

Is the brain in the Goldilocks zone?

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Governor, Dennis and Susan; colleagues. If I may quote Mark Twain, “I always get embarrassed when they introduce me, they never say enough.” Governor, you asked, “21st century brain; did I change my brain from last century?” I think the brain has not changed much significantly in the last 100,000 years, but, as Susan said, the demands on it have changed. Are we constructing a lot of mouse traps for ourselves? The brain is the only organ which has a map of the outside world, a map of the body, and a map of our experience in the next 15 minutes.

I will mention two recent techniques of studying the brain anatomically. I will take you historically through research, and then I’ll try to answer the question of whether the brain is in the Goldilocks zone. Is it the right size? The ancient Egyptians discarded the brain in funerary practices and sent millennia of Pharaohs brainless to their afterlife. The greatest hymn to the brain — and an astoundingly modern view of the brain — was sung by Hippocrates (460–377 BC): “Men ought to know that from the brain, and from the brain only, arise our pleasures, joys, laughter, jests, as well as our sorrows, pain, griefs, and tears.”

Unfortunately, Aristotle (384–322 BC) misjudged and thought that the brain was there to reduce the heat of the blood — an air conditioning unit. You would know that a professor’s greatness is measured by

how long he managed to stymie progress in his field. The adherents of Aristotle kept that thinking for over a thousand years. But there was opposition. Galen (129–216) presented the encephalocentric view against the cardio-centric view of Aristotle, and the two battled each other for 1,300 years until the dawn of modern science. We see in *The Merchant of Venice* when Portia asks, “Tell me, where is fancy bred, or in the heart or in the head?”

If you went to Bondi Junction on 14 February, 2022, Valentine’s Day, as I did — the new Athens of the South where I actually write my works in the coffee shop there, in the cognitively fertile crescent between Coles, Woolworths and Target — I was confronted with pharaonic thinking: there were 300 Valentine’s Day cards, all of them with at least one red heart on them, none of them with a brain. I was forced to write a letter in *The Conversation*, “Darling, I love you ... from the bottom of my brain.” A lady journalist from Melbourne ABC called me: “Are you insisting that the heart has nothing to do with love?” I said, “If in a heart transplant I get your heart, I am not going to fall in love with your husband.” She said, “What a pity and he’s such a lovely man.”

After such a battle to localise the seat of the soul, psychology loses its soul in the 1930s. Before giving a talk on clinical neuropsychology in Australia, I went to the coffee room and asked around: “Do you have

¹ This is an edited transcript of the address [Ed.]

a soul?” The question was always answered with a “Pardon me?” Eventually, a girl said to me, “I did until I started my PhD.”

According to Patricia Churchland (b. 1943), “There is no ghost in the machine” ... the soul is surplus to requirements for scientific considerations. If the “soul” is where emotion and motivation reside, where mental activity occurs, sensations are perceived, memories are stored, love is constructed, reasoning takes place, and decisions are taken, then there’s no need to hypothesise its existence. There’s an organ that already performs these functions — more credit to the brain. Psychotherapeutic drugs act on whatever else, except the soul, so the soul is not required to understand behaviour or modify it. Poor humans — do they at least have free will or is it just a brain? Is there free will? The Governor mentioned Robert Sapolsky, one of the most eloquent people in neuroscience: “there is no freedom, no dignity.” And B.F. Skinner (1904–1990), of course, said this long time ago: behaviour is the outcome of two and only two factors: genetic endowment and environment.

As I was writing my talk in Bondi Junction I asked the lady who sat across from me, “Excuse me, do you think you have free will?” She said, “I do but I’m not sure many out there have free will.” And this is the paradox: that everybody thinks they have free will but, as to the others, they’re not that certain.

Behaviour, of course, according to psychologists, is the outcome of the influences of nature and nurture. There’s no room for free will to elbow itself in the parade of genes and environment. And in this way the environment sculpts character just as the unknown artist (perhaps Phidias) sculpted Apollo from Parian marble in the statue at the Temple of Zeus in Olympia. The envi-

ronment sculpts behaviour just as Praxiteles sculpted Hermes. Poor humans, they have no soul. Perhaps at least it’s not required for anything that we know about. They have no free will. Again, more credit to the brain.

But is there any behaviour where you can show that there’s no freedom? Well, there is some evidence that in love there is no freedom. How many people who are deserted interfere with the person who deserted them — in their house, on the internet, in their work? They hit her, they kill her, they commit suicide. If only they had listened to neuroscience talks, they would understand that, much as they cannot jettison love, the person who abandoned them cannot make themselves love them. And if you don’t believe me at least listen to what Bizet’s Carmen sings in “*L’amour est un oiseau rebelle.*” What doesn’t obey the law is love. So is it only the brain?

Are we really slaves of our brains? Slaves of yesterday? Or are we architects of our destiny? According to many neuroscientists (of course, it could be the case that the minority of neuroscientists who say otherwise are correct we don’t settle scores by voting in science), they think we are slaves of yesterday. But look what psychologists have discovered: today is tomorrow’s yesterday and they work today with people who have a problem — an obsession, whatever it is — and assist them to make a different decision tomorrow under the same circumstances.

Now something about this organ — the brain — and how we study it at least anatomically. It used to be studied with Nissl stains — the traditional stain — but there has been some progress by using chemical stains — using acetylcholinesterase, an enzyme — it is to find the organisation of

the brain by looking at the brown-coloured stain we use to make atlases of the brains of rats, mice, monkeys, birds, humans. Somebody said, “The gain in the brain is mainly in the stain.” But there’s a new player in the mix now — MRI — where we can actually look at the connectivity of the brain: different colours show the direction of the different fibres in the brain. First is the rat, but we’re far more interested in the human brain, though as homologies go, the rat brain is a good facsimile of the human brain in terms of areas. The monkey brain of course is far closer to us — there’s actually structurally virtually nothing different.

We have constructed an atlas of the human brain of the living person. This is a living individual, one of my colleagues from the University of Wollongong — Mark Shira — and there are different colours: the different directions of the connections in the brain. And the connections of course could have different strengths, depending on what condition the brain is — if it is a pathological case or not — and the MRI shows with facility what is happening there where the connections are going. So this the other technique that I was going to mention to you.

Who is the governor here: in the brain or the mind? Well, according to many neuroscientists, the mind has no agency. If only it could have one, can you imagine! Virtually all of us will have an unwanted visit by dementia if we get to 100 — it would be nice if we could direct our neurons to jet-tison the neurofibrillary tangles and plaques that are responsible for the disease. But, no, the mind has no agency, according to many neuroscientists, and, thus, more credit to the brain.

I hope I’ve convinced some of you of Hippocrates’ notion of the primacy of the brain. If yes, it will be that much more important to figure out if it is the right size: if the brain were “smaller” (less clever and less capable of language) than it is, it would not have been able to produce science and technology which today threaten our existence. If the brain were “larger” than it is, humans might have been able to comprehend the problem or even rectify it. The brain is not in the Goldilocks zone — it is not the right size.

You might say, what is the problem? You have to try to solve the environmental issue and it’s not a small issue.

I asked my 8-year-old daughter, “Tell me something you’ll do today that doesn’t pollute the planet?” She said, “Running.” I said, “That’s good but if you run you’ll wear out more shoes.” And then she said, “Running barefoot.” I said, “That is good, but if you run, you build up your appetite and they have to slaughter more chicken to bring to you to eat.” She said, “Sitting in a chair.” I said, “That’s good, but to make a chair you have to cut a tree.” She said, “Then lying on the ground naked.”

There’s a problem with humans. We haven’t understood who we are: the triple delusion that we have a soul, that we have free will, and on the top of it we are made in the image of God. I try to explain to my granddaughter that the ancient gods were not fond of humans who had the hubris to compare themselves to the gods. I said, “This king of Corinth was condemned to push a rock up the hill only for it to fall down again because he was narcissistic, egotistical, and insulting.” She said, “Like Trump.”

The external similarity of humans with chimps — I didn’t have a chimpanzee to

pose for me — internally we are as well similar. In fact we found no difference in the brain stem of the chimpanzee we studied when we compared to the human and with the cortex and the rest of the brain of the rhesus monkey, even the marmoset. The areas are homologous (the same). Therefore, in whatever else we were made in the image of the Divine, in the brain were made in the image of the chimpanzee.

Now a chimpanzee brain is not easy to come by. I wrote to Taronga Park Zoo to give me the opportunity to do a post-mortem once any chimpanzee died. They responded that they would be happy to oblige but they hadn't had the death of a chimpanzee in the zoo for a decade. Two months after receiving my letter, three chimpanzees died. Luckily they didn't suspect me.

Of course, Darwin said it about human exceptionalism: how erroneous it is, and the problem we face is the human hubris, that we haven't understood the limitations of the human brain. And if we are to avoid constructing our own mouse traps, then it would be good to appreciate what we are capable of and what we are not. Phaethon was sent down crashing to Earth by Zeus because he didn't do a good job when he took the reins of the Sun god's chariot. If only we could understand this: what we face, what our brain is — what the limitations

are — then we might set our stern to the dawn and not to the grave of our children and make wings of our oars.

And I've been thinking about this for the last 21 years and I wrote a book on it: *A River Divided*. If anybody would like to have a complimentary e-book or an audio book, I'll be most pleased to send it to you. My email is g.paxinos@neura.edu.au.

Just before submitting it, a friend saw me writing it again in Bondi Junction, and she asked me, "How is it going?" I said, "21 years, I'm not finished yet." She said, "My cousin's novel was published posthumously." I said, "You are giving me hope."

Then I tried to find a publisher, who asked, "What does this deal with?" I said, "It deals with human cloning. It asks the question, What would someone with the genetic endowment of Christ do if He were present today? Would He join Wall Street or the Wall Street protests? It deals with the Amazon. It is identical twins raised apart, and, just like different artists would sculpt different statues from the same block of marble, different environments produce different characters, even with the same DNA." And he said, "And on what shelf would I place it?" And until that point I was convinced of Woody Allen's dictum that, if you are a bisexual, you double your chances of a rendezvous on a Saturday night.