

# Consciousness

Alan G. Carter

[alan@melloworld.com](mailto:alan@melloworld.com)

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## ***Introduction***

The origin and nature of consciousness is a practical and philosophical problem that our modern understanding has, to date, not been able to make any headway with whatsoever. In the context of the prior papers in this series, a comment frequently heard from Artificial Intelligence workers is suggestive:

"Every time we think we have understood something, we find that we have just discovered yet another thing that consciousness is not."

This paper draws on a property of the universe described in 3: Reciprocal Cosmology to present a model of consciousness that is consistent with the known facts and physically allowable, in terms of the existing physical paradigm plus the key new property. This is possible since the existing paradigm is not wrong as such - it is just not complete. Given the extra property that is true in Reciprocal cosmology for very good reasons, and which is allowable in the existing paradigm although there is no reason why it should be true, we can describe consciousness.

The ideas contained in this paper are then re-iterated in the next paper called 5: Hypertime, entirely in terms of the new paradigm. This reiteration of ideas that can be expressed either way forms a conceptual bridge explicitly connecting the old and new paradigms. Since the new paradigm describes a universe with additional constraints, it describes a universe where additional phenomena are physically possible. The new paradigm provides a detailed and concrete description of physical phenomena that occur naturally, which would be either extremely unlikely or physically impossible in the old one. Of course, our paradigm is merely the representation of a real universe. The real universe has always been the same all along. The paradigm shift allows us to move observed supernatural phenomena into the natural domain, and identify supernatural phenomena that people have claimed to observed when in fact they have not observed them at all as false reports.

In the old paradigm there are natural phenomena, and also supernatural phenomena of dubious provenance. In the new paradigm there are only natural phenomena, occurring in a more interesting universe. The most interesting (for us) phenomenon to move from the supernatural domain to the natural domain is consciousness itself.

## ***The Universe as Bennett Machine***

The key feature that the Reciprocal universe has that the old one does not (from the perspective of the old paradigm) is that it is a Bennett machine. What this means is that its components are so arranged that it does not in fact lose information in any of its operations. Intermediate states (results in a computer) are stored, allowing the thing to run backwards as easily as forwards, and ensuring that the amount of energy in the system is in fact the same, no matter what its configuration (where it is in the computation). The fact that such a machine is at least conceptually possible yields a remarkable result - at least it is remarkable in the old paradigm. It is that non-random data has an energy value - if you have a paper tape with a few million digits of pi on it, you can feed it into a Bennett machine and get a mashed tape and energy out. The energy has not come from burning the material of the paper tape, but from randomising the information itself! Things get really weird if the information on the tape is not obviously information. If it consisted of say, the second group of one million digits of pi, it would look to casual inspection like random data, but a Bennett machine that knew how to grind out pi would be able to extract "magical" energy from the tape!

Now just this idea, that the stuff in the universe happens to be arranged in the same way that the stuff that

makes up a Bennett machine is arranged, allows us to do some remarkable things in the universe of the old paradigm, while still leaving the "arrow of time" going in the same direction that we have always thought it goes in. The "evidence" of the arrangement of the universe as a Bennett machine is that everywhere we look, we see hidden order in the "random" distribution of things. Everywhere we look, the geometry of nature is fractal. There is self-similarity - a relationship between forms - not just between two mountains in a range of mountains, but between a mountain and the boulders on it, and the little pebbles on the boulder.

### ***Stochastic Cooling***

There is a wonderful effect that is commonly used in particle beam experiments, and occasionally used in fancy conventional cooling systems - refrigerators - called stochastic cooling. What this means is that one uses hidden order in a collection of energetic particles to effectively do judo on them - to make them oppose one another's highly energetic movement and sit still. The tangled or concealed information encoded in the high speed movements has been exchanged for explicit information held in slow moving particles. All you have to do is know the hidden order is there in the high energy version and you can arrange your fridge to exploit this and cool the particles. We will use the hidden order of the fractal geometry of nature, coming in through the senses of a person, to get consciousness in a couple of paragraphs!

### ***An Existing Hypothesis***

An existing hypothesis describing the origins of human intelligence and the development of tool using goes like this:

Humans did not come down from the trees. Our monkey ancestors ended up on the ground when the trees they were living in fell down during a hot spell in their native Africa. As soon as they were on the ground, those monkeys who could stand on their hind legs offered a much reduced profile to the sun and kept much cooler. This was useful because they had to cover a lot of ground in the arid conditions to find food without becoming food.

This produced strong advantages for the standing monkeys, and soon all the monkeys were descended from standers. Now the standing monkeys have their heads three or four feet above the ground (they were short little chaps), and in the breeze that is available above the drag of ground features. Those monkeys with good blood flow to the head had a significant cooling advantage, and quickly all the monkeys were descended from monkeys with good blood supply to the head. Unusually for simians, and seemingly counter-survival, but in keeping with some dinosaurs thought to have had cooling problems, humans are well endowed with blood vessels outside the skull, even passing through it, supporting this hypothesis.

Now the monkey is standing, with good blood flow to the head for cooling, and a good visual feed. The processing advantage in increasing the size of the visual cortex can make use of the visual data, and since blood is already being pumped to the head anyway, the optimal brain size got bigger.

Then a miracle happened, consciousness somehow evolved in the swollen brain, and the monkeys started to put their front paws to good use typing in computer programs. This is as far as the existing hypothesis goes.

### ***Co-Incidence Detection in Cognition***

Now we need to look at the issue of (visual) cognition, qualia and sleep. This bit is necessary for the next to work.

Animals have data arriving in the brain in the form of waves of electrical excitation from the senses - eyes, ears etc. I suggest that these waves are simply thrown into big "resonators" - ring circuits where excitations trigger or impede further excitations, and these ring circuits find co-incidences in input data that does in fact contain regularities because as Prof. Mandelbrot has observed, the geometry of nature is fractal.

I found that resonant co-incidence detection is an established reality. See: <http://www.gsu.edu/~biodhe/>.

The trick of it is this: The data resonates until it finds a co-incidence, which it indicates through a sudden drop in the excitation of the ring circuit caused by destructive interference. It is an analogue computer of course, that

simply does what it does, and to say it "finds" or "indicates" anything is incorrect. These "design hierarchical steps" do not occur. But that is the *effect* the animal enjoys. When the drop occurs,  $d(\text{excite})/dt$  detectors monitoring the resonators reflect the drop out, causing the subjective experience of a qualium (the inner experience of a colour - or something else), that is likely tied to the feeding *into* the resonator of a "redness excitation memory" during pattern matching. It is the feed of qualia signals out of the sensory resonators that marks the passage of experienced subjective time.

To allow reliable readouts and prevent disorientation, the resonators latch at low levels of excitation. Otherwise, excitations going the other way would cause ghost qualia to be generated, and possibly even a subjective experience of reversed time. This means that as the day wears on, more of the resonators are latched at the low excitation level, until the animal can perceive no more.

At this point, the animal must abandon awareness while the resonators return to highly energised states, or experience hallucinations as the brain performs emergency re-energisations of enough resonators to be able to see at all. This is sleep. Any remaining awareness experiences random qualia with loose relationships to the sensory input that caused the (now inverting) latched low energy state. These are dreams. Although dream perceptions are distorted, they may nevertheless contain valid analyses of sensory input.

Note the emphasis on resetting the system, not reading out the answer, inspired by Bennett's work on reversible computation.

### ***An Evolutionary Pathway to Consciousness***

So the monkeys are walking about on the savannah with their cooling towers on top of their necks, connected to eyeballs, and big brains doing loads of resonating. Then one day they discovered the mystical Buddhist experience of the Lotus Opening. Only it ain't so mystical.

The neurons doing the resonating metabolise oxygen every time they fire. This causes heat to be liberated within the brain, in patterns related to the fractal patterns in the universe they are perceiving. As anyone who has spent time in a John C. Lilly type sensory deprivation tank knows, time gets very peculiar without a constant stream of incoming sensory data as predicted by this model.

Conversely, the firing likelihood of at least some types of neurons is strongly dependent on temperature. See: <http://physiology.cup.cam.ac.uk/abstracts/1998/open/J507p1/7487>.

When the resonators reached critical thresholds in processing capability and physical size, they discovered that by using the electrical discharge to outrace the heatwave they could use the resonators to stochastically cool their brains, by detecting the hidden fractal (as opposed to simple harmonic) co-incidences in visual input. Probably using *errors* in the thermal component of the resonance to do it. These compensate for the "break beats" characteristic of multifractals - fractals composed of the addition of multiple fractal generators.

I discovered that there are 6 cm/s DC electrical waves observed in the brain - see: <http://www.ortho.lsumc.edu/Faculty/Marino/EL/EL2/Nervous.html> - that look like good initial candidates.

Stochastic cooling (of crystalline solids and particle beams) is a reality. Its possibility in organic tissue I cannot find any references to. But I don't think anyone's looked either. Also, we know that

there is more to thermodynamics than previously thought, and the missing energy in conventional thermodynamics is closely tied to this stuff.

The monkeys began to exchange waste heat for Barnsely IFS type analyses of their visual field, as allowed by Bennett's Theorem. In the thermodynamic world, the only thing lower than waste heat is Tao.

Now they are getting non-algorithmically accessible meta-patterns coming out of the qualia channel, which they transfer to chemical memory, and can buffer heat until the cold African night, when they can allow the resonators to randomise, exchanging electrical meta-pattern information for heat. We can check it, but I think the persistence time of electrical memory fits this.

Effectively they have used the fractal geometry of nature to bounce some heat off, buffering it into the future, and have received a copy of their *future* chemical memory of things unseen in exchange. In the rationalist, traditionally causal world, monkeys can *channel* algorithmically inaccessible (but *only* algorithmically inaccessible) information from the future! They are engaged in doing at a small scale, what the entire universe is engaged in doing at the largest scales.

Well this is a bit of a lark! The monkeys now have an anti-fuel crisis. The rather featureless landscape doesn't contain as much fractally compressible data as their swollen resonators can anti-burn to buffer heat. They must find more self-similar, fractal pattern hiding data. So they start to anti-burn their own experiences from chemical memory, and as *thermodynamic waste* self-awareness, reflection, and the seeing of possibilities come into the world.

## **Culture**

As soon as the new humans became self-aware, they continued the bootstrap. They discovered that they could enhance the flow of data from the future (I'm going to continue with this conceited but I believe valid interpretation to make the point - in the new paradigm it isn't a conceit at all - it is the literal truth) by engaging in the following practice:

They would start a rhythmic but broken beating sound that entered their ears. This produced excitation waves in the brain. They then monitored the outputs of their co-incidence detecting resonators and fed them into the motor centres governing the limbs, simultaneously increasing body temperature (cooling is always going to be proportional to temperature, and we are looking for significant cooling events) and producing further (tactile) sensory inputs providing error smudged echoes of the auditory data. Since the resonator outputs are not being directly monitored, the humans experienced a subjective sense of timelessness. They then began to dump life experiences from chemical memory into the resonators that were already firing with fractal patterns, and allowed the whole system to accomplish huge coolings if any deep structural patterns were found.

The results of these coolings, as they read them out of their resonators, they found contained deep truths about their world that profited them greatly and yet could not necessarily be reasoned towards using conventional, linear, deductive logic..

They learned music so that they could dance - the first human deed, art, magic, technology.

I assert that now that we know where to look we will see brain temperature drops that are co-ordinated with insights, sometimes requiring sufficient power that blood rushing through the rapidly cooling brain causes whole body temperature drops of short duration, but sustained maintenance of a meditative state by someone who *really* knows what they are doing will reveal sustained long term missing thermal energy. The association of insight and thermal cooling is generally known as "goose bumps", "somebody walking over one's grave", or "angels passing".

## **Losing Inductive Awareness**

The problems occurred when future-binding humans, seeking to increase their material well-being, perceived the possibilities inherent in division of labour, specialisation, deskilling and production lines. The boredom induced standby mode that increased the subjective sense of well-being and reduced awareness in the tree-dwelling monkey to allow it to outwait predators in sieges was implemented by raising the general level of the neuroinhibitor dopamine in the brain. The dopamine devastated the electrothermal loop by suppressing the tendency of neurons to fire when the thermal component of the feedback loop should have moved them into the firing envelope.

When the population sank into dopamine self-addiction, it lost the ability to use the fractal-structure discerning, Bennett cooling electrothermal loop, so self-awareness, deep structure discernment and reflection became impossible or pointless. Only simple harmonic structures that the electrical resonances could detect could be discerned.

Here is the association between the Ghost Not, seeing like an artist, feedback loops, modal logics, cognition and the cognitive strategy I have termed "mapping". The electrothermal feedback loop implements a

subversion, whereby the electrical signal can communicate a heatwave back into its own source. The stochastic cooling implements the resolution of a higher order term into a base Boolean state - a collapse or problem quake. The use of problem quake to allow the *appearance* of the detected image of an entity from sensory data *within* the brain is what gets the entity over the distinction of self and rest-of-universe barrier without flipping sign.

Once carrying data across the first distinction, and using a mark to indicate existence is established, Ghost Not polluted thinking, which is exclusive, describes a universe that does not contain the extra possibilities just around the fractal corner. So the thinker does not miss what purely electrical co-incidence detection does not see.