

Dorte Nielsen & Sarah Thurber

The secret of the highly creative thinker



**How to make connections
others don't**

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www.bispublishers.com

ISBN 978 90 6369 415 9

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Design: Dorte Nielsen and Katrine Granholm
Typographic consultant: Henrik Birkvig
Cover design: Katrine Granholm and Ulrik Jessen
Illustrations: Andrew Smart
Set in Gotham and Eames Century Modern

Most of the photos in this book are student work from the Creative Communications department at the Danish School of Media and Journalism. A full list of credits appears at the back of the book.

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*“Highly creative
people are good at
seeing connections.*

*By enhancing
your ability to see
connections,
you can enhance
your creativity.”*

Dorte Nielsen

Foreword

Creativity has moved up in the world. Where it used to be a nice to have, now it's a need to have.

Today, educators consider it among the highest form of learning. Psychologists consider it among the highest forms of self-actualization. Business executives consider it among the most critical characteristics of modern leadership. Frankly, creativity is not a luxury. It is a 21st century survival skill. Professional and personal success depend on it.

There has never been a more important time to cultivate creative thinking in our students, our citizens, our employees and ourselves. While creativity sometimes seems magical, in fact, as authors Dorte Nielsen and Sarah Thurber point out, creative thinking has its own distinct patterns, guidelines and mechanics, which when we understand them, can support better thinking, better collaboration and better solutions.

Our fast moving world demands creative responses, and the practical strategies and exercises in this book promote exactly that: creativity on demand. Why wait for the muse? Learn to take responsibility for your own creativity. Nielsen and Thurber offer proven practices that help you to do just that. Commit to these methods and you will be able to produce breakthrough ideas whenever and wherever you wish.

Gerard J. Puccio, PhD
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New York

Introduction

It all began at an ad agency in London. It was the early 1990s—a golden age in advertising—and I was in the thick of it, working as an art director in the creative department in one of the largest ad agencies in the world. Things were good. With awards rolling in and accolades mounting, I got an invitation from my old school, the Graphic Arts Institute of Denmark, to run a series of guest lectures on creativity and creative thinking.

Colleagues scoffed at the notion of teaching creativity. “You’ve either got it or you don’t,” they said. Some closest to me warned that I was wasting my time and squandering my career trying to teach creativity to others. But my students’ earnest desire to learn compelled me to try. Like many before me, I began to ponder the question “How can you teach people to become more creative?”

I became a stealthy observer. At the agency, I watched creative professionals hatch ideas and build award-winning campaigns. At the Institute, I watched students battle to produce original work. Over time, I noticed a striking pattern. It all seemed to boil down to just one thing.

**People who are good at having ideas
are good at seeing connections.**

Could it really be this simple? Could teaching people to see connections be a way to help them be more creative?

The idea was a little unorthodox. Most creativity training focused on process and tools. Seeing connections is simply a skill—a teachable skill, one I suspected was fundamental to creative thinking. So I took a leap. I built a creativity curriculum on the cornerstone of seeing connections.

What started as a hunch developed into a series of exercises, which now form the backbone of a curriculum for highly creative thinkers.

The core of creative thinking

One summer morning in the early 1970s, Bill and Barbara Bowerman were fixing waffles for breakfast. Bill, the head running coach at the University of Oregon, was bemoaning the fact that his runners didn't have track shoes that could grip the new artificial turf.

Having coached thirty-three Olympians, he was always on the lookout for better athletic gear. In the 1960s, he had co-launched a company to import light-weight running shoes from Japan. He even had a lab in his house where he could experiment.

Now he was looking for a lighter, faster shoe, one without spikes that could still grip the new running track.

At that moment, Barbara pulled a waffle off the hot waffle iron. Staring at the waffle, Bill suddenly made a connection. The grid pattern on the waffle might just create the perfect grip for the sole of a running shoe. He grabbed the waffle iron and ran to his lab.

By the end of the day, he had prototyped the shoe that would earn him his first patent and launch his company to international fame: The Nike Waffle Trainer.

The story is a perfect example of what happens at the moment a creative idea is conceived.

Coach Bowerman had been puzzling over his challenge for weeks when an unexpected connection at the breakfast table unlocked it. In an instant, the DNA of the waffle and the DNA of the running shoe combined in his mind to bring something entirely new into being.

Creativity is just that: the ability to bring new and valuable things into being. You can cultivate that ability. We'd like to teach you how.

This book serves up the findings of seventy years of research into the science of creativity and sets you on a path to pursue your individual creative potential. While most teachers aim to teach you things they know, our aim is to teach you how to come up with things nobody knows, things that you invent.

Everyone may be born with a different level of creativity, but everybody can learn skills that help creative thinking along. Making connections is such a skill. In fact it's an essential skill.

Making connections helps you see new options, create unusual solutions, and make the far-fetched combinations that lead to original ideas. Training your ability to see and make connections helps you build mental flexibility, agility, and adaptability. It also helps you come up with original ideas, which is a hallmark of creative thinkers. The truth about creative thinking is

**People who are good at having creative ideas
are good at seeing connections.**

**By training your ability to see connections,
you improve your capacity to think creatively.**

So we're going to help you crank up your connection-making machinery. First, we'll talk about the nature of connections. Then we'll share the research on how highly creative people think. We'll tell you what the neuroscientists have to say and walk you through a short course on creative thinking.

There's an old Chinese proverb: "When the winds of change blow, some build walls, others build windmills." In periods of change, our natural instinct is to dig in and build walls that shield us.

Creativity is what helps us build windmills. It's the type of thinking that helps us adventure into unfamiliar territory, see opportunities, generate options, and come up with new solutions in our private lives, our politics, our schools and our work. In business, creativity fuels innovation. There is no innovation without creativity.

Creativity used to be a bonus, an extra, a perk, or just a polite way to say you're a bit odd. "That's so creative, dear." But as technology and global competition cut into our jobs and market share, creative thinking skills are looking less like a luxury and more like a necessity.

Recently, IBM undertook the largest ever survey of CEOs, talking to more than fifteen hundred organizational leaders in thirty-three countries. CEOs reported that their most pressing concern was coping with the increasing rate of change. No surprise. What caught media attention was the leadership quality they voted as being the most important: creativity. Creativity is their best hope for adapting to change, for building windmills.

They weren't talking about artistic expression, which is one form of creativity, but about creative problem solving, the type of thinking that allows you to remain open to ambiguity, see gaps, follow hunches, reverse assumptions, spot strategic opportunities, connect ideas, and imagine a future so compelling that others will follow your lead.

Today creative thinking is becoming a necessity in every job. A new study from Oxford predicted the future impact of technology on nearly seven hundred jobs. The analysis showed that computers will be taking over any job that doesn't require a personal touch. That means that just to hold a job, everyone will rely on their creative intelligence—their ability to think flexibly and deliver solutions outside of standard operating procedures.

A new study from Adobe showed that, compared to other job skills, problem solving and creativity have gained the most value in driving salary increases in the last five years.

The unexpected connection

Once you start looking, you'll find connections everywhere. Free association, comparisons, gap finding and cross-fertilization are all forms of connection making. During incubation, when you are pondering over a challenge, your mind is simply waiting to make a connection between a trigger and your challenge. And it doesn't matter if the idea trigger is a newspaper headline, a waffle iron, or a lady on the bus with a funny hat. The point is, you have made a connection. Making connections is at the core of every creative process.

The more unexpected the connection, the more dramatic the breakthrough. Greek philosopher Heraclitus was onto this more than two thousand years ago when he said, "The unexpected connection is more powerful than one that is obvious." Consider the example of Johannes Gutenberg's printing press. Gutenberg was an entrepreneur and inventor by nature and a goldsmith by trade. He had already invented a movable, metal set of type, but he spent years struggling to find an effective way to transfer ink to the paper. The print impressions he could make using the more standard approaches of rubbing or stamping rendered poor quality text. One day, on a trip to a local winery, he noticed the screw mechanism on a wine press. In a flash, he saw a new way to transfer ink from his moveable type to the page. As with many great insights, the connection Gutenberg made between the wine press and the printing press seems simple, almost obvious to us now. But in the 15th century it was unexpected, and became the light that ushered Europe out of the Dark Ages.

There are plenty of other famous examples of unexpected creative connections: Isaac Newton connected a falling apple with the force of gravity. Gandhi connected nonviolence to revolutions. Coco Chanel connected suits to pearls. Elvis connected African-American blues to white teenage girls. In these and countless other cases, a creative connection resulted in something larger than the sum of its parts. The equation $1+1=3$ may not work in math, but it's a perfect description of what happens when your mind makes a new and valuable connection.

How highly creative people think

Sit back and watch a highly creative person think. Just watch. “Let’s colonize Mars.” “Your sandwich looks like it has a moustache.”

Creative people are forever surprising us by challenging assumptions, flipping ideas, and expanding, contracting, and recombining things in their heads. It’s a three-ring circus in there.

Actually, that’s not a bad analogy. While less creative people seem to think in logical, linear patterns, highly creative people think in analogical, web-like patterns—connecting all sorts of things that more conventional thinkers wouldn’t ever put together. What looks like ADHD to you, may well be creative genius at work.

In creative departments of advertising agencies, creative professionals will spend the day waltzing through a wide range of topics, pulling ideas out of thin air, making connections left and right and springboarding from data to inspiration. They are jugglers, throwing around high speed, high quality, original ideas that somehow still manage to stay relevant and aloft, whether the focus of the day is hair care or helicopters. For better or for worse, creative people seem to have the ability to look at the same thing as everyone else, and see something completely different.

What highly creative people do can seem magical, or completely off-the-wall. Who could have predicted that a cartoon mouse would become an international icon of creativity? That a cell phone could be the object of one’s affection? Or that electric cars could be sexy? But there is a method to the madness.

Highly creative people make connections all the time. Making a connection is like having a mini “Aha!” moment. It has the same quality of discovery and surprise. Aha moments happen every day to nearly everyone. They are often simple insights. They may not be flashy to anyone else, but if it’s new and useful to you, it qualifies as a connection.

Visual connections

When most of us look at a bike, we see a bike. When Picasso looked at a bike, he saw a bull. He described the famous sculpture he made of a bicycle seat with handlebar horns, saying,

"Guess how I made the bull's head? One day, in a pile of objects all jumbled up together, I found an old bicycle seat right next to a rusty set of handlebars. In a flash, they joined together in my head. The idea of the Bull's Head came to me before I had a chance to think. All I did was weld them together."

It takes a creative thinker to recognize a connection that is hiding in plain sight. Elliott Erwitt, who photographed Marilyn Monroe, Che Guevara, and Jackie Kennedy, also photographed the old woman sitting behind the gourds on the opposite page. He said,

"To me, photography is an art of observation. It's about finding something interesting in an ordinary place... I've found it has little to do with the things you see and everything to do with the way you see them."

Verbal connections

Making connections is by no means limited to the visual arts. Literature is chock full of connections. For centuries, writers, poets, rappers and politicians have been using similes and metaphors to woo, rant, entertain, persuade, teach and rule. Writers are masters at illuminating one thing by connecting it to another.

"My love is like a red, red rose," wrote poet Robert Burns. Of course, we all know his love is not a rose. His love is a feeling, and a rose is a flower. The language doesn't work on a literal level. The mismatch of the words "love" and "rose" creates a verbal vacuum that forces our imagination to fill in the gap. We automatically conjure up the character traits these two items might share. We imagine that like the rose, his love is alive, blooming, beautiful, delicate, arresting, and red hot.

Analogies are more complex than similes and metaphors. They ask us to connect many things at once. Fictional character Forrest Gump offered surprising wisdom with his innocent analogy: "Life is like a box of chocolates. You never know what you're going to get."

World-class connections

World-class creative accomplishments are often the result of not one, but thousands of connections and mini “aha moments,” each built upon the one before.

Mozart started composing music when he was five. Today we think of him as a musical genius, but his early works were largely derivative and unremarkable. “People err who think my art comes easily to me,” he said. “I assure you, dear friend, nobody has devoted so much time and thought to compositions as I.”

Mozart built on the work of Bach, Hayden and Handel. Every piece he wrote was an opportunity to explore a new musical connection. Mozart wrote over six hundred compositions. Before he died at age 35, he was, indeed, a musical genius.

Picasso, too, started his career, producing early works that could easily have been mistaken for other painters of the day. He studied the great masters as well as his contemporaries. Over seven decades, Picasso produced nearly fifty thousand pieces of art. Each allowed him to explore a different visual connection. His master works changed the way we see the world.

Scientific connections

Scientists are among the most deliberate connection-makers of all. They know that scientific discovery is almost never the result of a single connection, but a series of connections, each one standing on the shoulders of the one before.

Thomas Edison knew the value of making connections. He understood that finding the right connection was the key to invention. Many of his inventions didn’t work. He wasn’t concerned. He said, “I make more mistakes than anyone else I know. And, sooner or later, I patent most of them.” He patented cement houses and electric voting machines and photographs and electric car batteries. Through out the 20th century he held the world record for number of patents. In fact, he was just as committed to ruling out connections that didn’t work as he was to finding connections that did. After testing a thousand or more filaments for his light bulb, he famously stated, “Results! Why, man, I have gotten a lot of results. I know several thousand things that don’t work.”

Connections Hall of Fame

If there were such a thing as the “Connections Hall of Fame,” George de Mestral, the inventor of Velcro®, would be in it.

The legendary tale goes that in 1948, Mestral was hiking with his dog in the hills of Switzerland and returned home to find both the animal and himself covered with burrs from the trail. His struggle to remove the burrs piqued his curiosity.

He put the burrs under a microscope for a closer look and discovered the tiny hooks at their tips. Mestral saw the connection between the burrs’ hooks and the possibility of creating a synthetic fastening system.

It’s a classic story of connection making, but did you know that even the name Velcro is a connection? It connects the words “velour,” the smooth fabric on one side of the fastener and “crochet,” the pokey crochet-like hooks on the other. Vel + Cro = Velcro.

Biomimicry

Inspired in part by the Velcro story, today, scientists, engineers, and inventors, are now intentionally looking to nature for clues, solutions, analogies and insights. They call the practice “Biomimicry.” Nature, they argue, boasts 3.8 billion years of experience in product design, recycling, sustainability, and complex systems. Why not look there for inspiration and new connections?

Indeed, the water repellent properties of lotus leaves have helped engineers develop self-cleaning glass. The communal activity of beehives helped business consultants understand organizational behavior. And a bird beak recently saved Japan’s bullet train.

The story goes that when Japanese engineers proudly unveiled the latest model of the bullet train, they didn’t anticipate the downside of speed. The new train came zooming out of tunnels so fast that it created

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The story goes that when Japanese engineers proudly unveiled the latest model of the bullet train, they didn’t anticipate the downside of speed. The new train came zooming out of tunnels so fast that it created

a sonic boom. Neighbors from half a kilometer away complained. The sound was clearly out of regulation, putting the new train at risk of being decommissioned.

Company engineer Eiji Nakatsu studied the problem. He recognized that the sound came from the train emerging from the tunnel and hitting the higher air pressure outside. He went in search of an analogy that would help him study something that moved seamlessly at high speed from a low pressure environment into a high pressure one.

Nakatsu was also a birdwatcher, who knew that a kingfisher could enter the water without creating a ripple. The long wedged shape of its beak allowed it to move seamlessly from air to water. He redesigned the front of the train to mimic the kingfisher's beak. The connection he made not only resolved the noise problem, it let the train use fifteen percent less electricity and travel ten percent faster.

Scientific inventor Louis Pasteur said, "Chance favors the prepared mind." Connections do too. Many of the creative connections described in this chapter follow a similar pattern. People who saw connections had already devoted intense time and energy in the direction of their creative breakthrough.

Bowerman was obsessed with finding a running shoe that would grip the track. Gutenberg was determined to find a better way to transfer ink to paper. Edison hired an army of inventors to help him find a filament that could keep the light bulb burning. All of these creators were alight with curiosity, experience, intelligence, persistence, and a perceived need. But ultimately, it was their ability to make an unexpected connection that catalyzed their creative breakthrough.

As Edison said, "Nearly every man who develops an idea works it up to the point where it looks impossible, and then he gets discouraged. That's not the place to become discouraged." That's the place to start looking for a connection.

The theoretical foundation

We aren't the first to make the link between connection making and creativity.

In 1939, advertising executive James Webb Young wrote a book titled *A Technique for Producing Ideas*. "An idea is nothing more nor less than a new combination of old elements," he wrote. "The capacity to bring old elements into new combinations depends largely on the ability to see relationships."

In 1945, Albert Einstein wrote a letter trying to explain his own mental process as a scientist. He described his mechanism of creative thinking as "rather vague play" with images and symbols that he could reproduce and combine. In fact, he wrote, "This combinatory play seems to be the essential feature in productive thought."

In 1950, Australian animal pathologist W.I.B. Beveridge wrote a book for researchers called *The Art of Scientific Investigation*, in which he described the nature of scientific breakthrough. He wrote, "Originality often consists in linking up ideas whose connection was not previously suspected."

Connection making really blossomed in the 1980s, when researchers, writers, scientists, social activists, and business people all seemed to independently come to the conclusion that making connections was at the core of the creative process.

Popular American folksinger Pete Seeger, who dropped out of Harvard University to pursue a life of social activism, said, "In solving a problem, you often have to make connections between two things that aren't usually connected." He galvanized a generation of political activists when he connected the song "We Shall Overcome" to the Civil Rights movement. About his own songwriting, he acknowledged that creating something new was often an act of recombining words and musical scales that had been around for centuries.

Synectics

While musicians were connecting songs to social activism, creativity researchers and consultants George Prince and William Gordon recognized the value of connection making in business. Early in their careers, they joined the invention design group at Arthur D. Little to conduct creativity experiments. They pioneered the use of video cameras to record collaborative brainstorming sessions. They scrutinized hours of tapes, looking for patterns that could reveal how groups arrived at creative insights.

They discovered that part of what allowed groups to make new, valuable connections was their ability to break the existing connections they had with current norms, assumptions and expectations. As in quantum science, Prince said, "all newness comes from chaos, where everything is disconnected and random and new connections can happen." But who would hire creative consultants who purposely created chaos in a business meeting?

It was Gordon who struck on the solution. They would use analogies to create mental excursions that would draw people out of their habitual thinking patterns and take them on a mental exploration "to make the strange familiar and the familiar strange." Prince explained: "Using excursions, we were creating a 'safe' chaos." They called the new problem-solving approach "Synectics," from the Greek, meaning the joining together of different and apparently irrelevant elements.

The Synectics approach is powered by making and breaking connections. A Synectics expert might help packaging designers solve the problem of potatochip breakage by asking, "How is a potato chip like a leaf?" Or challenge a psychiatrist to consider, "How is a personality like a snowflake?" Or prompt a computer programmer to seek insights by imagining, "How is the Internet like a plumbing system for information?" In each case, the mind, bumped out of familiar territory, begins to seek new connections and come up with new ideas.

The Remote Associates Test

While connection making was alive in 1960s street protests and business boardrooms, it was also alive in ivory towers. In the psychology department at the University of Michigan, researchers Sarnoff and Martha Mednick were busy testing an entirely new theory of creativity, one based on making connections or what they called "associations." They defined creative thinking as "the forming of associative elements into new combinations which either meet specified requirements or are in some way useful." Through rigorous research, the Mednicks found that highly creative people have richer associative lives than less creative people. In 1967, Sarnoff Mednick described his research findings about highly creative people: "They can produce a greater number of associations to a wide variety of stimuli. They also show associative endurance; their rate of idea production does not drop off as rapidly as it does for the less creative individual. In addition, their ideas are unusual, and are less dominated by a single track. Furthermore, their associations are likely to vary from occasion to occasion."

The Mednicks' theory of creativity took the operational form of the Remote Associates Test, fondly known as the RAT. The test asks you to find a single word that makes sense when you combine it with each of 3 given words. For example, given the words FOUNTAIN, BAKING, and POP, you might think of the word SODA, because, by adding "soda" before or after the other words, you get soda fountain, baking soda, and soda pop. The Mednicks believed creative people would have an easier time making these remote associations, and therefore score higher.

Their theory and research broke new ground. However, as a test of creative ability, the RAT only worked part way. It works well at identifying creative individuals with high verbal IQs, but it altogether misses highly creative people who excel at visual or conceptual thinking. The RAT fell largely out of favor until recently when neuroscientists had to find a creativity test they could give to subjects lying stock-still in an MRI machine. Even so, it's a fun exercise in verbal connection making. You can try it yourself with the examples on the right.

Try the RAT

The Mednick's Remote Associates Test, the RAT, is based on word association. The task is to look at three given words and think of a fourth word that connects to each of the three. For example you could be given the three words:

Bird

Room

Tub

Your task is now to find a fourth word that connects to each of the words.

In this case the answer is "bath" because you can add the word bath to all three of the other words, as in birdbath, bathroom, and bathtub. Notice that the fourth word might either go in front or in back of each given word.

Now you try it:

Example 1:

Cottage

Swiss

Cake

Example 2:

Rocking

Wheel

High

Answer 1: Cheese. Answer 2: Chair.

"The Act of Creation"

In 1964, Nobel prizewinning writer, Arthur Koestler, wrote *The Act of Creation* in which he put forward an elaborate theory of human creativity. Building his case with countless examples of invention and discovery, he concluded that creativity is essentially an act of connection making. He called it "bisociation"—a putting together of two previously unrelated elements through a process of comparison, abstraction, and categorization.

To Koestler, analogies, metaphors, allegories, jokes, acting, identification and roleplaying were all forms of "bisociation," which he considered the cornerstone of creation.

IQ vs. The Torrance Test of Creative Thinking

Educational psychologist, E. Paul Torrance, published nearly two thousand works on creativity. He believed creativity should be taught in the classroom and argued that it was a type of intelligence overlooked by Alfred Binet's Intelligence Quotient (IQ) test. How could you measure originality with a test that sought only right answers? Such a test could never identify qualities of creative intelligence such as idea fluency, mental flexibility, originality and idea elaboration. So Torrance designed his own tests, and he awarded points for things like producing ideas, shifting perspectives and making novel connections. The test had not only verbal, but also visual and conceptual components.

Throughout the 1960s, Torrance gave his creativity tests to many schoolchildren and tracked the results over time. His research team revisited the students twenty-two, forty, and fifty years later. They discovered that IQ tests were actually poor predictors of creative achievement. Torrance's tests were three hundred percent more likely to predict the number of inventions, discoveries, and artistic accomplishments achieved in adulthood.

Torrance proved that the ability to get the right answer on an IQ test is no guarantee of a person's ability to produce new and useful work. The ability to think fluently, flexibly, and originally does.

If education strives to develop people who can innovate in business, science, sports, and the arts, he argued, we need to expand our view of intelligence and actively teach skills that promote creative thinking. Torrance believed that creativity training could literally change our minds. Forty years later, neuroscientists proved him right.

What neuroscientists have to say

Let's have a look inside your brain. What goes on when you're being creative? First of all, the whole thing lights up. Researchers have moved past the idea that creativity comes from just one part of your brain. "Creativity is not localized in one brain region," affirms creativity expert Keith Sawyer in his critical review of research on cognitive neuroscience. "Rather, creativity emerges from a complex network of neurons firing throughout the brain."

That means creativity is a whole-brain activity. But can scientists find a link between creativity and connection making?

In *Biological Bases of Creativity*, creativity researcher Colin Martindale says creative inspiration happens in a state of mind in which "attention is defocused, when thought is associative, and when a large number of mental representations are simultaneously activated." That is to say, creativity occurs in a mental state that's ripe for associative thinking—for seeing and making new connections. Sawyer, who surveyed a wide range of neuroscience studies, agrees: "The importance of association, and in particular, distant association, is confirmed by these studies."

So we're not just imagining that connection making is a key mechanism in creative thinking. But are creative people's brains actually different?

The brain of the creative thinker

Neurobiologist Andreas Fink offers insight. His research compares brain activity in highly creative and less creative individuals. The difference appears to be in the frontal lobe. Lower levels of cortical activation let highly creative people think more freely—as though their ideas let down their guard and fraternize with all the other ideas in their head. Creative thinkers are promiscuous connection makers. They naturally connect thoughts that others do not and generate ideas that can appear crazy, brilliant, chaotic, cool, unconventional, hilarious, ridiculous, odd, and original.

The brain of the conventional thinker .

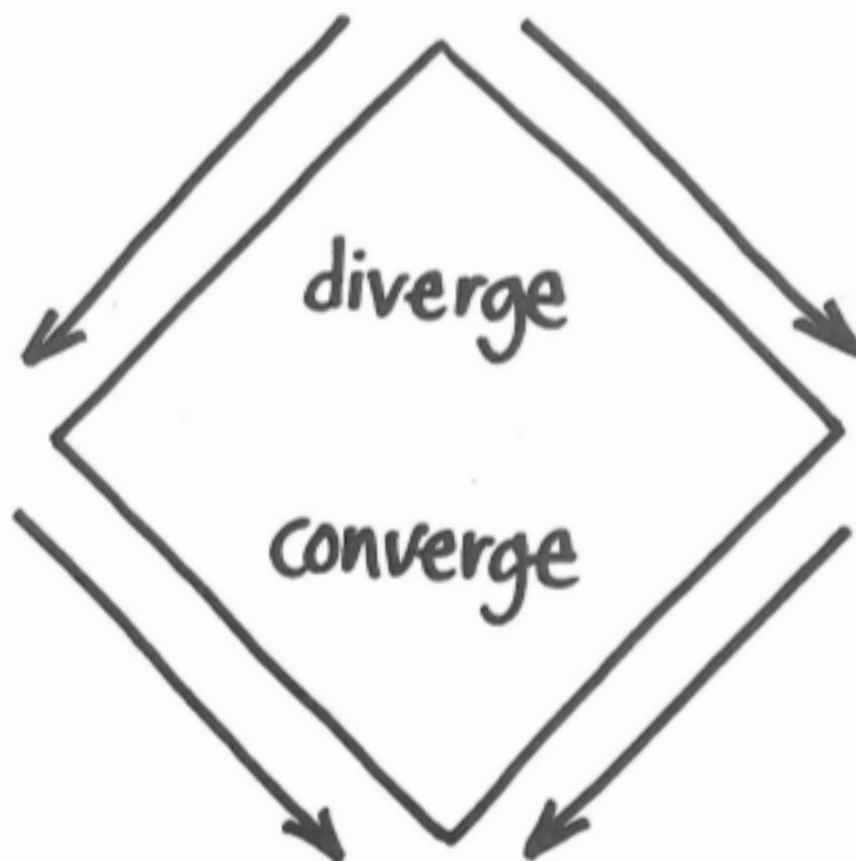
Conventional thinkers, by contrast, preserve mental boundaries that keep information neatly organized and tidily categorized. Their brains are a little more buttoned up. The information is kept in its proper place. The ideas don't tend to leap over. The ideas are appropriate. The information is accurate. These people might be world experts in their field, but when a well-meaning team member urges them to free associate, think outside the box or "brainstorm," nothing comes. For them brainstorming can seem like hell. New combinations and ideas are simply not as readily available to them. Their brains aren't wired to work that way. They have more mental constraints than highly creative thinkers.

Overcoming mental constraints

People have tried to overcome this limitation with various strategies. Australian inventors developed a thinking cap that runs electric current through the brain. English researchers claim that drinking a pint (or two) of beer will temporarily increase your creative quotient. Throughout history, writers, painters, poets, and creative geniuses of all kinds have experimented with everything from napping to narcotics. But the neuroscientists, seeking a more sustainable solution, pursued a different approach.

In highly creative thinkers who are constantly making novel associations, connections, and re-combinations, Fink found both lower levels of cortical activation and more alpha activity. He found that when a task required more creativity and when a subject's thinking got more original, the brain showed more alpha activity.

He took it a step further. In 2006, along with his colleagues Grabner, Benedek, and Neubauer, Fink conducted a study to determine if creativity training could change how people think. It was the first neuroscientific study of its kind. Half of the participants received training in divergent thinking, while the other half received none. After the training, the researchers actually saw and measured increases in the alpha activity of the trained group. Here, for the first time, was hard evidence that creativity training could alter brain function. Specifically, exercises such as word associations and writing challenges (activities that involve making and seeing connections) could increase alpha activity. They could actually make people more creative. How long before you could see the difference? Just two weeks!



The creative heartbeat

When it comes to creative thinking, even the simple act of separating divergent and convergent thinking will help you come up with more and better ideas. The recent "Bus Study" from the International Center for Studies in Creativity shows that even people who were not trained in creative thinking produced significantly better solutions when asked to diverge first and converge later.

The heartbeat of creativity

Whether you consider yourself “creative” or not, creative thinking is a natural capacity of all human beings. There are predictable dynamics and knowable stages. Better still, there is a common language, and there are guidelines that can help us think and collaborate more effectively.

Like heartbeats and breathing, creative thinking has a natural and unconscious rhythm of its own. It expands and contracts: we instinctively open up the possibilities before we narrow our choices.

Psychologist J.P. Guilford called this phenomenon “divergent” and “convergent” thinking. He suggested that, to enhance our creative output, we should consciously separate the two.

Divergent thinking opens possibilities

Divergent thinking is all about expanding—generating lots of options, combining ideas, stretching for wild and unusual possibilities, all the while deferring judgment. It thrives in a state of dreamy, playful, defocused attention.

Divergent thinking is standing in front of an open refrigerator and considering all the things and endless combinations of things you could possibly eat for lunch.

Convergent thinking narrows the options

Convergent thinking is all about contracting, tossing out the off-target ideas, and focusing on the few on-target options that will really help you reach your objective. The trick to converging is to be deliberate about your choices and be sure you don’t throw out all the novel options in your effort to be reasonable.

Convergent thinking is when you grab the ham and cheese, add the unexpected mango salad, and close the fridge.

In terms of creative connections, divergent thinking is when you connect to possibilities. Convergent thinking is when you connect the most promising possibilities to your goal.

Divergent and convergent thinking are the heartbeat of the creative process. The Yin and Yang. The Fred and Ginger. To do the dance, they need to work together, yet remain respectfully apart. First diverge. Then converge. That's what allows the blood flow of new thinking. If you judge every idea as it comes along, you'll be stepping on the toes of every new connection you could make.

Creating a climate for connection making

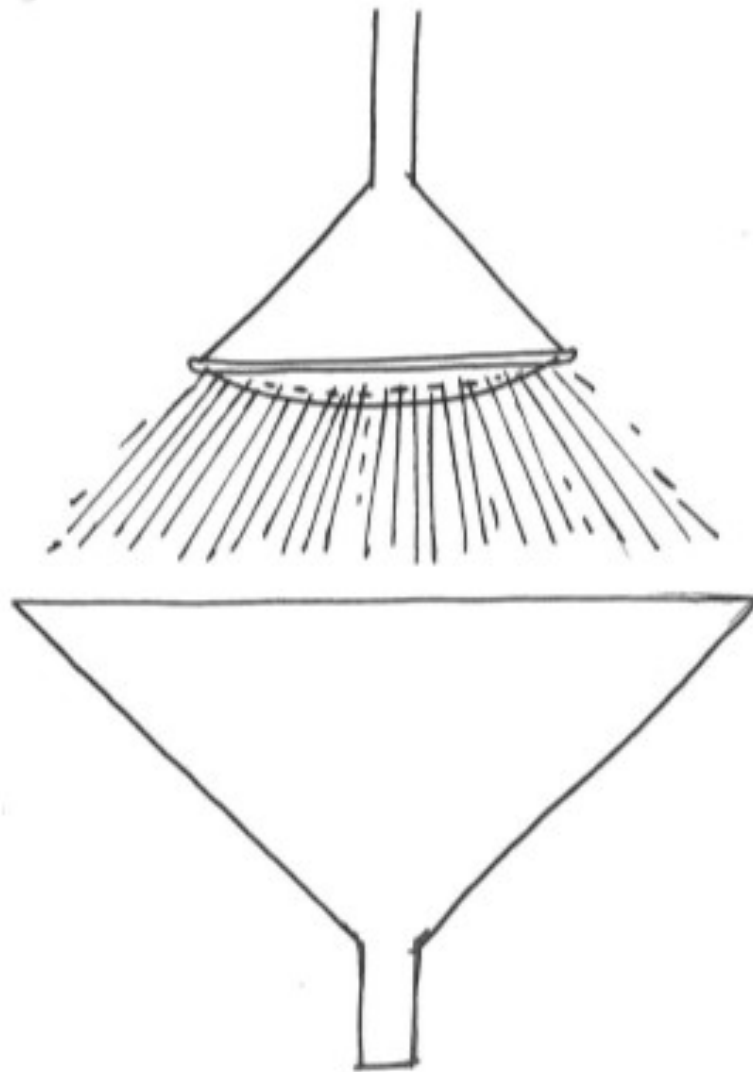
As the "O" in the advertising agency BBDO, Alex Osborn prized the creative output of his company. He believed creativity could be understood and cultivated.

Osborn made a careful study of his creative team, and in 1940, he coined the term "brainstorming." It described the approach the BBDO creative team used to come up with a new slogan or ad campaign. They would gather and toss ideas about. They'd play with concepts and tease out silly far-fetched connections. The atmosphere was free of harsh judgment, and the best ideas didn't come early. They were often the result of much banter, extraction, exaggeration, and extrusion.

The ads that resulted often looked simple, almost effortless—as if someone had simply had an "Aha!" moment in the shower. In fact, they were the product of intentional, intense divergent thinking.

Whether you love brainstorming or hate it, it's worth remembering that the point of brainstorming—and divergent thinking in general—is to spend enough time in a "safe" space for idea generation, so that you can get past the obvious ideas, push beyond the silly ideas, and start to explore where truly original connections and ideas are.

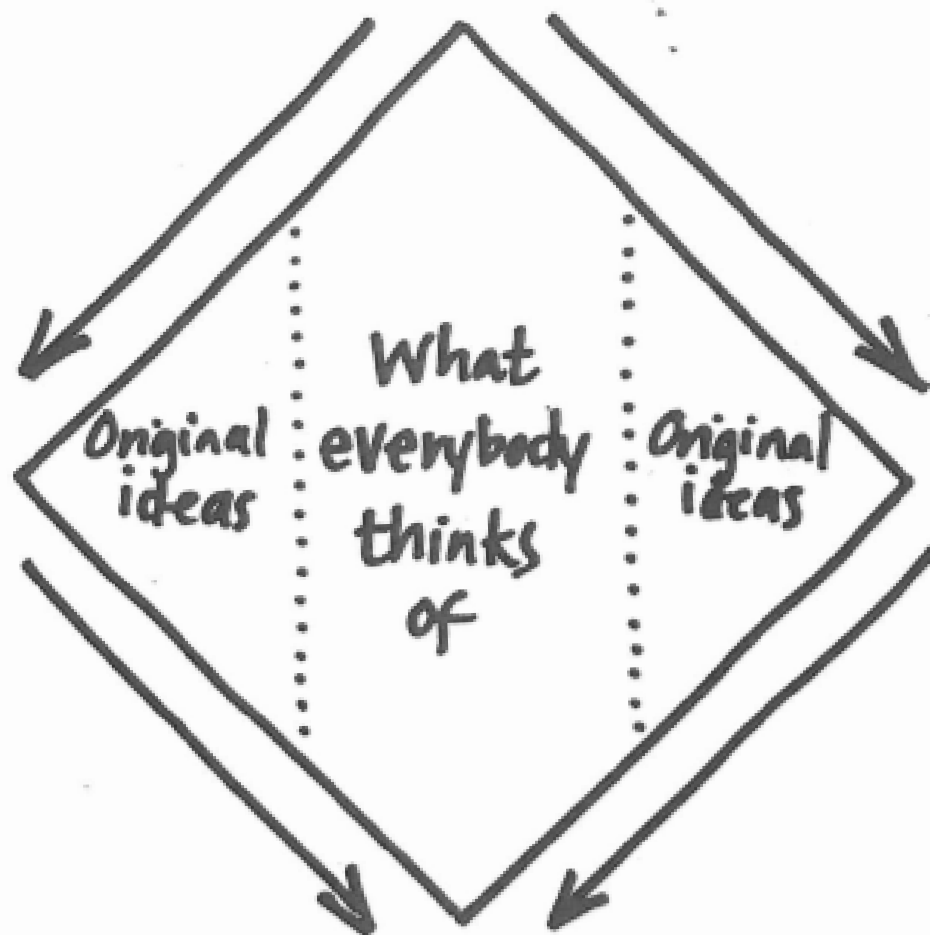
You can achieve that—in groups or on your own—by following the guidelines for diverging. First, defer judgment. Resist the temptation to show how clever you are by shredding a new idea to bits. Give the idea a chance. Show it mercy. Let it live. Use it to build other ideas and make new associations. Seek novelty. And don't stop diverging the first time your pen droops. Keep at it. Strive for quantity. The more options you have, the more connections you can make.



The Shower and the funnel

Think of divergent thinking like a shower of ideas. If the flow is too low, you'll only get a trickle of conventional ideas, just the usual suspects. If you turn up the flow, the spray goes wider and the ideas get more exploratory and more original. When it's time to converge, replace your shower with a funnel and drain away all but the very best.

Concept by Dorte Nielsen.



Original ideas

In this diagram of divergent and convergent thinking you can see that original ideas live on the edges, away from the ordinary ideas that sit in the middle. When you're trying to come up with a truly original idea, it often takes some hard rowing to pull yourself away from the ideas that everybody else is proposing. Learning to make connections is a skill that can help you pull away from the mainstream and point your thinking toward more distant associations where original ideas live.

*Diagram (above) and guidelines (next page) from the book *Creative Leadership* by Puccio, Murdock, Mance.*

The courage to converge

Most of us associate creativity with divergent thinking, but convergent thinking is every bit as important. Done badly, convergent thinking sounds like this: "Let's just go with what we did last year. It worked fine."

The evolution of our species has left us with a compulsive need for safety and a natural aversion to try new things. So new ideas and connections, even good ones, don't have a chance unless you intentionally give them one. That's where convergent thinking comes in.

It takes creative courage to opt for the original, untried choice. Good convergent choices can change the world. That's why convergent thinking has its own guidelines to help people do it well. The first guideline is "be affirmative," which is to say, focus what you want (not what you don't want) and emphasize what you like (not what you don't like) about your choices. Next, be sure that you're choosing an option that not only delights you but also meets your criteria of success. Third, be deliberate about your choice. This is your chance to get it right. And finally, keep novelty alive.

A creative solution is both novel and valuable. If you kill the novelty, you kill the creativity, and any chance of innovation.

Separate but equal modes of thinking

We know that divergent and convergent thinking are both essential components of creativity. But they're odd bedfellows. Psychologists have found that some people are irresistibly drawn to divergent thinking, while others favor convergent thinking.

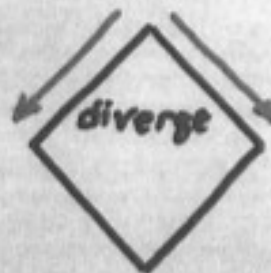
Trouble arises when people who prefer different modes of thinking try to battle it out. Picture a team of divergent ad copywriters zinging ideas endlessly, while the account managers stand with crossed arms and pursed lips waiting for them to pick a path forward. The first group could diverge all day. The second won't be happy until a convergent decision gets made.

On the next page, the guidelines for divergent and convergent thinking help groups align their thinking, improve their creative collaboration and avoid shooting down ideas prematurely. They also apply when you're working solo.



Guidelines for
Divergent thinking

Defer judgment
Strive for quantity
Make connections
Seek novelty



wild card: Allow for incubation.

Guidelines for
Convergent thinking

Be affirmative
Check objectives
Be deliberate
Keep novelty alive



wild card: Allow for incubation.

Divergent thinking and leadership

Divergent thinking is fun and exploratory. It's full of dead ends, red herrings, and ideas that will never see the light of day. In case you think it's all mental fluff and frivolity, let us share one more research finding.

In 2002, researchers Vincent, Decker, and Mumford were curious to see if they could find a statistical correlation between creativity and leadership. They set out to find exactly how, or if, creativity and leadership connect. The team purposefully chose a group of leaders that fell outside of our cultural idea of who is "creative." In fact, they chose military leaders and analyzed their responses to military challenges. The findings came as a surprise to everybody.

Going in, the researchers assumed that leadership would correlate directly with experience and intelligence (of the IQ variety). What they found instead was that leaders are the people who come up with the best solutions. Simple enough. People vote with their feet. The best solutions will get the most followers.

Where do great solutions come from? Again, the researchers assumed the finger would point to experience and intelligence. But the strongest correlation was to great ideas: Great ideas produced great solutions.

Where do great ideas come from? Experience? Intelligence? This was the biggest surprise of all: according to the statistical analysis, great ideas come from divergent thinking, the ability to think fluently, flexibly and originally, the ability to explore untried, undervalued, untested, and unimagined options, the ability to do just the sort of thing we're talking about in this book.

The statistics showed that great leaders come from great solutions, great solutions come from great ideas, and great ideas come from divergent thinking. What ever happened to experience and intelligence? They still figure prominently in the play, but they work in direct support of divergent thinking, not in direct support of leadership.