The research in neurosciences is expanding at a rapid pace. The recent development in the field of Genomics, Neurotechnology, Brain imaging is bringing new hopes and newer challenges. Are we as psychiatrists prepared to meet the challenges when these innovations are now coming to field from the benches. There are 3 fundamental questions posed by this development.

1) Are we aware of the developments?
2) Are teaching programmes flexible enough to impart this knowledge?
3) What are the ethical and social challenges posed to the practice of psychiatry?

I will try to summarize these issues.

1. NEWER DEVELOPMENTS IN THE FIELD OF NEUROSCIENCES

As we have anti-depressants today to elevate mood, tomorrow we can expect a kind of Botox for the brain to smooth out wrinkled temperaments, to turn shy people into extroverts, or to bestow a sense of humor on a born grouch. But what price will human nature pay for these nonhuman artifices? (William Safire)

Neuroimaging - Neuroimaging particularly fMRI is providing an insight to the functioning brain. The imaging studies done in Alzheimer's disease and depression are an insight to be of predictive value. However, major area of research is moving into decision making, intention, and thinking, lying or deceiving. The number of fMRI studies looking at decision-making tasks has increased within the last five years, not merely because of greater availability of fMRI machines. The entire field of decision-making research is concentrating on questions of function at a systems level, rather than studying decision-making by examining analogous structures in simple model systems.

Brain mapping and personality typing is being done through fMRI and its potential use remains for military, insurance, forensic etc. The inconsistent science of lie detection is now being used in courts. In a research it was possible for the participants who can see their feedback to improve their performance.

Neurotechnology - Deep Brain Stimulation (DBS) is already being used for the treatment of neurological disorders like Parkinsonism. DBS is now experimented with changing behavior, impulse control improving mood in depression. Potential use of inducing happiness, love, controlling rage etc. But the most recent advance includes non invasive methods of brain stimulation. Scalp electric current has been found to change behavior. rTMS has been found to change morality. Researchers have found that stimulating right temporoparietal junction through magnetic stimulation can change morality and values which in turn may significantly alter the behavior. Other exciting brain researches are erasing memories through working on a particular protein, to prevent neuronal death through controlling micro RNA. Optokinetics or stimulating brain region and even single neuron through LASER and implanted optical fiber is now possible raising the issue of the control of the person through remote.

Neuropharmacology - Drugs have been used in the treatment to correct imbalances and deficiency of particular brain substances. They have also been used as drugs of abuse to enhance happiness, boost performance. New research with Donepezil in volunteers is pointing towards it usefulness in learning new skills. The research is moving towards areas of mood enhancers and Nootropics.
CREB modulators

CREB modulators are designed to enhance memory formation, without the treatment of any particular disease in mind. They are thought to work by inhibiting PDE4, an enzyme that breaks down cAMP, an important neuronal and intracellular signaling molecule. By increasing the levels of cAMP, these drugs upregulate the activity of a transcription factor called the cAMP response element-binding (CREB). CREBs activate a pattern of neural gene expression that results in synaptic growth and strengthening the connections among active neurons. This may augment the acquisition of long-term memory and strengthen memory consolidation. Once activated, CREB modulators appear to allow brain cells to make the connections vital for memory formation. Tim Tully, a professor of genetics at Cold Spring Harbor Laboratory in New York who developed the drug, said: "If it proves safe and effective, it could ultimately be used by people who want to learn a language or a musical instrument or even in schools." Intranasal oxytocin can be used to reduce shyness and making people more extrovert. Pharmacogenomics has already become important for clinical decisions and even in India now kits are available commercially to test the CYP enzyme system and identify rapid and slow metabolizers.

Neurogenetics- Neurogenetics is a branch of genetics that analyzes the impact of genes on the structure and function of the brain and peripheral nervous system. The major use of neurogenetics is the identification of genetic basis of diseases. The second aspect of neorogenetics is identifying genetic mechanism for various capabilities like memory, intelligence, sports etc. Human genome is already decoded and work in this area is progressing very rapidly. Home-based self-diagnostic tests are available for genetic testing. Genetic engineering may remove perceived weaker genes and enhance perceived desirable genes.

2) ARE TEACHING PROGRAMMES FLEXIBLE ENOUGH:

coming to the second question, Whether our teaching programmes are flexible enough to incorporate these changes. The answer is sadly no. Our residents are hardly exposed to neuroimaging, genetics not to talk about neurotechnology. This gives a real scare of us being left behind.

3) SOCIAL AND ETHICAL ISSUES

The advance in technology is providing almost science fiction like tool to the hands of corporations and government and raising the issues of employment, confidentiality, and military uses.

The Human Genome Project was completed in 2003. While the medical community is still digesting the results, some questions are already emerging:
1. Are psychiatrists prepared to discuss with patients and families the genetic aspect of mental illness?
2. Since genetic testing reflects probabilities and risk factors for mental illness, are patients and families able to understand that genes do not cause diseases or symptoms, but rather “conspire” with the environment to bias the individual toward a syndrome or symptom?
3. Is the data relevant enough to be communicated even in the absence of adequate treatments?
4. Do the offspring of mentally ill patients have the right to know the results of their genetic testing? What about the right not to know if they choose so?
5. Can insurers or employers misuse genetic information?
6. Are we headed toward a twenty-first century neo-eugenics?

Sadly the history of psychiatry is full of collaboration with state. The invention of "sluggish schizophrenia" in erstwhile Soviet Russia for political dissidents, heading the eugenic experiment of Nazi Germany to being a wiling partner in torture of prisoners in Guatemala Bay, psychiatrist have always provided their expertise in the service of state rather than in service of humanity.

It increases our responsibility to understand this development and apply the science ethically for the betterment of our patients. Military is one of the major contributors of brain research. The goal becomes evident by going through the following deposition in Presidential commission
Casebeer continued the discussion of neuroscience and related ethical issues by placing them in the context of the Department of Defense. He emphasized the importance of the BRAIN Initiative to DARPA, whose mission is “to prevent strategic surprise, and make it possible for our armed forces to create strategic surprise and prevent battles from happening.” Given that human beings are an integral part of warfare, DARPA has had an ongoing interest in developing neurotechnology, he said. He described four important neuroscientific goals that DARPA is currently undertaking:

1. Whether DARPA can use neuroscientific goals to “understand how we protect, repair, and restore the brains and minds of our fighters,”
2. Where neuroscience technologies can “give fighters an advantage on the battlefield,”
3. Whether neurotechnologies can be used to “develop better technology, teaching and learning tools to augment minds and brains,” and
4. The possibility of being able to emulate some of the functions of the brain."

References


3. Neuroethics Module 3, colombia


