

# Exploring the MIND

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With its cavernous interior and concrete floors, San Francisco's Exploratorium looks more like an airplane hangar than a museum. In fact, a visible workshop taking up part of the first floor inspires, at least for a moment, thoughts of mysterious projects at Area 51.

But it's no secret why the 39-year-old science museum is one of the world's leading institutions for hands-on science education. The Exploratorium is a collection of interactive exhibits that allow visitors to learn about topics ranging from global climate change to the physics of skateboarding. And now, psychological science is in the spotlight with MIND, the museum's newest exhibit, highlighting the complex and sometimes mysterious processes that govern everyday thinking and behavior.

Taking a Sip of Conflict at the  
Exploratorium

(Photo: (c) The Exploratorium,  
[www.exploratorium.edu](http://www.exploratorium.edu)  
Photo Credit, Amy Snyder)

## Know Your Own Mind

MIND's primary goal is to get visitors to observe and reflect upon their own psychological experiences through a series of interactive exhibits. The exhibits run the gamut of psychological research, but they center around three main themes: attention, emotions, and judgment. At the entry to the MIND exhibition, visitors encounter the first station: an invitation to drink out of a water fountain made from an unused toilet. Drinking from the fountain forces visitors to experience tension between the logical knowledge that the toilet is just as clean as any other water fountain and their visceral reaction that toilets are dirty. In other exhibits, visitors can see themselves sweat through a powerful magnifier, experience how color affects mood by placing their heads in an orb which surrounds them with one color at a time, detect when a friend is lying based on physiological and facial cues, identify emotions based only on eyes, and take an Implicit Association Test by categorizing specially made cards, in addition to many, many more tasks designed to highlight psychological phenomena. Volunteers are often on hand dissecting animal brains and providing a first-hand look at the biological structures involved in the processes that the visitor is learning about.

MIND is the result of four years of meticulous planning, which included collecting input from advisors, brainstorming ideas for exhibits, and contemplating how to market psychology to a generally uninformed public. Several APS Fellows played a prominent role in this process.

APS Fellow Steven Palmer, University of California, Berkeley, has been with the project since its inception. "They ...interviewed me about what I thought were some of the most exciting developments in cognitive psychology and cognitive science," he recalls. "It was a fun afternoon."

After initial planning, the Exploratorium received a grant from the National Science Foundation, which was used to build prototypes of possible exhibits. Advisors to the exhibition reconvened to evaluate the museum's progress. "Basically, we got to 'test drive' them" says Palmer.

After parsing out what worked and what didn't, the museum had 40 exhibits encompassing attention, emotion, and judgment areas of research in psychological science.

### **Reaching the Public**

The exhibition is in line with one of APS's primary missions: the giving away of psychology. The museum hopes to have visitors come away from the exhibition with the understanding of the science of psychology. According to the Exploratorium, "Visitors will learn firsthand that mental and emotional processes — often subtle or even unconscious — are accessible to deep and quantifiable exploration." The exhibit also is designed to broaden public perception of the mind beyond just issues of mental illness.

### **Bringing Research to the Exhibit Floor**

Emulating psychological science on the floor is no easy task. "It's actually rather rare for the methods or results of a real research project to find their way into an exhibit," says Hugh McDonald, Senior Science Writer for the Exploratorium. "Often what makes a good research stimulus or protocol doesn't make a good informal exhibit" given the broad audience range and generally frenzied state of the museum floor.

And as any seasoned researcher knows, psychological effects are often small, producing noticeable outcomes only when they are examined statistically. The Exploratorium was thus faced with the challenge of creating installations that would consistently work and more importantly, create what McDonald describes as a "wow" experience for the visitor. This meant a lot of tinkering on behalf of The Exploratorium, with most exhibits evolving into only rough facsimiles of the original research.

There are exceptions, however: the *Competent Candidates* exhibit is derived directly from research conducted by APS member Alexander Todorov, Princeton University, and his colleagues (for more in-depth reading, see the June 10, 2005 issue of *Science*, 1623-1626). Visitors to this exhibit discover that they are able to determine the competence of political candidates — and thus their likelihood of winning an election — merely through a split-second exposure to their faces.

There is also *Count the Bounces*, which lifts stimuli directly from attention research done by Dan Simon, University of Illinois at Urbana-Champaign. Visitors are instructed to count the number of bounce passes in a video of a simulated basketball game. It comes as a surprise to most visitors that they were paying such close attention to the basketballs, they failed to notice a man dressed as a gorilla walking through the background.

*Trading Places* is a take on the Implicit Association Test developed by APS Fellows Mahzarin Banaji and Anthony Greenwald. But rather than using a computer (a standard procedure for the task, which aims to measure underlying attitudes and prejudices), visitors attempt to quickly sort cards into their appropriate piles, making for a more interactive exhibit than sitting at a computer screen. This mutation from computer to card game illustrates the inherent challenges in adapting psychological research for the exhibit, but the hard work has paid off. "It does seem to work in getting visitors to actually feel their own conflict in working with stereotypical categories, which was the aim" says McDonald.

One of the challenges the Exploratorium faced was determining how to treat the less pleasant workings of our mind. This was a particular concern given the interactive nature of the exhibits, which are designed to educate through direct experience.

Take, for example, the *Center of Attention* exhibit. Visitors enter a voting booth-like box with a fake lectern and are asked to speak freely. A simulated audience will then cheer or boo while the visitor experiences their emotional and cognitive reactions to being the center of attention. As can be expected, the exhibit can elicit some negative emotions. It is rumored, in fact, that *Center of Attention* brought one Exploratorium employee to tears during pilot testing.

What results is a constant push and pull for the exhibition to be the comprehensive educational tool it sets out to be while also providing an experience that visitors can deem enjoyable.

### **“So Completely Different”**

Overall, the MIND exhibition has experienced considerable success since it opened its doors in November. “People like them,” says APS Fellow Paul Ekman of the four exhibits based on his own research. “They are crowded most of the time.”

Regardless, the exhibition continues to evolve. In fact, it might become a laboratory itself in the near future. Palmer and the Exploratorium are currently working towards collecting data on the museum floor. This makes sense, as the Exploratorium draws large crowds of diverse people — an ideal testing ground for any researcher looking to boost the ecological validity of their research.

“The idea is that once behavioral scientists know about this opportunity, they could submit requests to the Exploratorium staff and advisors, some appropriate subset of which could then be implemented on the ground floor,” says Palmer.

But, for now, MIND is happy to serve as an interactive playground to explore our complex and interwoven psychological processes that departs from traditional ways of learning about the connections between the brain and behavior. ?

*Additional reporting for this article by Ann Conkle.*

## **Paul Ekman’s Pioneering Work on Human Emotional Expressions**

### **By Hugh McDonald**

Paul Ekman’s work has been called “groundbreaking,” “pathfinding,” even “revolutionary.” Those adjectives are often misused, at least in the popular press — but in this case, they’re apt: Ekman’s New Guinea research established the universality of human emotional expressions and illuminated a key aspect of our evolutionary history.

In January, Ekman, APS Charter Member and Fellow and Emeritus Professor of Psychology at University of California, San Francisco, discussed his work with APS Past President Robert Levenson, Director of the University of California, Berkeley’s Institute of Personality and Social Research, in a standing-room-only presentation at San Francisco’s Exploratorium. In a warm conversation with

longtime friend Levenson, Ekman gave the audience a glimpse of the ideas that inspired his research and the passion that drove it forward.

As a child, Ekman dreamed of exploration and discovery: “Magellan was my hero. I wanted to go where no one had been, to find what no one else had found.” But at 14, his interest in emotion was sharpened by his mother’s suicide. “I was very attached to her,” he said, “and I wanted to do something to help people like her.” When he first encountered Freud in a rhetoric class, he knew he had found his path.

However, Ekman’s instincts led him to question much of the day’s accepted psychological wisdom. For one thing, “I thought that the road to understanding, to helping, was not to study abnormal but *normal* behavior.” And he had methodological concerns: “How could you tell whether depressed people, suicidal people, really meant what they said? I don’t think most people know why they’re doing what they’re doing.” This early quest for new windows on our emotional lives crystallized in Ekman’s growing interest in nonverbal behavior — and particularly in the subtly emotive human face.

Our faces are capable of an incredible expressive range, and many of its movements are outside our conscious control. Furthermore, as social creatures, we read the expressions of others with amazing perceptual agility. But are those expressions learned, or are they part of our evolutionary legacy?

That this question now seems settled is, in part, a testament to how Ekman’s work affected the field. Ekman pointed out that at the time of his training (he received his PhD in clinical psychology from Adelphi University in 1958), “Learning was everything. I learned that behavior came from learning, from family.”

The behaviorist dogma extended to our faces. Most famously, anthropologist Margaret Mead argued for the idea of facial expressions as learned, culturally arbitrary symbols. This contrasted sharply with Charles Darwin’s view that our facial expressions were innate and shaped by evolutionary processes.

The Darwinian position would be supported by evidence showing that widely separated peoples shared facial expressions associated with common emotional experiences. But resolving the dispute called for a methodology that ruled out explanations based on learning or cultural transmission. And *that* meant collecting data in remote places, with people isolated from Western contact.

Ekman saw this as an opportunity to explore a new frontier. Furthermore, he knew he had little time; given the pace of human expansion, there would soon be no “untouched” cultures left to study.

Paul Ekman in New Guinea, 1967,  
(Photo Courtesy of Paul Ekman Group, LLC)

The opportunity came in 1967, when Ekman and his colleagues made their first journey to New Guinea to photograph the Fore (pronounced for-ay), an isolated society living in the island’s rugged southeastern highlands. Trudging through a remote jungle, collecting data to resolve a fundamental psychological question — this was the realization of the young scientist’s dream. But as in many research projects, the process evolved as the project continued.

Initially, Ekman's team used a *Thematic Apperception Test*-like method: He showed a photograph of a smiling or frowning person and asked the participant to tell a story about the pictured person's feelings. But although the data were intriguing, the method made participants uncomfortable. Ekman began to feel as if his journey might end in failure. "I was listening to the Beatles," he said, "and I felt like 'The Fool on The Hill.'"

That's when he hit his methodological stride. He switched to a production-oriented process, describing a situation and asking participants to make the corresponding facial expression. The team also studied judgment by giving participants a story and asking which of three faces showed the appropriate emotional response.

Ekman found that the Fore's facial expressions for happiness, sadness, fear, surprise, anger, and disgust were strikingly similar to those found in other cultures. For example, when asked to make expressions associated with meeting an old friend or stumbling upon a decaying animal, they showed the same movements of eye and mouth muscles seen in Westerners under similar circumstances.

The fact that the Fore showed these "universals" despite little contact with other cultures — and that both Fore and Western viewers of facial expressions were quick to identify the underlying situations — strongly suggested that Darwin's view of innate expressions was correct.

But in addition to resolving the controversy, the work also generated new inquiry and experimentation. Since his time with the Fore, Ekman's continuing study of the face has revealed our fleeting "microexpressions," explored display rules governing our attempts to control our faces, and deepened our understanding of links between facial expressions and deception.

With prodding from Levenson, however, Ekman conceded something more profound about his life's work — that its ultimate aim is the reduction of human suffering. That goal is highlighted by an upcoming book co-authored with the Dalai Lama. As Ekman notes, the Nobel laureate became interested in the field because the universality of emotional expressions illustrates the unity of all humankind.

Ekman's thoughtful reflections coincided with an exhibition of his New Guinea photographs as part of the Exploratorium's new MIND collection. Even after forty years, these images of the Fore are striking; Although they are key data from a particularly influential social science research program, they are also richly human documents, evocative statements of both our shared emotional experience and of our passion to understand ourselves.

*The Search for Universals in Human Emotion: Images from the New Guinea Expedition will be on display at the Exploratorium through May 11, 2008. To learn more about the museum's National Science Foundation-funded **MIND** collection, please visit [www.exploratorium.edu/mind](http://www.exploratorium.edu/mind). Learn more about Paul Ekman's work at [www.paulekman.com](http://www.paulekman.com).*

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