

## Visionaries

### Using Medicine and Science to Improve the Quality of Life

Medical and scientific breakthroughs, some with ethical concerns, are being used to help people.



#### Building Blocks of the Brain

**Sergiu Pasca**

*Assistant professor of psychiatry and behavioral sciences at Stanford University*

By **KAREN WEINTRAUB**

**B**etween his thumb and forefinger, Dr. Sergiu Pasca held up a small vial of liquid. Inside floated a milky ball of cells — the early stages of an effort to better understand the human brain by building its parts from scratch.

A decade ago, just out of medical school in Romania, Dr. Pasca pioneered work transforming skin cells into multipurpose stem cells and then into the type

of brain cells found in the cerebral cortex — the thinking area and most distinctly human part of our brains. He has made brain cells from people with autism and schizophrenia, for instance, and is working to understand the ways in which they operate differently.

Scientists used to grow cells in a flat layer on a petri dish, but Dr. Pasca discovered that when he and his colleagues allow stem cells to grow in a ball shape and guide them to become brain cells, they begin to self-organize, develop and function more naturally. Other researchers are using similar approaches to build three-dimensional cultures, also known as organoids, such as the eye, gut or liver.

When Dr. Pasca, 36, put two balls resembling different brain regions next to

each other, they started to communicate and form neural circuits. After he had fed them nutrients for about nine months, they had matured to look more like the cells of a newborn brain than those of a fetus.

Before anyone accuses him of playing Frankenstein, Dr. Pasca is quick to note that these brain balls are still worlds away from a true, working brain. There are no blood vessels, so the balls don't have the energy supply to grow, and many types of cells are still missing.

But he and several colleagues recently published a commentary in the scientific journal *Nature* calling for a public conversation to discuss ethical research guidelines in this area. "An ethical framework must be forged now, while brain surrogates remain in the early stages of development," they said.