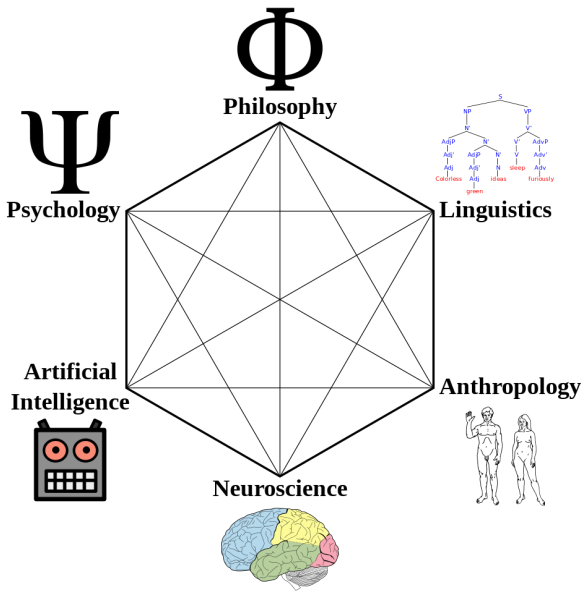
PENSÉE

Monthly updates from Cognitive Science



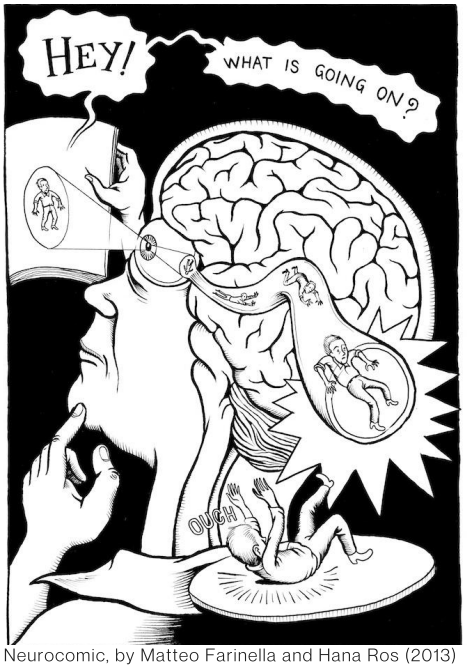
Cognitive Science Hexagon. Adapted from Miller (2003)

Where and how did Cognitive Science begin?
How has it evolved?
What does that mean to the present-day cognitive scientist?

This month, we start from the Cognitive Revolution and make our way through the foundational ideas of Gibson, Pylyshyn, and Marr. We present a lowdown on what is currently happening in the field, and finally, we ask a scientist about what needs to change.

IN THIS ISSUE

Cognitive Revolution, Verbal Behavior, Computing: Research Recap



Neurocomic, by Matteo Farinella and Hana Ros (2013)

- **The cognitive revolution: A historical perspective**
  George Miller was among those at the forefront of the inception of Cognitive Science. Read his personal account of moving away from behaviorism, grappling with Information Theory, and witnessing paradigm shifts in Linguistics and AI.
- **A Review of B. F. Skinner's Verbal Behavior**
  This paper by Noam Chomsky is widely agreed within the Cognitive Science community to be the provenance of the Cognitive Revolution. Chomsky's take-down of behavioral explanation of language acquisition remains a lore worth a read for its exceptional insight, despite, the somewhat hasty cognitive underpinnings.
- **Models of Visual Perception**
  In '**Visual information processing: the structure and creation of visual representations**', David Marr presented a prolific, if somewhat deliberately vague, computational account of vision, with an added possibility of extending the analysis to other cognitive processes.
  Counter to Marr's computationally intensive outlook, JJ Gibson took an ecological approach. Edwin Hutchins reviews Gibson's somewhat disparate, yet impactful analysis in '**Cognitive Ecology**'.
- **Computing in Cognitive Science**
  Last month, we looked at Van Gelder's opposition to the computing machine analogy. Surprisingly, though, researchers and philosophers remain divided on the definition of computing. Zenon Pylyshyn tackles this question and discusses the many roles computing plays in cognitive science - that of a tool, a source of ideas, and a way to understand cognition itself.

For more..

Read this Stanford Encyclopedia entry on Cognitive Science for a thorough overview of all that contributes to making the subject interdisciplinary.

Watch

Károly Zsolnai-Fehér summarizes Lake *et al*'s paper 'Building Machines that Learn and Think Like Humans'. Watch it here. DeepMind researchers have something to add to the original idea; read their commentary on the paper here.

Handpicked from the World Wide Web

Digital Gem

It's Grad School Application Season!
Applying to graduate school is daunting and time-consuming. Find a repository of resources, including sample interview questions and personal statements, in this Google Drive.

Too Many Bookmarks
We keep bookmarking lists of useful resources, only to eventually get lost among the links. This website is a meta-list of all those lists, with a focus on Cognitive Neuroscience.

Events and Opportunities

Neural Interfaces for Neurobiological Insights (October 9)
Find more details here. Register here. If you are a graduate student and want to deliver a 10-minute talk about Brain-Machine Interfaces and/or Motor Control, go here.
Deadlines: September 9 (for speakers), October 8 (for attendees)

Bernstein Conference (September 29 - October 1)
Registration and more details here.
Deadline: September 22

Vision in Context Symposium (September 15)
More details here. Register here.

DST AWSAR (Augmenting Writing Skill for Articulating Research) Awards
Only for Indian citizens registered as doctoral or postdoctoral candidates in STEM. More details here.
Deadline: September 30

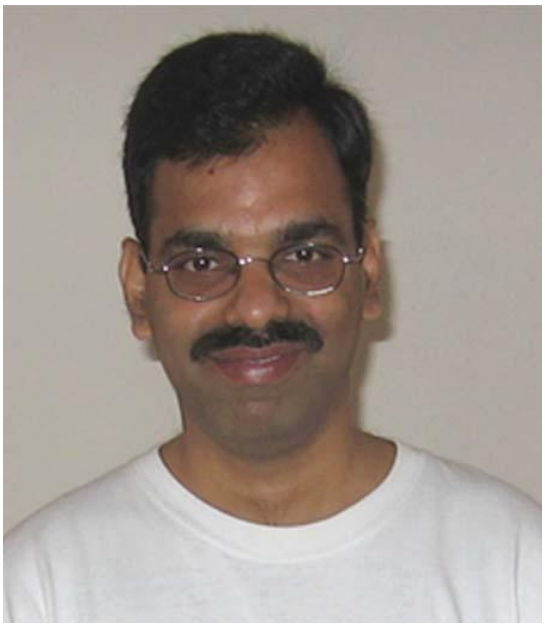
Oxford Autumn School is Neuroscience (September 28-29)
More details here. Register here.

Triangulating Intelligence: Melding Neuroscience, Psychology, and AI (October 7)
Agenda and registration details here.

Meet CGS: Narayanan Srinivasan

Narayanan Srinivasan is a Professor in the Cognitive Science IDP at IIT-Kanpur. He has wide ranging interests in cognitive science and uses multiple approaches to study mental processes. We talk to him about how philosophy informs his work and the trade-off between breadth and depth in research.

How do you define Cognitive Science?
My simple definition is 'Cognitive Science is the study of mind'.



Do we have a clear definition of what the mind is?
That's the reason we need to study it.

If our problem isn't well defined, can we study it?
It is not necessary to define everything at the onset. For instance, there are no agreed upon definitions of space and time in physics. They are fundamental concepts, but continue to be debated. I don't think definition is the beginning of science. You propose entities or processes or certain things to explain certain other things. You observe your surroundings using common-sense. We think we have minds, we perceive, we remember, we speak and are conscious. These are our observations. We want to understand how these observations occur and that is essentially what cognitive science is about.

Some of your work falls under the broad domain of consciousness. How does one design experiments to study an abstract and subjective idea such as this? More broadly, what is the relationship between Philosophy and Cognitive Science? How does Philosophy inform and enhance theoretical frameworks?
You use observations from subjective experience to find patterns which are lawful relationships of some kind. You then theorize on the basis of these patterns and, ideally, make predictions. Experimental results consistent with the predictions can lead to the expansion of your theory to explain more things. You can alter the theory if the results are inconsistent and this process goes on iteratively. This is true of all sciences.With regard to consciousness, the minimum starting point is to consider your first person experience or phenomenological reports as data. Like any other data, try to look for consistencies or patterns in the data, manipulate certain things and see how the phenomenological reports change. If you can theorize about these changes, you're studying consciousness scientifically.

Are there any pointers you can share about good practices while working within the field, based on your experience guiding several students over the years?

The first thing you need is motivation and interest. If you are not very motivated, it is hard to keep going. Working hard and devoting time are important as well. One needs to devote time to master any skill. I know this is generic advice, but I think it's important to enjoy what you do and stay motivated. If you're enjoying something, you won't mind doing It for a long time.

What are the pitfalls to avoid and good ways to think about the experiments we do? You have, in the past, talked about failure when we try to put our research out. How do you keep your motivation up in the face of failure?

There are people who have worked on a single problem for many years, like Fermat's theorem. It is just the love of problem-solving that's key. Assuming you entered the field with an active interest, the only purpose should be actually doing it.While designing an experiment protocol, it is very important to control for your biases and think about what the outcomes could be. Set controls for as many variables as you can account for, ideally all of them. The better you do control, the better chance of finding out the effect you are attempting to explore. Measurement techniques are also something you should be careful about, especially as they are improving with the progression of science.

With new Cognitive Science programs starting in various universities, what does the job market for Cognitive Science graduates look like? Has it evolved over the years?

As for academic jobs, Cognitive Scientists in India do not necessarily teach in Cognitive Science departments. They may get jobs in Social Sciences or Computer Science or Neuroscience departments, to name a few. Some choose to go abroad for PhDs and postdocs and start labs there. I don't think there will be a hundred Cognitive Science departments in India, that is unlikely to happen. What we want is those disciplines that interface or associate strongly with Cognitive Science to start hiring Cognitive Scientists. For industry jobs, I think it's highly skill-dependent. If you have the skills that a job requires, your background becomes secondary.

Dedicated Cognitive Science graduate programs are relatively new in India. What is your opinion on the pedagogy - are students learning the necessary skills, or does the teaching need to evolve?

The answer can depend on students, faculty, and even the facilities. As teachers, we know our training can never be perfect and always want to improve it. We also try to make our programs better, based on experience and student feedback.There are certain things that students need to know - experiment design and data analysis, for instance. But once these basic skills are in place, one can only learn by doing. Doing cognitive science is what can help students learn all aspects of it. They can always have preferences and specific things they're better at, but the goal should be to learn as much as possible by doing.

Across academia, the number of publications (or similar metrics) have become a measure of people's skill. At every stage, be it graduate studies or jobs, one of the primary decision factors is the number of publications. People agree that it is not a very good measure of someone's knowledge or skill, but it continues to be used.Does this need to change, and if so, how? What are the alternatives?

I don't think we should aim for high scores on a metric. The reason for doing something should be enjoyment. Metrics can work as positive reinforcements, but they are not meant for self evaluation and shouldn't be your reason to do research.Generally speaking, it's rare that people are good at their work but fall short on the metrics. It can happen, but it's not common. As a scientist, I think publishing is important, not to improve your publication score, but to communicate with others.As an evaluator, I don't think there is a perfect way to evaluate. It will be a mistake to use only some numbers to evaluate someone and we try to include multiple factors. We talk to candidates during interviews and also learn from how others evaluate people's work.

There is a vast array of topics one can study within Cognitive Science. At the same time, there are several tools to study these topics. Your own research work is very diverse in the topics that it covers. Is there a trade-off between the depth and breadth of research one does?

Isaiah Berlin wrote an interesting essay called The Hedgehog and The Fox. The gist is that a fox knows about many things, there's breadth but not depth. A hedgehog knows one thing, but in depth. You can think of this as two categories of people, or two strategies. I find many topics interesting and I can learn a little bit about them by working on them. It's a matter of personal choice and interest. However, if I have to give advice, I'd say that students should start with one area and spend a few years exploring its depth, and diversify after that.