

NOTA BENE: DEVELOPMENTAL BIOLOGY

God Bless Us, Every One

Tognina Gonsalvus, born to a hirsute family that fascinated the 16th-century royal courts of Europe, reigns over the cover of Armand Marie Leroi's first book, *Mutants: On Genetic Variety and the Human Body*. She is pictured holding a piece of paper upon which a baroque script details her condition. The young girl peers out from her downy fur-covered body, bearing a half smile like Mona Lisa's; only the rims of her eyes, the tip of her nose, her lips, and her fingers remain bare.

Mutants
On Genetic Variety
and the Human Body
by Armand Marie Leroi

Viking, New York, 2003.
447 pp. \$25.95. ISBN 0-670-03110-0.

Gonsalvus is one of many abnormal individuals in Leroi's book, which not only explores examples of human development gone awry but also reports the science behind them and its history. The average human, Leroi estimates, is born with 300 mutations.

These mutations alter an embryo's development, but their effects are of variable severity. The author likens our developmental process to a "mutational storm" from which there is no shelter. "We are all mutants," he writes. "But some of us are more mutant than others."

Hairy people are not abundant in any population, now or in the past; the condition is rare, like all the congenital abnormalities that Leroi discusses. The author introduces each scientific topic with at least one example of how the condition affected a person in history or legend. He recounts the tale of a child apparently born a girl, inexplicably drawn sexually to other girls, who began to grow not only a beard in adolescence but also a small, functional penis. There's the story of a father-to-be who, cursed by a woman whom he had sent (in a moment of self-righteousness) to a drowning death among the river crabs, was soon borne a child with hands that each developed only two crablike fingers. These tales of monstrosity start out as mysteries, and then Leroi exposes what we know of the "wizard" behind the curtain.

The topics Leroi covers range from conjoined twins, to the development of properly proportioned skeletons and genitals, to how skin and appendages change through growth and aging. He draws our attention to the mutations in humans that reveal the most about the language of the embryo, trying to define the rules of its "grammar" by observing those nature has broken. His narratives hook the reader and build up to a climax, and the science supplies the denouement. Sometimes the seams show between the narrative and the lecture, but, as any science writer knows, discussions of developmental biology are extraordinarily difficult to keep light and simple.

To follow the detailed science behind the storytelling, one needs either a college-level background in developmental biology or an un-

shakable interest in acronyms, abbreviations, signaling molecules, and enzymes. The book would make a fine companion to an undergraduate class in developmental biology, particularly one built around case studies. It should come, then, as no surprise that the author lectures at Imperial College London on developmental biology and the evolution of animal form.

To construct his fascinating account, Leroi has mined a vast literature and many folk histories. He identifies his sources only at the back of the book, where he offers some 650 references and a 30-page section of notes. (These notes are not cited in the main text, but they parallel it and are linked back to sentences on given pages.) Much of this background work may go unnoticed, however, as it is all too easy to get wrapped up in the cadence of Leroi's narratives without any awareness that he expands on his thoughts and sources in the end matter.

A forthcoming television documentary modeled on parts of the book should be a welcome supplement to the book's black-

and-white photographs and drawings. (The short series is scheduled to air on the United Kingdom's Channel 4 in May and should later appear stateside on the Discovery Channel.) It will be interesting to see this production; perhaps the use of animated graphics and photographs of embryos can help ease the understanding of the technical science.

Images in the book, while sometimes gruesome, serve the reader well by illustrating individuals often almost too bizarre to imagine: the Brazilian aleijadinhos, who walk on their knees because their legs taper to a point instead of having long calf bones and feet; the Transylvanian Jewish family who, chosen by

Auschwitz's Mengele for their small bodies, endured torturous experiments in the name of medicine; and one Harry Eastlack, a man who died in his forties of a rare disease in which every insult to his body tissue became ossified until his very joints "froze" over, his skeleton consuming him.

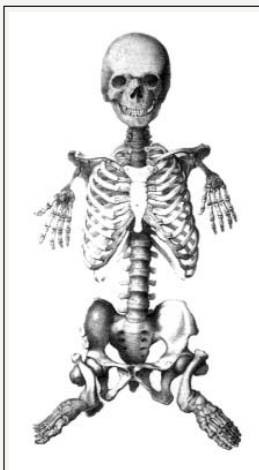
Leroi uses these descriptions not as cautionary tales of monsters, dwarves, or tin men—as his history of scientific inquiry shows they once were—but rather as points of interest on the way to understanding how to facilitate normal human development. It's a marvel that so many normal humans are born each day in light of all the errors that wait to derail the process. These stories of sometimes horrific deformities will inspire budding biologists or anyone interested in knowing how we get two eyes, two arms, and two legs but five different fingers and toes, one tongue, one set of genitals—and why our rather tall order of parts can sometimes get scrambled.

Most of the people Leroi describes evoke sadness in the reader. Nevertheless, they are portrayed with an elegance that belies historical assumptions about their own responsibility (through divine punishment or perhaps karma) for their fate. Leroi's unveilings dissolve the mysticism and the freakishness associated with malformation. Although beauty is usually measured by the absence of mutation, Leroi shows us, through his scientific explanations of developmental abnormalities, a different sort of beauty: innocence.

—MONIQUE MARTINEAU



Portrait of a Girl Covered in Hair by Lavinia Fontana (1552–1614).



Phocomelia. Skeletoin of Marc Cazotte ("Pepin").