COMMITTED TO MEMORY

John Seamon's research at Wesleyan over the past four decades has contributed to major advances in our understanding of human memory

BY LAUREN RUBENSTEIN

When John Seamon reflects back on his career, John Lennon's lyrics from the song "Beautiful Boy" come to mind: "Life is what happens to you while you're busy making other plans."

Seamon hadn't planned to study cognitive psychology. And he definitely never intended to become a professor. Yet this is what he's been doing ever since he joined Wesleyan's Psychology Department in 1972. And over the past 40 years, he has seen the field of cognitive psychology transformed. Research conducted by Seamon and students in his Wesleyan lab has contributed to major advances in our understanding of how human memory works.

As an undergraduate at Columbia University, Seamon became interested in a field known as engineering psychology. But after being accepted to a Ph.D. program at the University of Massachusetts-Amherst, he learned the program's focus had shifted to a brand new field called cognitive psychology, so he decided to pursue that instead. After a year in a post-doctoral fellowship at NYU, he took the advice of his adviser and applied to jobs for practice. Despite having no interest in being a professor, Seamon interviewed for an opening at Wesleyan and, much to his surprise, was offered the job a few days later. He accepted the position and has been at Wesleyan ever since. In 2009, he was awarded Wesleyan's Binswanger Prize for Excellence in Teaching.

David Gallo '97, formerly a student in Seamon's lab, credits Seamon with inspiring him to pursue a career in cognitive psychology. Today, Gallo directs the Memory Research Laboratory at the University of Chicago.

"John is soft-spoken but with a good sense of humor. He also is incredibly patient with students, and very encouraging," said Gallo. "In the class and in the lab, he was always genuinely interested in our ideas (including the bad ones, and I'm sure there were many). In fact, looking over his publication record, almost every paper has several student co-authors. This is a testament to his ability to motivate students to engage in quality research."

Gallo adds: "As a scientist, John is internationally recognized for his contributions to human memory research. He seems to have a knack for recognizing the most fascinating phenomena before the rest of the field, and publishing insightful studies that change the trajectory of future research in the area. One example that comes to mind is his early research on non-conscious (or subliminal) processing, which had a major impact on the implicit memory work that captured the field's attention in the 1990s. Another example is his work on creating false memories, where he published important research showing that some kinds of false memories are easy to establish and difficult to avoid. This continues to be a hot area of research to this day."

In June, Seamon officially assumes emeritus status. However, he plans to continue working on a line of research at Wesleyan and the Olin Neuropsychiatry Research Center at the Institute of Living at Hartford Hospital studying how devices known as "memory cameras" may be able to assist those with mild memory impairments, such as patients suffering in the early stages of Alzheimer's disease. Though this research is still in its infancy, early results are promising and suggest that the prevailing beliefs about what's going on in the brains of these patients may be incorrect, or perhaps too simplistic.

Seamon's work with memory cameras is emblematic of the pioneering research studies he has conducted for decades, which have shed light on the complexities of human memory. When Seamon's research began in the late 1960s and early '70s, memory was thought to be a unitary cognitive ability, a simple repository of information from the past; it could be either long term or short term. It wasn't until the early 1980s with the advent of cognitive neuroscience that researchers began to recognize that humans have multiple memory systems, each tied to different neural structures of the brain that operate independently. Thus, a person who suffers a severe head injury or neurological disease may sustain damage to one memory system, while the other systems continue to operate perfectly.

These memory systems include short-term working memory, or the conscious awareness that allows us to follow a conversation as it happens. Then there are different types of long-term memory. Episodic memory is the conscious recollection of our experiences—last year's summer vacation, a movie we saw over the weekend—which can be recalled and shared with others. Episodic memory is slow to develop in childhood, and is the first to be lost in old age. Semantic memory is our knowledge about the world—2+2=4, grass is green. It consists of facts we know rather than things we remember. Procedural memory is our ability to perform different actions, like riding a bike or tying our shoelaces. This type of memory is acquired slowly through trial and error, but once learned, the memories are retained virtually forever and the skills performed without thinking.

Also in the 1980s, Seamon and other researchers became fascinated with studying implicit memory, or how people can be influenced by things in their past of which they're not consciously aware. This area of research arose from studies conducted by social psychologists into the "mere exposure" effect, which posits that mere exposure to something breeds fondness for it. In the social psychology studies, subjects were shown a set of random polygons they had never seen before. They were later shown each of these polygons paired with a brand new polygon, and asked which shapes they had seen before and which they preferred. The subjects were able to recall which polygons had been shown earlier, and, more often than not, expressed a preference for the familiar polygons. A researcher at the University of Michigan then repeated this experiment, but instead of *showing* subjects an original set of polygons, he flashed the images so rapidly that the subjects didn't remember seeing them. Yet when asked which polygon they preferred in a pairing, the subjects chose the ones to which they had been previously exposed. Seamon was astonished by this finding, and had to try it for himself. He set out to reproduce the studies in his lab using Wesleyan students as subjects, and lo and behold, found the same remarkable results. He and his students went on to publish a series of papers on the phenomenon.

"This was really curious," Seamon says. "It's the past reaching forward and touching you in the present without your conscious awareness of it." He recalls being invited to present at a conference of advertisers in Canada, who were interested in how the research could help influence consumers. But Seamon declined, believing the research didn't have the kind of applicability that the advertisers hoped for.

Mauricio Delgado '97 was one of the students who worked with Seamon on the implicit memory research. As a freshman, Delgado had taken a psychology class in which Seamon "challenged us to think critically—not just regurgitate information. That's when I learned about research, and how you can test out different ideas." Seamon invited Delgado to join his lab.

"John opened my eyes to a career in academia, specifically doing research. At the time, I was pre-med, but once I started working in the lab I knew that my path was going to be a different one," says Delgado, now an associate professor of psychology at Rutgers University, and head of the Social and Affective Neuroscience Lab there. "John helped me focus and understand what would be needed to go to graduate school, and what things to aim for."

"He has been integral in my career, and I will always be grateful," Delgado adds.

By the 1990s, Seamon's lab shifted directions, and he was at the forefront of research into false memories. Around that time, there was much media coverage of people—including a number of celebrities—who, in the course of psychotherapy, had recovered memories of childhood sexual abuse. In one prominent case in 1991, Marilyn Van Derbur, a former Miss America, told the world that she had discovered her father's sexual abuse of her as a child. Later that year, actress Roseanne Barr claimed she

SEAMON'S CURRENT RESEARCH CONSIDERS HOW A 10-YEAR-OLD MICROSOFT INVENTION KNOWN AS A VICON REVUE CAN HELP THOSE WITH MILD MEMORY IMPAIRMENTS, SUCH AS PATIENTS SUFFERING IN THE EARLY STAGES OF ALZHEIMER'S DISEASE.

THIS IS WHY.

had recovered 30-year-old memories of her parents molesting her, which they denied. At the time, cognitive psychologists had no documented evidence of people repressing traumatic childhood memories. In fact, says Seamon, it's well known that highly emotional events are usually remembered extremely—often, painfully—well.

According to Seamon, a great debate ensued between the clinical psychologists, who believed they had helped patients recover repressed memories, and skeptical memory researchers, who suspected these memories may have been unintentionally implanted in patients by their therapists. Through a series of experiments, Seamon and other memory researchers demonstrated that false memories—such as taking a hot air balloon ride, or even proposing marriage to a Pepsi machine—*can* be implanted in people under the right conditions: In the context of real memories, a trusted person (such as a parent or psychologist) tells the subject that something happened, which didn't occur in reality; the subject reminisces about this event over a period of time, imagining it repeatedly. Eventually, the subject has difficulty discriminating between what they've imagined and reality. "It's relatively easy to get someone to believe something really happened, when in fact it never did," says Seamon.

Yet, using medical, police and court records, the clinical psychologists also were able to prove that some of the uncovered childhood traumas truly did happen. Thus, in some cases, traumatic experiences *could* be forgotten, only to be recovered years later.

"We ended up with a better understanding of the complexity of memory," says Seamon. "Where before we had these two camps arguing with each other, we now know—as is often the case in psychology—that the truth is somewhere in the middle."

During his junior year, David Gallo worked with Seamon on this groundbreaking research in false memory. The work ultimately became Gallo's first scientific publication.

Reflecting on the research now, Gallo says, "In a nutshell, it has long been known that people sometimes make false memories or have distorted views of the past. However, these errors were often considered to be relatively rare or minor, attributed to poor encoding conditions, not paying attention, etc. Our work showed that some kinds of false memories can occur relatively automatically and can be very difficult to avoid, even in high-functioning undergraduates that were explicitly told that we were trying to trick them. Much like perceptual illusions, these memory illusions showed that some aspects of memory are inherently reconstructive. The mind automatically creates a sense of reality, and it is not always accurate. We often use associations to fill gaps in our memory, adding missing pieces of information to make sense of the world."

Professor John Seamon, right, with students in his Memory Lab. From left to right are Psychology majors Julian Zhong '13, Ashley Swan '13 and Tacie Moskowitz '13.

Seamon's current research considers how a 10-year-old Microsoft invention known as a Vicon Revue can help those with mild memory impairments, such as patients suffering in the early stages of Alzheimer's disease. The Vicon Revue is a small, lightweight camera that is worn on a lanyard around the patient's neck. It automatically takes a photograph every 30 seconds, or whenever it senses motion or a change in light. A handful of case studies have been published in the last five years about memory-impaired people wearing the camera who are taken on an outing by their spouse or adult child. When the people later review pictures of the day taken by the camera and reminisce about the events with their loved ones, they show improved recollection of the outing, which remains for a period of months. The recollection with the memory camera is much more detailed and longer-lasting than in other cases where the memory-impaired person reviewed the day's events with the assistance of a diary written by their loved one. Perhaps most exciting, says Seamon, is that with help from the memory camera, memory-impaired individuals are able to remember details from the outing not captured in the pictures.

"That's really intriguing because it tells us that this information is getting into their minds, but part of their difficulty is getting it *out*," he says. "We've more or less been assuming that these people have a problem producing new memories. But that may not be it, or it may just be a part of their problem. This suggests that there's something we can work with. It may be a matter of finding the right kind of cues to help them remember."

These case studies, while promising, have many uncontrolled variables. Working with outpatients at the Institute of Living at Hartford Hospital, Seamon is now studying the camera's effectiveness in a more controlled, experimental setting. In one study, the patients are taken on a 15-minute walk, during which they observe the experimenter perform 12 different actions in 12 locations. The actions are atypical—tickle a fire alarm, pet a plant—so they can't be easily associated with the location in retrospect. Some of the participants wear the memory camera during the walk while others use a written diary to take notes. After they return to the lab, the participants reminisce about the walk using their assigned memory aide. They are then given a test to determine what they remember from the walk. The reminiscing and testing process is repeated several times over the course of weeks. So far, says Seamon, the participants using the memory camera have shown better recollection than those using the diary. Moreover, the performance gap widens with each subsequent round of reminiscing and testing, suggesting the memory camera may help patients retain memories in the long term. Seamon plans to expand the study to include many more memory-impaired subjects. He's also performing similar experiments using Wesleyan students as subjects, to see how the cameras can improve recollection in people without memory problems. With both groups, he plans to show subjects short film clips and test how the camera improves recollection.

As our understanding of the complexities of human memory has grown more sophisticated, it's become clear that memory is not just a repository of information, as it was once thought of, says Seamon. Our brains don't store literal copies of past experiences to be retrieved, like the snapshots from a memory camera. Instead, our memories are interpretations of these experiences.

"Because it's reconstructive, memory allows us to take our interpretations of past experiences and combine them in novel ways to think about the future. The function of memory is to help us use what we've learned in order to lead better future lives," says Seamon. This was important from an evolutionary standpoint in allowing our ancestors to avoid predators, find food and choose a mate.

Memory-impaired people, such as the patients he now works with at the Institute of Living, "all have problems remembering the past, but they also can have problems thinking about the future. These two things can go hand in hand. And so one of our goals is to see not only if we can help people with memory impairments, but whether we can enhance their well-being by improving the way they think about the future," says Seamon. "That's what's going to be really exciting."

PARADISE LOST, RETAINED

One man, nine years, 10,565 lines of poetry

Many of us can remember having to stand up nervously in front of our sixth grade English class and recite a poem from memory. One man decided to try such an exercise well into adulthood—and take it to the extreme.

John Basinger, MAT '66 and MA '79 (in theater), committed to memory all 10,565 lines (12 books) of *Paradise Lost*, the epic poem by 17th-century English poet John Milton. Basinger—who is professor emeritus of theater and sign language at Three Rivers Community College in Norwich, Conn., and is the spouse of Wesleyan's Corwin-Fuller Professor of Film Studies Jeanine Basinger—tours around the country performing the poem. He hands out copies of *Paradise Lost* for the audience to follow along.

John Seamon attended a performance and Q&A session Basinger gave at Wesleyan in 2009. Afterwards, Seamon introduced himself to Basinger, and Basinger eagerly agreed to take part in some memory tests.

In the lab, Basinger told Seamon and his students that in 1993, at age 58, he decided to undertake a big project in honor of the upcoming millennium. He borrowed a copy of *Paradise Lost* from Middletown's Russell Library, and headed over to the gym to read it on the exercise bike. He repeated this ritual—cycling and memorizing—every day; he also drilled on the material while waiting in line at the supermarket or driving. After describing his technique to Seamon, Basinger learned that he had, "in a naïve and intuitive way," followed a memorization method known to be effective.

"I would learn about seven new lines every session, and then I would back up and repeat seven lines I had learned the day before, and then maybe seven from the day before that. Then I'd run them all together. I would just keep moving forward, picking up from the day before and overlapping," Basinger explained. "I never, ever read ahead because that, to me, was like wasted time."

Nine years and thousands of study hours later, he had memorized the entire poem. He gave the first complete performance in December 2001. The reward for his hard work, Basinger said, was, "the sheer pleasure it gives me to tell Milton's story using his amazing language, and the impact this has on listeners. People often tell me how much more intelligible and powerful it is to really hear the poetry in the poem, compared to what they can get from just reading it alone."

In the lab, Seamon and his students tested the ability of Basinger, then 74, to pick up reciting the poem from a line they chose—first in order, then at random. They found his recollection was about 90 to 95 percent accurate. They also analyzed tapes of Basinger's live performances, and found his accuracy was just as good on stage.

In addition, said Seamon, "We were really interested in seeing what he was like in terms of everyday use of memory. It turns out that he sometimes forgets where he puts his car keys. He needs a list to go grocery shopping. He was certainly performing at a high cognitive level, but he doesn't have any extraordinary memory skills day to day.

"This was fascinating, because here was a person with no inherent special ability who decided to achieve this really phenomenal feat," said Seamon. "It showed us the incredible flexibility of our memory."

Before our ancestors could read and write, there were storytellers who memorized epic poems like the *Iliad* and the *Odyssey,* he added. "John Basinger showed us that people are still capable of this."

"I was so grateful to John [Seamon] for taking this seriously, and validating my sense that what I was doing wasn't just a stunt, but really was something of value to scholars," said Basinger. "Together, we demonstrated that ordinary people like myself can undertake something of enormous magnitude and succeed just through dint of hard work. One doesn't have to be touched by the gods to do something extraordinary."

Seamon and two of his students published an article about their findings on Basinger in the journal *Memory*. The write in the abstract: "Consistent with *deliberate practice theory*, JB achieved this remarkable ability by deeply analyzing the poem's structure and meaning over lengthy repetitions. Our findings suggest that exceptional memorizers such as JB are made, not born, and that cognitive expertise can be demonstrated even in later adulthood."

Do you have an opinion about this topic? Please write us at letters@wesleyan.edu.