# Interview: Mark D'Esposito with Michael S. Gazzaniga

*Fifteen years ago, Mike Gazzaniga founded the* Journal of Cognitive Neuroscience. *This year, Mike has decided to step down as Editor-in-Chief and pass on the torch. From the humble beginnings of putting together* JOCN *in his garage, Mike has transformed* JOCN *into the leading voice of cognitive neuroscientists, and a journal on steep upward trajectory. This is a tough act to follow and these are big shoes to fill. With the start of* JOCN*, and a few years later the Cognitive Neuroscience Society, Mike launched a scientific discipline. As the new Editors and I undertake the enormous responsibility of carrying on Mike's tradition of handling the publication of* JOCN *with innovation and integrity, we thought it would be appropriate to begin a our first issue with a few words from Mike himself. As you will see, we have asked him some difficult questions, and as usual, Mike's answers are not only remarkably insightful but will undoubtedly guide and inspire us regarding our direction over the next fifteen years.*

***Mark D'Esposito***
***Editor-in-Chief***

**JOCN:** Has the conduct of brain/mind research changed since you entered the field in the 1960s, or is the process the same, merely the methods different? If there have been paradigm shifts, and so forth, what were the most important? Were they related to individual scientific discoveries and theoretical insights, or to changes in society that then modified the scientific venture?

**MSG:** It is funny you should ask. I recently had the pleasure of being the "wildcard" speaker at the Stanford Neuroscience Retreat in Monterey. The assignment was to reflect on what the future of neuroscience might look like. After the proper caveats that only fools spoke about the future I took my shot at it.

One of the first things I discussed was the fact that scientific enquiry is much less direct and personal and much more interdisciplinary and communal. When I started my graduate studies with Roger Sperry and stumbled into doing the first human split-brain studies at Caltech, it was relatively easy and very personal. Everything from calling the patient to conceiving, designing, and implementing the experiments were done by me. Nothing was between the scientist and his topic. There were not 6 technicians, complex devices, and a hierarchy of staff to deal with. It was you and the patient. There was no networking and the artificial relationships that arise from that kind of thing. I was all deeply personal and almost private.

Of course, all of this was enhanced in immeasurable ways with daily conversations that sometimes went on for hours with Sperry. He and I had a very personal relationship during my time at Caltech. He was every much a part of the work as I was and his wisdom was all over the place. Sperry was a truly great scientist. That goes without saying. Yet, the actual ability to do the work was much simpler.

So I think the process has changed dramatically. Adding to the process is the content of the questions asked. In the early 1960s the full impact of cognitive science on neuroscience had not yet occurred. Moving out of SR psychology and into the realm of "representations" was a process that took time and to some extent continues until this day.

**JOCN:** What is the single greatest unknown question about the human mind? What is the single thing you most want to know about the human mind? Indeed, what constitutes a breakthrough in cognitive neuroscience?

**MSG:** With each passing decade, more and more is known about the mechanistic action of the nervous system and how it produces perceptual, attentional, and mnemonic function and decisions. While this assertion serves as the motivating aspiration of modern neuroscience, it should also be observed, the actual goal is nowhere in sight.

Having just completed a conference where over 80 leading scientists presented their research findings on how the brain enables mind, it became obvious that the central question of cognitive neuroscience remains not only unanswered, but worse—it remains unexamined. The brain scientists who are addressing issues of human cognition are producing work that illuminates which brain systems correlate with particular measurable human behaviours. Thus, a series of studies might investigate which areas of the visual system become activated when the subject attends to a particular visual stimulus. While these correlations are of interest and have been found, the question of how the brain knows whether, when, and how to increase the gain of a particular neuronal system remains unknown. Overall, modern studies always seem to leave room for the little homunculus, the little ghost in the machine, which does all the directing of brain traffic. As a field, it is commonplace to hear the phrase "top–down processes versus bottom–up processes" (that is, processes driven by feedback from "higher" areas of the brain, rather than direct input from the sensory stimuli), but the fact of the matter is that no one knows anything about the "top" in "top–down." This is a

major problem of cognitive neuroscience today and I hope that it will become one of the central issues in cognitive neuroscience.

**JOCN:** What motivated you to start the Journal and the Society? These enterprises involve a lot of work and headaches. Why hassle with all that when you are also running a lab, directing grants, developing graduate programs, and so on?

**MSG:** There is insouciance about me that I can't explain. Taking on new projects is part of my nature and it is not that I don't worry about each and every one of them. I simply don't worry myself to death about them. That, combined with a deep distaste for group decisions and the amount of time that they entail, finds me jumping at projects that require only action in order to launch! Both the Journal and the Society required someone to take the plunge and I was there to do it. Both efforts were assisted by dozens of others and the workload was quickly distributed.

**JOCN:** Regarding the Journal, how were other journals at the time handling papers that were studying the physical basis of mind?

**MSG:** At the time, there were many great journals but none had the idiom of cognitive neuroscience at their core. *Neuropsychologia* emphasized classic neuropsychology with straight forward structure/function correlations. *Brain*, a truly great journal, was centered in neurology and the *Journal of Neuroscience* was centered in almost atheoretical basic neuroscience. Given this background, we were still urged NOT to start another journal. But we did, and it has been a huge success.

**JOCN:** What's the fun side of running the Journal? Or the Society?

**MSG:** In getting both efforts off the ground there were many moments where there were more mirrors than content. Indeed, my wife and I started the Journal in our garage in Vermont and actually set the type via Pagemaker for the first issue. We bullied our dear friends into writing papers for us. We asked other friends to help with the reviewing process before it was clear it was worth their time. Now, while this may sound like a tedious job, it is actually fun because behind it all, we were part of an activity that would allow cognitive neuroscience to flourish. We could change the order of papers to make a particular issue more balanced. I would hear a terrific paper at a conference and would invite the author to submit it to us and guaranteed them a cover story. That sort of thing. By being small and independent, we could improvise and be, well, inventive.

**JOCN:** Has the success of the Journal and Society exceeded your expectations?

**MSG:** Yes, but that is almost entirely due to the field itself. Cognitive neuroscience is where the serious action is in brain science. It is the vanguard for those that are in this field because they are trying to figure out the deepest mystery of biology, namely, how does the brain enable mind.

**JOCN:** This past year, there are over 20 faculty positions in cognitive neuroscience. Are you thrilled, surprised, or worried about this fact?

**MSG:** It can only be that way. E. O. Wilson, in his marvelous book *Consilence,* talks about inevitable fact that psychology, and indeed all social sciences, will become more biological. A taste that a cognitive question can actually be better understood or at least more deeply understood when framed in biological terms trumps all earlier efforts to understand the mind. Although the field is terribly young and woefully short of wrestling to the floor the big questions, I think few doubt that students of the mind sciences will have to take the cognitive neuroscience approach.

**JOCN:** What has been your greatest career achievement?

**MSG:** Well, as the readers of this Journal surely know, there is nothing on this earth quite like scientific discovery. There is that moment when you first know something, have unlocked a secret of nature, that is so gratifying and in a way so humbling. It feels scary in a way as well. How did the great opaqueness of Mother Nature let us discover one of her secrets? I remember my first moment, more than 40 years ago, when Case W.J. denied he had seen a light I had flashed in the left visual field. Yet almost simultaneously I observed his left hand hit a reaction

time button. I was stunned and it was the trial that gave birth to 40 years of work. To this day, when one of our split-brain patients carries out a task that reveals the basic syndrome, I am a little short of breath.

**JOCN:** You've written a lot of books. What's your favorite?

**MSG:** I guess it is *The Social Brain*. It felt right in writing it and in re-reading it years later. The split-brain story is dynamic and ever changing. I have written a sequel to that story but I am sitting on it.

Writing books is a major extra effort. What is so gratifying about the work though is the unsolicited letters one receives from the army of really bright people in this world who keep informed on all kinds of matters. They may be famous (Tom Wolfe wrote me to say *The Social Brain* was the best book on the brain every written!) or they may be housewives who somehow work in to their schedule reading such arcane adventures and have huge insights into life's story.

**JOCN:** And now you've gotten into textbook writing, first with the cognitive neuroscience book and now a new introductory book. Why?

**MSG:** All of these efforts have the pedagogical objective of pushing the biological side of the mind. That is a good thing to do. Of course, there is the financial aspect as well. I have six children and so far every dime of my royalties goes back to higher education in the form of college tuition.

**JOCN:** When someone asks you what you do for a living, what do you tell them?

**MSG:** The short answer is "Study the brain." The longer answer involves a discourse on wonder, on the fantastic things science is now doing and the things we are finding out about ourselves. I continue to be floored about the gap that exists between the cold, sober assessment of human history and modern knowledge about how human beliefs emerge with those that hold on to the received wisdom of religious beliefs. My work on the concept of the "interpreter" finds me always aghast at the value people place on their current beliefs. Our species spins out stories, seeks meaning when frequently there is none. Why I am such a devotee to science is that, in the long run, it gets the story right, establishes what is real and what is not.

**JOCN:** Tell us about your time on the President's Council on Bioethics. Do you think that this council will have an impact on public policy?

**MSG:** Only history will tell. The first report that emerged represented some sort of triumph of reason over prior assumption. After 6 months of debate 10 out of 17 members voted to support biomedical cloning. The general scientific press thought the council was "stacked" against such a conclusion but in the end, reasonable people saw the value of going forward with stem cell research using the techniques of somatic cell nuclear transfer and only 7 wanted to ban both biomedical cloning and reproductive cloning. None of the members were for reproductive cloning.

A second report has just come on entitled "Beyond Therapy". This is a largely an educational publication that draws attention to a variety of issues we should all think about. For example, Ritalin is used to control hyperactive children, mostly boys. That is the therapy use. It can also be used to up SAT scores, fight against afternoon lassitude, and a variety of other uses. Is that OK?

Of more interest to cognitive neuroscientists are the findings on memory. If we can selectively abolish bad memories, should we do it? Does that change the fabric of a full psyche? These and dozens of other issues came up in the course of the testimony and, while I didn't feel all fields were represented with the same depth, fascinating issues were raised that we should all be thinking about. Some people say the ethical questions of the 21st century will be centered in the brain sciences.