that contain essentially identical copies of DNA and become the building blocks of the organism.

In the 1880s at the Zoological Institute, cell biologist Theodor Boveri studied a species of parasitic worms called Panstrongylus, which has a relatively large genome compared to other worms—so large that its DNA was visible even through a primitive 19th century microscope. He observed that a large chunk of the germline genome was removed as somatic cells developed. More than 100 years later, more sophisticated molecular biology assays revealed that this worm removed an astounding 80 percent of its 2.5-billion-base genome.

As those were still the early days of cell biology, Boveri assumed that this was a normal part of development. But as scientists looked for this process in more organisms, they realized that programmed DNA elimination was not universal.

Early work focused on microscopic species, including various species of parasitic worms and single-celled organisms called ciliates. Scientists learned much of what they know about programmed DNA elimination by studying a family of parasitic worms called Ascaris, which removes around one-fifth of its germline genome. In the 1980s, researchers finally found a family of vertebrates, the hagfish, that removes between one-fifth and one-half of its germline genome. More recently, studies have shown that nearly all songbirds appear to eliminate parts of their germline genomes.

“We are exposed to organisms that have programmed DNA elimination every single day,” said Alexander Suh, an evolutionary biologist at the Leibniz Institute for the Analysis of Biodiversity Change and Uppsala University.

Recent technologies such as DNA sequencing have bolstered researchers’ efforts to probe this process. By comparing sequences of the genomes of germ cells and somatic cells from the same organism, researchers can look for long stretches in the germline genome that are absent from the somatic genome. These studies have shown that species can eliminate anywhere between 0.5 percent and 90 percent of their genomes.

Many species undergo programmed DNA elimination, a process where specific parts of the genome found in the original sperm and egg cells are removed from the cells of the developing body. Different species use varied cellular mechanisms to remove specific parts of their genomes. This process has recently been documented in worms in the *Mesorhabditis* genus, which eliminates approximately thirty percent of their DNA.

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In a wild-type cell, you would never see this. This would be a red flag.

—Marie Delattre, Ecole Normale Superieure de Lyon