

Trends in Neurosciences .

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Neurosciences in our country has existed for many decades but it was only after independence and the establishment of many scientific institutes and medical research centres that real progress has been made. Neurosciences in India have progressed on three parallel streams helped by three different groups. Human physiologists getting interested in the nervous system, biologists striving in their laboratories and thirdly clinical neuroscientists. Recently these three have been joined by scientists from other areas who have started contributing vigorously to the progress of Neurosciences in India; namely pharmaceuticals scientists, toxicologists, mathematicians, clinician, biomedical engineers etc.

Clinical Neurosciences

With the spread of neurology and neurosurgery as a distinct speciality in our country, it became possible for clinicians to interest themselves to research in clinical neurosciences. This has covered a fairly wide field of which a few may be mentioned : New knowledge about infections of the nervous system, specially tuberculosis; the variation in cerebrovascular diseases; pattern of head injuries; neuropathology of cerebral oedema, variations in intracranial tumour patterns, different types of polyneuritis etc. Though the number of clinical neuroscientists have increased in the past decade, it is seen that clinical neurosciences research has received a set back. A review of the research proposals granted by the Indian Council of Medical Research (ICMR) indicates that request for clinical neurosciences research has dwindled into a trickle from the large stream which was seen in the 60's and 70's. Clinical Neurosciences are as important as other branches of Neurosciences and often have an immediate relevance to the cure of the sick. It would be my appeal to the clinical neuroscientists in India, to resume their vigour and enthusiasm in the pursuit of new knowledge.

Basic Neurosciences

As President of the Neurosciences Society of India, I have had the privilege and the opportunity of understanding and appreciating different facets of neuroscientific endeavour that is going on in various parts of our country. Naturally the Institutions that are well provided with basic facilities have taken

the lead as they have attracted the persons who have enthusiasm for neurosciences research. In the background of a developing country, where there are many competing priorities, it is heartening to see the youthful vigour of our neuroscientist, despite the odds against them. These difficulties are well known and need not be repeated here. In spite of such odds, these enthusiastic men have been devoting themselves to basic neurosciences. Still, I am sure many here would concede that for a country with so much of talent we have not built up a large enough base for progressive neuroscientific advances. These are visible and high peaks here and there but the base is not widespread enough. This has to be remedied and appropriate changes have to be introduced at the University and medical school levels to encourage young persons, who like to devote themselves to scientific research specially in neurosciences.

It is true that the education system in India is based on the ideas of Mcaulay of last century and is completely memory based. Under this system there is no opportunity at all for an enquiring mind to develop and the spirit of enquiry in our students during their education in schools and colleges is positively extinguished. In spite of this there are still souls who brave the system and start research and these deserved to be encouraged in full measure.

At this stage we have to acknowledge the helpful role played by the ICMR, the CSIR and the Department of Science & Technology in providing funds for basic Neurosciences research. The most important medical research organisation in this country namely, the Indian Council of Medical Research has an important part to play in this context. Unfortunately due to the prevalent conditions in our country, the stress in medical research has shifted to communicable diseases which are preventable. Instead of vigorously pursuing preventive measures to abolish communicable illnesses, money and effort are proposed to spent on fields of research in the preventable diseases. This trend has diverted attention, enthusiasm and money from basic medical research. It is essential that the ICMR reverses this trend and actively encourages basic medical sciences research of which neurosciences form most important group.

In spite of all this, the contribution by India to neurosciences during last two decades has been substantial. This can be seen in the programme that has been offered to us during this symposium; scientists with varied interest converging towards the common goal of elucidating the functions of the nervous system. We see biology, physiology, biochemistry, anatomy, neurophysiology and neuropsychology. This is as it should be, as all the world over the best brains are being attracted to the challenge of unravelling from various angles the mysteries of the human brain and the nervous system. Next to space research, it is neurosciences research that provides the attraction and challenge in the scientific circles of the world. In India, also we see evidence of this trend though it may not be as strong as all of us would like to be. It will be a good idea if senior scientists interested in neurosciences and medical educationists could pool their ideas and discuss as to how best to encourage neurosciences at all levels.

At this juncture, I would like to touch briefly on the contributions to Neurosciences which my colleagues and myself were able to make during the past three decades.

Neurosurgery as speciality did not exist in India before 1949 and thus everything had to be learned and applied.

In this process, we were able to contribute greatly to the understanding of the infections of the nervous system, specially that of tuberculosis. The origin and life history of tuberculomas were clearly defined and the diagnosis and treatment techniques determined. The way tuberculous meningitis could affect

the spinal cord and the futility of surgical procedures in arachnoiditis was pointed out. It was interesting to discover that ruptured intracranial aneurysms were uncommon in this country and it was proposed that this may be due to the lower incidence of arteriosclerosis of the cerebral blood vessels encountered in the Indian subjects.

Regular application of stereotactic techniques to the treatment of various illnesses afforded larger opportunities for making important observations. Lesions were made in the cingulum and the basofrontal region for certain psychiatric conditions, in the thalamus and cerebellum for movement disorders and in the amygdala and the hypothalamus for aggressive disorders. It was proposed that stereotactic ablation of the medial temporal structures could be an effective first step in the treatment of temporal lobe epilepsy. The role of the hypothalamus in gastric acid secretion was also confirmed. Each neurosurgical procedure was treated as a unique neurophysiological opportunity to learn about the mysteries of the human brain. If better neurophysiological support had been available more observations could have been made in human neurophysiology.

A study of the functioning of the nervous system involves a widespread spectrum of problems that have to be tackled through different technological approaches. While at one end we have molecular biology and sub-molecular approaches to the functioning of the nervous system, we have the other end of the challenging panorama of the highest culmination of neural function namely consciousness, awareness and superconsciousness. In this area the National Institute of Mental Health & Neuro Sciences has taken a keen interest and has initiated "The Project Consciousness". The difficulties that face such a project are obvious, but there is no doubt that research in this area should be pursued vigorously as it is likely to yield fruitful results. Apart from this, this is an area in which our own country and our scientists would be able to contribute in a large measure because of the peculiarly Indian ethos and milieu in which we exist and function. While we may not be able to compete with the highly advanced neuroscientific technology of some western countries we can still create new knowledge and explore new ideas in this field of consciousness. It has been apparent for sometime that there are certain levels of consciousness and awareness at which the functioning of the body, brain and mind are altered from the usual states in which they are generally known to function. All of us as individual human beings in our day to day life function only at one level of consciousness - awareness whereas we have been told that there are other levels of "consciousness-awareness" from which we can function better, at which we can perform our tasks more efficiently and also from which we can better preserve the integrity of the nervous system itself. Treatises on this subject of Indian psychology and philosophy are available to us written with beautiful logic and precision. It is not only desirable but also possible to examine scientifically, these tenets and prove their verity by new techniques.

This effort should also be combined with the continuously emerging new knowledge about the functioning of the nervous system at the molecular level. While everyone would agree that a study of the function of a single neuron may not explain the functioning of the mind or the nuances of consciousness, we as neuroscientists are beginning to realise more and more that there are many widespread mechanisms existing in the nervous system which enable the system to function as a whole, co-ordinating and orchestrating the thousands of neuronal pools that constitute our human brain.

It has been postulated and also proved that in certain higher levels of consciousness the entire body and the nervous system function at a lower metabolic rate with less expenditure of energy and less strain on the system This has been proved by experiments in our own country at various centres. This

knowledge can now be corrected with the latest theories about the functioning of the nervous system at the neurochemical level. The new knowledge about peptides in the brain has opened a vista which leads to an understanding of some of the so far unexplained problems. Neurotensin, one of the peptides that is found widespread in the brain and in the hypothalamus can induce hypothermia by lowering metabolism. This is one example which shows that researchers into consciousness would be able to correlate the variations in peptide chemistry with states of meditation or superconscious state where body changes become apparent. Many such examples could be given where correlation can be sought and obtained between the total functioning of the whole brain at its highest level and the basic neural mechanisms that pervade the nervous system.

In our own experience at the Dr. A. Lakshmi pathi Neurosurgical Centre at Madras in altering the level of awareness and functioning of the nervous system, we have been able to show that a feedback of alpha or theta waves into the nervous system as a visual or auditory impulse, changes the functioning of the system for the better as shown by the improvement in the clinical condition of the patient. Computer analysis of the EEG recordings during and after biofeedback confirms this impression. If such research could be associated with neurochemical investigations with peptide estimation, we can advance one step further in our knowledge.

An overview of neuroscientific efforts in our country in various centres like Bangalore, Bombay, Delhi, Banaras, Lucknow, Aligarh, Calcutta, Madras and other centres makes one feel proud about all the efforts in Neurosciences that are going on in our country. But as stated earlier, in this most fruitful field of scientific endeavour, our input compared to our countries scientific talent is too little.

The efforts in NIMHANS neurophysiology department of trying to understand neural function at the highest level of cortex and the sub cortical system has been fruitful and has thrown light on some difficult areas. NIMHANS as the only centre in our country specially designated as a centre of Neurosciences has a serious and a responsible role to play in the spread of a neuroscience ethos in our country. An institute in which there is an unique combination of basic neurosciences, clinical sciences as well as psychology and psychiatry is a wonderful experiment and we can hope that they would be the torch bearers in the progress of neurosciences - not only should the scientists here be torch bearers but they should make every effort to light as many torches in neurosciences in our country as possible.