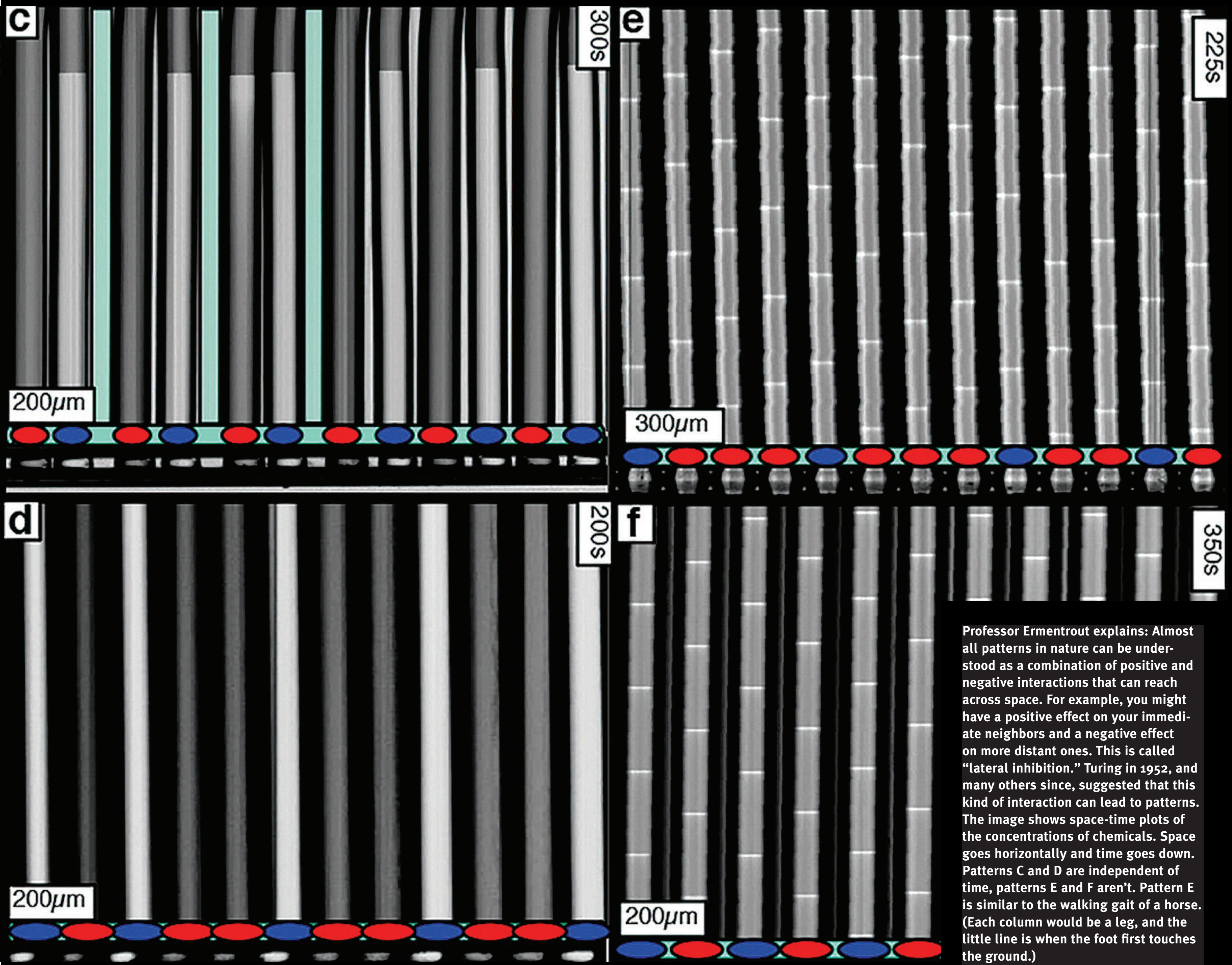

Professor Ermentrout explains: Almost all patterns in nature can be understood as a combination of positive and negative interactions that can reach across space. For example, you might have a positive effect on your immediate neighbors and a negative effect on more distant ones. This is called "lateral inhibition." Turing in 1952, and many others since, suggested that this kind of interaction can lead to patterns. The image shows space-time plots of the concentrations of chemicals. Space goes horizontally and time goes down. Patterns C and D are independent of time, patterns E and F aren't. Pattern E is similar to the walking gait of a horse. (Each column would be a leg, and the little line is when the foot first touches the ground.)

THE PATTERN OF YOU

You have around 37 trillion cells in your body. Skin cells and spleen cells. Bone, blood, and eyelash cells.

This wasn't always the case, of course. Once, you were just a single cell, the gelatinous consequence of a union between egg and sperm. How did this humble envoy turn into all that is you?

Back in 1952, Alan Turing—of WWII code-breaking fame—posited an explanation to this question, one based on symmetry in chemistry. He called it the Theory of Morphogenesis.

More than 60 years later, a team of researchers from the University of Pittsburgh and Brandeis University has provided the first experimental evidence for Turing's theory using cell-like droplets of oil. They published their findings in the *Proceedings of the National Academy of Sciences*, in time for the debut of the Turing biopic, *The Imitation Game*.

It all comes down to inhibitors and activators, says G. Bard Ermentrout, a PhD and Distinguished University Professor of Computational Biology and Mathematics at Pitt and a coauthor of the study.

Imagine cells as tiny, somewhat selfish people. Each cell wants to help itself and those it's closest to, while at the same time depriving cells farther away of resources.

"These systems have certain kinds of symmetries," says Ermentrout, "and these symmetries force a pattern."

Six patterns, according to Turing's theory, all of which the team observed with their oil droplets. They also saw a seventh pattern, not foreseen by Turing but predicted by others.

Differentiation happens when the symmetries break down, notes Ermentrout.

Everything then, from a zebra's stripes to the face of a child, may just be the result of microscopic patterns wrought out over the course of trillions of cells. Each of us is symmetry run amok. —*Jason Bittel*