

# Heaven in a Chip

## Bart Kosko

**W**hy do all symphonies have just one author? Why is it so hard to work together as a society or an organization or a family? The "meat" answer is that brains do not communicate well.

Brains do not have direct access to one another. Skulls get in the way. When we talk, write, or gesture, our brain sends signals through complex networks of nerves and muscles. Some version of these signals then disturb the air or paper or keyboard.

The receiving brain must reverse this process. It must convert the noisy sense data into electrical impulses and chemical packets and pass these through layer after layer of neural filters. Then it can process the signals in the same coin as brain talk.

Now think a thought experiment. Think of a big meatloaf in the center of a room with lots of people in it. The people make the meatloaf. Each person takes out his or her brain and throws it on the floor as if it were a loaf of bread. The loaves combine to form one large meatloaf or brainloaf.

Each person has his own chunk of the brainloaf. That grounds his identity in the space-time continuum. But now all the brains can talk in the same neural language just as the two halves of each brain talk to each other. The brains can receive the same flux of sensor signals. Or they can divide that labor among themselves.

What would it be like to live or think in a brainloaf? At first there would be the "blooming buzzing confusion" of all the brain talk. Soon you would get used to that just as you get used to the background chatter at a party or a mall.

And at first the parallel talk and thought would tax you. You would get used to that, too, as your neural muscles stretched and tuned themselves to meet



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the new processing demands. Dissent and debate could reach new heights. But think of the art and science the brainloaf might produce. There would be joint symphonies.

There would be something new in the brainloaf: global thought. This is a meat version of "collective consciousness." The brainloaf would form one huge neural network or dynamical system. Like all neural networks it would "cool down" or equilibrate when inputs stimulate it. The whole brainloaf would *resonate*. The points of resonance would define the group thoughts just as the neural-net resonance in our brains defines our much simpler thoughts.

The brainloaf dynamical system would swirl into complex patterns of resonance. These would no doubt in-

clude chaotic (aperiodic) attractors. The chaos thoughts would bring novelty into the brainloaf. They would create new information. Or they may just be fun to think for their own sake.

This is not science fiction. It is a problem of engineering design. Dr. Ralph Merkle of Xerox Palo Alto Research Center has shown that the human brain stores about  $10^{18}$  bits of information or a billion billion bits. The brain processes those bits at about  $10^{16}$  bits per second. These numbers are not exact. But they are close to within a power of 10 or so.

How big a chip do you need to replace your brain? Right now it would be the size of a house or an office building.

But the density of circuits on a chip doubles every two years or faster. "Moore's law" has held up for over twenty years in the chip race. We can assume it will hold for at least the next decade and perhaps longer. Then by the year 2020 your brain will fit in a chip the size of a sugar cube. Since Moore's law seems to be speeding up, the year may be more like 2010. Most young people today will see that day come to pass. Suppose you do, too.

You go to sleep one night and wake up in a chip. Your brain switches from meat to silicon but you are the same. At least at first you are. The old memories are still there but now you do not access them the same way. They are not just vivid when you recall them. They are as intense as when you first lived them. And you can edit them as if they were dreams you controlled.

Your memory is just one small database that you can access at the speed of light. You can sense all stored knowledge of art and science and news and history much as you now scan a newspaper.

And you can feel and act and do it alone or with thousands of other chip souls. In a brain you see an apple and squeeze it in your brain. The hand touches the apple and the eyes see its reflection. Those signals feed to the brain, and command signals feed back down from it to the hand and to the eyes. In a chip you do the same thing but you do more of it faster. You have more types of sense data. You can see



all parts of the spectrum and hear the subsonic and supersonic. You can dampen or amplify pain and pleasure signals and weave new patterns of emotion or feeling and shut them off when you tire of them. And all this you can share with others in the chip net or chiploaf.

In the chip, time passes a million or billion times more slowly if you want it to. The time it now takes you to read this essay may then seem like years. A good crystal chip could last for thousands or millions of years or until it fell into a star or a black hole. In the best case it could last most of the 20 billion years or so until the universe falls in on itself and ends in the Big Crunch. Multiply that by the millions or billions of new subjective seconds per old second and you get something like eternity.

That long life in a chip might be as close as we can come to heaven in a universe made of matter and energy. There will be no need to work or to be governed unless you want to. There will be no sickness or pain or death unless you want to play with them. The virtual will be real and the real will be virtual. Will and mind will live in the same stream of electrons and protons.

Religion holds no monopoly on the concept of heaven. And it has failed to explain how you could sense heaven (or hell) with no body. The soul takes you from here to there. But what can a soul do when it gets there? How does it feel or think or act?

Heaven in a chip completes the rival world-view of science. The creation myth gives way to the Big Bang or a whole

sequence of big bangs if the universe oscillates. Divine law gives way to the laws of math and science. The soul gives way to complex information processing. The Resurrection myth gives way to cryonics and cell repair with nanocomputers or to the gentle sleep that takes you from brain to chip.

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*Bart Kosko is the author of Fuzzy Thinking (Hyperion) and an associate professor of electrical engineering at the University of Southern California. An earlier version of this article appeared in Datamation.*