

PROFILES

Charles Nelson: Searching for early signs of autism

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Lost children: Charles Nelson's most famous work follows the lives of orphans, like this young girl, at institutions in Romania.

Cross-eyed toddlers running up to strangers with their arms outstretched. A boy with a head as big as a basketball. Another with a narrow head who sits sedated in a chair all day. A 1-year-old child in the body of a 1-week-old. A room full of babies, each lying in a crib and staring at a white ceiling.

This is what **Charles Nelson** saw in 1999, on his first visit to the eerily silent St. Catherine's Orphanage in Bucharest, Romania.

Nelson knew what to expect before the trip, but was still not emotionally prepared. "It was so heartbreaking," he says. "We had to make a rule that we were not allowed to cry in front of the kids."

Ten years had passed since the execution of Romanian dictator Nicolae Ceaușescu, and his infamous network of state-run orphanages was beginning to disintegrate. As these children came under international scrutiny, the **MacArthur Foundation** funded the **Bucharest Early Intervention Project**. Led by Nelson and several other scientists, the longitudinal study would randomly place some children in foster care and then compare their fates to those of children who stayed in the institutions.

Nelson's team found that even when institutionalized children receive adequate food and decent living conditions, their social and physical neglect results in stunted growth, motor delays, anxiety, attention deficit, repetitive behaviors and low intelligence quotients¹. But they also found an encouraging trend: Many of these symptoms can be at least partially reversed if the children enter foster homes before age 2.

Famous for his sense of humor and easygoing charm, Nelson's personality is a natural fit for interacting with families. The work is an intellectual fit, too. Whether it is studying how infants learn to recognize faces (his self-described obsession), or measuring the brain effects of premature birth or maternal diabetes, Nelson says he has always been fascinated with the question of how early experience alters development.

From his lab at Boston Children's Hospital, he is asking the same thing about autism: How do different risk factors — whether a single mutation, a family history or extreme social deprivation — lead to different manifestations of the diverse disorder?

His strategy is to analyze brain waves in babies with autism syndromes caused by a single genetic glitch, as well as in **infant siblings** of children with the disorder. He aims to find patterns, or **biomarkers**, that can predict not only which babies are likely to develop autism, but how severe their symptoms will be and what treatments might work best.

Natural experiments:

Nelson's scientific curiosity germinated as a child growing up in Long Island, New York, when he and his father dissected roadkill in their basement — despite his mother's exasperation with the smell of decaying flesh. "They were always dead first. I wasn't one of those people who went out and tortured animals," he says with his characteristic grin.

Nelson first became interested in how experience shapes the brain as an undergraduate student in psychology at McGill University in Montreal. But his mentors told him there was no way to study that in people. "The advice I got was, to do neuroscience you're going to have to work with rats or mice," he says.

As it happens, he is terribly allergic to rats, cats and rabbits, and instead decided to study developmental psychology. When he received his Ph.D. in 1981, electroencephalography (EEG) — a technique in which non-invasive electrodes measure brain waves — was just emerging.

"My first epiphany was when I put electrodes on babies' heads and saw their brain activity," Nelson says. "It was like this is what I was meant to do."

In 1986, Nelson launched a lab at the University of Minnesota. Over the following 19 years, he used EEG to show that babies produce different brain responses to objects² as well as to the faces

of monkeys³, strangers and their own mothers⁴.

Several of Nelson's colleagues attribute his success partly to his good nature, rare in academia's competitive culture.

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