

# In creating so-called mini-brains, how close to a real human brain is too close?

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Do I exist? Do you exist? How do I know you exist?

These ancient questions have been given new urgency by 21st century

[science](#). Some of San Diego's top researchers met recently in La Jolla to discuss them.

The topic was so-called mini-brains, pea-sized structures of human neurons grown from stem cells. Called human brain organoids by scientists, they are yielding important discoveries about autism, [brain damage](#) from Zika and other neurological conditions.

These mini-brains enable scientists to probe brain functioning in a way that's not ethical in healthy humans. said Dr. Alysson Muotri, a UC San Diego brain organoid researcher and a meeting leader.

But the mini-brains are becoming more complicated, giving rise to the theoretical possibility they might eventually acquire minds of their own, he said.

These [mini-brains](#) show no signs of consciousness at present, he said. And existing technological limitations make that very unlikely.

Muotri said mini-brain are limited in size because they don't develop blood vessels. That means that as the organoids grow in their cultures, the inner ones begin to die. They also don't develop all the types of cells found in a human brain.

But Muotri and colleagues recently demonstrated that these organoids can make brain waves similar to those of premature babies—something never done before. And as for the future, it's impossible to say.

So while a self-aware [human brain](#) in a vat of nutrients is science fiction today, the scientists said it's important to be thinking seriously about these issues, and how to discuss them with the public.

Patricia Churchland is a Salk Institute professor emerita who studies the

linkage between philosophy and neuroscience. She said the possibility that [human brain organoids](#) could eventually become self-aware should be considered.

"We don't really know actually where this is all going," Churchland said. "It's very, very difficult to predict the future in science, as in baseball."

Citing the late Nobel Prize winner and Salk Institute researcher Francis Crick, Churchland said meaningful scientific predictions can be made about five years out, or 10 years if the science is especially strong.

"After that, it's just speculation," she said.

"Some panpsychists want to say that everything is conscious to some degree, even my toenails, even my toenail clippings," she said. "It kinda flies in the face of common sense at this stage."

To avoid speculation, she said discussions need to be grounded in what science has already discovered about consciousness.

We take it for granted that other humans possess [self-awareness](#) or self-consciousness, Churchland said. And that consciousness is known to be linked to the activity of structures such as the [brain](#) stem and thalamus. These exist in other mammals that also demonstrate outward signs of purposeful behavior.

In dealing with the public and the press, scientists should communicate these issues and the current state of knowledge as honestly as possible, she said.

If scientists don't discuss these issues with the public, they'll become vulnerable to political activists who exploit a lack of knowledge, Churchland said.

"Those highfalutin scientists who have the moral arrogance to play God are a favorite target," she said. "And you do not want to be that target."

The public's confidence in science could be lost in that confrontation, she said. And that would undermine efforts of scientists and doctors to develop better ways to treat and prevent diseases.

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