**PROFILE**

# Thinking All Over The Brain

WHEN ROLF FASTE was in grade school, he remembers sitting in science period one day drawing a cross-section of a rocket ship. It was a hydrogen rocket, and he was trying to figure out how you'd keep the liquid hydrogen from heating up before it got to the combustion chamber. Absorbed in this problem of science and engineering, it came as a shock when his teacher came up and told him to stop drawing. "This is science. Art is on Tuesday," the teacher said. Among other influences it had, the experience made Faste resolve to "teach better than I was taught."

Now a professor of engineering and director of Stanford University's Product Design Program, Faste has everybody draw. "Art is a means of exploring reality with your firsthand perceptual hardware," he says. For him, ignoring the grammar of visual perception is tantamount to shunning one of the five senses or forbidding the use of reason on Fridays. Says Faste: "Most people when they draw look at their paper, not at what they're drawing. It's not a skill; it's a perception issue. And if you look at what you're drawing and follow some guidelines on how to use your eyeballs and your fingers, your fingers will do a real good job of duplicating what you see."

While it's the easiest to picture, Faste's focus on art is only one element in a passionate, holistic approach to teaching and learning, research and exploration. It's an approach that has made Standford's Product Design Program one of the most innovative and respected in the country, and an approach that is offering new leadership in the way engineering — not just product design — is being conceived of and taught.

## A Need For Synthesis

"We make these assumptions that you either do this or you do that," says Faste. "The things I was doing in the margins of my notes from grade school on were frowned upon, and were seen as art, not engineering or a manifestation of thinking about scientific issues. So that's the culture we exist in; yet the problems we face are complex and involve human aspirations and needs, and there are lots of aspects of technology to be brought to bear on them. So there is a profound need for *somebody* to be doing synthesis."

Drawing, or seeing with the fingers, is only one of the stretches Faste asks his students to make. His courses — with such revealing informal names as "Ambidextrous Thinking," "Visual Thinking," and "Need Finding" — come with lots of assigned reading, but they approach learning primarily through activity. "Students work in small groups or large groups brainstorming, working on projects. We try to have everything our students learn come through an activity of doing it and coming to a conclusion about it. In 'Visual Thinking,' and 'Ambidextrous Thinking' we don't talk more than about fifteen minutes out of two hours, and those fifteen minutes are spent explaining the next activity or assignment.

"I've probably talked to you more in this interview about these ideas than I do with my students," Faste laughs. "They learn by doing."

## Need Finding

Activity of the kind Faste and his colleague David Kelly in the Product Design Program call for leads to leadership, Faste believes. "Leadership is having a vision of what needs to be done and of how to go about doing it," says Faste. "Leaders are the people who assign problems to people. And mostly that's what people learn in school: how to do what they're told. They're told what the issue is.

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"But in our program, it's different," Faste continues. "I teach a course called 'Need Finding,' and in it, we spend a whole quarter putting ourselves in human situations and just seeing what is missing. The whole course is one big perceptual problem: how to see problems, how to see what no one else has identified."

Rolf Faste

"Need Finding" plunges students (graduates and undergraduates) into a crucible of real-life experience, a place that makes demands not just on what they know, but also on who they are. Forty students divided into teams of two take up positions in twenty different situations in San Francisco General Hospital. The situations cover the spectrum ranging from the emergency room to security, the laundry, and Fire Rescue One. "They go there for twenty-four hours, sleep in the fire house, ride the trucks. This year on their watch there were seven suicide attempts, two of them successful. They experience things like that, real life and death." In that experience, Faste argues, "Students come to grips with their own personal resources as humans, and think about what it is they want to accomplish and work on."

## Accessing Affect

To put it another way, just as Faste insists his students open their seeing to what their often unused ability to draw has to teach them, his course

design calls for a similar openness to a problem's affective dimensions. The value of this approach is being felt throughout the engineering program at Stanford and across the country. "I gave an hour guest lecture last week to a class in Manufacturing which is televised nationally on accessing one's emotions and what that has to do with this whole notion of quality," says Faste. "They get a lot of these bean-counting kinds of tools to apply to manufacturing, but I was actually *invited* to come and speak about something so unquantifiable as emotion and its relation to quality." Only five years ago, that wouldn't have happened, he says. But more and more engineers throughout the discipline are coming to understand the importance of what Faste calls "this 'fuzzy notion' of quality."

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When he took a degree in architecture at Syracuse University, Faste was seen as an engineer visiting the art school. When he started at Stanford in 1984, he was seen as the artist on the engineering faculty. "We used to be seen as the lunatic fringe," he says, but that's changed.

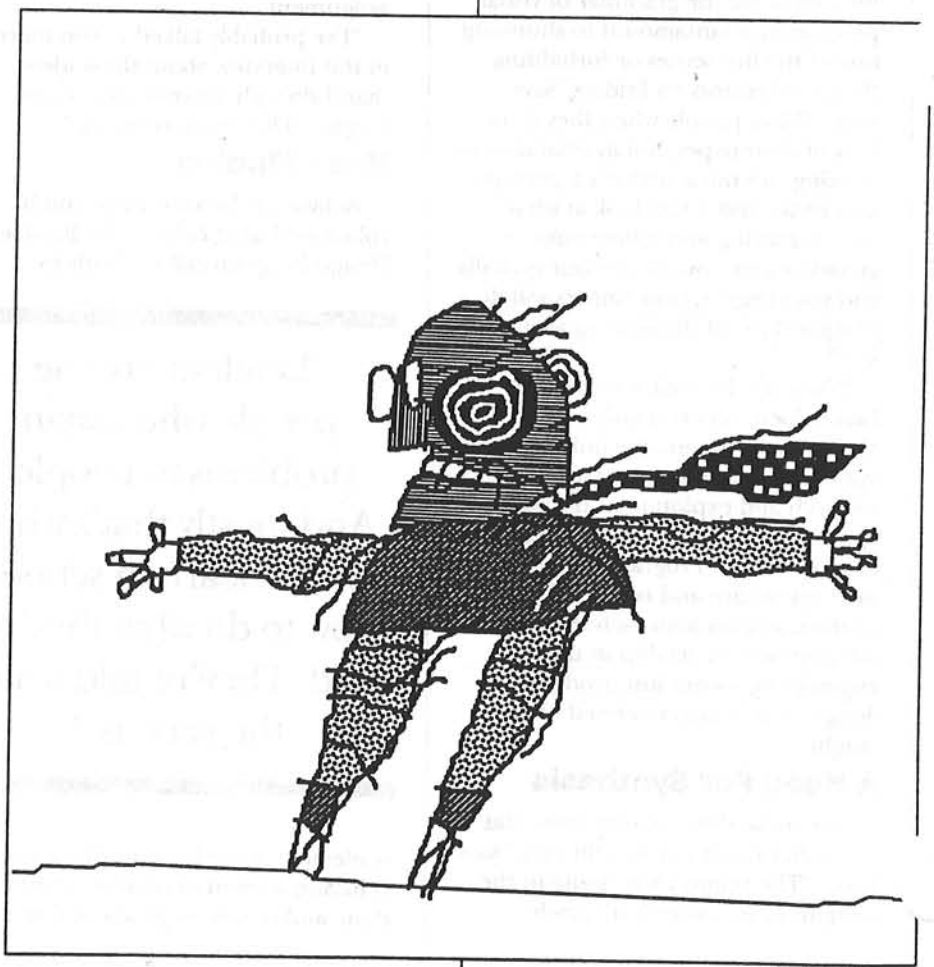
"Engineering schools really value their left-brain skills — all the number- crunching, formula-tossing activities: It's really become a primal thing with engineers. And then here came all these people mucking around with the arts and trying to merge all that with technology. I guess we're tolerated because the synthesis we achieved often did lead to startup firms which were successful. It's partially the culture here, the silicon valley mentality, this kind of thinking was kind of in the air and it was just manifested here in this program."

Faste is quick to point out that it takes both sides of the brain to make a whole. "That's why I retitled the course 'Ambidextrous Thinking,' to value the left-mode thinking skills my engineering grad students possess," he says. You need both, he says. Quantitative, left-brain thinking skills put ideas to the test, but right-brain holistic approaches allow ideas to come forward and be tested that would probably not even be considered without the freedom of discovery and synthesis characteristic of less logic-driven ways of thinking.

## A Creativity Course For Faculty

For the last three summers, Faste and colleague Bernie Roth have been applying the approach they take to teaching engineering to the challenge of teaching engineering faculty. With sponsorship from the American Society for Engineering Education, they've been leading a course called "Creativity," but like most of Faste's courses it's a nominal title for an experience that might be called "How to loosen up and bear down in new ways in your thinking." "The funny thing is they all come expecting to be taught a course where we get up and talk," says Faste. "They think they'll be able to go home and tell their deans about it; maybe offer their own course where they talk about creativity. Well, we don't talk about creativity; we manifest it. So they have this kind of intense two-week thing that they didn't expect where their own personal motivations and personalities are being challenged, because that's the only source of creativity that we know of."

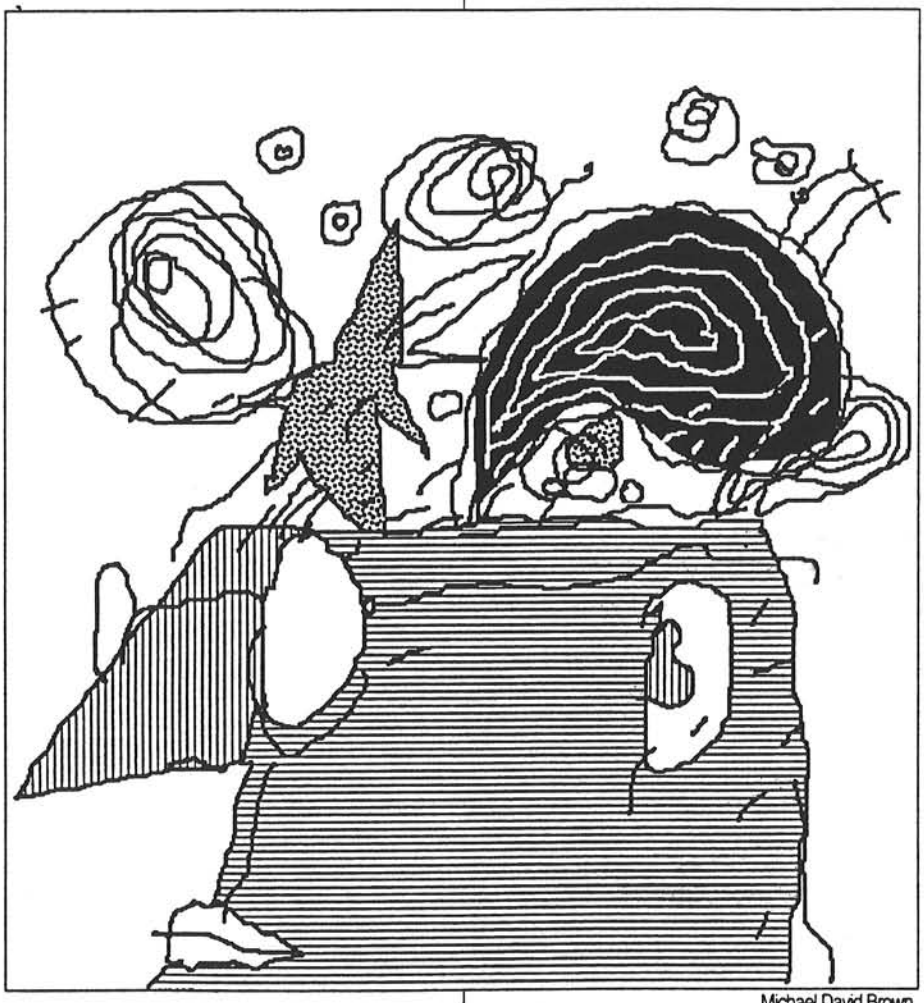
Our culture and most successful cultures, Faste believes, discourage creative behavior. "Creativity is risk taking," says Faste, and therefore "creativity isn't uniformly good. It's upsetting the apple cart." A convention or pattern of conventional thinking, he points out, becomes a convention because it works; it's safe. "But it happens that we're in a strange period today where being conservative, being safe, will lead a healthy



Michael David Brown

corporation into ruin probably within five years," Faste believes.

Can the same be said of conventional teaching? Faste seems to think so; that's why in the middle of his summer workshops, teaching suddenly becomes the subject matter in the discussion of creativity. "We do a whole day on teaching," Faste explains. "We line up five of the most outstanding lecturers that teach at Stanford — each of them with a different style — to give a twenty minute segment of one of their good lectures, just so the workshop participants can see how many different approaches there are to conveying subject matter."



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As one might expect, Faste quickly turns from showcase to looking glass. "Then in the afternoon — and they don't know this is going to happen," Faste continues, "we say, 'Ok, we're going to give you five minutes to think of the intro to one of your favorite lectures, and then, in front of color video cameras and everything, you're going to stand up here and start your course.' And so they stand up and start giving their favorite lecture. And we deal with all the issues that come up, like taking charge of the course, creating a space, projecting your own enthusiasm, lecturing to the blackboard — all of them, large and small." If the experience sounds gruelling, it is. Participants are stopped and asked to begin again as many as a dozen times.

Out of the fire comes stronger metal, Faste believes, forged in a fuller (if painfully achieved) awareness of all that's going on when one teaches (or at least more of what's going on when one lectures). "Since the Renaissance we've evolved a point of view in the West that's very mechanistic," Faste says quietly. "We're still quite Newtonian and linear in our thinking. The very word 'thinking' we think of just as a word meaning 'being logical.' All the other modes of thinking, we discount." If Faste's work as a teacher has a message, he says, it's simple: There's more to thinking than ratiocination. It takes two halves to make a brain — and a life — whole.

*For information on the summer workshop or Professor Faste's approach to teaching, contact :*

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# More On Visual Thinking/ Visual Literacy

Our story on "Visual Literacy" in the last issue of *The National Teaching and Learning Forum* created a great deal of interest, interest which, in part, led us to Rolf Faste. Many readers wanted further sources of reading on these topics.

Professor Robert Blystone commends two books by Edward Tufte as thought-provoking looks at a multitude of (often beautiful) ways to present visual information: *The Visual Display of Quantitative Information* (1983) and *Envisioning Information* (1990). Though he'd published widely as a political historian specializing in the use of statistics, Tufte was ahead of his time with these extremely handsome books; he ended up publishing them himself. They are available from Graphics Press, Box 430, Cheshire, Connecticut 06410.

Professor Faste cites a number of more theoretical works he finds of great value:

Robert McKim, *Experiences in Visual Thinking* (Brooks/Cole Publishing Co., 1980)

Rudolf Arnheim, *Visual Thinking* (University of California Press, 1971)

Robert Root-Bernstein, *Discovering* (Harvard University Press, 1989).

And in addition he commends Betty Edwards's well-known *Drawing on the Right Side of the Brain* (Houghton Mifflin, 1979).