

*The Chronicle Review*

<http://chronicle.com/weekly/v55/i15/15b00801.htm>

From the issue dated December 5, 2008

## In the Thrall of Neuroscience

### Researchers across academe mine the possibilities of brain imaging

By JENNIFER RUARK

An economist, an electrical engineer, and a philosopher walk into a lab. That sounds like the beginning of a joke, but such scenarios are becoming more frequent. Researchers across academe are collaborating with neuroscientists to incorporate brain imaging into their work.

For decades, scholars in many disciplines have drawn ideas from cognitive psychology about, say, how people make decisions or respond to aesthetic cues. More recently, advances in brain imaging hold out the promise that psychological processes are based on biological activity that can be identified for all behavior. Researchers have examined which neural circuits fire during a religious experience, how the brain processes Shakespearean syntax, how the mind responds to pictures of political candidates.

The three guys walking into the lab were all, as it happens, trained in neuroimaging. Ming Hsu, an assistant professor of economics at the University of Illinois at Urbana-Champaign, Cédric R. Anen, then a graduate student in electrical engineering at the California Institute of Technology, and Steven R. Quartz, a philosopher and neuroscientist also at Caltech, were interested in what is at work in the brain when people make moral trade-offs.

A standard debate in philosophy is whether it is more moral to strive for equity or for efficiency. When delivering food to a region suffering from famine, for example, should relief workers try to spread the food around equally (as Immanuel Kant would) or limit distribution in order to save more food from spoiling (as the utilitarian John Stuart Mills would)? Psychologists have found that people generally prefer the first option but differ in how much inequity they will tolerate to maximize individual good. Whether such decisions are based on level-headed logic or gut feeling is another question that thinkers in both fields have pondered.

Hsu and his collaborators asked 26 adults to submit to functional MRI's while choosing how to allocate meals to a group of orphans in northern Uganda. The subjects who preferred the loss of some meals to ensure that the food was distributed fairly showed more activity in regions of the brain (such as the insula) that tend to fire when a person is asked to think about inequity, but not more activity in regions (such as the putamen) that tend to be active when a person is asked to think about efficiency or benefiting the most people. In other words, those people seemed to weigh equity more in choosing how to distribute the food — a finding consistent with previous research in cognitive psychology as well as work in neuroeconomics that examined people's brains when they merely considered moral questions rather than taking action.

The researchers also found that during the experiment, brain activity was high in the insular cortex, a region associated with emotion. So while the subjects' sense of justice aligned more with Kant's than with Mills's, it appeared to be based on feelings rather than cool calculation — in contrast to Kant's notion that moral decisions are solely rational ones.

Or not. Some social-scientific work based on neuroimaging has been criticized for overstating the tool's ability to "read minds." A controversial article published last year in *The New York Times* was headlined "This Is Your Brain on Politics." The authors — neuroscientists and political scientists — claimed, for example, that swing voters who rated Hillary Clinton unfavorably on a questionnaire were actually ambivalent, because when looking at images of her they showed "significant activity in the anterior cingulate cortex, an emotional center of the brain that is aroused when a person feels compelled to act in two different ways but must choose one."

Geoffrey K. Aguirre, a neurologist at the University of Pennsylvania, said such a leap was tantamount to treating neuroimaging data like "a Rorschach blot." Writing in September in the magazine *Cerebrum*, he attacked the nascent field of political neuroimaging — and, while he was at it, social, economic, and marketing neuroscience — for getting the science backwards: trying to identify people's states of mind based on images of their brains rather than observing the effects on their brains of known states of mind.

But in large part, critics like Aguirre are preaching to the converted, says Hsu, the economist at Illinois. "Brain imaging is just one of the methods that we use," he says. "We all know that fMRI is correlational, that there is a problem with reverse inference. That's one of the reasons that having a very good understanding of the behavior, and having a model of the behavior, is important."

Daniel Lende, an assistant professor of anthropology at the University of Notre Dame, would like nothing better. Lende, a founder of the blog [neuroanthropology.net](http://neuroanthropology.net), says more neuroscientists should be looking for opportunities to collaborate with social scientists — particularly cultural anthropologists, who, he says, so far have been left on the margins of the neuroscience revolution. "Brain imaging is a wonderful technology, just for the ability to have maps," he says. "But they're akin to geographic maps, just as those don't tell you why states go to war. For that you need social science." His own research on drug addiction combines findings about the role dopamine plays in the brain with his field research, which shows that addicts' cravings are in part determined by their cultural and social context. "How addiction plays out on the ground could drive more ecologically valid testing in the lab," he argues.

Lende and his collaborator on [neuranthropology.net](http://neuranthropology.net), Greg Downey, an anthropologist at Macquarie University, in Sydney, Australia, organized a panel on "The Encultured Brain" in November at the American Anthropological Association's annual meeting. The panel brought together cultural anthropologists interested in neuroscience and how it might both inform their work and be informed by anthropology.

A sociologist posting recently on the blog [orgtheory.net](http://orgtheory.net) said that he'd found that reviewers in his field were put off by references in his work to neuroscience, but seemed less bothered by the term "cognitive science" (not exactly the same thing). Scholars in the humanities may find it even harder to make their adoption of neuroimaging credible. After all, fields like literary studies tend to be driven less by data than by efforts to understand human experience — of life, of literature — in qualitative ways. In an article in *The Times* of London last April, headlined "The Neuroscience Delusion," Raymond Tallis, a gerontologist and longtime critic of reductionist evolutionary biology, accused some neuroscientists of "colluding" in the hype surrounding their field and of leading scholars of literary theory and other aesthetic disciplines to take an approach that "is, at the very least, a little premature." Scientists "have yet to make observations in or about the stand-alone brain that explain even simple experiences," he wrote.

"The switch from Theory to 'biologism,'" Tallis wrote, "leaves something essential unchanged: the habit of the uncritical application of very general ideas to works of literature, whose distinctive features, deliberate intentions and calculated virtues are consequently lost."

Ira Konigsberg, a professor emeritus of film and English at the University of Michigan at Ann Arbor, would not deny that the makers of literature and film deliberately create distinctive features. And Konigsberg, editor of the new journal *Projections: The Journal for Movies and Mind*, which publishes work in

"neurocinematics," among other subfields, acknowledges that neuroscience is in its infancy. "But all discussions of aesthetic pleasure are going to be theoretical to begin with," he says. Neuroscience at this point merely opens the future possibility of seeing what was theoretical documented scientifically.

"In the development of thought," Konigsberg says, "it will make its contributions, and at some point those contributions will become accepted, and people will move on to other things. But right now the ability to bring science together with the arts is very exciting."

For example, a recent article in *Projections* argued that film theorists might use brain imaging to better understand the effects of certain aesthetic choices — lighting, movement, montage, and so forth. The authors even suggested that Hollywood could use brain scans, rather than surveys and focus groups, to judge how engaging its new movies are.

Researchers at New York University's Center for Neural Science used MRI scanners to measure the brain activity of subjects while they watched three clips: 30 minutes of Sergio Leone's *The Good, the Bad and the Ugly*, an episode of *Alfred Hitchcock Presents*, and an episode of the comedy *Curb Your Enthusiasm*. To establish a baseline, the researchers also showed subjects a 10-minute, one-shot video of an outdoor concert — a mere reproduction of reality.

The Hitchcock clip was found to evoke the most similar brain activity among all subjects, consistently turning on and switching off responses of different regions in more than 65 percent of the cortex. The study, wrote the researchers, offers neuroscientific evidence for Hitchcock's "notoriously famous ability to master and manipulate viewers' minds."

"Our data suggest," they wrote, "that achieving a tight control over viewers' brains during a movie requires, in most cases, intentional construction of the film's sequence through aesthetic means."

Those conclusions may make some neuroscientific researchers cringe as much as a Hitchcock film does. But say the findings hold up: What's so surprising about finding that the brain responds to aesthetics?

"This is exactly what people have been saying in film theory since the 1950s," acknowledges Ohad Landesman, a film theorist and Ph.D. candidate at NYU who collaborated with the neuroscientists on the article. But the work — more significantly than being a tool for the film industry — sets the stage for more neurocinematic research. Working with neuroscientists, Landesman says, film theorists could examine what happens in the brain when people watch physical comedy, or how brain activity differs between viewers of a foreign film who rely on subtitles and those who are native speakers of its language.

"There is so much more work to be done with this tool to understand how narrative works," he says.

Meanwhile, his co-author, Uri Hasson, an assistant professor of psychology at Princeton University, has been contacted about the research by a neuromarketing company. n

*Jennifer Ruark is a deputy managing editor at The Chronicle.*

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