Psychological understanding of the term 'artificial'

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Can we always distinguish between what's natural and what's artificial? And does that distinction even make sense? Credit: David Padilla

Is natural always good and artificial always bad? We talked to psychologist Angela Bearth and biotechnologist Sven Panke about science, skepticism, misunderstandings and how language influences the way we think.

Ms. Bearth, based on your research in the Consumer

Behavior Group, why do you think people get so emotionally worked up about techniques they see as artificial, such as genetically modified plants or vaccines?

Angela Bearth: The term "artificial" has negative connotations and is often associated with risk. Most people won't automatically know how an mRNA-based vaccine works, for example. That's the kind of situation where we tend to rely on so-called heuristics—mental shortcuts or simplified rules of thumb that help us make quick decisions of the type "if it's artificial, it must be bad".

Mr. Panke, your area of specialization is synthetic biology, which sounds pretty artificial…

Sven Panke: That term was coined by an MIT and Berkeley working group, and we've never been very happy with it! As science branding goes, I would say it hits all the wrong notes, at least in Europe. But, yes, at its core, synthetic biology is about creating genetic circuits that do something useful in a cell. It always involves some kind of manipulation of a biological system—and, of course, that's another word with negative connotations.

So language influences our attitudes towards these things?

Bearth: This is one of the biggest challenges and something I'm also looking at in my work. If I ask you how dangerous you think biotechnology is, then I've already implied that it might be dangerous. A better approach is to start with a broad focus and talk about bigger issues before actually asking for people's opinions.

Coronavirus and the mRNA-based vaccine are the big issues right now. Mr. Panke, you're in charge of a new EU consortium that is examining the therapeutic benefits of mRNA. What are you aiming to achieve?

Panke: We want to find out if we can leave the realm of chemistry that nature has laid out for us. What possibilities might we unearth by working at a cellular level to manipulate molecules that exist in the same form just about everywhere? Might that enable us to develop new drugs, for example?

People have always striven to stretch the bounds of possibility. Is what's happening in research today really any different?

Panke: When we look at nature, we see how certain types of molecules appear again and again in virtually the same form, such as DNA. You could argue that just suggesting we try something different is already pushing back the boundaries.

So perhaps some skepticism is justified?

Bearth: Skepticism isn't a bad thing per se. It's actually good to instinctively take a precautionary approach. When we are unsure, we try to protect ourselves on an individual level. But it becomes problematic when decisions on a societal level are based purely on feelings and not on science.

Does public skepticism affect you, Mr. Panke?

Panke: Absolutely! I couldn't do things that would upset or alienate

everyone around me. That's not in my personality. Obviously we're very open to new things at ETH. But that's balanced by a raft of government regulations that give me the framework for my research. I can move within that framework without having to constantly worry that I might be about to do something wrong.

Ms. Bearth, as well as being a researcher at ETH, you're also Vice President of the Forum for Genetic Research at SCNAT. What's your experience of the interaction between science, policymakers and the general public?

Bearth: For the most part, I find it very constructive. We're witnessing a new generation that grew up with climate activism and sees plenty of opportunities in new technologies. CRISPR has a better image than traditional genetic research. In addition, the research community is becoming more aware of the issue and is investing more in science communication.

Panke: Those of us working in synthetic biology have certainly tried to engage in dialogue early on, but overall I have a very different impression of the current situation. It seems to me that society has lost a huge amount of trust in scientists since the 1980s. There's a crisis of confidence, and our efforts to remedy this with better information aren't working. People don't believe us any more because we've messed things up too many times in the past.

Bearth: I don't think that's the case. Hardly any studies point to a steady decline in people's trust in science. In reality, the level of trust is pretty much stable, and in some areas it's even increasing. If there is the opposite impression, it might be because people who have lost trust in science are very vocal. Ultimately, they are a minority, but they are well

organized. For example, the anti-vaccine movement is a powerful campaigning force. Their message can certainly undermine trust but mostly just makes people feel a little unsettled.

Panke: But what about genetic engineering in plant breeding? Researchers working in that field have tried so hard to get information out to the public, but my feeling is that none of their efforts have ever really got anywhere. Why is that?

Bearth: I agree that information is probably not the only solution. We can't all become experts in everything, but people do need to have some basic understanding of the issues. We recently did a study on potato blight where we offered people various solutions. Interestingly, the approach people were most enthusiastic about was gene transfer, which is gene technology. And that was true whether or not we used the term gene technology. People tend to generalize about consumers being against genetic engineering, but I don't think it's as simple as that.

One of the arguments that's often used to support genetic engineering and CRISPR is that we're doing the same thing that nature does, only faster and in a more targeted way. Is that a fair point?

Bearth: Obviously those technologies can produce mutations that might also occur in nature. The difference is that genetic engineering involves a specific person with a specific intention, who can then be held responsible for it. This is where consumers might judge differently, whereas a scientist wouldn't necessarily take that issue into account. Basic researchers don't put a big emphasis on which company uses a technology or who profits, but public opinion takes all those kinds of things into consideration.

Can we always distinguish between what's natural and what's artificial? And does that distinction even make sense?

Panke: It absolutely makes sense, because we're talking about social codes that are clearly important. Society uses the terms natural and artificial to contrast and compare certain things. As a scientist, I don't have sole power to define those words, and I wouldn't even want to. Instead, I need to focus on what society feels about what I do.

Bearth: I would largely agree with that, but I do think there's a problem when these terms lead to uninformed decisions, especially on a political or societal level. I've done a lot of research into toxicology, and it's a great example of how people misunderstand basic concepts. Many people think that the word "chemical" refers to something in a test tube, but not to the air we breathe or the water we drink. And that of course can quickly lead to all sorts of misunderstandings.

Mr. Panke, does it bother you that scientists and lay people interpret the terms differently?

Panke: No, quite the opposite! Scientists like me and the insights we offer are just part of a broader toolkit. We try to use the means we have at our disposal to help build the society of the future, but we shouldn't see our contribution as some kind of absolute.

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