The Intersection—Your Best Chance to Innovate

Monkeys and Mind Readers

EXCERPTED FROM

The Medici Effect:
What Elephants and Epidemics Can Teach Us About Innovation

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Harvard Business Press
Boston, Massachusetts

ISBN-13: 978-1-4221-4640-8
4639BC

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CHAPTER one

The Intersection—Your Best Chance to Innovate

MONKEYS AND MIND READERS

In the spring of 2002, a team of researchers at Brown University in Providence, Rhode Island, conducted a remarkable experiment.[1] The experiment went something like this: A rhesus monkey is trained to play a computer game. The point of the game is to use a yellow cursor to chase down a red dot that moves randomly across the screen like an erratic hockey puck. The game looks and feels like something designed for a child except for one noticeable difference. The monkey doesn't use a mouse or a joystick to play this game. Rather, the monkey moves the cursor with its mind. It controls where the cursor goes—mentally.[2]

When these results were published in the prestigious science journal *Nature*, they became what was likely the most reported Brown University science story ever.[3] The day the press release circulated over the wires, Mijail Serruya, the graduate student behind the experiments, was flooded with calls from every corner of the globe. "I'm on the way

to the bathroom to brush my teeth, half asleep," Serruya recalls, "and it's 'Hello. This is the BBC.'" Reporters wanted to know everything from whether people could use the technology for military contraptions to whether it could help a "couch potato" get off his butt.

This story is especially compelling not just because of what the team of scientists discovered, but also because it was a result of a deliberate effort to find an intersection of disciplines. The group behind this particular breakthrough consisted of mathematicians, medical doctors, neuroscientists, and computer scientists, all playing crucial roles in understanding how the brain works. The team was firmly planted at the Intersection—and they struck gold because of it.

This was no accident. Professor Leon Cooper, who pioneered the brain science research efforts at Brown University, made a special point of bringing together a wide range of disciplines to understand the human mind.[4] Cooper himself has a broad set of interests. When he received the Nobel Prize for his work in solid-state physics, almost three decades before the "mind-reading" experiment, he had already switched fields once. He had moved into brain science and founded, among other things, Nestor, Inc., one of the very first neural networking companies in the United States.[5] Cooper had witnessed the awesome benefits of bringing different fields together and made it an essential part of the Brain Science Program's strategy. "Brain research is different [from] pure physics research. The nature of the beast is that you have to put together a different kind of team," Cooper told me one afternoon. "Our interdisciplinary approach sets us apart and gives us a chance to lead new discovery in this area." The mind-reading experiment is an excellent example of what he was talking about.[6]

The team had in this case managed to "eavesdrop" on the part of the brain that plans motion. Tiny implanted electrodes read signals from the monkey's brain cells, which a computer deciphered through advanced statistical techniques. What was once a lot of incomprehensible data from the brain could now be translated into what the monkey was thinking. As a result, the team could turn thoughts into action in real time. This incredible breakthrough was a result of different

people from different fields coming together to find a place for their ideas to meet, collide, and build on each other.

The implications of the discovery are enormous. "This implant is potentially one that is very suitable for humans," says Mijail Serruya. "It shows enough promise that we think it could ultimately be hooked up via a computer to a paralyzed patient to restore that individual's interaction with the environment." Looking into the future, Serruya says, a prosthetic arm that moves by thoughts alone is no longer just a sci-fi dream.[7]

Today the Brain Science Program, now headed by John Donoghue, consists of researchers in the cognitive sciences, neuroscience, computer science, biology, medicine, psychology, psychiatry, physics, and mathematics. Both Donoghue and Cooper believe it is critical to step into the intersection of these diverse fields to achieve the breakthrough ideas that will push discoveries forward. "For instance, unexpectedly bumping into a statistician in the hallway one afternoon can lead to a discussion that solves a particular problem I have been struggling with," Donoghue explains. The researchers are not quite sure when something interesting will happen, but if they keep talking, they know that something eventually will.[8]

The same approach that led this team of scientists to groundbreaking discoveries is, at its root, the same approach that led to the unique architectural designs of Mick Pearce and the investment/philanthropic strategies of George Soros. But why does such an approach have a better chance of radically changing the world than any other? Before we can answer that question, we must first understand something about the nature of creative ideas and the process of innovation.

Creative Ideas and Innovation

WHY, EXACTLY, do we call the experiments made by the team at the Brain Science Program innovative? The fact that most people get their socks knocked off when they see the rhesus monkey

play the game is not enough. We can be wowed by any number of things, from the size of the world's largest pumpkin to a 5 P.M. Los Angeles traffic jam—but that doesn't mean they're innovative.

Here's why: The mind-reading experiment was creative because it was *new* and *valuable*, and it was innovative because the creative idea had become *realized*. This definition of creativity and innovation aligns most closely with that posed by leading Harvard Business School creativity researcher Teresa Amabile.[9] Although the definition may seem obvious, it is worth spending some time to examine it more closely.

Creative Ideas Are New

The team behind the experiments had accomplished something unique, something no one had done before—clearly a key characteristic of a creative idea. If you duplicate a painting by Monet you have not done something creative, and if you set up a bookshop Web site that operates exactly like Amazon.com, you have copied a business model, not innovated.

This criterion seems obvious, but it can be deceptive in its simplicity. What if an idea is new to the creator, but not to others? Unfortunately, it would be hard to consider such an idea innovative. Imagine, for instance, if someone claimed to have discovered the double-helix structure of DNA. No one would pay any attention. Watson and Crick did that more than fifty years ago. But what if the situation is the reverse? What if the idea is old to the creator, but new to others? The creator could, for instance, tell an old story in a new rendition, or use a screw cap in a new fashion (as Thomas Edison did when he and his team developed the fixture for the light bulb). In such a case society will agree that the product is indeed creative. In fact, most creative activity happens in this way.[10]

Creative Ideas Are Valuable

Interestingly, to be considered creative, it is not enough that an idea is new. To say that 4 + 4 = 35,372 is definitely original, but it hardly

qualifies as creative.[11] For an original idea to be creative, it must also have some measure of relevance; it must be valuable. Saying that 4 + 4 = 44 while keeping a straight face (as Chris Rock did in his movie *Head of State*) could fulfill such a requirement, since some people may find it amusing. This, then, explains why the experiment made by the brain science team was creative. It was new and valuable to a fairly large number of people, as clearly indicated by the publication of the research in *Nature* and the media onslaught that followed.

Innovative Ideas Are Realized

The reason we call the team's experiment innovative is that they made it happen, and others are now using the discoveries to further their own research. Innovations must not only be valuable, they must also be put to use by others in society. Simply imagining the most amazing invention ever does not qualify one as an innovative person. If an idea exists solely in someone's head, it cannot yet be considered innovative. It has to be "sold" to others in the world, whether those people are peers who review scientific evidence, customers who buy new products, or readers of articles or books.

In some ways this generally accepted definition of creativity and innovation is a bit disconcerting. Usually we think of individuals as creative, but creativity really occurs when people act in concert with the surrounding environment, and within society.[12] Ultimately society decides whether an idea is both new and valuable. In the words of psychologist and leading creativity researcher Mihaly Csikszentmihalyi, "There is no way to know whether a thought is new except with reference to some standards, and there is no way to tell whether it is valuable until it passes social evaluation."[13] Thus, it is impossible to determine if a person's products are innovative if they have never been seen, used, or evaluated.

Having built some boundaries around the world we will explore here, let's drill back down. This book argues that the Intersection is the best place to generate an explosion of new breakthrough ideas—what I call the Medici Effect. But what, exactly, *is* the Intersection?

The Intersection: Where Different Fields Meet

When we say that the Brain Science Program sits at the intersection of mathematics and medicine, of computer science and neurophysiology, what we are really saying is that *the people in the program have managed to connect these fields, and through these connections they have come up with new creative insights*. Individuals, teams, or organizations step into the Intersection by associating concepts from one field with concepts in another. The Intersection, then, becomes a virtual Peter's Café, a place for wildly different ideas to bump into and build upon each other.

The term *field* is used in this book to describe disciplines, cultures, and domains in which one can specialize through education, work, hobbies, traditions, or other life experiences. Fields can, for instance, include mystery writing, painting, Chinese business customs, molecular biology, and the enterprise software industry. They encompass areas as diverse as sport fishing, cable television, Hispanic-American culture, equity analysis, object-oriented programming, poetry, carpeting, and movie editing. Fields can, in turn, be divided into a subset of more narrowly defined fields. For instance, you can talk about the field of cooking generally, but you can also talk about the specialties of Swedish and Thai cuisine. Ultimately, in order for an area to be called a field, a person should conceivably be able to spend a lifetime involved with it.

Fields consist of *concepts* such as knowledge and practices. Changing a tire can be called a concept. So can the item *tire*, in and of itself. These two concepts are both included in a field called mechanics. In order to understand a field, one has to understand at least some of its concepts. The more concepts one understands within a field, the more expertise one has built within that field.

The key difference between a field and an intersection of fields lies in how concepts within them are combined. If you operate within a field, you primarily are able to combine concepts within that particular field, generating ideas that evolve along a particular direction—what I

call *directional* ideas. When you step into the Intersection, you can combine concepts between multiple fields, generating ideas that leap in new directions—what I call *intersectional* ideas. The difference between these two types of ideas is significant.

Intersectional Ideas Will Make You Do a Double Take

The evolutionary biologist Richard Dawkins is well known in his field. In 1976 he published *The Selfish Gene*, a book that pushed evolutionary theory a big step forward. Dawkins suggested that evolution did not occur between species or even between organisms, but between genes—and that these genes were "selfish." This theory was a notable contribution to his field and earned Dawkins significant acclaim.[14]

It is therefore rather curious to note that Dawkins's arguably most widespread contribution to society was a very different type of idea, one that originated from a single, fairly off-topic chapter in his book. In it Dawkins connected the field of genetic evolution with that of cultural evolution—and made the connection explicit. He suggested that ideas, which are the building blocks of our culture, evolve and propagate just like genes. He called these building blocks *memes* and wrote:

> *Examples of memes are tunes, ideas, catch-phrases, clothes fashions, ways of making pots or of building arches. Just as genes propagate themselves in the gene pool by leaping from body to body via sperm and eggs, so do memes propagate themselves in the meme pool by leaping from brain to brain via a process which, in the broad sense, can be called imitation.*[15]

Most people I know did a double take while reading this chapter by Dawkins. What an incredible notion! Ideas, or memes, compete, in a real sense, for space in our minds. Some memes persist and transform,

others die out; the process is similar to that of genetic evolution. Not only did this notion seem to make intuitive sense, it was *cool*. And it came from an intersection.

Dawkins's first idea about the selfish gene was directional; his second idea about memes was intersectional. The first idea pushed an established field farther along an established direction; the second idea came out of nowhere, ultimately launching a field of its own—memetics.[16]

The concept of the meme took off almost immediately and has today become a way for marketers, sociologists, and historians to explain, predict, and affect cultural phenomena.[17] For example, in his best-selling book *The Tipping Point*, Malcolm Gladwell examines how the Hush Puppy was transformed from a dowdy shoe with stagnant sales to a hot fashion accessory in just a couple of years through a process best understood as an epidemic of an idea virus. Today many marketing strategies are based on the notion that ideas and fads act as a virus while spreading through a population of minds.[18] These strategies are a direct result of Dawkins's intersectional insight during the mid-seventies. Intersectional innovations, like the meme, are often more powerful and widespread than directional ones, but it is important to note that both types are needed for long-term success.[19] Why?

Two Types of Ideas

The major difference between a directional idea and an intersectional one is that we know where we are going with the former. The idea has a *direction*. Directional innovation improves a product in fairly predictable steps, along a well-defined dimension. Examples of directional innovation are all around us because they represent the majority of all innovations. Consider, for instance, a company that improves efficiency by streamlining and refining an existing process, a scientist who defines a particular phenomenon to its sixth

decimal (after knowing its fifth), or a successful policy program from one city that is tailored to fit into another. The goal is to evolve an established idea by using refinements and adjustments. The rewards for doing so are reasonably predictable and attained relatively quickly.

People and organizations do this all the time through increasing levels of expertise and specialization. It is absolutely necessary if one does not wish to squander the value of an idea. Even an intersectional idea will, once it has become established, develop and evolve along a specific direction. When Stephen Covey, author of the widely popular self-empowerment book *The Seven Habits of Highly Effective People*, released *The Seven Habits of Highly Effective Families*, he most likely did not intend to introduce a radically different idea, but to present the original idea with adjustments (and continue to reap rewards from it). The same holds true for companies that refine their products to new market segments, for researchers who delve deeper into an established field, and so on.

Intersectional innovations, on the other hand, change the world in leaps along new directions. They usually pave the way for a new field and therefore make it possible for the people who originated them to become the leaders in the fields they created. Intersectional innovations also do not require as much expertise as directional innovation and can therefore be executed by the people you least suspect. Although intersectional innovations are radical, they can work in both large and small ways. They can involve the design of a large department store or the topic of a novella; they can include a special-effects technique or the product development for a multinational corporation. In summary, intersectional innovations share the following characteristics:

- They are surprising and fascinating.
- They take leaps in new directions.
- They open up entirely new fields.
- They provide a space for a person, team, or company to call its own.
- They generate followers, which means the creators can become leaders.

- They provide a source of directional innovation for years or decades to come.
- They can affect the world in unprecedented ways.

The Intersection Is Your Best Chance to Innovate

For most of us, the best chance to innovate lies at the Intersection. Not only do we have a greater chance of finding remarkable idea combinations there, we will also find many more of them. To be specific, stepping into the Intersection does *not* mean simply combining two different concepts into a new idea. These types of combinations are part of both directional and intersectional innovation. Instead, the Intersection represents a place that drastically *increases* the chances for *unusual* combinations to occur.

Imagine that you are a health care worker caring for paralyzed patients. If you wish to develop new treatment strategies from within your field, you have to understand that field thoroughly. It is critical that you master most concepts within your field to find new ideas that work. In addition, since it is easy to predict where the field is heading, you will have a lot of competition at every turn.

Now imagine that you reach out and connect your experience with that of neuroscience. Suddenly there will be many new options and ideas for you to explore. Neurological concepts you had no idea even existed can potentially be combined with existing treatment strategies to generate breakthrough intersectional ideas. By stepping into the Intersection you will, in other words, have unleashed an explosion of fresh, intriguing idea combinations.

This explosion of remarkable ideas is what happened in Florence during the Renaissance, and it suggests something very important. If we can just reach an intersection of disciplines or cultures, we will have a greater chance of innovating, simply because there are so many unusual ideas to go around. And as the following chapter will show, there has never been a better time to do it than now.

Notes

Chapter 1

1. You can actually view this game at the Web site: <donoghue.neuro.brown.edu/multimedia.php>.

2. Mijail Serruya et al., "Instant Neural Control of a Movement Signal," *Nature*, 14 March 2002.

3. Emily G. Boutilier, "Monkey Mind: The Most-Reported Brown Science Story Ever?" *Brown Alumni Monthly*, May/June 2002.

4. Leon Cooper, interview by author, Brown University, Providence, RI, August 2001.

5. Mark Williams, "Profile: For Leon Cooper, Biology and Technology Are Merging," *Red Herring*, January 2000.

6. There are many others. Leon Cooper's interest in combining fields can also

be found in his teaching at Brown University. He has, for instance, developed an introductory physics course that also provides credit for coursework in theater arts!

7. The quotes in this paragraph come from the following article: Scott Turner, "Researchers Demonstrate Direct, Real-Time Brain Control of Cursor," *George Street Journal*, 15 March 2002. The remaining information from Serruya in this chapter comes from a personal interview and correspondence during the summer and fall of 2002.

8. John Donoghue, interview by author, August and September 2002.

9. Teresa Amabile, *Creativity in Context* (Boulder: Westview Press, 1996), 35–37.

10. Robert Sutton, *Weird Ideas That Work* (New York: Free Press, 2002).

11. Sarnoff Mednick emphasizes this point in his groundbreaking paper, "The Associative Basis of the Creative Process," *Psychological Review* 69, no. 3 (1962): 220–232.

12. Although there have been numerous attempts to find objective criteria for creativity and innovation, such approaches suffer from several drawbacks. See Teresa Amabile's book *Creativity in Context* for a detailed discussion on this. Mihaly Csikszentmihalyi is a strong advocate of using society as the measure for a creative idea. His arguments are outlined most comprehensively in *Creativity: Flow and the Psychology of Discovery and Invention* (New York: Harper Perennial, 1996).

13. Csikszentmihalyi, *Creativity*, 23.

14. Richard Dawkins, *The Selfish Gene* (Oxford, UK: Oxford University Press, 1976).

15. Ibid., 192.

16. Most of the academic information available for this field can be found online. See, for instance, <http://jom-emit.cfpm.org/> for one of the more prominent journals.

17. See, for instance, Robert Wright's book *Nonzero: The Logic of Human Destiny* (New York: Vintage Books, 2001).

18. The person who has taken this particular idea farthest is Seth Godin. Read his book *Unleashing the Ideavirus* (New York: Hyperion, 2001) for a comprehensive description of how idea viruses can be used for marketing purposes. To read about the Hush Puppy, see Malcolm Gladwell, *The Tipping Point* (New York: Little Brown, 2000).

19. Probably the most comprehensive paper discussing this balance is James G. March, "Exploration and Exploitation in Organizational Learning," *Organizational Science* 2, no. 1 (1991): 71–87.