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IN MEMORIAM

Esther Thelen

Esther Stillman Thelen died on December 29, 2004, of cancer, at the age of 63. She had successfully battled the same cancer into remission 25 years earlier at the start of her career. Esther changed the face of developmental psychology by introducing researchers to a dynamic systems approach to development and by reinvigorating the moribund field of motor development. She was a highly respected colleague, a cherished mentor and friend, and a licensed movement therapist. She was a loving wife of 42 years, a proud mother, and a delighted grandmother.

Esther had a remarkable sense of style, both personally and intellectually. Her clothes, her homes, her hobbies, her papers, and her talks—all bore her personal, creative touch: a colorful scarf to cap off an outfit, the perfect turn of phrase to capture an idea. As a researcher, she loved both the minute details of the data and the big ideas that build an overarching theory. Unparalleled by other infancy researchers, Esther conducted dozens of detailed microgenetic longitudinal studies. She illustrated how the use of high-speed motion capture systems and electromyographic recordings with infants provided new insights into the processes of change over multiple nested time scales. She painstakingly observed infants' movements with the confidence that individual patterns of stepping and reaching would reveal larger patterns of learning and development.

Esther was an extraordinary observer of behavioral development. Like McGraw and Piaget before her, she discerned patterns of behavior that had previously gone unnoticed and she changed prior conceptions of previously noted phenomena. Like her great predecessors, she aimed to establish a grand theory of development with general principles that could apply across varied phenomena and traditionally disparate content domains.

After receiving her undergraduate degree in zoology from the University of Wisconsin in 1963, Esther chose the traditional path of supporting her husband's career and starting a family. Only partially tongue-in-cheek, she credited her children with starting her on an academic career. To "expand her interests beyond Jell-O cubes and Sesame Street," Esther took a graduate course in animal behavior. She was instantly hooked. The ethological perspective stressed the importance of

detailed observations of animals' natural behavioral patterns and raised fundamental questions about the developmental origins.

Based on a study of grooming behavior in wasps, Esther received her master's degree in 1973 from the University of Missouri. The repetitive, stereotyped grooming movements of the wasps seemed reminiscent of Piaget's notion of circular reactions described in her developmental psychology classes on human infants. Esther's dissertation was the first in a series of heroic longitudinal studies that were to become her trademark. In a tour-de-force descriptive study, she collected biweekly observations of 49 different types of repetitive stereotyped movements in infants' arms, legs, trunks, heads, faces, and fingers. In 1977, she received her doctoral degree in biological sciences.

Esther's career soon skyrocketed despite her late and unconventional start in academia. In 1977, Esther took a part-time faculty position in the Psychology Department at the University of Missouri. Her first lab was a former morgue, carpeted and covered in posters to make it welcoming for infants. Every modern textbook contains images from the work that she began there: infants performing alternating leg movements while lying on their backs, held upright by an experimenter, with tiny weights around their ankles, submerged chest-deep in a tank of water, on a motorized treadmill, and with one foot on a fast-moving treadmill belt and one foot on a slow-moving belt. One of her best-known findings was that developmental changes in the ratio of leg fat to muscle over infants' first year of life were responsible for the famous U-shaped developmental trajectory in infants' upright stepping movements. The notion that leg fat, not neural maturation, might be responsible for aspects of motor development flew in the face of a century-long tradition of stressing the primary role of brain maturation in motor development. Esther's proposal that no single factor, not even the brain, is necessarily responsible for the course of development would prove to be an enduring theme of her work.

Moreover, the seemingly simple patterns of movement kinematics and muscle forces in infants' leg movements provided the basis for addressing central questions in motor control and child development. Can patterns emerge without a pattern generator to guide them? What are the developmental origins of new behavioral forms? How might researchers understand the effects of multiple interacting factors, each changing at its own rate and with possible reverberations through the whole system? In 1985, Esther moved to the Department of Psychology at Indiana University as a full professor. Inspired by the dynamic systems approach to emergent movement patterns championed by Peter Kugler, Scott Kelso, and Michael Turvey, Esther realized that ideas from dynamic systems could be used to address the emergent nature of development itself. With her long-time colleague, Linda Smith, Esther wrote "A Dynamic Systems Approach to the Development of Cognition and Action" in 1994 and compiled an accompanying edited volume.

In the early 1990s, Esther extended dynamic principles to perceptually guided, goal-directed behaviors by studying the development of infants' reaching in

weekly sessions over infants' first year of life. Although dozens of researchers have demonstrated age-related improvements in reaching, Esther showed that babies must discover idiosyncratic solutions for bringing their hand to a target object. Because of individual differences in infants' bodies, energy levels, and experience, every infant has a different motor problem to solve. One solution might involve mustering sufficient muscle force to raise the arm from the side. Another solution might involve using the muscles to brake the inertial forces generated by ongoing arm flaps and flails.

Esther's research programs on repetitive movement stereotypies and discrete reaching movements came together in the late 1990s when she and Linda Smith investigated infants' perseverative errors in Piaget's classic A-not-B search task: Why might infants continue to reach in the A location when they can see the object hidden at the B location? Esther and Linda argued that infants' repetitive reaching movements are embodied and reflect the biomechanics and perceptual-motor history of the individual. In collaboration with Gregor Schöner, they proposed a formalization of the dynamic systems approach using dynamic field theory to explain the A-not-B error.

Most recently, Esther was expanding dynamic field theory to account for phenomena in other domains. For example, by modeling patterns of looking behaviors during visual habituation, Esther aimed to characterize the real-time processes of looking and remembering that underlie infants' familiarity and novelty preferences. The field theory, like dynamic systems itself, embodies Esther's approach to her science: an explanation of the big picture that is based on the nitty-gritty real-time details.

Esther always felt strongly that basic research must be pointed toward and informed by real-life applications. Every generation of her students included a physical or occupational therapist. In the last 10 years of her life, Esther became increasingly interested in a way to integrate her theoretical and research interests with practical applications. She was impressed by similarities in the fundamental assumptions of the dynamic systems approach and a particular movement therapy, the Feldenkrais method of movement education. After 4 years of training, she became a licensed practitioner and hoped to open a small practice for infants with motor disorders.

Esther's prolific research output included three books, an SRCD monograph, and more than 120 journal articles, book chapters, and commentaries. Despite an untimely foreshortened career lasting only 25 years, she received many prestigious honors. She was a recipient of the Boyd McCandless Award for Early Contributions to Developmental Research. She was a fellow of the American Association for the Advancement of Science and the American Psychological Society and a member of the National Research Council of the National Academy of Sciences. Her research was continuously funded by NSF and NIH from 1979 and included a Research Career Award, two Research Scientist Awards, and a Merit Award. Her service to the ac-

ademic community was equally impressive. She served on the editorial boards of 15 journals, including the leading journals in child development and motor control. She was elected president of the International Society on Infant Studies in 1996 and was the current president of the Society for Research in Child Development, the two primary professional societies in child and infant development.

Esther was a special friend to ISIS. She served for 6 years on the Executive Committee, from 1994–96 (President-Elect), 1996–98 (President), to 1998–2000 (Past President). During this time, the Executive Committee was in a crisis regarding its journal. Esther worked to found a new journal that would be owned and controlled by the Society. She appointed a Publications Committee, chaired it herself, entertained offers from various publishers, chose one, founded the journal, and named it *Infancy*. She handled each task, seemingly effortlessly, with tremendous tact and energy. ISIS is enormously indebted to Esther and will continue to benefit from her leadership for many years.

Working with Esther meant becoming part of her family and her extended intellectual family. To all of her students, she was the consummate model of a good, well-rounded person as well as a disciplined, integrative scientist. While holding us to the highest scientific standards, Esther stressed the importance of a balanced life, engaging in the larger social community, and following one's own unique life path. Esther is survived by her husband Dave, her children Jerry and Jenny, her sister Harriet, her grandson Jackson, and several generations of grateful and fortunate students.

Contributions in her honor can be made to the Esther Thelen Memorial Fund—Indiana University Foundation, c/o IU Psychology Department, 1101 East 10th Street, Bloomington, IN 47405.

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