at Pennsylvania State University, said in a phone interview February 28 that the latest evidence shows "beyond any reasonable doubt" that at least two planets are orbiting an extremely dense rotating star called a pulsar about 1,200 light years from Earth.

The latest findings, first announced by Wolszczan at an astronomy meeting earlier this year, are due to be published in the journal Science.

"All my peers who deal with problems of this kind are quite convinced," Wolszczan said. "I'm a careful person and I wouldn't stick my neck out for something that's not definite at this time."

Other scientists have called the new data scientifically convincing. "We know absolutely for sure now that there are planets there," said Frederic Rasio, a theoretical astrophysicist at the Institute for Advanced Study in Princeton, New Jersey.

Researchers have claimed to discover evidence of planets around some two dozen stars in the past decade. But up to now scientists have not conclusively established the existence of any planetary system outside the solar system.

Because existing telescopes cannot detect objects as small as planets outside the solar system, scientists have searched for planets by looking for wobbles in a star's motion that might indicate the gravitational tug of a nearby body.

Wolszczan and a colleague, using the 305-meter radio telescope at Arecibo, Puerto Rico, first announced in 1992 that they had found such indirect evidence for the existence of at least two planets orbiting a pulsar in the Milky Way Galaxy.

The two bodies appeared to have masses of at least 2.8 and 3.4 times that of Earth, and appeared to orbit the pulsar every 98 days and 67 days, respectively — approximately the size of the orbit of the planet Mercury around the sun.

The new planets both showed up as slight inconsistencies in the regular pattern of radio pulses emitted by the pulsar. Those irregularities appeared to be caused by the pulsar's being pulled to and fro by the gravity of the orbiting planets.

A pulsar is believed to be a rapidly rotating neutron star — an extremely compact ball of neutrons formed from the central core of a collapsed star.

The pulsar studied by Wolszczan spins at a rate of hundreds of times each second.

Wolszczan said the flashes

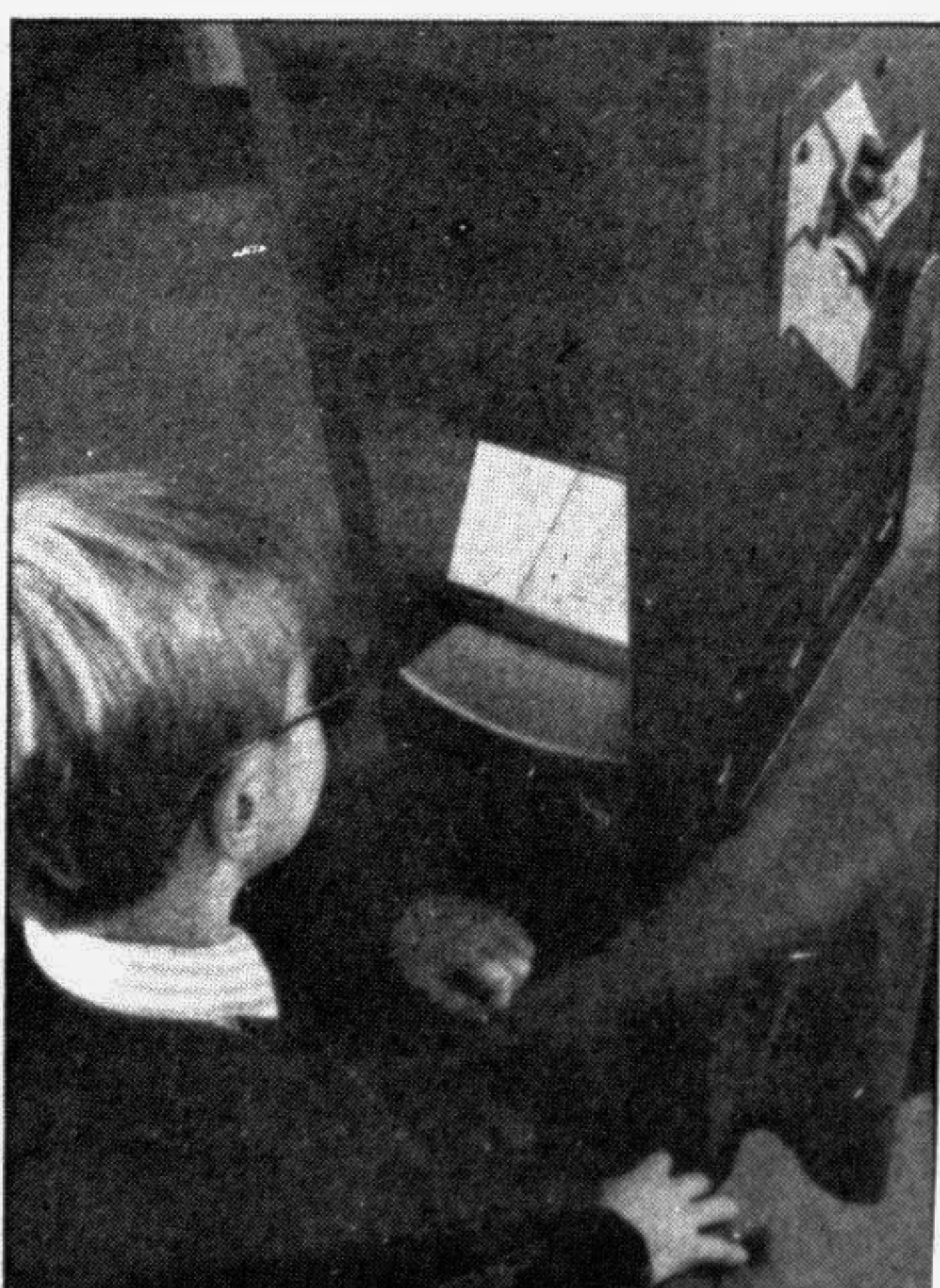
Helping to Solve Reading Problems

THE tricky business of learning to read is made even more difficult for children with dyslexia, a condition that interferes with their perception of words and letters.

Now a technological breakthrough by a British company has led to the development of a new system that helps people with dyslexia and other reading difficulties.

They have developed equipment, seen here in use, that enables a patient to select an individual precision ophthalmic tint that will improve perception. Glasses can then be made as non-prescription lenses or with an individual's refractive prescription.

Studies throughout the world have shown that at least two



pupils per classroom have a form of reading difficulty, and it is considered that the wearing of glasses with an individually chosen colour tint will help to improve some children's ability. The lenses could also help those suffering from reading-induced migraine and photosensitive epilepsy.

The system, known as colorimeter, was devised after extensive collaborative research by Dr Arnold Wilkins at the British Medical Research Council's Applied Psychology Unit in Cambridge, eastern England and Cerium Visual Technologies, a company based in Kent, southern England.

The equipment, which can be used by opticians, educational establishments, hospitals and psychologists, allows people to choose the appropriate tint quickly and easily.

— LPS

of radio emission from a pulsar as it spins have an accuracy comparable to atomic clocks on Earth, and scientists have achieved micro-second precision in their measurement.

"The gravitational forces from the planets cause the pulsar to wobble in space," he said. "And that makes the travel times of the pulsar's radio pulses to us a little longer and a little shorter periodically. And we can measure that effect."

Wolszczan added that detecting planets by this strategy "is 1,000 times more accurate than any visible astronomy technique."

However, Wolszczan said that the findings two years ago did not represent 100 per cent proof that the planets existed because of the possibility that something that mimics planets, such as a "brown dwarf," was causing the irregularities in radio pulses. Brown dwarfs are gaseous bodies too big to be planets but too small to become stars.

Wolszczan said that the latest findings, based on additional study, show that the planets are also tugging gravitationally on each other and thus altering their orbits.

"Now it's not only the effect of the planets on the pulsar that we are detecting, but also the slight perturbations between the two planets that's been detected, confirming that what we see are planet-sized objects," he said. "And at this point it's beyond any reasonable doubt, because the masses of those two objects are quite similar to the mass of the Earth."

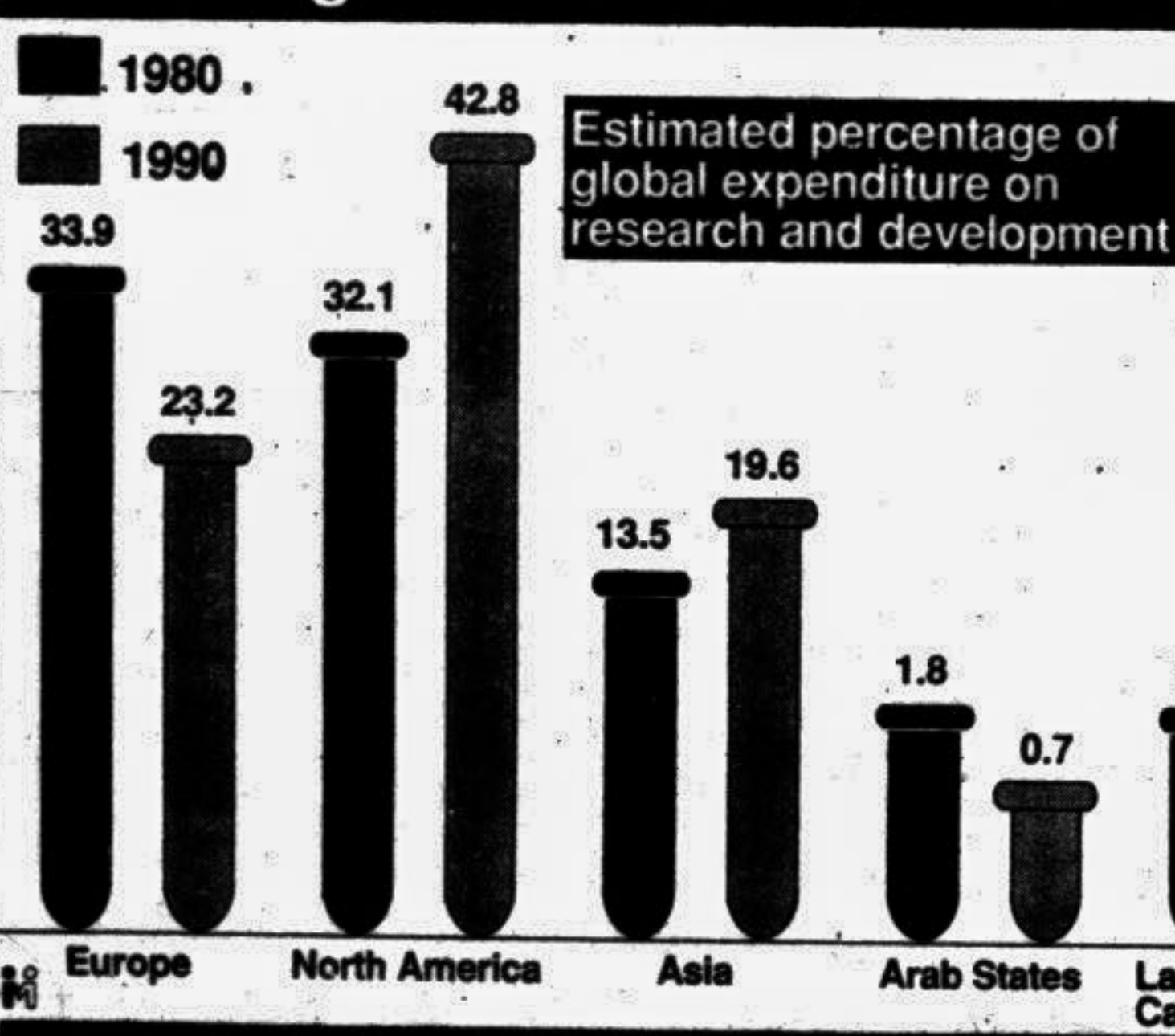
Beside the two planets detected originally, the latest data reveals a moon-sized object orbiting nearer the pulsar, and there maybe still more orbiting objects, Wolszczan said.

Wolszczan said that the rapidly rotating pulsar, which is basically the dead remnant of a star, doesn't shine with visible light but instead produces a fierce stellar wind that would blast any planet with particles traveling near the speed of light.

He said this heavy dose of radiation would probably make the surface of the newly-discovered planets very inhospitable — something like that of Mercury, the nearest planet to the sun, where temperatures range from 510 degrees Celsius on the sunlit side to minus 210 degrees Celsius on the dark side.

Courtesy — USIS

Investing in science



In the United States, expenditure on scientific research by private companies tripled from 1960 to 1990, totalling \$89 billion by 1992. Companies believe that success in the high-technology marketplace depends on investment in research and development.

A patent on an invention or new product has its own market value and gives the holder a monopoly on its exploitation. As most patents are controlled by TNCs, they will be the main beneficiaries of GATT.

In the Third World, countries which have performed well economically have given great importance to scientific and technological education. South Korea's gross national product (GNP) increased from \$2.3 billion in 1962 to \$169 billion in 1988, reflecting a

meeting growing energy needs. In Africa, the report says, "Poverty in science is even more crucial than the immediate poverty of the material kind — because science can well determine the future."

The report, published by the United Nations Educational, Scientific and Cultural Organisation (UNESCO), points out that African governments have halved their expenditure on scientific research in the past decade.

The effects will be serious. As UNESCO director-general Federico Mayor says, "The gap between poor and rich is a knowledge gap. There can be