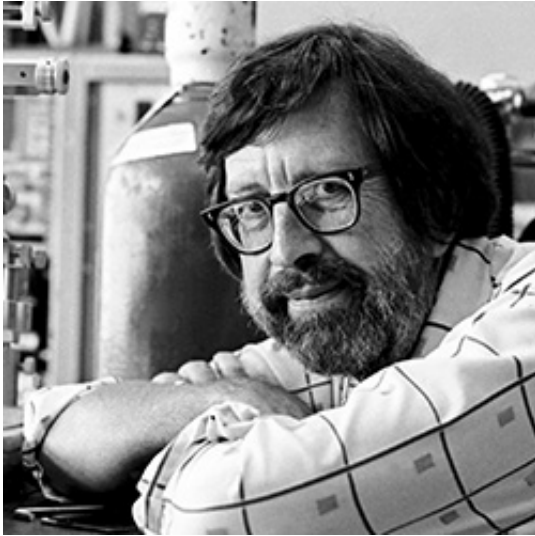


# Remembering Richard F. Thompson

December 31, 2014



## Richard F. Thompson

The world lost a neuroscience pioneer in September 2014 with the passing of [APS](#) Past President Richard F. Thompson. Widely regarded as a leading authority in his field, Dick focused his research on the broad field of behavioral neuroscience with a focus on the neurobiological substrates of learning and memory. He was the first neuroscientist to identify and map the neural circuits responsible for classical conditioning.

Dick was Keck Professor of Psychology and Biological Sciences at the University of Southern California and served as Director of the USC Neuroscience Program from 1989 to 2001. Subsequently, he served as senior scientific advisor to the USC Neuroscience Research Institute. He also held appointments as professor of neurology, School of Medicine, and senior research associate, School of Gerontology.

Before joining USC, Dick was a professor of human biology and psychology at Stanford University, where he chaired the Human Biology Program from 1980 to 1985. Previously, he served as professor of psychobiology in the University of California, Irvine, School of Biological Sciences; professor of psychology at Harvard University; and professor of medical psychology and psychiatry at the University of Oregon Medical School. He earned his PhD in Psychology at the University of Wisconsin–Madison, where he conducted his postdoctoral research in the neurophysiology laboratory. He also did postdoctoral work in the Laboratory of Neurophysiology at the University of Gothenburg in Sweden.

Dick did groundbreaking work that linked neural plasticity with behavioral plasticity. For example, using a spinal cord preparation while at UC Irvine, he studied and defined the processes of habituation and sensitization. At UC Irvine, he also began a long series of studies built on Russian psychologist Ivan

Pavlov's classical conditioning theory. Dick used the classically conditioned nictitating membrane/eyelid response model on rabbits to initially advance our understanding of hippocampal function during associative learning. But arguably his most famous work came in 1982 when he was at Stanford. There, he used the rabbit preparation to map the brain substrates of classical eye-blink conditioning. He made the seminal discovery that populations of neurons in the cerebellum were responsible for the acquisition and retention of the classical conditioning of discrete motor responses. This work was controversial, to say the least, as the cerebellum had long been considered strictly a motor region of the brain and not capable of demonstrating plasticity.

Dick continued his work at USC, where he was instrumental in bringing together many leading neuroscientists to form the nation's first interdisciplinary neuroscience program. His research showed how the brain saves a memory by bolstering the connection between neurons. He also explored the effects of behavioral stress, estrogen, and aging on learning.

Dick published 450 research papers, served as editor of three journals, and authored several books — including the classic *Foundations of Physiological Psychology* (1967), which revolutionized the way that behavioral neuroscience was presented and learned.

He is also remembered as a stellar mentor, guiding the careers of many students and postdocs who are now leaders in the field of behavioral neuroscience. I was one of the beneficiaries of his skill as a mentor while I was a postdoctoral fellow in his laboratory at Stanford from 1983 to 1987. Perhaps above everything else, Dick taught me how to ask the important questions and how to design clever experiments to seek answers to those questions. He also instilled in me a deep passion for discovery and taught me how to stand strong when others did not agree with or did not want to agree with the findings and direction of the research. After all, as Dick was fond of saying, “strong data are much better to have than merely a strong opinion.” On a personal note, Dick and I maintained very regular contact after I left his laboratory and began my own independent career at Indiana University. We remained collaborators over the years. He was a mentor for life. He nurtured my career; he was always there when I needed him for professional and personal advice; and he always cared about how my family was doing. In hindsight, Dick Thompson was more than a mentor: He was a dear friend. Psychological science and neuroscience have lost a giant.

What follows are remembrances from some of those whose lives Dick touched.

**-Joseph E. Steinmetz**  
The Ohio State University



**Richard F. Thompson (third row, third from right) with other researchers at the Center for Advanced Study in the Behavioral Sciences at Stanford, 1978–1979. Photo courtesy of Elizabeth Loftus.**

## Michel Baudry

*University of Southern California*

I met Dick when I arrived as a young postdoc at the University of California, Irvine, in 1978. He was already a major figure in what was then the Psychobiology Department. More importantly, he had been elected in 1977 to the National Academy of Sciences, and had an army of students and postdocs in Steinhaus Hall. I was fortunate to develop a first collaborative project with his lab in which we decided to look for changes in glutamate receptors in the hippocampus of rabbits following training in the eye-blink conditioning paradigm, his “simple” model system for learning and memory. From these days, he rapidly became a mentor, a role model, and a friend. Although he soon left UCI to move to Stanford, I became part of the large Thompson family of students, colleagues, and friends. When he moved to the University of Southern California to start the Neural, Informational, & Behavioral Sciences program and asked me to join it, I was honored and thrilled. From 1989 until Dick’s retirement in 2010, I had the privilege to work closely with Dick and Judith and to share many exciting moments. We published 37 papers and chapters together, coedited three books, and trained many students and postdocs. As we all know, Dick is a giant in the neurobiology of learning and memory, and while he left us, he will continue to live forever through his legacy. He discovered the engram, the location and mechanism for storing a particular form of memory in the mammalian brain, an accomplishment that no one else had done before him. All of us who followed him through these years know what this represents in terms of amount of work, amount of time fighting to be funded and recognized, and amount of energy to convince your detractors that you are right and they are wrong. Indeed, one lesson I learned from Dick is that you should never give up, you should keep fighting to show the world you are right. Dick was also never afraid to speak his mind and to let people know when they were wrong. At the same time, he was also a very kind and passionate man, who would enjoy listening to me telling him about our efforts to get the calpain hypothesis accepted by the scientific community. His too premature death is a big loss for the field of learning and memory and for all his family, friends, and numerous students and associates.

## **Ted Berger**

*University of Southern California*

I first met Dick Thompson in 1973 when I was a beginning graduate student at Harvard University. Dick had just accepted the Karl Lashley Chair in Psychology at Harvard (coming from the University of California, Irvine, or UCI) and was setting up a fabulous laboratory in William James Hall to carry on Lashley's tradition in the study of the neural basis of learned behavior. In contrast to Lashley, Dick felt that memories were most likely to be localized in the brain, and that it should be possible to identify the brain site of storage for the conditioned response, i.e., the engram. I still recall the day that Dick had the various members of his lab meet around a conference table to "divide up" various targets in the brain to test for neurophysiological correlates of conditioned responding — Brad Alger and I eagerly chose the hippocampus. In prior years, Dick had led the field by developing conditioning paradigms best suited for localizing sites of synaptic plasticity underlying nonassociative learning, such as habituation. In this new effort to understand associative learning, Dick had brilliantly chosen to use Isidore Gormezano's rabbit conditioned eye-blink preparation; Dick was always a master of experimental strategies and design. In one of the first applications of this paradigm, Brad Alger, Dick, and I discovered a most unexpected result — one of the earliest signs of plasticity to appear in the brain — an increase in hippocampal pyramidal cell firing having a temporal pattern that correlated with the conditioned and unconditioned responses. During subsequent studies of inputs and outputs to hippocampus, Dick decided to return to UCI, and Harvard allowed me to finish my PhD thesis from California. I and many other graduate students and postdocs at UCI continued to study this hippocampal phenomenon, showing that it was necessary for trace, reversal, and other higher forms of conditioning.

In those years as a postdoc at Irvine (and at The Salk Institute) I got to know Dick, Judy, and the Thompson family better, house-sitting during the summer, etc. Both Dick and Judy were incredibly kind, and were always warm, welcoming, and just plain fun to be with. In 1979, I accepted a faculty position at the University of Pittsburgh, and continued rabbit eye-blink research. We successfully mapped hippocampal output to the ventral pontine nuclei through the subiculum and retrosplenial cortex, thus connecting the hippocampus to the cerebellum — to where Dick and colleagues had localized the "engram." Thus, Dick and I continued to share experimental interests. My attempt to map learning-related hippocampal activity to other sites in the brain raised the critical problem of nonlinearities of synaptic transmission. It was from this vantage point that I entered into the study of engineering applications to the nervous system, and specifically nonlinear systems analysis. I became so engaged in engineering that by 1989, when Dick moved to the University of Southern California (USC) to direct their Neuroscience Program, he invited me to join him in 1992, though with my having a tenured appointment in Biomedical Engineering. It is testimony to Dick's interdisciplinary flexibility that he could easily conceive of someone training with him and then moving to another "distant" discipline; it was the problem that mattered to Dick, not the route to the solution. The subsequent more than 20 years at USC with Dick have been absolutely fabulous. Having Dick and Judy as colleagues and friends is one of the greatest gifts I could imagine. During one of his rare but unfortunate stints in the hospital, I stopped by late in the afternoon or evening and Dick and I talked science (and also "gossiped") for hours in as comfortable a manner as possible. Being friends with Dick is my most cherished memory of him.

## **Stephen D. Berry**

I was truly saddened when I heard of Dick Thompson's death. He was a mentor and friend to me for more than 40 years, providing me with a critical opportunity at the beginning of my career. Dick was, first, a dedicated and brilliant scientist who devoted his career to a systematic and rigorous pursuit of the memory trace, or "engram," that had eluded physiological psychology, and later behavioral neuroscience, for more than 100 years. I was in his lab at the University of California, Irvine, just prior to the emergence of his cerebellar explanation of eye-blink classical conditioning. At that time (1974–79), the lab was devoted to mapping forwards from the sensory systems (for tone and airpuff) and backwards from the motor output in hopes of finding a critical locus (synapse or structure) of change in order to elucidate essential mechanisms of associative learning. For obvious reasons, we also looked into the potential role of the hippocampus. At Harvard, he had begun this work with Ted Berger and Brad Alger, discovering very rapid (in less than 10 trials) changes in unit responses in trained animals that far preceded the emergence of behavioral conditioned responses. He recognized the importance of this rapid change because it could be critically responsible for any later-developing neurobiological changes. My own work on hippocampal theta has supported the notion of a very early role for the hippocampus in eye-blink conditioning and, recently, how it may interact with the essential circuitry in the cerebellum. Dick's reaction to my early findings served as guidance for my entire career. He decried what he called "hand waving," which I understood to be the common tendency to jump levels of reduction and start thinking/talking/theorizing about major learning constructs (based on one or two empirical findings) perhaps better explained in simpler terms. Thus, he advised me to do straightforward assessment of potential mechanisms for our findings and postpone the expansive, critical theoretical experiments until much later (if and when the data supported and required them). He specifically said something to the effect of: "Design studies that are simple and direct enough so you know what you have found when you're finished." In my opinion, this encapsulates a theme that can be seen in his own body of work — very direct experiments aimed at specific structures or mechanisms involved in clearly-defined behavioral aspects of eye-blink conditioning. This rigor and sustained intensity over decades in this disciplined approach has led to an impressive system map of essential and modulatory changes in the rabbit brain during eye-blink conditioning. With good cause, it has been referred to as one of the, if not the, most complete map of brain substrates of mammalian associative learning. Dick was justifiably proud of this record but always acknowledged that he was part of a larger group in which one of his major roles was to recruit talent and provide resources and an environment in which good science would reveal some of the brain's secrets. He was always about the science, always open to the surprising result, always looking to the future and the studies that would move us closer to the essential nature of learning in the brain. He was also unfailingly loyal to his students, staying in contact and promoting their careers even after they left his lab. It is an exciting time to be involved in the neurobiology of learning and memory. There are many revolutionary techniques coming on line and a growing recognition that memory comes from a system rather than a center. It is a sad shame that we must move forward without Dick Thompson.

## **Michael S. Fanselow**

*University of California, Los Angeles*

I was never formally a student of Dick Thompson's, but he was a profound and continuing influence on

me from the very start. My first undergraduate research project, in the lab of W. F. Oakes at Brooklyn College around 1974, was on sensory preconditioning. As I began to research the literature, I ran into an amazing series of experiments that Dick conducted between 1958 and 1965. It taught me that good research was not a single experiment but the building of a systematic story. When Dick's name comes to mind, we usually think first of eye-blink conditioning and habituation, but his reach was far beyond those topics. A few years later, during my first year of graduate school (1977) I was thrilled to attend an invited address by Dick. I forget whether it was at WPA in Seattle or APA in San Francisco, but what I will never forget was Dick showing the neural representation of Pavlovian eye-blink conditioning in the hippocampus.

Dick and I arrived in Los Angeles, him from Stanford, me from Dartmouth, at about the same time (1987–88). We immediately began off-and-on collaborations and exchanges of students, with me becoming his academic son-in-law! One of my fondest memories was the Saturday morning that Dick showed up at my lab with Gig Levine. Gig's view was that during fear conditioning, conditioned corticosterone release would never stand up to rigorous conditioning controls. Jeansok Kim, then a grad student in my lab, ran the computer and did the scoring. I put the rats in and out of the boxes and cleaned litter trays. Gig decapitated rats and collected blood. Dick stood in supervision of the three of us, occasionally giving an approving nod. It was a long day and the University of California, Los Angeles, being the progressive place it is, had recently banned cigarette smoking in campus buildings. Dick and Gig were having none of that, but I did at least get them to agree to not smoke in the lab, although the B floor of Franz Hall got pretty cloudy. When Dick saw the rats perfectly freeze to CS onset [conditioned stimulus onset] he exclaimed, "Now that is science!" and I was pretty proud. Gig was right about corticosterone release, though, and we never published the paper despite the manpower dedicated to it.

Dick taught us all both how to do good science and how to enjoy good science. I will always miss him.

## Mark A. Gluck

*Rutgers University–Newark*



Attendees of a 1999 Festschrift honoring Richard F. Thompson. Photo courtesy of Mark Gluck.



Dick was a mentor, friend, and father figure to many of us — an academic “parent” who nurtured us in the early stages of our careers, then kept a helpful eye on us throughout the rest of our lives, always promoting and guiding and assisting his former students whenever he could.

Dick’s influence on my own life extended far beyond just my career, but even to the license plate I chose for my car (as did Paul Solomon up in Massachusetts). We modeled our plates on the “Engram” plate that adorned Dick’s little Porsche sports car that followed him from city to city (and is now owned and used by his children). These three “Engram” license plates are much like the brain’s engram itself, distributed across a wide geography, reminding us just how distributed and interconnected was Dick’s influence on his students, friends, and colleagues around the country and abroad. We miss him, but he remains embodied within our own engrams.

A Festschrift volume with contributions from 15 of Dick’s former students and colleagues emerged from a May 21–22, 1999, Festschrift conference held in New York at the Harvard and Williams Clubs and was published as Steinmetz, J., Gluck, M., & Solomon, P. (2001). *Model Systems and the Neurobiology of Associative Learning: A Festschrift for Richard F. Thompson*, Mahwah, NJ: Lawrence Erlbaum Associates.

Photos from the 1999 Festschrift can be found at [www.gluck.edu/photo/festschrift/festschrift\\_start.html](http://www.gluck.edu/photo/festschrift/festschrift_start.html).

Photos from a 1995 Thompson and Friends SFN Dinner at “Dick’s Last Resort” in San Diego are at [www.gluck.edu/photo/dinner/dinner\\_start.html](http://www.gluck.edu/photo/dinner/dinner_start.html).

Photos from Dick’s 80th birthday and retirement dinner at the University of Southern California in Los Angeles in May, 2010 are at [www.gluck.edu/photo/thompson/1.html](http://www.gluck.edu/photo/thompson/1.html).

## **Barbara Knowlton**

*University of California, Los Angeles*

My first memory of Dick Thompson was a high-profile talk he gave at the Society for Neuroscience meeting in 1983. He was describing the systematic program of work in his lab showing that the interpositus nucleus of the cerebellum was the site of the engram for the conditional eye-blink response. At the time, this work was relatively new to the field, and completely new to me. I was an undergraduate attending my first scientific conference and starting to work on grad school applications. With the thought that I could become part of the elegant line of work he was describing, Stanford rocketed to the top of my list. I remember the palm-tree-lined drive up to Jordan Hall for my interview with Dick. I was excited but also intimidated as I sat in what seemed like a small chair in front of his huge imposing desk. He asked me about my research and coursework — I didn’t get the sense that he was trying to test me, but rather to impart that joining his lab was a serious undertaking.

I started working in Dick’s lab at Stanford and ultimately moved with him to the University of Southern California to complete my dissertation. I would consider his mentoring style “paternal” in several senses of the word. In the same way it is not considered good parenting to try to be best friends with your child, Dick kept his grad students at a respectful distance. And we were appropriately fearful of doing

something that would displease him. Yet, by the same token, his concern for his students was also fatherly, and far exceeded his professional obligations to them. When I was an advanced grad student, the news that my grandmother had died came as a phone call to the main lab number. Dick found me to let me know. When he saw that I was fighting back tears he let me use his office where I could be alone to compose myself. I am sure that on a busy weekday morning he had plenty to do, but he nevertheless let me take as long as I needed.

Dick was also fatherly in the pride he took in his students and his promotion of their work after they had left the lab. I remember a talk he gave at the University of California, Los Angeles, where I was a new assistant professor. He was able to work in a study I had done many years ago in his lab. In truth, it wasn't particularly relevant to the rest of his talk, but I was touched by the fact that he had made this effort on my behalf. It meant a great deal to me that he was proud of my accomplishments.

## **Gary S. Lynch**

*University of California, Irvine*

Dick Thompson's name will figure prominently on future Top 10 lists of the greatest behavioral neuroscientists. I was a colleague of his in the early days of the University of California, Irvine, and vividly recall our first encounters. While his processing speed and breadth of knowledge were intimidating, it was an ability to move from arguments to remarkably innovative concepts that floored me. I knew of scientific heroes from graduate studies but here was the thing itself. Dick's lab was then finishing the first description of synaptic substrates for two simple forms of learning and moving on to conditioning. His objectives were breathtaking, and in the opinion of many out of reach: He intended to define the essential circuits for linking cues and responses and then to identify synapses that encoded the learning. But the skeptics underestimated Dick's singular intellectual powers and scientific skills. Working at several institutions (always a wanderer), he succeeded in isolating a collection of cerebellar networks, and pinpointing the plasticity site responsible for the acquisition of a classic form of learning. He had found a mammalian memory trace, an engram, and so was the first to reach a primary goal of the brain sciences since the 19th century. By any standard, this has to be viewed as a monumental achievement. And one that stands alone: Thompson's engram is still the only one we have.

The work then shifted to ever more complex aspects of learning and the hippocampus. There, he established surprising relationships between higher order features of conditioning to neuronal firing patterns, results that extended his analyses into the time-span of cognition. Dick's outstanding students subsequently made many fundamental discoveries along these lines, and work on spatio-temporal firing patterns in hippocampus is now a major part of neuroscience. So much of this can be traced back to Dick Thompson.

He will always be remembered for these scientific triumphs (and there are others), but those of us who knew him will never forget the person. No one ever helped me so much in my work and career, and there are many, many others who will say the same thing. Dick possessed unfailing generosity and loyalty, traits unaccompanied by any kind of calculation but that instead emerged naturally from a very big spirit. And he showed all of us that it is possible to chase your own ambitions, to ignore fads and academic politics, and still be highly successful. Once, knowing that Dick was in the audience, I used



the quote, “The object of life is not to be on the side of the majority, but to escape finding oneself in the ranks of the insane.” Dick doubled over laughing; he knew whose sentiments were being referenced.

A great scientist and a great man: I doubt that I will see his like again.

## **Stephen Maren**

*Texas A&M University*

I joined Dick’s laboratory as a graduate student in 1989, not long after he was recruited to the University of Southern California to lead the neuroscience program. After I arrived on campus, Dick called me into his office on the top floor of the Mudd building to plot a course for the experiments I would begin in his lab. In preparation for the meeting I had been poring over his work — particularly the influential review that he wrote for *Science* in 1986. I had previous experience working with rabbit conditioning models in Mike Gabriel’s lab at Illinois and had (what I thought) were some great ideas to pursue in eye-blink conditioning. When I walked into Dick’s office, he sat me down and warmly greeted me. Leaning back in his chair, he asked, “How do you feel about long-term potentiation [LTP]?” I stammered awkwardly, but managed to indicate my interest. His eyes lit and up and he proceeded to describe a series of new experiments the lab was pursuing to link hippocampal LTP and glutamate receptors to learning and memory. He described work by Tracy Shors, who was examining stress effects on LTP in hippocampal slices, and Georges Tocco and Michel Baudry, who were characterizing glutamate receptors in the hippocampus after eye-blink conditioning. His excitement in the work was palpable and his enthusiasm for the science was obvious (in Dick’s understated sort of way). I hung on every word he said, as one does when in the presence of such a powerful persona. “What is missing,” Dick said, “is an experiment linking LTP to glutamate receptors.” He placed his hands on the desk, leaned forward, squared his shoulders and looked me straight in the eye. “Are *you* interested?” he asked. Was I interested? How could I not be? In that brief conversation, Dick inspired a new line of work that I undertook in his lab on glutamate receptor binding after hippocampal LTP induction *in vivo*. He was a brilliant and caring mentor not only for me, but also for many other graduate students and postdocs he worked with throughout his career. Indeed, he has left an unparalleled legacy of training, mentoring, and supporting an entire generation of behavioral neuroscientists. It is apropos that a man distinguished for his seminal contributions in memory research will himself be so fondly remembered.

## **James L. McGaugh**

*University of California, Irvine*

Richard (Dick) Thompson will be remembered as one of the leading neuroscientists of memory of the last half century. It seemed clear to him early in his career that Karl Lashley failed to find an engram in the brain simply because he did not look in the correct way. Dick approached the task of locating an engram by choosing an appropriate learning task, conditioned eye-blink, and using knowledge of the circuit controlling the behavior to investigate the neural locus underlying the conditioning. In an extensive, and classic, series of experiments, he found a specific brain region, the interpositus nucleus in the cerebellum, whose activity appeared to be necessary and sufficient to serve as a locus of change

underlying learning. This classic finding is now found in every behavioral neurobiology textbook.

I first met Dick in the early 1960s when I was at the University of Oregon in Eugene and he was at the medical school in Portland. When I moved to the University of California, Irvine, I invited him to join me. Dick had a major influence in the early development of the department then called Psychobiology (now called Neurobiology and Behavior). He attracted outstanding graduate students and postdocs and achieved the recognition that resulted in his election to the National Academy of Sciences and an offer of the Karl Lashley Professorship at Harvard. We were subsequently fortunate in being able to attract Dick back to Irvine, where for several years he continued his spectacular scientific career. During that time he and I collaborated with Harry Harlow in writing a textbook on introductory psychology.

No discussion of Dick and his contributions would be complete without recognizing the sustained collaborative contributions of Judy Thompson. It is clear that their collaboration in research was essential to the success of the “search for the engram.” Dick and Judy attracted an “army” of devoted Thompson “engramologists,” or perhaps “Thompsonites,” who are continuing to add to our knowledge of how and where our brains create memories. Dick is missed and will continue to be missed by all who knew him. But because of his research, we can be assured that the engrams of our interactions with Dick are located firmly someplace in our brains.

## **Michael M. Patterson**

*Nova Southeastern University (retired)*

Dick was the consummate skeptic. I joined his lab in June 1969, having come from Dore Gormezano’s lab where I had become an expert in rabbit nictitating membrane conditioning. Dore recommended to me that I go to Dick’s lab as a postdoc because he realized that I wanted to know more about neurophysiological psychology. Dick’s lab was devoted at that time to spinal cord process, mainly habituation/sensitization processes. I spent the first 8 months in the lab learning the techniques of single cell recording, etc. I talked with Dick about the rabbit preparation and what it did. He finally decided to let me build a rabbit conditioning chamber and he ordered the rabbit restraint box from Indiana University. I built the programming devices and other things. I had to order three rabbits to the animal facility, since there were no rabbits available there at the time. I put a rabbit in the conditioning apparatus and started the program to condition the nictitating membrane conditioned response. At about trial 35, I called Dick and asked him to come down to see the process. The rabbit was not giving conditioned responses [CRs] yet, but at about trial 48, a CR occurred, just as I had said it would. Dick said it was just a random event, always being the skeptic. Soon, CRs were occurring regularly, and Dick was blown away at the behavioral control that Dore had developed and what it meant for exploring the connection between behavior and brain activity. That insight changed the trajectory of Dick’s lab and career, and proved that Dick was a true skeptic who could be convinced that a new direction was the way to go. I remember Dick as one who had to be convinced that a new direction was the way to go. However, when that happened, he was fully behind it. The other thing about Dick was that he always gave credit and support to those he saw as being the best of those under his leadership. His support of those he felt were doing good work was unwavering. He was the best of the best of both a scientist and a trainer of new scientists.

# Tracey J. Shors

*Rutgers University*



I was very close to Dick Thompson, and so when I was asked to write a tribute, of course I said yes. And then my mind started racing. How do you express deep appreciation and respect for the one person who had the biggest impact on your professional life and someone who you loved as dearly as you did your father? As I pondered, I kept coming back to Dick's unconditional and unwavering love of science. Dick Thompson loved science more than anyone else that I have ever met, and I have met a lot of scientists who do. It was an all-consuming love, only surpassed by his love for his wife, Judith Thompson. I know their love because I shared an office with Judith for 4 years. They were married for more than 50 years and working alongside one another for 30 of those. They were rarely apart and had an especially close connection.

Just the other day, we had a journal club meeting at Rutgers to discuss a recent article about learning in the cerebellum. The authors examined the Purkinje cell response to classical conditioning, concluding that the memory for timing was localized within the cerebellum (of course) but also within the cell. I was sad that Dick wasn't alive to contemplate these data and dismayed that he was not referenced. But then again, his discoveries are so fundamental and now so ingrained that they need not be referenced. After all, we don't reference Pavlov either. That said, I do so wish that everyone could fully appreciate what Dick Thompson did for neuroscience. He was the first scientist to identify the circuitry for associative memory in the mammalian brain. He should have gotten the Nobel Prize for that, and I know that he wished he did too. But deep down, Dick Thompson knew that his discoveries were fundamental and as such would stand the test of time.

Dick did not want to retire. He always told me that he didn't know what he would do because science was his one and only hobby. His many friends, students, and colleagues had three — count them, three — Festschrifts before he did retire in 2010. After that, he closed his lab and moved north with Judith to be close to their children and grandchildren. I did talk to him on the phone every now and then. The last time, we spent a few minutes catching up on personal things, but within a minute or two, he was telling me about the red nucleus. That made me happy. I heard from Judith that he spent much of the last year or so of his life reading voraciously, several books a week. Just as I so vividly remember him sitting at his desk, writing book upon paper upon book (in long-hand, mind you), I picture him at home sitting in

his chair reading book after book. I love those images and they are what I turn to now as I miss him so.

## **Diana S. Woodruff-Pak**

*Temple University*

As a scientist, Richard F. Thompson was brilliant. He thought and wrote so clearly that his ideas and discoveries were conveyed to graduate and postdoctoral students and colleagues throughout the world. His bestselling textbook, *Foundations of Physiological Psychology*, introduced many cohorts of undergraduate students to the field we know as behavioral neuroscience. Indeed, as editor of *Comparative and Physiological Psychology*, Dick Thompson persuaded the American Psychological Association to change the journal's name to *Behavioral Neuroscience*.

My first encounter with Dick occurred at the Festschrift for Donald B. Lindsley in 1977 at the University of California, Los Angeles. Most of us attending had worked in the Lindsley lab, but Dick was invited as a good friend and eminent colleague of Don's. Dick, who emphasized Lindsley's contributions and their relevance to Dick's own work, gave the best talk of the Festschrift.

We met again in 1979 on a National Institute of Mental Health study section on mental health education and soon started talking outside the formal meeting time. Dick's lab group had been working with the rabbit model system of eye-blink conditioning and had identified correlates of conditioned learning in the hippocampus. However, in the early 1980s they turned their focus to the cerebellum, where lesions eliminated this form of learning. Dick was so excited about this work that his evening discourses were captivating. He thought if they could isolate the region of plasticity for learning, then they could map the neural circuitry that input to the site and eventually discover the molecular changes involved in making the "engram." Dick's red MG at Stanford had the license plate "ENGRAM" — one of the many signs of his passion for his research.

My interest in memory and aging was piqued by Dick's work in isolating the site of learning. There were some data indicating that older rabbits were impaired in eye-blink conditioning. I was excited by the prospect of focusing on a brain region to identify the processes of aging that might occur there. At the time that I wrote a proposal to collaborate with Dick, none of the cerebellar work was published. A great deal had been published about Dick's hippocampus research in the rabbit model system, and my National Institute on Aging Senior Research Proposal was awarded to spend 2 years in Dick's lab at Stanford studying the hippocampus and memory in aging. We carried out some hippocampal recordings in aging rabbits, but the thrust of the lab's research was on the cerebellum. I was captivated by the cerebellar work then and have collaborated with Dick on research on learning, memory, and aging for the last more than 30 years. It has been a wonderful experience and an honor to work with such a great man.