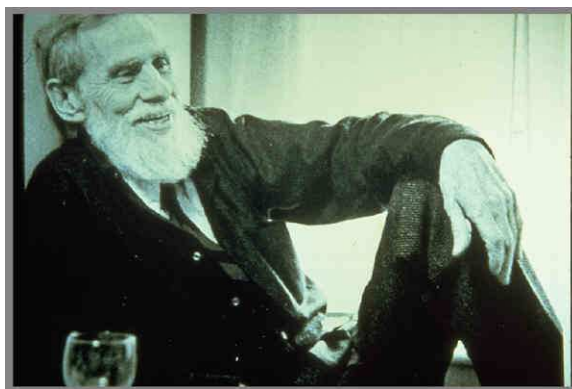


Metaphysics of an Experimental Epistemologist

Heinz von Foerster

(1996)



Warren McCulloch: “Don’t bite my finger, look at where I’m pointing!”

Most likely, everything that could be said about Warren McCulloch has been said already and, most likely, everything that McCulloch ever said, had never been said before.

What to say now about Warren McCulloch and what he did say.

I am most grateful to Seymour Papert, who concluded his introduction to the first published collection of some of McCulloch's essays, *Embodiments of Mind*¹, by reminding us of one of his favorite teaching aids to help his baffled disciples to overcome their befuddlement: “Don’t bite my finger, look where I am pointing.”

What is he pointing at? For me he is pointing at pointing. What do I mean by that? Let me give examples. At one place² he discusses potential and limits of what we do or what we do not know. And then:

“With all of these limitations and hazards well in mind, let us ask whether a knower so conceived is capable of constructing the physics of the world which includes himself,” and then he continues: “But, in so doing, let us be perfectly frank to admit that causality is a superstition.”

The first part connects McCulloch to himself; in the second part he connects with Ludwig Wittgenstein, a connection about which I shall talk later.

The fascinating problem of inclusion appears at another place³, where he talks about constructs in theoret-

ical physics, “... we invent surprising regularities ... or invariants, which I call ideas, whether they are theorems of great abstraction or qualities simple sensed.” He noticed they are not included into physics proper and he proposes:

“... let us now compel our physicist to account for himself as a part of the world. In all fairness, he must stick to his own rules and show in terms of mass, energy, space and time how it comes about that he creates theoretical physics. He must then become a neurophysiologist (that is what happened to me), but in so doing he will be compelled to answer whether theoretical physics is something which he can discuss in terms of neurophysiology (and that is what happened to me). To answer “No” is to remain a physicist undefiled. To answer “Yes” is to become a metaphysician—or so I am told.”

No! Nobody told him that; I say it is what he wanted to be. Remember him telling us of a desperate Clerk Maxwell who addressed himself to an in principle undecidable question, namely, how to explain “thought” *ab ovo*,⁴ that is⁵:

“He (Maxwell) cut short his query with the memorable phrase, ‘but does not the way to it lie through the very den of the metaphysician, strewn with the bones of former

explorers and abhorred by every man of science?" To which McCulloch responds, "Let us peacefully answer the first half of this question 'Yes', the second half 'No', and then proceed serenely."

Indeed, let us join McCulloch and proceed serenely with him in a quest for treasures that will lead us through spaces cluttered with horrors for the fainthearted. Even those bones can not scare us because, as he says later, he expects some of his own to fall besides them.

And now, let this journey be a party by inviting not only metaphysics by herself, but also our friends from Crete and Elea, and at last but not least Carlos Castaneda's brujo Don Juan in the company of "Uncle Ludwig", I mean, of course, Ludwig Wittgenstein.

Metaphysics

The charm of her character lies in her elusiveness. Very much like her sister Language, who always runs on two tracks, so when you think you catch her as denotative, she jumps to be connotative, and if you think you have her there, she will be back at pointing, so it goes with Metaphysics.

Her nature is well accounted for by the British scholar W.H. Walsh⁶. He begins his description of her character with the following sentence:

"Almost everything about Metaphysics is controversial, and it is therefore not surprising that there is little agreement among those who call themselves metaphysicians about what precisely it is they are attempting."

When I proposed to invite Metaphysics to join us on his quest it is not that I seek agreement with anybody else about her nature, because I can say precisely what it is when we become metaphysicians. We become metaphysicians, whether or not we call ourselves such, whenever we decide upon in principle undecidable questions.

Questions of decidability have of course ancient roots: "Can a circle be squared?", "Can an angle be trisected?", etc., and then conditions are listed under which these problems are to be solved: "With ruler and compass only!", "With ruler and conchoidograph only!", etc.

These questions floated amongst the learned for about two millenia until Gauss showed the unsolvability of some and the solvability of others. It was Hilbert and Ackermann⁷ who introduced the term "Entscheidungsproblem" for similar questions in formal logic, a term later used by Godel⁸ and Turing⁹ to demonstrate undecidability regarding some propositions in Russell's *Principia* and in Hilbert's *Funktionenkalkul* respectively.

The formal fireworks illuminating these profundities kept us from noticing such decidables in the use of language and in our daily life. We know how to talk, but, I say, we have not the slightest idea how we do it, how we ever learned this. Since these faculties can be mapped onto universal Turing Machines, and since for these the general analytic problem is unsolvable in principle, these faculties, in turn, are analytically undeterminable.

It is easy to find other such undecidable questions, for instance, "How did our Universe come about?" Nobody was there, how could we know? Nevertheless, there are many different answers. Some say it was an act of creation a few thousand years ago; others suggest the Universe had no beginning and will have no end: it is a self-generating system in a perpetual dynamic equilibrium; others insist that what we see today are the remnants of a "Big Bang", perhaps 10 or 20 billion years ago, of which we can still hear a faint noise through large microwave dishes. In this short list I have not mentioned what the Eskimos, the Arapesh, the Ibos, the Balinese, and all the others would say should we ask them about this event. In other words, "Tell me how the Universe came about, and I tell you who you are!" Or tell me about "consciousness", and I shall know something about you! How come these many different answers for apparently one and the same question? This is clear, because only those questions that are in principle undecidable we can decide.

Why? Simply because all the decidable questions are already decided by the choice of the framework in which they are asked. It may take a moment of reflection, or very hard work to decide them, eight years, for instance, for Andrew Wiles to prove Fermat's last theorem, by then 200 years old. But ultimately—thanks to the inescapable force of logic—we shall be rewarded with a definite "Yes" or a definite "No".

A quite different affair is it with in principle undecidable questions. We are under no compulsion, not even by the "inescapable force of logic" which way to decide: we are free to decide in this or that way, and then we have to take the responsibility for our decision. But who wants to take responsibility? Pontius Pilatism, hierarchies, objectivity, the "selfish gene", and other devices provide us with escape routes for avoiding it. Clearly, making decisions on in principle undecidable questions is not for the fainthearted. Here is another one to be decided by each of us:

"Am I apart from the Universe? That is whenever I look I am looking as through a peephole upon an unfolding universe."

"Am I part of the Universe? That is whenever I act, I am changing myself and the universe as well."

McCulloch clearly does not avoid making decisions. He opts for the one which includes himself in the world

of his construction. But in doing so, he had to free himself from the constraints of causality, "... let us be perfectly frank ... causality is a superstition."

Our Friends from Crete and Elea

McCulloch never wanted to cut the umbilical cord that connects him with the intellectual matrix of the pre- and post-Socratic philosophers. In fact, he saw them all sitting around his kitchen table, arguing with each other 'til the wee hours of the night:¹⁰

"Anyone who had the good fortune to listen to Wiener and von Neumann and Rosenblueth and Pitts wrestling with the problems of modern computing machines ... , has a strange sense that he is listening to a colloqui of the ancients."

It is the life of the discussion, not its results, to which he is pointing: the logical curlicues, the frictions, the contradictions, the tensions that keep the dialogue going.

While he takes the notion of invariants from Parmenides, "All change is contradictory, therefore it does not exist," he follows Heraklitus, "All change is contradictory, therefore contradiction is the essence of life," and appreciates our Cretan friend's ultimate contradiction, the "Liar's Paradox", as the ultimate logical perpetual motion machine: from "false" it generates "true", from "true" it generates "false", from "false" it generates ... and so on and so forth. Or take McCulloch's fascination with Zeno's "in between", the argument of immeasurability: "Given two existents, there must be at least one in between."

This argument is a generatrix for infinity with finite means. When I was a student, a 6-year old asked me to write an infinite number, "Is it so long as to go to the moon?" "No, not at all," I suggested. "Write a number consisting of 1's only, where each 1 stands in between two other 1's. He was happy. The next day he showed me an infinite number and said, "You have to read it around."



If only our teachers would understand that!

But who is suddenly crushing the party? Clearly an elderly man, lively, dynamic and full of enthusiasm: "Your logic is not rich enough to discuss all this and still keep hoping it will make sense!"

It is Gotthard Gunther, the eminent Hegelian and student of Eastern philosophy. Warren met him in Richmond, Virginia, in the early sixties, a fugitive from Hitler's Germany, lost for a while in South Africa, and then living on a tiny grant for work on non-Aristotelian logic in Richmond.

"Heinz, here is a man who asks all the right questions. Invite him to your Lab." This was Warren's voice over the telephone at 2 o'clock in the morning.

Of course, I invited Gunther, and he stayed with us for many years, teaching us his "place-value logic" which requires a "place" to be stipulated first into which a proposition may enter before its fate can be considered, namely, to become either true or false. Logical richness is now created by being in a position to reject the entire proposition in its affirmative or negative mode.

If only our revolutionaries would understand that: "Down with the king!" can turn into a commercial for, or even paid by, the king.

Gotthard Gunther wrote perhaps the most touching, the most admiring, and the broadest eulogy for Warren McCulloch¹¹. He is cordially welcomed to our party.

Don Juan and "Uncle Ludwig"

Carlos Castaneda wanted to learn "how to see". Don Juan, a brujo living in Sonora, a Northern State of Mexico, accepted him as a student. On one morning they broke up very early, the sun not yet over the horizon, and began their march through the dense chapparal of that region. After about one hour walking Don Juan stopped suddenly and pointed in one direction, "Carlos, did you see that?" "No", he replied "I didn't see a thing." They continued their journey with the sun now rising. Don Juan: "Carlos, did you see this?" and Carlos again: "What?" And so it went again and again with the sun burning down onto the two travellers, and Castaneda seeing nothing. Finally, Don Juan stopped and turned to Castaneda: "Carlitos, I know why you can't see. You can see only that what you can explain. Don't do that, Look!"

In explanations we wish to establish links between one affair and another one. But here are Wittgenstein's propositions¹²:

5.135 There is no possible way of making an inference from the existence of one situation to the existence of another entirely different situation.

5.136 There is no causal nexus to justify such an inference.

5.1361 We cannot infer the events of the future from those of the present. Belief in the causal nexus is superstition.

And there is again McCulloch: "... let us be perfectly frank to admit that causality is a superstition."

Through common friends living in Chicago he must have heard of my (very!) distant relationship with Ludwig Wittgenstein. So, whenever I made a slip in a logical argument, he wiggled his forefinger in front of my nose and said, "What would 'Uncle Ludwig' think about that?!"

In fact, it was more through the friendship of my mother with Margaret Stomborough, Ludwig's sister, that I ever met him when I was a little boy. I just had passed the entrance examination into Gymnasium, the Austrian junior highschool, when my mother took me along for a visit at Aunt Margaret. It happened that her brother was there as well, and after a while he asked me what I wanted to become when I am grown up. I knew exactly what I wanted to be and said "ein Naturforscher", a naturalist, who, in my mind, is a combination of Raul Amundsen and Marie Curie. "But then you must know a lot" he said. Since I had just passed my entrance examination, I could confidently say "Yes, I do know a lot." He looked at me smilingly and seriously, "But you don't know how right you are." (How was I to understand that?)

When as a student I took courses from the founders of the Vienna circle, Carnap, von Schlick, Menger, Hahn and others, I came upon Wittgenstein again, this time through his *Tractatus*. I was taken immediately by its precision, depth, clarity and brevity (only seven propositions (not counting the sub- and the sub-sub- etc. propositions)), and there were times, when I knew almost the entire *Tractatus* by heart. Fortunately, a cousin of mine, a nephew of "Uncle Ludwig", Paul Wittgenstein¹³, was affected by the *Tractatus* in very much the same way as I was. So, as a game, we tested each other's competence by rattling off, on command, propositions x,y,z, etc. Already at the early stages of my assimilation of the *Tractatus Logico-Philosophicus*, I felt it should be called *Tractatus Ethico-Philosophicus*. The propositions that set this feeling in motion are under point 6, where he discusses the general form of propositions. This culminates in proposition 6.421:

6.421 Es ist klar, da sich die Ethik nicht äußersprechen ist.

or in my translation into English (the official one, I feel is just wrong):

6.421 It is clear, that ethics cannot be articulated.

What does he want to say with this cryptic statement? How can one understand it? My understanding was to adopt for myself the following rule¹⁴: For any discourse I may have—say in science, philosophy, epistemology, therapy, etc.—to master the use of my language so that ethics is implicit.

How can one justify this understanding? Or better, who could justify such an interpretation?

As it came somewhat late in my life, the justification came from an experimental epistemologist. Among the many other clues, I found in McCulloch's "A Hierarchy of Values Determined by the Topology of Nervous Nets"¹⁵ the answer to my problem. It is the topology of our neuronal organization which, by its double-closure, allows the so called "value anomaly" to arise. Here A is preferred over B, B over C, and finally—Oh horror!—C over A. That is what experiments teach us. What the epistemologist is telling us is that, keeping this in mind, the notion of "hierarchy", the notion of a *sumum bonum*¹⁶ collapses.

With this, the pedestal of the moralist, who always tells the others how to act: "Thou shall ...", "Thou shall not ..." vanishes, and we are left to our own devices: "I shall ...", "I shall not ...": ethics becomes implicit, responsibility explicit.

When Rook McCulloch chose the papers that should go into the *Collected Works by Warren S. McCulloch*¹⁷, she placed his vision of the *Twilight of the Gods*, the Norse *Ragnar Rokr*, at the end of the collection. Here is the end of that end:

No more would I go along with Plato in exiling the poets, who play on the limbic cortex. Not even they are powerful enough to evoke the whole of man. If we are to survive our own destruction of our world and of ourselves by our advance of culture we had better learn soon to modify our genes to make us more intelligent. It is our last chance, that by increasing our diversity we may be able to make some sort of man that can survive without an ecological niche on this our earth. We may be able to live in gas masks and eat algae and distill the ocean.

I doubt that we have time enough.

We are, I think, nearing the end of a course that left the main line of evolution to overspecialize in brain to its own undoing.

Time will tell.

And here the beginning of the beginning¹⁸

Lift up your hearts and sing! Gather the clan,
The human brotherhood. Bend to the clay.
Build with exultant song and eager cry
Our desolation's dream, our nature's plan
Our earth, a temple to the yearning heart,
A city for the Soul. Let love hold sway,
And stupid selfishness and lonely lie
In silence end; while beauty that fore ran

Our wisdom shares in the language of a finished art
 Its tranquil mood 'till work is done with play;
 And we, the transients of life's finite span,
 Make room for greater man and gladly die
 Leaving to them the wages of our day,
 The deep communion of the whole of man.

Notes

¹McCulloch, W.S.: *Embodiments of Mind*, The MIT Press, Cambridge, Massachusetts (1965)

²McCulloch, W.S.: "Through the Den of the Metaphysician" in Ref. 1, p. 148.

³McCulloch, W.S.: "Why the Mind is in the Head" in Ref. 1, p. 71

⁴From the (very) beginning.

⁵Ref. 2, p. 143

⁶Walsh, W.H., "Metaphysics, Nature of." in *Encyclopedia of Philosophy*, McMillan, New York, 7, 300-307 (1967)

⁷Hilbert, D. and W. Ackermann: *Grundzuege der theoretischen Logik*, Springer, Berlin, Chapt. 3 (1928).

⁸Gödel, K., "Ueber formal unentscheidbare Sätze der Principia Mathematica und verwandter Systeme, I" *Monatshefte Math. Phys.*, 38, 173-198 (1931).

⁹Turing, A. M.: "On Computable Numbers, with an Application to the Entscheidungsproblem", *Proceedings of the London Math. Soc.*, ser. 2, 42 230-265 (1936-7)

¹⁰Ref. 2, p. 143.

¹¹Gunther, G.: *Number and Logos: Unforgettable Hours with Warren S. McCulloch*, MS, Archives H.v.F. #5059 (1985).

¹²Wittgenstein, L.: *Tractatus Logico-Philosophicus*, Routledge and Kegan Paul, London (1961)

¹³Schaefer, C.: *Hommage: Paul Wittgenstein*, Edition Freibord, Freibord sonderreihe #14, Vienna (1980).

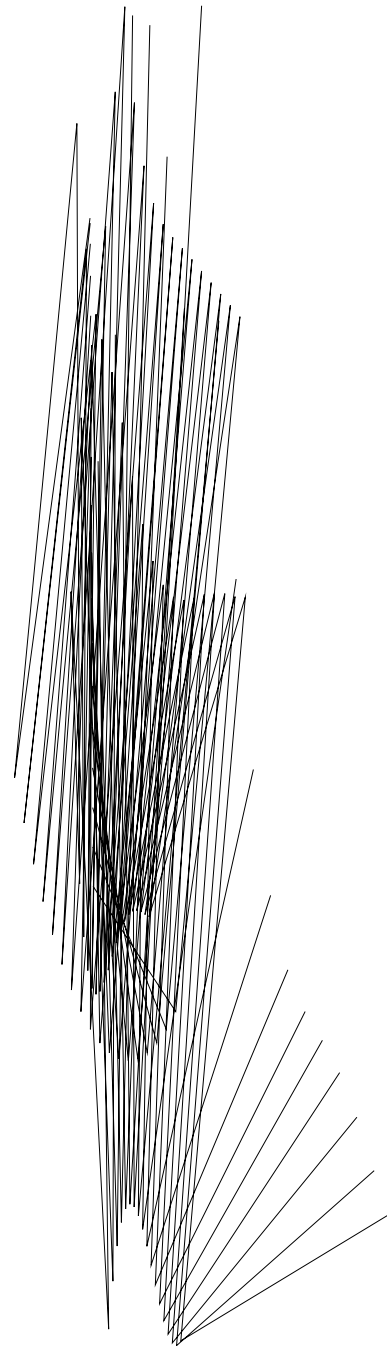
¹⁴von Foerster, H.: "Ethics and Second Order Cybernetics" in *Constructions of the Mind: Artificial Intelligence and the Humanities*, Stanford Humanities Review, 4, #2, 308-19 (1995).

¹⁵McCulloch, W.S.: "A Hierarchy of Values Determined by the Topology of Nervous Nets", in Ref. 1, 40-5 (1965)

¹⁶*summum bonum*: The chief or supreme good: properly a term of *Ethics*; often in trivial or jocular use.

¹⁷McCulloch, W.S.: "Ragnar Rokr: The Effects of Conscious Purpose on Human Adaptation" in *Collected Works by Warren S. McCulloch*, Rook McCulloch (ed), Intersystems Publications, Seaside, 1400-1407 (1989)

¹⁸McCulloch, W.S.: "The Natural Fit." in Ref. 1, p. 347.



Computer graphic by Herbert Brün