PNAS RETROSPECTIVE

Frans B. M. de Waal, 1948 to 2024: Primatologist and evolutionary cognition researcher who brought us closer to our nonhuman relatives

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Frans B. M. de Waal, one of the giants in the study of primate behavior and a remarkably prolific scientific and popular book writer, passed away at the age of 75 this past March. He is widely regarded as a pioneer in the observational and experimental investigation of conflict resolution, cooperation, and empathy in nonhuman primates. In addition to contributing several hundred peer-reviewed papers to the scientific literature, he wrote more than a dozen books (one more is forthcoming) that challenged the public to question their views of human supremacy within the world of animals.

Born in the Netherlands in 1948, Frans developed a fascination for animals from a very young age and a self-described interest in working with them. He pursued that passion to a PhD, which he received from the University of Utrecht in 1977. While his doctoral research was on aggression in macaques, his observations of chimpanzees at the Arnhem Zoo in the late 1970s revolutionized our understanding of the complexity of nonhuman primate behavior. He described in vivid detail the power struggles between males, the surprising calm that followed intense fighting, and the calculated decisions that males and females made to negotiate power. In Frans' descriptions of chimpanzee sociality, published in his first book, *Chimpanzee Politics* (1), in 1982 and in more than 40 years of subsequent observational and experimental research with chimpanzees and other primate species, he wrote about aggression and conflict, but also cooperation, helping behavior, reconciliation, consolation, empathy, and culture. Frans arrived at Emory University in Atlanta in 1991 and, after nearly three decades of teaching and leading an expansive research program there, retired in 2019. He was the C. H. Candler Professor of Psychology, as well as the founder and director of the Living Links Center at the Yerkes (now Emory) National Primate Research Center (Fig. 1).

With students, postdocs, and colleagues, he studied chimpanzees and capuchin monkeys living in a number of different social groups. His collaborative experimental research with these animals, for example, demonstrated cultural transmission (reviewed in ref. 2), prosociality (3), and cooperative problem-solving (4), as well as aversion to inequity (reviewed in ref. 5) and facial/body recognition (6). For the latter study, which demonstrated that chimpanzees could recognize images of familiar individuals based on images of their rear-ends, Frans and a PhD student at the time, Jennifer Pokorny, won the satirical Ig Nobel Prize; ever a scientist with a great sense of humor, Frans attended the award ceremony and always made light, with pride, of the recognition.

For scientists and public readers alike, Frans' writings encouraged people to consider, often for the first time, that the divide between human and nonhuman animal cognition may not be so great. Frans often bristled at criticism by colleagues of how he interpreted primate behavior; in fact, he coined the term "anthropodenial" to express his exasperation with science's continued reluctance to ascribe complex, "human-like" emotions and cognitive abilities to animals.

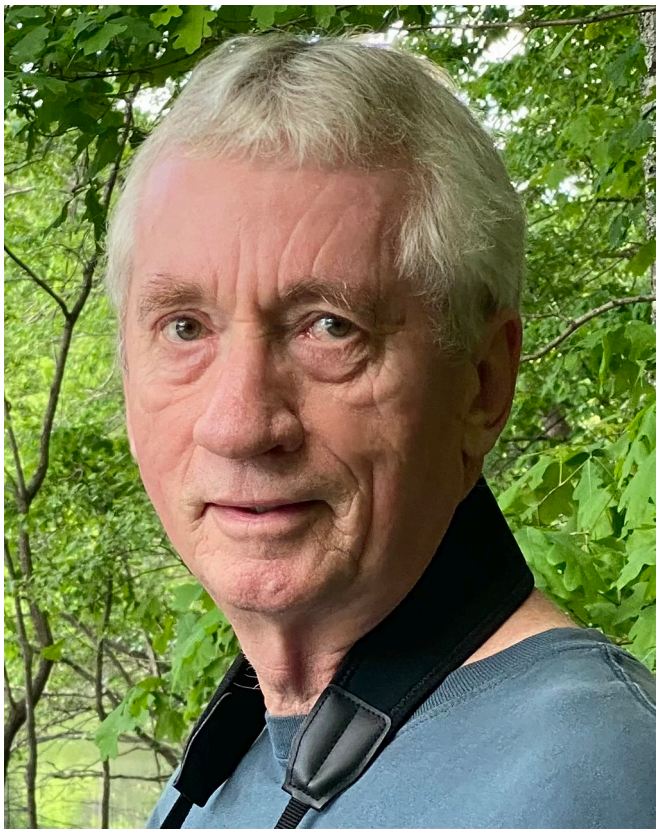

Fig. 1. Frans de Waal on a walk with his wife near their home in Stone Mountain, GA. Image Credit: Catherine Marin (photographer).

Since his passing from stomach cancer this past March, many people who knew of Frans through his lectures, opinion pieces, or TED talks, have asked me what it was like to know him personally. Throughout his career, he was as famous as any academic could be; whenever I mentioned

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him to colleagues in other fields or to family members, many lit up, recognizing his name or telling me how several of his books sat on their nightstands. To me though, Frans was first my PhD advisor, and, in the years between my graduation and his passing, one of my closest colleagues and friends.

It's strange how often your life can be dramatically impacted by a seemingly inconsequential decision, but that's how it was at the start of my relationship with Frans. One day, while working as an intern at the Central Park Zoo in NYC during my junior year of college, I showed the curator a list of faculty at Emory University with whom I could conduct research as a summer student. He quickly pointed to Frans' name and said, "You must work with him." I did, and it was the most impactful career-related decision I ever made.

Two years later, as a PhD student in Frans' lab, I approached him rather sheepishly, as one does when asking a mentor if it would be alright to study animals to whom he didn't already have ready access, and asked what he thought of me testing hypotheses about convergent cognitive evolution—the process by which similar cognitive abilities evolve in evolutionarily distant species due to similar environmental pressures—in a nonprimate animal. He was enthusiastic and supportive immediately, offering to help me identify a path forward. Six months later, I was in New York studying whether Asian elephants could recognize themselves in a mirror we installed at the Bronx Zoo. When I returned to Atlanta after the completion of that study, I asked Frans what he thought about my visiting elephant facilities in Asia to develop ideas for a dissertation. He funded my airfare without hesitation, and I found myself a year later sitting on a bamboo platform in northern Thailand revisiting Frans' early chimpanzee consolation papers in my head as I watched a female elephant run trumpeting toward another who had called out in distress. I returned to Atlanta again to tell Frans what I had seen, and I remember him immediately telling me with excitement to "go back and watch more." He visited me in Thailand as I collected dissertation data, and remarked at how unsurprised he was at how intelligent the elephants seemed (Fig. 2).

I agreed. I've now been studying elephant cognition for nearly 20 years. I often think back on how supportive Frans was of my desire to start my own field sites; other advisors would have discouraged me from taking such a risk (possibly because it could negatively impact their own careers if I had failed), but Frans never shied away from risk or scientific debate. In fact, he encouraged his students to test hypotheses that challenged the status quo, despite the potential for criticism from other researchers of animal cognition or primatology. He often spoke of the importance of doing exciting research, not at the expense of fundamental science but to move the study of animal behavior forward and to keep the public interested in wanting to know more about animal minds. Frans was an exceptionally talented writer; his ability to edit his students' academic work in such a way that they learned to be better writers is a talent few researchers possess. While his advising style and busy schedule often required that his students collect data independently, he responded to his students' emails from wherever in the world he was when he received them with such speed that many of us wondered when or if he slept. Emails to Frans were often met with automatic away messages when he traveled, but I cannot recall the

Fig. 2. Frans de Waal with the author in 2008 at an elephant facility in northern Thailand where they completed a study on reassurance and consolatory behavior in elephants (7). Image Credit: Catherine Marin (photographer).

receipt of a single one that wasn't immediately followed within hours by a carefully worded, always thoughtful personal response. He was there for us when we needed him.

For me, a student struggling with the difficulties of the pressures of graduate school and the cruelty of more senior academics, Frans was a steadying hand who often handled stress with seemingly impossible ease. My first paper as a PhD student was published in the pages of this very journal and centered on the ability of elephants to recognize themselves in a mirror (8). On publication day, I quickly sent off an email to a well-known scientist in the field I thought might be interested in reading about our results. I'm paraphrasing his reply, but I will never forget the gist of what he said and how he said it. First, either quoting a fellow academic whom he had asked about our work or himself anonymously, he wrote: "'Whoppingly unconvincing,' an imminent psychologist said after reading your paper—but hey, at least it was published in PNAS!" Such cruel words may not easily penetrate the callused skin of a seasoned academic, but it hurt me, as a junior graduate student, deeply. Nearly in tears, I showed the email to Frans, who read it, paused and then burst into laughter. "Josh, I wouldn't put too much weight in the words of a man who doesn't know the difference between imminent and eminent." Frans was brilliant and funny, and he brought levity to situations when others perhaps took them too seriously. He reminded me often that discussion of one's science, whether positive or negative, meant people were paying attention. "Keep going, you're doing it right," he would say.

I saw Frans twice within the past year; the first time was in New York last summer, a few months before he was diagnosed with the aggressive cancer that would claim his life less than a year later. At that meeting, we discussed an exciting project idea and our different plans for future travel, and Frans told me he was proud of my accomplishments. This past January, I sat in his living room with him and his wife, Catherine. If understanding the minds of animals was Frans' life's work, Catherine was his life's love. It was a bittersweet time together; one of the most special aspects of being a student in Frans' lab was the regular dinner parties we attended together at his home. Wonderful, eclectic meals—cooked by the talented chef Catherine—and never-ending conversation and laughter over topics ranging from science to politics to music—the latter often led by Frans, a fan of both the Beatles and Bach—will be a lasting memory for all of us who had the honor of being a part of the de Waal lab.

Sitting in his living room in what would be my last meeting with Frans, we tried to emulate our previous happy meetings together; we attempted to tell new jokes, we discussed future collaborations that we knew would not happen, and now, for the first and last time, I made a point of telling him how honored I was to call him a friend, and how much he had meant to me as a mentor. He was an extraordinary scientist, whose work will have an impact on the fields of primatology and animal cognition for decades to come, and on the millions of people who have read his books and listened to his lectures. In the PNAS profile of Frans published in 2005 following his election to the National Academy of Sciences, Frans described the reasoning behind his move, in 1991, from a full-time research position in Wisconsin to his faculty position at Emory University, explaining that he wanted the opportunity to mentor students. "I was missing the fact that I had no legacy," he said (9, p 11138). Frans needn't have worried. He is and will continue to be, sorely missed for the scientist he was and the incredible body of work he left behind, as well as for the kind and supportive mentor he was to so many of us.

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