INTRODUCTION

New Yorkers had been anticipating his visit for months. At Columbia University, where French intellectual Henri Bergson (1859–1941) was to give twelve lectures in February 1913, expectations were especially high. When first approached by officials at Columbia, he had asked for a small seminar room where he could directly interact with students and faculty—something that fit both his personality and his speaking style. But Columbia sensed a potential spectacle. They instead put him in the three-hundred-plus-seat lecture theater in Havemeyer Hall. That much attention, Bergson insisted, would make him too nervous to speak in English without notes. Columbia persisted. So, because rhetorical presentation was as important to him as the words themselves, Bergson delivered his first American lecture entirely in French.[1] Among the standing-room-only throng of professors and editors were New York journalists and "well-dressed" and "overdressed" women, all fumbling to make sense of Bergson's "Spiritualité et Liberté" that slushy evening. Between their otherwise dry lines of copy, the reporters' incredulity was nearly audible as they recorded how hundreds of New Yorkers strained to hear this "frail, thin, small sized man with sunken cheeks" practically whisper an entire lecture on metaphysics in French.[2]

That was only a prelude. Bergson's "Free Will versus Determinism" lecture on Tuesday, February 4th—once again delivered in his barely audible French—caused the academic equivalent of a riot. Two thousand people attempted to cram themselves into Havemeyer. Hundreds of hopeful New Yorkers were denied access; long queues of the disappointed snaked around the building and lingered in the slush. According to legend, motorists on Broadway slowed to a standstill to observe the spectacle. Between the goose-necking and the meandering pools of onlookers, Bergson's lecture instigated the first traffic jam in the history of Broadway.[3] Though the traffic did not become a problem again, this level of overcrowding continued through nearly all of his Columbia University lectures. Bergson clearly touched a nerve in New York. He had nearly everywhere he spoke.

He claimed, self-deprecatingly, to have no well-articulated philosophical system, nothing to champion, no reason for his audiences to be this large, this engaged. His supporters in Europe and North America knew better. Bergson was a philosopher, of course, but his brand of philosophy felt fresh and new, not just a rehashing of Kant or Aristotle. Some called it *vitalism*. Living things, Bergson believed, possessed an élan vital, some animating force or spirit irreducible to mere chemistry or physics. Organisms, and by extension humans, were not mere automatons; according to Bergson, we were special. It was Bergson's notion of organic specialness—and the individualistic self-determination that seemed to come with the vitalism—that resonated with audiences in the early twentieth century.

Yet the ideas that motivated Bergson and drew his crowds were not originally his ideas at all. Two decades earlier, in Naples, Italy, a young German named Hans Driesch (1867–1941) squinted through his microscope at a developing sea urchin embryo. It had just divided: one egg into two gelatinous cells. He had decided to repeat an earlier experiment done by Driesch's well-known mentor, Wilhelm Roux. Roux had used frogs' eggs and had lanced one of the two developing cells with a hot needle, killing it. The second cell from that egg lived and continued to grow and divide, but it formed only half a tadpole. This result made sense to Roux. Any complex system that lost half of itself would, at best, form only halfway. But Driesch saw something else there, and he altered the experiment. Instead of killing one cell with a needle, he painstakingly teased the two cells apart, making them float alone. After several trials, the floating cells, separated from their other halves, grew not into half sea urchins, but full ones with all of their parts in their right places. What kind of machine, Driesch wondered, could lose half of itself yet continue to develop into a whole, functioning system? Only a living thing had the ability to do this. So, he thought, living things must be exceptional, crucially different from nonliving things, and this insight led Driesch to vitalism.

The ripples of Driesch's experiment and his endorsement of vitalism tore open an older debate that appeared to have been settled once and for all decades earlier. By the beginning of the twentieth century, Driesch, together with Bergson and others, stood for a reinvigorated vitalism against what they saw as the dehumanizing hegemony of mechanism. Theirs were only the first salvoes; this new battle between mechanism and vitalism would continue for decades.

The mechanism-vitalism debate originated in a set of perennial questions. Aside from superficial dissimilarities in size, shape, and density, what makes mountains distinct from mountain lions, stars unlike starfish, or sea anenomies crucially different than the seawater surrounding them? Do organisms possess certain attributes—the ability to replicate, for instance, or the need to breathe—that fundamentally set them apart from nonorganisms? Put another way, what makes something alive? Is organic life *essentially* different from the inorganic and nonliving, or is it just a wetter way of assembling the carbon, hydrogen, oxygen, and so on that chemists find in the earth and the earthworm alike? Traditionally, mechanists believe there is no real line between life and nonlife; vitalists believe that without something extra, something outside of physics and chemistry alone, nonliving material cannot live.

These questions preoccupied some of history's most influential natural philosophers. Long ago, Aristotle and Theophrastus wrestled over them while walking along the Aegean coastline; the Philosopher—Aristotle—insisted living beings were greater than the cold material causes imagined by Democritus and the atomists. Five centuries after Aristotle, Galen of Pergamon, surgeon to the gladiators, insisted that arterial blood carried *pneuma*, a vital fluid or spirit, unique to the living. Over a thousand years after Galen, in the seventeenth century, Britain's William Harvey corrected Galen's antique theories of anatomy but retained an almost commonsense faith in the need for an extra fluid or spirit to account for the complexity of life—that hallmark of vitalism echoed in Henri Bergson's élan vital. Harvey's seventeenth-century contemporary René Descartes, by contrast, maintained that organisms were little more than automata—mechanical devices. The modern conflict between mechanism and vitalism was born.

It continued to involve some of the most important thinkers in seventeenth-, eighteenth-, and nineteenth-century Europe. Gottfried Wilhelm Leibniz weighed in; so did John Turberville Needham, Lazzaro Spallanzani, Georg Ernst Stahl, William Hunter, and many others. The debate died down in the mid-nineteenth century due to, among other things, a decisive advance from four prominent German mechanists. Emil Du Bois-Reymond, Carl Ludwig, Ernst Brücke, and Hermann von Helmholtz vowed to explain life itself and every function of an organism solely through physicochemical means. Wilhelm Roux's work was in the lineage of these mechanists.

Surprisingly, given the effectiveness of the "Helmholtz school," vitalism was reinvigorated in the wake of Hans Driesch's embryological work. But it settled little. Once again, an aggressive mechanistic opposition met the new vitalism, this time through the work of Jacques Loeb (1859–1924). Like Driesch, Loeb was an adroit experimentalist who emigrated from his native Germany to better-funded American laboratories.

Sparked by Driesch, Bergson, and Loeb, the mechanist-vitalist dispute continued on into the new century. Between the First and Second World Wars, individual biologists, including Nobel laureates, would declare the defeat of one or the other position. Decades later, Francis H. C. Crick (1916–2004) reminded his audience that his work in molecular biology contributed to the final conquest of vitalism. But in the 1960s, another group of accomplished biologists gathered in Alpbach, Switzerland, to claim that Crick had overstated the strength of his mechanistic position. Some biologists took an even stronger stand for vitalism. Sewall G. Wright, founding father of the neo-Darwinian synthesis, for instance, held that some extramaterial substance or principle was required to explain the vast complexity of life and evolution.[4] Clearly, the conflict was still very much alive in the middle of the twentieth century.

Like any conflict, the mechanism-vitalism debate has gained a lot of attention from historians and philosophers over the years. This makes sense: The battle lasted so long and involved some of the most memorable names in biology. But, important as that debate is, this is not a book about it.

Instead, this book maps a comparatively understudied network of scientists who shared two features in common. The first is that they were not vitalists like Bergson and Driesch; the second is that they were not mechanists like Roux and Loeb, either. What they were instead of these two things was hard to define, even for them. Using their own idioms, each claimed that they were pioneers of a "third way," a path that cut across the mechanism-vitalism debate. They advocated a new manner of *seeing*—the way that, when given a fourth point and a triangle, one might create a pyramid instead of a trapezoid. It was a way of seeing life, even the universe, organically; advocates often called their approach the "philosophy of organism," "organic philosophy," "organismalism," or "organicism."

Their concepts require unpacking, not because they are counterintuitive or even unfamiliar, but because their "third way" was much more complex than the mechanism or vitalism it was intended to displace. There were more threads to hold in tension. Stated as a positive definition, the philosophy of organism was the belief that a whole organism is "*as essential to an explana-*