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How MIT maps the mind

Ramananda Sengupta

Vinay Gidwaney *is a Research Affiliate at the Synthetic Neurobiology group of MIT's Media Lab. Though he has a background in enterprise software, (he started his own software company while still in his teens) he dabbles in neuroscience because he believes that "unlocking the mysteries of the brain" is the next frontier, something that could radically change the way the world thinks.*

Gidwaney, who was in New Delhi for the first EmTech India conference organized by MIT's Technology Review and the Cybermedia Group, took time out to speak to ***Ramananda Sengupta****.*

Excerpts:

What exactly is neuroscience?

Neuroscience is one of those areas that we think is the next frontier in technology and bio-technology. Understanding what happens in the brain is an area that we like to joke gives us a net negative in knowledge each year. Every time we discover something that is happening, we sometimes see how little we understand of the brain. That's one of the challenging areas of the research but at the same time it is very exciting.

Because if we can unlock the mysteries of the brain we can start to understand how the brain works, how it functions in people's lives on a daily basis, the disorders of the brain, the diseases that it could have, and how to treat them. Then we could change the world's mental health and learn how to keep people happy in their lives.

MIT Review's Top 10

Would tinkering with the brain not pose an ethical challenge?

There's different ways of working with the mind. There is the molecular way, which is what the pharmaceutical companies work on. Drugs that affect the brain, such as anti-depressants, are the number one drugs sold in the US. They are obviously very popular, they certainly work for some people and they are sometimes effective in what they try to do. In some cases, however, there are some challenges to that theory lately.

But beyond the molecular side, there is also the electrical interface with the brain. As we know, the brain operates primarily through electrical signals that are passed between cells –I am generalizing here, it is actually a lot more complicated than that—but when we try to interface with the brain electrically, there are some interesting things we can do, both as we try to influence what the brain does and also read out what the brain is doing. There's been some interesting research in the area of neuro-chips, for instance.

'Arise, awake, and stop not till the goal is reached'

These are integrated circuits, in one case they is an multi-electrode array of 100 by 100 electrodes which are inserted into the motor cortex of the brain, to allow somebody who is a paraplegic – who do not have control over their muscles—to be able to control a cursor on the screen, so that they can read and write and interface with the environment. So there's some capabilities on the electrical side.

In that case, we are sensing what the brain is telling us by controlling something. Then there's something like deep brain stimulation, the idea of inserting a well placed electrode into different parts of the brain, in order to be able to make changes. For example recent research shows that people with depression can get affected with deep brain stimulation. So in that case we are using a simple electrode to change how the brain operates.

Technology Review magazine launched in India

So you are tinkering with the brain electronically?

Beyond that, the real cutting edge of neuroscience is how you bring all these together. The molecular, the electrical and furthermore, how you bring in the idea of neuro-plasticity. Neuro-plasticity is the idea that the brain has this ability to change itself.

There's some interesting research in stroke rehabilitation. If somebody has a stroke, what happens is that blood flow to a part of the brain is blocked, and as a result the brain cells die. What often happens is that you lose control over bodily functions, you lose control over your feet, your arms, your legs. But what's been found is that if you exercise those arms, even if they are not controllable anymore, if you use a machine to exercise the arm, the brain will start to retrain itself.

So that eventually it can train itself to control the arm using different parts of the brain that were not damaged. In that case, it is the brain fixing itself. So it's not like we are putting something into the brain, but that we are trying to retrain it. There's some very interesting research going on in that area and we believe that bringing together all of those areas is one of the promising areas of neuro-technology.

$100 human genome in sight

So does that make you a biologist or a technologist?

I think that technologist is the best way to look at it. I think neurotechnology is by nature is a multi-disciplinary approach.

So you don't necessarily need to have a background in biology...

That's right, in fact, I don't. I have a software background. And my interest is still in software and I still do a lot of work in software professionally, but my interest as a research affiliate at MIT is in neuro-technology.

Now I don't need to have a specific biological background to have an interest in that area, or to make progress in that area. In fact in our lab at MIT we have a mix of people from various backgrounds. We have people with software backgrounds, electrical engineering backgrounds, neuroscience background too, but all those come together in order to do what we are doing.

The best people are those who can move around those multiple areas. I firmly believe that neuro-technology is one of those areas which demands quite a bit of hopping around between different disciplines in order to achieve what you want.

10 technologies which could change the world

Let's talk about you: where did you grow up, what made you choose this particular field?

I grew up in Edmonton, Alberta, so I am a Canadian. My parents grew up in Calcutta, and then moved to England and then to Canada. Being typical Indian parents, they would encourage my brother and I to pursue whatever we were passionate about. And both of us knew at a very early age that we were passionate about entrepreneurial activities, like starting a business.

In my early teens I started writing software for the purpose of selling it. We started a company when we were quite young, in high school, and we had a technology that allowed teachers within a kindergarten to a grade XII environment to use software to interface with computers in a lab environment. This would allow a teacher sitting at the front of the class to broadcast what they were doing to a screen or observe what the students were doing on their computers, basically help manage that classroom environment.

So we created this software, and signed up a bunch of customers all over the world, there were quite a few resellers selling our software, and from there, primarily out of the idea that we had trouble supporting our own software, I was in high school at the time, there's only so much you can do between classes and supporting teachers and so on. We started to recognize that there was an opportunity in helpdesk software, and how to automate the helpdesk process. So we started a company called Control-F1, which was the idea of automation within the help desk environment. This was in 1999.

Chek it out! | The future is here

And then what happened?

So we started a small company, we raised venture capital funding from both Canadian and American venture capitalists. We raised this money just as the dotcom boom was about to crash, so it was a difficult time. But we grew that company from nothing to about 50 people, and then in about late 2005 early 2006 we were acquired by Computer Associates, a very large software company. They have an office here in Hyderabad.

Your visiting card says 'VP for Communications, India Initiative'...what does that mean?

The lab that I am an affiliate with in MIT is the Media Lab. Now the Media Lab works through corporate sponsorships. So unlike a lot of other university labs that primarily function through grants, the Media Lab takes most of its funding from corporations such as Motorola, Microsoft, and Google and IBM. These companies put money into these labs so that they can look at what MIT is producing.

'Mobile number could become ID'

The Media Lab focuses on a wide variety of areas. The area of interest for me is neuro-technology, but there is also a group focused on smart cities, which is green transportation, they have the robo-scooter, which is an electric scooter, which is very lightweight and folds up and is thus able to be transported around very easily, to other groups, like one focused on autism research, another one on music and technology, there's even a group on the future of banking and how trust relationships can be facilitated between banks and their customers using technology.

So there's a wide variety of research, and because we are corporate funded, the way it works is that corporations actually have access to the intellectual property that is developed from the labs.

Ideas for new India | 'Perfect opportunity'

So that means the Corporates also have a say on what the research subjects should be?

They do have the ability to collaborate with the research. They certainly can be involved in the research process, they can provide feedback, they can make that a discussion, and then we have specific researchers in the areas they can interact with. But the important thing is that as a result of that relationship, they can then continue on and take that technology and build it into their own companies. A few examples of that are Hallmark, a sponsor... they have cards which play music when you open them, .some of that core technology was developed at the lab.

Then the one laptop per child—the $100 laptop, that's perhaps the most famous example...that was started by Nicholas Negroponte, who was actually one of the founders of the Media Lab. To technologies like E-ink, which makes screens that are visible in daylight....they are the technology behind the Amazon Kindle, which is a e-book reader.

Special: Gadgets & Gizmos

So a variety of different technologies have come out of the lab, and what I am working on right now is finding Indian companies to sponsor research. We believe that India not only is a destination for technology but also the research process itself. There's some very interesting things that can be done. So we are here talking to big Indian names in the corporate world, to see if they are interested in funding that research at the lab.

So how successful have you been?

It's been mixed. There's a downturn across the globe and India's seeing some of that now, Our message has been to look at that downturn now as an opportunity for competitive advantage. If you are a company that is build on a good foundation and has a good research outlook, then you can start to define your future, and why not define your future with an institution like the MIT, where you can get access to some really interesting and great research. Our message has been that although there is a downturn, this is a great way to be able to do research with a cutting edge institution like MIT.

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