MAPPING THE MIND

Searching for the Why of Buy

Researchers scan for insight into how marketing may brand the brain's preference for products and politicians.

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Pictures of products danced in his head.

There was an Apple iPod, then a black Aeron chair. A coffeepot by Capresso and a washing machine by Dyson. Christian Dior followed by Versace, Oakley, Honda, Evian and Louis Vuitton.

Each icon of commercial design — 140 in all — was projected onto goggles covering the eyes of a 54-year-old, college-educated, middle-class white male.

The volunteer's head was cradled inside a 12-ton medical imaging scanner at Caltech, held firmly in place at the focal point of a pulsing magnetic field. The chamber reverberated with a 110-decibel sandblaster roar.

Behind a double-thickness of shatterproof glass, Steve Quartz, 42, and Anette Asp, 28, monitored the flicker of his thoughts in color-coded swirls on a computer display.

The two Caltech researchers were investigating the effect of perhaps the most pervasive force in a consumer culture — marketing — on the most complex object in the world: the human brain.

Quartz, director of the school's social cognitive neuroscience laboratory, and Asp, his project manager, were seeking evidence in the subject's brain of an all but indefinable quality of fashion and product branding — the subjective essence that makes an object irresistibly cool.
As the magnetic signals hammered the air, the subject's brain told them things that his mind did not know.

Steve Quartz, with images from a functional MRI, leads a Caltech team that is using brain imaging technology to explore the decisions people make, including how the brain reacts to “cool” and “uncool” products and celebrities.

(Gary Friedman / LAT)

Psychologists and economists are using sophisticated brain scanners to tease apart the automatic judgments that dart below the surface of awareness.

They seek to understand the cellular sweetness of rewards and the biology of brand consciousness. In the process, they are gleaning hints as to how our synapses might be manipulated to boost sales, generate fads or even win votes for political candidates.

They have glimpsed how the brain assembles belief.

The why of buy is a trillion-dollar question.

By one estimate, 700 new products are introduced every day. Last year, 26,893 new food and household products materialized on store shelves around the world, including 115 deodorants, 187 breakfast cereals and 303 women's fragrances. In all, 2 million brands vie for attention.

To find profit in so many similar items, marketers attempt to brand a product on a buyer's mind. Such efforts put the average American adult in the crosshairs of as many as 3,000 advertising messages a day — five times more than two decades ago.

Children are exposed to 40,000 commercials every year. By the age of 18 months, they can recognize logos. By 10, they have memorized 300 to 400 brands, according to Boston College sociologist Juliet B. Schor. The average adult can recognize thousands.
"We are embedded in an enormous sea of cultural messages, the neural influences of which we poorly understand," said neuroscientist Read Montague, director of the Human Neuroimaging Laboratory at Baylor College of Medicine in Houston. "We don't understand the way in which messages can gain control over our behavior."

That is starting to change. By monitoring brain activity directly, researchers are discovering the unexpected ways in which the brain makes up the mind.

Images from a brain scan taken at UCLA, a pioneer in the use of such technology to study political thinking. Research suggests brain scanners could be used in campaigns. (Lori Shepler / LAT)

Many seemingly rational decisions are reflexive snap judgments, shaped by networks of neurons acting in concert. These orchestras of cells are surprisingly malleable, readily responding to the influence of experience.

Moreover, researchers suspect that the inescapable influence of marketing does more than change minds. It may alter the brain.

Just as practicing the piano or learning to read can physically alter areas of the cerebral cortex, the intense, repetitive stimulation of marketing might shape susceptible brain circuits involved in decision-making.

These inquiries into consumer behavior harness techniques pioneered for medical diagnosis: positron emission tomography, which measures the brain's chemical activity; magneto-encephalography, which measures the brain's magnetic fields; and functional magnetic resonance imaging, which measures blood flow around working neurons.

"This is a way of prying open the box and seeing what is inside," said psychologist
Jonathan Cohen, director of Princeton University's Center for the Study of Brain, Mind & Behavior.

Inside the Caltech scanner, faces flashed before the subject's eyes.

Each one was famous — an easily recognized emblem of celebrity marketed as heavily as any designer label.

Each triggered a response in the volunteer's brain, recorded by Quartz and Asp with Caltech's $2.5-million functional magnetic resonance imager (fMRI) and then weighed against the volunteer's responses to a 14-page questionnaire.

Uma Thurman. Cool.

Barbra Streisand. Uncool.

Justin Timberlake. Uncool.

Al Pacino. Cool.

Patrick Swayze. Very uncool.

The volunteer's brain cells became a focus group.

In his mind's eye, the celebrities triggered many of the same circuits as images of shoes, cars, chairs, wristwatches, sunglasses, handbags and water bottles.

For all their differences, objects and celebrity faces were reduced to a common denominator: a spasm of synapses in a part of the cortex called Brodmann's area 10, a region associated with a sense of identity and social image.

"On first pass, there might seem to be nothing in common between cool sunglasses, cool dishwashers and cool people," Asp said. "But there is something that these brains are recognizing — some common dimension."

None of these neural responses may come consciously to mind when a shopper is browsing brand labels.

Much of what was traditionally considered the product of logic and deliberation is actually driven by primitive brain systems responsible for emotional responses — automatic processes that evolved to manage conflicts between sex, hunger, thirst and the other elemental appetites of survival.

In recent years, researchers have discovered that regions such as the amygdala, the hippocampus and the hypothalamus are dynamic switchboards that blend memory, emotions and biochemical triggers. These interconnected neurons shape the ways that
fear, panic, exhilaration and social pressure influence the choices that people make.

As researchers have learned to map the anatomy of behavior, they realized that the brain — a 3-pound constellation of relationships between billions of cells, shaped by the interplay of genes and environment — is more malleable than anyone had guessed.

Lattices of neurons are linked by pathways forged, then continually revised, by experience. So intimate is this feedback that there is no way to separate the brain's neural structure from the influence of the world that surrounds it.

In that sense, some people may indeed be born to shop; but others may be molded into consumers.

"We think there are branded brains," Asp said.

The Caltech experiment, funded with a $1-million grant from the David and Lucille Packard Foundation, seemed to detect a part of the brain susceptible to such influences.

After analyzing test data from 21 men and women, Quartz and Asp discovered that consumer products triggered distinctive brain patterns that allowed them to classify people in broad psychological categories.

At one extreme were people whose brains responded intensely to "cool" products and celebrities with bursts of activity in Brodmann's area 10 — but reacted not at all to the "uncool" displays.

The scientists dubbed these people "cool fools," likely to be impulsive or compulsive shoppers.

At the other extreme were people whose brains reacted only to the unstylish items, a pattern that fits well with people who tend to be anxious, apprehensive or neurotic, Quartz said.

The reaction in both sets of brains was intense. The brains reflexively sought to fulfill desires or avoid humiliation.

Asp, a Swedish researcher who once majored in industrial design, volunteered for the fMRI probe. The scanner revealed a personality quite at odds with her own sense of self.

She searched the scanner's images for the excited neurons in her prefrontal cortex that would reflect her enthusiasm for Prada and other high-fashion goods. Instead, the scanner detected the agitation in brain areas associated with anxiety and pain, suggesting she found it embarrassing to be seen in something insufficiently stylish.

It was fear, not admiration, that motivated her fashion sense.
"I thought I would be a cool fool," she said. "I was very uncool."

Inside the brain of the 54-year-old male volunteer, the sight of a desirable product triggered an involuntary surge of synapses in the motor cerebellum that ordinarily orchestrate the movement of a hand.

Without his mind being aware of it, his brain had started to reach out.

Deconstructing the anatomy of choice, the researchers are also probing the pliable neural circuits of reasoning and problem-solving — the last of the brain's regions to evolve, the last to mature during childhood, and the most susceptible to outside influences.

They have begun to obtain the first direct glimpses of how marketing can affect the structures of the brain.

Consider something as simple as a choice of soft drink.

At Baylor College of Medicine, Montague, 44, remembered telling his 17-year-old daughter: Let's give the brain the Pepsi Challenge.

His daughter had been working as a summer intern in his Baylor laboratory. To give her a taste of practical neuroscience at work, he wanted to frame a research question that a teenager "could wrap her head around."

Since 1999, consumers have been offered 545 new brands of carbonated beverages. Despite differences in taste, color, caffeine and fizz, they are all based on a single sensory theme: sugar and water.

What happens in the brain, Montague wondered, when people decide between Coca-Cola and Pepsi, two of the most popular — and most similar — soft drinks in the world?

With funding from the Kane Family Foundation and the National Institute on Drug Abuse, they designed an experiment that became a test of the relative importance of the label on a cola can and the contents of the container.

Coca-Cola, in the words of one industry analyst, is "advertising incarnate." The company was the first sponsor of the Olympic Games, gave its cola free to U.S. soldiers during World War II, and is credited with inventing the modern image of Santa Claus.

Against such a formidable competitor, Pepsi was able to transform itself from a bankrupt company in the 1930s into a $69-billion enterprise today, largely through marketing.

In all, 67 people took the 47-minute test inside Baylor's fMRI machine.

Each swallowed sips of cola from a tube in a series of carefully calculated variations on the classic taste test. Each sip was preceded by a picture of a distinctively labeled red or
blue cola can. Montague and his colleagues varied the order of the sodas, the labels and the timing of the sequence.

The volunteers had no preference when the drinks were offered unlabeled, the researchers discovered. But they overwhelmingly preferred Coke whenever that brand was displayed — no matter what cola was actually delivered through the sip tubes.

When the researchers analyzed the brain scans, they discovered that the Coke label appeared to activate a memory region called the hippocampus, along with structures in the midbrain known to compute the likelihood of rewards.

A brain region linked to the sense of self — the ventral putamen and the medial prefrontal cortex — also lighted up.

The Pepsi label prompted no such response.

"What is it about these two almost chemically identical drinks that causes such different behavior?" asked Baylor neuroscientist Damon Tomlin. "The answer, of course, is marketing."

While Pepsi's marketing campaign has been successful, it apparently has not reached as deeply as Coke's.

Montague elaborated: "We can show that the idea of Coca-Cola activates structures in your midbrain that literally drive your behavior. That is how ideas gain control over instinct."

The study is a first step, he said, in the effort to answer a more fundamental scientific question: "Why do we believe anything?"

The creation of belief is the essence of marketing.

Brain scanning has opened the possibility of new forms of manipulation, by charting ways for marketing savants to harness neural circuits of reward and desire more effectively.

In Atlanta, a consulting organization called the BrightHouse Neurostrategies Group launched the first neuromarketing company in 2002, promising in a press release "to unlock the consumer mind." The company, whose clients include the Home Depot, Hitachi, Georgia-Pacific and the Metropolitan Museum of Art, has conducted experiments with neuroscientists at Emory University in an effort to understand product preferences.

Justine Meaux, the company's director of research, said BrightHouse helped businesses apply neuroscience to marketing, brand development and product innovation.
"It is fantastically relevant research," Meaux said. "A few companies are at the stage where they want to incorporate it into their strategy." She declined to name them.

In Los Angeles, Quartz and his Caltech colleagues have been negotiating with a marketing company called Lieberman Research Worldwide to find a way to sell brain-scanning services to advertisers.

"Our intent is to develop some type of strategic alliance that would develop tools and perhaps products for marketing-research users, based on the work Steve's doing," said Tim McPartlin, a senior vice president with the company. "It looks extremely useful to us."

At the Open University in England and London Business School, researchers have been recording brain activity as shoppers tour a virtual store. The researchers say they have identified the neural region that becomes active when a shopper decides which product to pluck from a supermarket shelf.

In Germany, DaimlerChrysler Corp. used brain imaging to assess how young men responded to different car designs. In Japan, researchers at Nihon University and the Gallup Organization used brain scanning to probe customer loyalties to a Tokyo department store.

Many researchers are skeptical of efforts to commercialize insights into how the brain works.

"Right now, brain scanning, especially at the level of neuromarketing, is to some degree a matter of tea leaf reading," said George Lowenstein, a behavioral economist at Carnegie Mellon University.

Nevertheless, a consumer group called Commercial Alert sought a congressional investigation of neuromarketing research last year.

"What would happen in this country if corporate marketers and political consultants could literally peer inside our brains, and chart the neural activity that leads to our selections in the supermarket and the voting booth?" asked Gary Ruskin, the group's executive director, in a letter to the Senate Committee on Commerce, Science and Transportation.

"What if they then could trigger this neural activity by various means, so as to modify our behavior to serve their own ends?"

Already, some researchers have experimented with brain scanning as a way to probe how the brain responds to political advertising.

At the level of brain cells, sophisticated political arguments and party loyalties are reduced, like product preferences, to the activity of neural circuits honed by eons of
Research suggests that political beliefs appear to trigger the same malleable circuits of reward, identity, desire and threat.

In a series of unpublished experiments conducted during the recent presidential campaign, UCLA neuroscientist Marco Iacoboni detected intriguing differences in how political brains react. It was the first time brain scanning had been used to study a political question, several experts said.

To 13 volunteers screened for political expertise and party loyalty, Iacoboni showed pictures of Sen. John F. Kerry, President Bush and Ralph Nader while recording their neural activity. He then screened footage for them from Republican and Democratic campaign ads.

Afterward, he recorded how their neural responses changed when they were shown the same faces a second time.

Not surprisingly, Iacoboni found that people watching their favored candidate responded with a surge of activity in the reward circuits of the brain.

Republican die-hards, however, seemed to have a strong positive emotional response to any prominent leader.

The Bush campaign ads appeared to change those Republican brain patterns by stimulating activity in areas involved in more rational deliberation, Iacoboni said.
Shown campaign advertising that touched on the Sept. 11, 2001, terrorist attacks, Republicans and Democrats again had different responses.

"The Democrats had a big response in the amygdala — the anxiety threat detector and bell-ringer in the brain," said UCLA psychiatrist Joshua Freedman, who helped organize the experiment. "Republicans did not have a statistically significant response to that, for whatever reason."

The findings suggest that brain scanners, like focus groups and polling, could someday be a potent tool in probing voter preferences and the impact of campaign ads.

"When we start asking questions about somebody's political disposition and their brain responses, then we start making interpretations about what defines us as people," said Judy Illes, a senior research scholar at the Stanford Center for Biomedical Ethics.

"That might have some potentially scary possibilities for misuse," she said.

The research also undercuts traditional beliefs about the relationship between the brain and the mind, between the body and its intangible well of being, Illes said. In the process, personality becomes little more than an accidental byproduct of biology, a pattern of spots on a brain image.

"We are starting to probe neural signatures of preference ... one of those things that make us uniquely individual. We have to be careful," Illes said. "We are far more than the sum of our spots."