

**A Biological Basis for
Being-in-the-World**
Autopoiesis and Heidegger's Phenomenology

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*To Picacho Del Diablo, the Middle Fork of the Eel, and other wild philosophers
who helped me through this project*

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Introduction

This introduction is rather long, even though the thesis that it introduces can be stated in a single sentence: Dasein is an autopoietic organism. The general problem, however, is not as compact: the problem of human subjectivity. What is it that we are—this subjectivity—that is at all times closest to us, and yet seems to elude any consensus as to what it is? Part of the difficulty with “subjectivity” lies in the fact that we can hardly think of it without thinking of its counterpart, objectivity. I believe that it is because subjectivity is set against objectivity and the subject right beside the object, that so many problems with it have arisen, the foremost being that we cannot even get a handle on what this “it” is.

Perhaps there is no “it”, no “subject”, per se, and the most primordial phenomena of human being is somewhere “between” or “before” the subject/object dichotomy. In this essay I will try to show that philosopher Martin Heidegger establishes precisely this point phenomenologically, while biologists Humberto Maturana and Francisco Varela ground it scientifically. Pure subjects and objects are actually absent for all of us in our everyday experience; just as well, there also is a way for cognitive science to think of the human organism without presupposing a subjectivity inside of an objective world. But I am already far ahead of myself....We first need to sketch out what this notion of subjectivity is before suggesting an alternative to it.

The Metaphysics of the Subject

Some find that subjectivity is an essentially personal thing, something each person has to himself inside the box of the mind. This is a box filled with qualia, raw feels, colors, tastes and pains, which in themselves are inaccessible to others in their qualitative character. This is to be contrasted with the objective physical structures of the world that are accessible and visible to everyone and that science is able to describe. Subjectivity characterizes what is “inside”, and objectivity the “outside”; each of us lives in a subjective rendering of the external objective world.

This is a metaphysical supposition. I don’t think it follows immediately from the fact that each of us is a brain inside of a skull oriented in a different spatial, historical and

cultural position in the world from all the other subject things. It is a metaphysical conception of the subject as a thing-in-itself, distinguished from the objects it knows and the objective world in which it is placed. René Descartes conceived of this distinction quite explicitly by dividing the ontology of the world into two substances, the *res extensa* and the *res cogitans*, matter-stuff and mind-stuff. He made the distinction based on his own method of radical doubt, by which he thought he could put everything into question except for the fact of his own existence—the fact that he, or the mind, was a thinking thing. In this view, the mind is a thinking, feeling subject that is essentially different—and, importantly, essentially isolated—from the objects it knows. This mind knows the world through the mediation of *ideas*, which are subjective presentations of the world to the thinking thing, private qualia which are, strictly speaking, all that the subject really has before it.

Furthermore, in indicating that the mind is a substance in the same way that physical matter is a substance, each individual subject is a thing much like other things. It just happens to be made out of different substance. In determining it as *thing*, a *res* or *subjectum*, it becomes something that can enter into relations with other things, while remaining essentially different from them. Just like one cup can sit next to another cup and both keep their identity as individual things, so does the mind enter into relations with objects, such as knowing and perceiving, all the while remaining independent from them as befits one thing beside another. More to the point, it becomes the sort of thing that can be in an inside/outside sort of relation with the world. Clearly, there is no spatial inside to the mind, no pineal gland with a little movie screen inside of it, but nonetheless, subjectivity is taken to be somehow “inside” or “private” with respect to the world when the subject is conceived of as a kind of thing, a thinking thing. No one finds an actual movie screen, but the image of a private subjective theater is powerful nonetheless: qualitative images are spread across the mental screens, and judgments about the world are made solely on the basis of these images. I will refer to this conception as *the metaphysics of the subject* because it is a conception of the way in which the subject *exists*.

Both realists and idealists share this Cartesian position because the character of the subject as private thing goes unquestioned. We can see the metaphysics of the subject in Kantian idealism, for example, where there is no totally external world since we can know nothing about the noumenal universe. The Kantian subject is central because everything

that it perceives as “outside” it are actually “inside” of it. It is an absolute transcendental self, able to construct a rich and varied phenomenal world by shaping the sensible manifold with the forms of space and time and the categories of the understanding. Every subject is the constituting center of its world, a nexus of experience not shared by others. Realism gets equally embroiled in a subjective metaphysics since it insists that there is indeed an objective universe. At the same time, the realist subject is more or less a lone player, a subjective singularity picking up sense data from the world in order to construct good representations that makes it viable in its environment. For example, Sidney Shoemaker claims that seeing colors occurs when “visual stimulation by an object of a certain color under standard conditions produces in the person the associated qualitative state.”¹ Here, colors are properties of external objects, outside in the world, which produce, through “visual stimulation”, an internal “qualitative state” in the subject. Objects are essentially different and independent from the subject who knows them through some representational apparatus.

Shoemaker’s claim shows that this notion of a subject is still with us. Even though most contemporary philosophers of mind label themselves materialists and pride themselves in having done away with Cartesian dualism by insisting that there is just one kind of substance (the physical kind) instead of two, the metaphysics of the subject is still pervasive. Even if there is no dualism of substances, and all “mind” events must be caused somehow by matter, a strong epistemological split is still made between the knowing subject and the outside universe. The subject is still thought to be a thinking-thing, something isolated in its own subjectivity, different from the external world and knowing (or constructing) it only through Cartesian ideas, or *representations* as the contemporary cognitive scientist would say. To claim to be free of Descartes’ metaphysics by insisting that the mind is the brain while at the same time claiming that this brain is manipulating representations of the external world, is nevertheless to subscribe to the Cartesian conception of the subject. Heidegger points out that, “Ontologically, every idea of a ‘subject’...still posits the *subjectum* along with it, no matter how vigorous one’s ontical protestations against the ‘soul substance’ or the ‘reification of consciousness’.”² Descartes’ lasting legacy is not a dualist conception of the world, but rather a strong

¹ Shoemaker, *Functionalism and Qualia*, 399

² Heidegger, *Being and Time*, 72

metaphysical commitment to a notion of subjectivity which relies on an “in-here” / “out-there” picture of reality.

The metaphysics of the subject allows a whole class of problems to arise. For example, it is often wondered if people really see the “same” color when they look at the same object. Yet I can only really wonder if my red is the same as your red, or if my entire qualia spectrum is inverted with respect to yours, if I conceive of the subject as something that projects primitive features of the world on its private viewing screen that no one else can directly inspect. The intuition that there are qualia that are mine and mine alone is more or less Descartes’ insight that his knowledge of himself as a thing that thinks is the soundest knowledge he possesses. Both give privilege to the subject “in here” as opposed to the lesser physical things on which we can all agree. Also, many epistemological problems are based on the metaphysics of the subject (without, of course, ever questioning this metaphysics!). This conception of the subject, since it drives a wedge between the “actual” world and our mental states, representations, intentions and such, leaves the door wide open to skepticism. Is the problem with knowledge? The traditional definition of knowledge is “Justified True Belief”, which implies that the mind is filled with beliefs, or representations, and the problem is how to relate these beliefs to the real world accurately so that they are true. While this tripartite definition is largely rejected by contemporary analytic philosophers, they do this not because it supposes the cognitive subject, but because justification is too tricky. Few question that knowledge is a species of belief, a representational entity or a type of intentionality, and is thus a matter of relating an internal mental state to the external state of the world.

It may seem that, with this talk of qualia and epistemology, this has to do only with philosophy. Perhaps it is only related to the concept of consciousness, where the privacy of subjective experience is highlighted in current debates on the subject. The metaphysics of the subject has a far stronger foothold than this, however. Indeed, the most sophisticated instance is to be found in mainstream cognitive science. The metaphysics of the subject holds sway in any theory of the mind where cognition is most essentially the generation and manipulation of symbolic representations of the external world.

It holds sway when artificial intelligence researchers build agents or robots that have internal models and databases full of facts that can represent features of the world. It also holds sway when we consider the mind to be an information processing device like a

computer. The way that this device works is that information is picked up from a world outside the subjective sphere (outside the skull), and input into the brain. Thus, there is already a shape to the world; there are “real” things or at least real features out there; that is, there is *information* to be picked up and not just noise. Then, through internal (and largely computational mechanisms), this information is processed in order to form a representation of the world. Consider Allen Newell’s claim that “to be intelligent is to be able to...exploit (encoded) knowledge to attain whatever (encoded) goals the organism has at the moment.”³ Here, intelligence is more or less like a computer program acting on the data stored in its memory, independent of however the CPU is related to the world. Cognitive events are accounted for by the manipulation of symbolic representations.

I will use the term *cognitivism* to denote this view.⁴ Cognitivism is the idea that thinking (conscious or subconscious) takes place behind the closed doors of the subject’s skull as the computational manipulation of representations of objects and concepts. The hypothesis of representation implies a strong division between the subject who does the representing (even if this subject is just a finite automaton with consciousness thrown in to the computational mix) and the objects in the real world that are represented. This division is never conceived of as a metaphysical dualism, but it is a strong epistemological one in which the subject with its bountiful array of representations is different and isolated from the real world outside of it. We are essentially in epistemological isolation from one another, our representations and computations being similar due only to similar biological architecture and ontogeny.

Cognitivism is not limited to thinkers such as Jerry Fodor who advocates a kind of solipsism as the workspace for the syntactic manipulation of representations,⁵ or Herbert Simon who believes that intelligence is nothing more than efficient search through a database of representations.⁶ Even John Searle, who vigorously attacks the notion that thought is computation, still makes a strong real-world-out-there / subjective-world-in-here distinction.⁷

³ Newell, *Unified Theories of Cognition*, 158

⁴ Cognitivism is to be distinguished from more recent connectionist ideas of cognition as non-symbolic emergence, although notions of input/output and information processing still used in some connectionist thought belie a commitment to the metaphysics of the subject. This will become more apparent in chapter 2 where we discuss the autopoietic approach to cognition.

⁵ Fodor, *Methodological Solipsism as a Research Strategy for Cognitive Science*

⁶ Simon, *Cognitive Science: The Newest Science of the Artificial*

⁷ Searle, *The Rediscovery of the Mind*

Towards an Alternative Ontology

The metaphysics of the subject pervades our modern scientific understanding of the mind. The notion of a thinking, representing subject thing beside the world is indeed a *ontological* notion, since it pertains to what the subject *is*. It pertains to the kind of *being* that the subject has, the kind of thing in general that it is, and not to what the concrete details of it might be. That is, it is a presupposition that must be made in cognitive science, for example, before going into sophisticated detail about what our representations are, how we get them and organize them, how recall works, *etc.* It is this ontological precommitment which is in question now.

For Martin Heidegger, the standard concept of subjectivity does not accurately portray the ontology of human being. He argues that, rather than existing as an isolated subject knowing the world, human beings are actually active engagement with the world. Each human is intimately involved with a world that it understands in terms of its purposes and action in that world, a world which is nevertheless still public and shared. *Dasein* (literally, “being-there”) is Heidegger’s term for human being. Instead of existing as an isolated subject-thing, *Dasein* is *being-in-the-world*: there is no division between subject and object, or agent and world, because the human being is essentially skillful *coping* embedded in a meaningful world of human purposes. Being-in-the-world is “before” the division between subject and object, and free, therefore, of the metaphysics of the subject. Heidegger presents an alternative picture of subjectivity by freeing it from its isolation, arguing that the evidence for this is available in the ontological structure of our everyday experience. For Heidegger, there can be no rigid division between subject and object, or between “in here” and “out there”, because such divisions are actually founded on a more basic way of existing: being-in-the-world.

We will return to this in great detail, for now (unfortunately) leaving the notion of being-in-the-world elusive and murky. It is important at this point merely to recognize that *there is an alternative* to the standard metaphysics of the subject, and that, moreover, there are phenomenological problems with this traditional understanding of the subject.

So what is being-in-the-world supposed to mean to cognitive science? How can a criticism that says there can’t be a division between what’s in here and what’s out there be very meaningful, when clearly there is a brain inside the skull and an environment outside

the skull that needs to be related to ensure the success of the organism? It seems that the only way this brain is able to cope is by synthesizing representations to mirror external realities, and acting upon them. This is the basic idea behind Jerry Fodor's idea that methodological solipsism must necessarily be assumed for working cognitive science. The dominant assumption continues to be that experience is just mere experience and is rather separate from the real world that is experienced; thus, if an analysis of "experience" reveals something like being-in-the-world, this would just be a feature of the representations, or mere experience. The ontological criticism thus wouldn't really mean anything to the practice of cognitive science and its use of representations.

I'm not sure that there are any knock-down air-tight arguments for abandoning the metaphysics of the subject, as well as for leaving behind the notion of representation in the practice of cognitive science, that would make a logician sleep soundly. I'm not sure if it can be shown that, *in principle*, the conception of cognition as computation upon representations is wrong. However, there is as little reason to hold on to it if there is a viable alternative, since it is indeed a hypothesis; furthermore, there are also no reasons to think that thought must be, in principle, representative. By appealing to human experience phenomenologically, we can see that there is no need for representations. And then, if it can be shown that this phenomenology can be biologically realized without representation, then representations begin to seem like excess baggage that we no longer need to carry around.

I find Heidegger's descriptions of human experience as non-representative being-in-the-world convincing; if they are indeed accurate, they need to be accounted for. It's hard to see how to accommodate a description of an embodied, engaged, active "subject" within a cognitive science model of this same subject as essentially a manipulator of representations, disembodied, de-worlded, and isolated from the environment. There suddenly emerges a huge gap between the machine and being that machine if we have solipsistic computations on representations on one hand, and being-in-the-world on the other. Can a cognitive science theory based on the metaphysics of the subject really generate our experience in which this subject is absent?

In short, an accurate phenomenology would give some guidelines as to what a cognitive science account of the mind and brain would have to be able to produce through neurophysiological mechanisms. If we are indeed something like being-in-the-world, then

a scientific theory should be able to explain why this is so. In this respect, I agree with Gordon Globus, a philosopher who has looked for commonality between Heidegger and connectionist cognitive science:

The account of existence (Existenz) tells us what kind of machine we should be looking for at the highest level of brain functioning. Thus the existential analytic is of heuristic value to the behavioral and brain sciences, for it tells us what the machine's capacities have to be.⁸

If Heidegger's account does indeed offer heuristics for cognitive science, then I believe that Humberto Maturana and Francisco Varela have developed a model of living organisms that satisfies them. Their basic idea is that life is self-organizing or self-producing, and that all living things have a special organization that the authors call *autopoietic*. (I will refer to Maturana and Varela's theory as 'Autopoiesis'—with a capital 'A'—leaving 'autopoiesis'—with a small 'a'—to refer to the living organization.) The theory of Autopoiesis will be developed in a later chapter as a different paradigm for cognitive science than that offered by cognitivism. It allows us to account, in principle, for the vast repertoire of human behavior and biological phenomena solely in terms of the organism's self-organization, rather than through the coordination of representations of an external world. The theory shows that something like being-in-the-world is actually possible in a physical machine, and hence shows that Heidegger's criticism is *not* irrelevant to cognitive science. Basically, the point is, if representations, or subjects and objects for that matter, aren't needed in either experience or neuro-biology, why should they be postulated at all?

Dasein and the Human Organism

This essay is an attempt to establish a dialogue between two traditions that have had little communication: natural science and continental philosophy. Heidegger himself may be partly responsible for the barrier between his thought and scientific biology. He claims that, "The existential analytic of Dasein comes before any psychology or anthropology, and certainly before any biology."⁹ By this he means that biology, as a human activity, is already a specific interpretive stance taken by the human being, whereas

⁸ Gordon Globus, *Existence and the Brain*, 450

⁹ Heidegger, *Being and Time*, 71

Heidegger is instead interested in this interpretive activity itself. According to Heidegger, the biologist brings to his field a certain understanding of the kind of things that can possibly be found, the categories into which they will fit, and the explanations which can be given—he would want to say that the biologist already has a certain *understanding of being* when he starts doing biology, and this interpretive understanding predetermines the kind of being that things in his study will have. (Note that determining the *being* of something does not mean determining that *something*; Heidegger does not want to imply in any way that the biologist is somehow constructing the reality he discovers. We will return to this point in the appendix.) Heidegger is interested in giving an account of that entity, Dasein, to which, as he says, something like an understanding of being belongs. Heidegger’s phenomenology (which he calls the *existential analytic*) would be ‘before’ biology in the sense that biology is only a particular interpretive activity of Dasein, whereas the existential analytic is a general description of the structure of interpretation and skillful activity engaged within a world. For Heidegger, the fact that there is a biological interpretation of the world presupposes the interpretative activity of Dasein. Only thus is Heidegger’s existential analytic primary with respect to biology.

Nevertheless, however we interpret the claim that the existential analytic is “certainly before any biology”, we always have the fact that if there was no such thing as a functioning human body and brain, there couldn’t be any such thing as an existential analytic of Dasein. A brain is an important thing, because without it, there would be no Dasein. As Globus says, “No brain, no Dasein.”¹⁰ This means that, although the Heideggerian account of Dasein may (and probably must) be carried out without recourse to biological concepts, the entity called Dasein is in *no way* itself prior to, or independent from its biological makeup. It is true that it takes a certain interpretive stance to be able to understand brains the way we do, but it is also true that we need a brain to take that interpretive stance.

Therefore, cognitive science, understood as the science that studies the human being as a functioning machine, is in some sense relevant to the study of human *being*—the investigation of Dasein. We will later see just how the existential analytic can be squared with a cognitive science account. For now, it suffices to point out that both study this existing, living, interpreting entity which Heidegger calls Dasein. And if this is true,

¹⁰ Globus, Heidegger and Cognitive Science, 20

then Heidegger has something to say to cognitive science as well. As I mentioned above, I think that the value of his existential analytic to cognitive science is largely heuristic, demonstrating the sort of phenomenology that any model of the human machine must be able to generate.

Nonetheless, Heidegger's words oft fall upon deaf or disinterested ears. It seems that Heidegger does provide concrete details on how to abandon the metaphysics of the subject. Science is appropriately interested in the structure of actual beings, rather than the structure of the being of those beings, as Heidegger is, and so he is often dismissed. The barrage of philosophical criticism from Heideggerians and others arguing that human thought is non-symbolic and constantly engaged in a historically interpreted world, often seems murky, misguided, or just plain irrelevant to scientific minds. As neurologist Christine Skarda writes:

In order to adopt a nonsymbolic, nonrepresentational approach to cognition we need more than the phenomenologists of the continental tradition have produced, more than discussions of why knowledge is a matter of 'being in a world'....As cognitive scientists we want a model of how this self-organized interaction works.¹¹

This is where Maturana and Varela come in. I believe that Autopoiesis is such a model. A self-organizing autopoietic machine is just the sort of machine that Dasein could be, and this machine can be described completely in physical / biological terms that would be scientifically acceptable. It will be my project to show that an organizationally closed nervous system structurally coupled into the environment can be described as being-in-the-world.

Perhaps not surprisingly, Heidegger himself seems to voice yet another objection to this marriage. In their development of Autopoiesis, Maturana and Varela were greatly influenced by cybernetics,¹² the science of information and automata of which computer science and cognitive science are its modern heirs (a debt that sometimes escapes recognition). Heidegger, however, harbored a great dislike for cybernetics. He disdained it on largely ethical grounds, calling it "the metaphysics of the atomic age", a vain attempt to dominate nature and humanity by, for example, transforming language into mere information and the human spirit into an automaton, thus allowing nature and humanity to be manipulated as things of use. By making calculation and measurement the ultimate

¹¹ Skarda, Perception, Connectionism, and Cognitive Science, 266-7

¹² Dupuy, The Autonomy of Social Reality, 17

standard of reality, humanity would be hobbled because it would forget that this standard had, in fact, been made. Cybernetic thought would miss the “essence of technology” by thinking only about beings and not about being itself.¹³

It might seem, therefore, that this essay is a strange pairing of two cyberneticians with a great anti-cybernetician. This in no way threatens this project, however. The ethical considerations that both Maturana and Varela draw from their work are nothing like the bleak utilitarianism and scientism that Heidegger finds in cybernetics, for they are quite positive and humanitarian. Also, cybernetics developed long after the 1927 publication of *Being and Time*, my major Heideggerian source. His attack on cybernetics occurred after the so-called “turn” of Heideggerian thought, when he began to focus not on the being of Dasein, but on the history of being, something about which I have little to say here. Therefore, although interesting, Heidegger’s antipathy to cybernetics is somewhat irrelevant to this essay since it does not emerge directly from the analytic of Dasein. No doubt he would still be uncomfortable with this project; I can only reply that perhaps he wasn’t able to recognize the fruitful possibilities of communication between the two traditions. The great result of this mix is that we get a phenomenology that is biologically grounded and a biology that is phenomenologically consistent.

One can only infer support from Maturana and Varela for this type of project. For instance, in his most recent book, Varela argued that a new understanding needs be established between cognitive science and human experience, occasionally drawing on the phenomenology of Merleau-Ponty.¹⁴

How to Get There

A quick sketch of our path towards a biological basis for being-in-the-world follows:

The first two chapters introduce and summarize Heidegger’s phenomenology of Dasein and the theory of Autopoiesis, respectively. The discussions of both will include a comparison of the system under consideration with the traditional cognitivist view that

¹³ Dupuy, *The Autonomy of Social Reality*, 12
also, cf. Heidegger, *The End of Philosophy and the Task of Thinking*,
and Heidegger, *The Question Concerning Technology*

¹⁴ Varela, *et al.*, *The Embodied Mind*

they are challenging. These chapters will undertake to show how the metaphysics of the subject is vulnerable to criticism and how Autopoiesis avoids this criticism. Both of these chapters are long, so readers familiar with either of the theories should feel free to skim.

The third chapter brings the two theories together to show explicitly how Autopoiesis provides a scientific explanation for the Heideggerian phenomenological description. I will freely mix the two traditions, discussing Heidegger in terms of Autopoiesis, and vice versa, in order to show not only how it is possible to think that Dasein is an autopoietic system, but also that Autopoiesis can provide the necessary biological machinery to realize Dasein.

The goal of this essay is to explain Heidegger in terms of Autopoiesis, showing that there is a machine that could implement Dasein. We would thereby scientifically accommodate a deconstruction of the metaphysics of the subject. As an appendix, I will look at the question from the reverse perspective. This takes into account Heidegger's description of Dasein as engaged in interpretive activity within-the-world and the consequence that science is one of its possible activities. Here science is a certain attitude that Dasein takes in order to discover the world scientifically—Dasein “clears” the space for the objective scientific world to occur by embedding it in a certain conception of being as objective being. By taking into account the hermeneutic circle which encompasses human interpretation and physical reality, this last chapter is meant to ensure that in explaining Dasein scientifically, the essay avoids explaining Dasein away.

Chapter 1: Dasein

In *Being and Time*, Martin Heidegger deconstructs the metaphysics of the subject by investigating the way humans exist in their everyday dealings within the world. Since the metaphysics of the subject is a position on the way in which the subject exists, Heidegger has to show that there is different way to exist than as an isolated, cogitating *subjectum*. He does this by describing *how* we exist normally, everyday.

We are usually in some situation within which we automatically take effective action, without mediation of representations, or rational, disembodied planning. For example, the playing pianist is not presented with an array of keys on a bare piano-thing that she decides to act upon; rather, she understands the piano immediately through her action with it, and she is totally absorbed in the playing. Action is a phenomenon that is

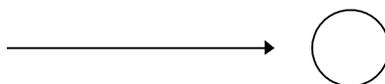
not reducible to a simple, side-by-side relation between actor and the object of action. The pianist-playing-the-piano is a phenomenal totality, where the piano and how it is used are inseparable from the activity of playing. The pianist has a way of existing that is quite different from an isolated subject thing in a relationship with the piano-object.

These kind of observations are phenomenological. They rest on pointing out that there is a difference between things and the way in which those things *are*, and that an investigation of *something* is not the same as the investigation into the *being* of that something.

Husserl's Phenomenological Reduction

The above distinction makes Heidegger's phenomenology methodologically possible. I think it can be clarified with a few words on the phenomenology of Edmund Husserl, Heidegger's teacher and the founder of phenomenology at the beginning of this century. Husserl developed phenomenology as the study of the *structure of experience*, rather than the *things* which we usually experience. There is a very strong distinction in phenomenology between the general "shape" of experience, and the actual things that have that shape. This distinction captures the spirit of the Heideggerian one made above, even though Heidegger equivocates on the notion of experience in trying to avoid the metaphysics of the subject.

One of the basic phenomenological "discoveries" is *intentionality*. This "discovery" is also methodologically important. By intentionality, Husserl means "the unique peculiarity of experiences 'to be the consciousness of something.'"¹⁵ Every conscious act, be it looking, hearing, remembering, judging or loving, always has some object that it is directed at, or which it "intends": a tree, a symphony, an event, a proposition, or a person.

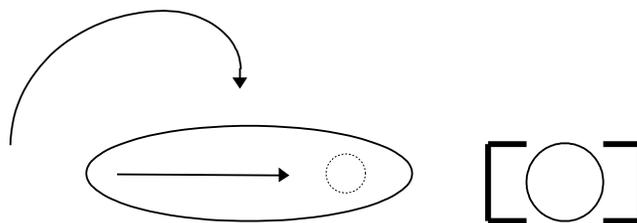


Intentionality: *all* mental acts are directed at some object.

¹⁵ Husserl, *Ideas*, 223

Normally, we do not notice *intentionality as such*; because we are directed at objects, it is only in objects that we are normally interested. Husserl calls this the *natural attitude*: being active in a real world with real people, plants, buildings, tools and other things, always interacting with them, using them, discovering new things about them, and so on. It is a world of particular objects—where an “object” could be mathematical, acoustic, visual, theoretical, *etc.*—that is *always already there*, and with which we are engaged.

Phenomenology, however, is not interested in particular objects. Husserl only mentions them insofar as they are examples of an *object in general*. He is interested in the structure of experience, which includes intentionality itself and the “intentional object”, or the way in which the object is intended. Thus, the phenomenologist doesn’t describe the blue color of my friend’s car is or how it works, but only the fact that that it, like all other perceived objects, is always experienced on some visual and temporal background, that it retains sameness through variation of perspectives upon it, *etc.* The specific nature of particular objects, as well as any questions as to whether they “really” exist, are put “in brackets” as they are not a part of the investigation. Instead, we try to describe what is the structure of experiencing the world and objects in general. “Let our subject now be not the world simply, but the world exclusively as it is constantly pregiven to us in the alteration of its manners of givenness.”¹⁶ The methodological process of switching attention from objects and their existence in the natural attitude to intentional consciousness of these objects is called the *phenomenological reduction*. Recognizing that all consciousness is consciousness of something, we can then make consciousness an object for itself.



Husserl’s Phenomenological Reduction:

The object of the phenomenological intention is consciousness itself. The existence of objects, as well as empirical theories about them, are put “between brackets”.

¹⁶ Husserl, *Crisis of the European Sciences*, 154

Husserl's ideal was to leave aside theories about objects in his description of the experience of objects. This means that phenomenology can not use neurobiological theories about experience, since those are descriptions of a particular object, namely, the nervous system. Empirical sciences like biology are thus also put "in brackets" in the attempt to give the most general description of experience possible.

All sciences which relate to the natural world, though they stand never so firm to me, though they fill me with wondering admiration, though I am far from any thought of objecting to them in the least degree, I disconnect them all, I make absolutely no use of their standards, I do not appropriate a single one of the propositions that enter into their systems, even though their evidential value is perfect, I take none of them, no one of them serves me for a foundation.¹⁷

This is much the same reason as Heidegger claimed that his existential analytic was "certainly before any biology". Biology is not at all made insignificant, it is just unused. An ideal phenomenological description would be accurate for the structure of all human experience, no matter how we actually empirically learned that experience was caused by the brain. A perfectly executed phenomenology would still be accurate no matter how wildly we changed our ideas about how biological cognition worked—even if we learned that the pineal gland really *was* the seat of consciousness. As I mentioned before, phenomenology is thus of heuristic value to cognitive science, telling us what sort of experience our biological machinery must be able to generate.

I will not go into detail about how Heideggerian and Husserlian phenomenology differ. The major difference is that Husserl conceived of intentionality as issuing from a "Transcendental Ego", and there was still "intentional content" left over after the reduction had separated out the question of the object's existence. This implies that each human subject is the absolute center of his constituted world, and thus plays right into the metaphysics of the subject, which is exactly what Heidegger is trying to get away from. Heidegger objects to Husserl's "neglect the question of the being" of the subject, intentionality, and the intentional object, which, Heidegger believes, leads Husserl to take up the traditional conception of man as a rational, deductive and cognitive subject—an *animal rationale*.¹⁸

Nevertheless, Heidegger still is a phenomenologist, because he preserves intentionality. The only difference is that the directedness of the human being is not a

¹⁷ Husserl, *Ideas*, 100

¹⁸ Heidegger, *History of the Concept of Time*, 128-130

relation between an ego-pole and an object-pole. For this reason, I left the ego out of the above pictures. Heidegger's "existential analytic" investigates the general structures that entities must have with respect to this human directedness if they are ever to be dealt with as particular things in concrete ways.

Ontological and Ontic Description

Where Husserl's phenomenology distinguished the essence of things from things themselves, Heidegger instead distinguishes being from beings. In doing so, Heidegger does phenomenology without appealing to the same sort of subjectivist concepts that Husserl does in his descriptions of intentionality. Namely, Heidegger does not want to separate the noematic aspect, or intentional content, of experience from the "thesis" that things exist factually in the world; it was just this reality "thesis" that Husserl put between brackets, preserving the intentional content of the thing for phenomenological description without being interested thus in the thing itself. Heidegger refuses to separate the question of intentionality from the question of existence. It is exactly existence that is overlooked by Husserl, and to the detriment of a fundamental phenomenology, Heidegger thinks.

Thus, Heidegger is not seeking to separate our "experience of things" from "things" because this implies that it is *merely* subjective experience that phenomenology is describing. When we make the division in this way, we bring to it a notion of what experience *is*, namely, that it is somehow different and separated from real existing things, as if experience meant "mere appearance". Even talking straight away about "things" may be misleading, since we all bring to the concept an idea of things existing in-themselves, extendend in space, just "there" in front of us with whatever properties they happen to have. That is, we all already have an idea of what things *are*, even if we don't ever express this. Things have *ways of existing* that must already be understood before we examine them as particular things with particular properties. To elucidate this background understanding of the being of things, we have to try to leave aside assumptions about this phenomena that aren't found in the phenomena themselves. Thus, we don't want to separate "experience" from the "objects of experience" when asking, "how do things exist?" if this separation isn't justified. The phenomenological way of going about

business tries not to import any theoretical or empirical baggage about how things exist, or try to figure it out through pure reason, but rather looks around at how entities “show up” in the “world” and in our dealings with them.

Heidegger’s “reduction” would thus be a shift in attention from *entities* to the *being* of entities. Questions about entities are *ontic* questions. Questions about the being of entities are *ontological*. We are normally interested in the ontic character of things, even though they have some ontological way of being all the while. Heideggerian phenomenology is thus an attempt to make explicit the ontological character of entities. Ontological questions are very different from ontic questions, and this is because *being* is not *a* being. “Being—that which determines entities as entities, that on the basis of which entities are already understood, however we may discuss them in detail. *The being of entities ‘is’ not itself an entity.*”¹⁹ The way things exist is not itself a thing, nor should ‘being’ be thought of as some magical transcendental substance.²⁰ Rather, to even understand this “something” or to interact with it, we have to already understand the way something exists—the kind of being that it “has”.

Furthermore, there is one being—*Dasein*—that is special because, in its dealings with entities, it always “understands” the way they exist. We are constantly using things, talking about them, or maybe just looking at them, but in doing so, all these entities have some ontological way of existing, no matter what they happen to be ontically; furthermore, they *must* have some ontological way of being if we are to have any dealings with them at all. For this reason, Heidegger says that human beings are ontically different from other beings because they have an “understanding of being”: “*Dasein* is ontically distinctive in that it is ontological.”²¹

Moreover, *Dasein* always has this understanding. We might say that it *is* this understanding. In all of its normal dealings, day to day, from the most common to the most theoretical, it deals with things on the basis of their existing in some way. Heidegger’s use of “understanding” in no way should connote a mental judgment, or cogitative act; it is rather an existential state of being that affects the way the world shows up at all times.

¹⁹ Heidegger, *Being and Time*, 26 [my emphasis]

²⁰ This is why I follow Dreyfus (*Being-in-the-World*) in avoiding writing “being” as “Being” with a capital “B”; “Being” tends to imply some transcendental essence, or thinglike determination, and Heidegger is clear that being is nothing of the sort. Heidegger’s “being” is not “a” being.

²¹ Heidegger, *Being and Time*, 32

Since Dasein has this understanding “everyday”, Heidegger picks the most common, average ways of existing for his inquiry. The ontological foundations of our everyday abilities to cope with the world, use tools, and get around in a world that is always familiar, will still be laid when we go on to more theoretical endeavors, like philosophical deduction or scientific hypothesizing. Furthermore, Heidegger thought that it was precisely this “everydayness” that Husserl had reduced away with his phenomenological reduction, by examining only explicit mental acts, like judging, reasoning, hypothesizing, and perceiving. Husserlian phenomenology attempts to describe the experience of the object that the phenomenologist is staring at, carefully examining the way it looks. However, our everydayness is not this sort of “mere staring” and perceptive contemplation, Heidegger would argue, but is rather based on our constant dealing with equipment in some active and purposeful context.

By taking up an ontological inquiry into the everydayness of Dasein, Heidegger initiates a thorough criticism of the metaphysics of the subject. Heidegger believes that the tradition has overlooked this most important feature of being human, because philosophers have been interested in rational thinking, logical deduction, reasoning, or *cogitaciones*—defining the human as *animal rationale*—rather than in our everyday, common sense coping abilities. There is a rich ontological structure in our everyday activity that is totally missed when we assume that “mere” common sense is not very philosophically interesting. Or worse, when we assume that our everyday behavior is full of errors, a “naïve realism” that needs philosophy to straighten it out by giving proofs for the existence of the world or the validity of sensations and judgments, rational bases for action, *etc.* This is clearly Descartes’ position, who thinks that we all could be horribly deceived about the appearance of the world, and that we should conduct rational inquiry to find out how things “really” are, rather than dwell mistakenly in the way that they “appear” to common sense. If subjectivity is defined as disembodied ratiocination, common sense is naïve to take things on faith without reasoned proof. Heidegger totally reverses this position, arguing that the Cartesian approach, far from clearing up the naïve assumptions of common sense, actually invents problems by totally overlooking what this common sense really *is*. The tradition never asked about the being of the common sense everyday world, and in doing so, immediately assumed the kind of being—as rational *subjectum*—that the human being would have. In order to not make any mistakes by

assuming the being of things, as well as being of the human being, Heidegger thinks we have to go back to everyday experience.

As the oversights of the tradition may suggest, an ontology of everydayness is not totally obvious. Even though each of us is a Dasein, and each of us exists as an understanding of being, we don't exist in an *explicit* understanding of being:

Because this average everydayness makes up what is ontically proximal for this entity, it has again and again been passed over in explicating Dasein. That which is ontically closest and well known, is ontologically the farthest and not known at all.²²

Heideggerian phenomenology is an attempt to make explicit the kind of being that each of us, as Dasein, possess. Since we are normally fascinated with the ontic aspects of entities, our projects and ourselves, we miss the ontological determination that is inherent in our dealings with these things. Heidegger is trying to make this ontology explicit. To do this, he only asks us to look at our everyday living, rather than importing other principles and theories that have an unquestioned grounding in the metaphysics of the subject.

Being-in-the-world

Before showing how Heidegger's critique stems from a phenomenological look at everydayness, it is important to have in mind the alternative to the metaphysics of the subject that Heidegger is suggesting. I'll outline that here now, and support it with the phenomenological evidence in the following sections.

As we have said, the human being has been traditionally construed as a subject-thing that enters into relationships with object-things. Heidegger definitely wants to get rid of this. "The person is not a Thing, not a substance, not an object."²³ Instead, he suggests that the basic state of being of Dasein is *being-in-the-world*. There is no clear division between a "subject" on one hand, and an "object" on the other, because the human being is concrete coping activity—learned through socialization—in a world organized by and for this activity. Everything that the human does is done in some actual situation. Conversely, every situation has a rich phenomenal structure that is inextricably bound to the sorts of things that Dasein can do in that situation.

²² Heidegger, *Being and Time*, 69

²³ Heidegger, *Being and Time*, 73

For example, when driving down the freeway to work, we just do the right things, almost without thinking about it. If there is an obstruction in the road, we immediately see it as “something to be avoided” and we automatically brake or steer around it. The road opens up not as a strip of gray with white painted lines, but as a place to drive; the offramp appears instantaneously as the right way to go in order to go to work. The situation suggests the actions we should take, while at the same time, the project that we are engaged in organizes the situation. We drive skillfully, situated in the driving-to-work-world without having to make anything explicit. If we did make all rules and situational details explicit, we might get so distracted as to be in an accident! Even when we were first learning to drive the car, there was still a definite situation that was “already there” because we already knew how to cope in the world which we had been walking around in, biking in, and constantly using tools within.

Dasein always finds itself in some particular situation that “matters” and in which it acts effectively without deliberation. Dasein is skillfully able to do many complex tasks without following any rules or making any judgments, because it is engaged in the world, a world that both prompts Dasein’s action, and which is organized in terms of Dasein’s projects. Concernful, situated, *knowing-how* is a more basic than abstract, propositional *knowing-that*, and acting with things is more basic than making judgments about them.

Everything that Dasein does happens within the world. This is part of the way it exists. For this reason, “subject and object do not coincide with Dasein and the world.”²⁴ When Heidegger says that Dasein is being-in-the-world, this means that having a world is essential to the sort of existence Dasein has. It is not the result of merely joining two separate things—a subject and an object—together to form some new aggregate; rather, being-in-the-world is from the start a totality that synthesizes the situation and Dasein’s action within it. Dasein is always “outside” in the world, as well as “inside” as directed engagement in whatever tasks it is involved with. The categories “inside” and “outside” are really misleading. In the following passage, Heidegger emphasizes that the relationship of Dasein to world is not that of a subject that has to get data “from the outside” to construct an “inner” awareness, because all knowledge and action is actually a matter of situated skillfulness within-a-world.

²⁴ Heidegger, *Being and Time*, 87

When Dasein directs itself towards something and grasps it, it does not somehow first get out of an inner sphere in which it has been proximally encapsulated, but its primary kind of being is such that it is always 'outside' among entities which it encounters and which belong to a world already discovered....And furthermore, the perceiving of what is known is not a process of returning with one's booty to the 'cabinet' of consciousness after one has gone out and grasped it; even in perceiving, retaining, and preserving, the Dasein which knows *remains outside*, and it does so *as Dasein*.²⁵

Being-in-the-world is neither subject, object, nor the joining of the two. Rather, it is a totality that is before such a division, and must not be analyzed in terms of subject and object. "Being-in-the-world" takes into account both the structure of the world and Dasein acting in a world, whether we approach it from one direction or the other.

The compound expression 'being-in-the-world' indicates in the very way we have coined it, that it stands for a *unitary* phenomenon. This primary datum must be seen as a whole. But while being-in-the-world cannot be broken up into contents which may be pieced together, this does not prevent it from having several constitutive items in its structure.²⁶

These "constitutive items" are different ways to approach being-in-the-world, without being just the enumeration of members in an aggregate. We can look at the phenomena from three different angles in order to make distinctions in the structure of being-in-the-world. The first is the phenomena of the world. What does it mean to have a world, and what sort of thing is a world if Dasein is being-in it, and how is the world organized in terms of Dasein's actions? The next is the identity of everyday Dasein. As Heidegger puts it, this is the answer to the question, who is Dasein? The third is the phenomena of being-in, which addresses the ways Dasein exists within the world that matters to it, how it understands the world in which it finds itself and acts within it.

In the following sections we will briefly introduce each of these aspects of being-in-the-world, as they arise from a phenomenological description of everydayness, and then show how they all are aspects of a single unified phenomenon with the concept of *care*. All throughout, it's important to remember that this is a departure from the metaphysics of the subject, achieved through the focus on situated action within a world conducive to that action. Accordingly, there is a transition from the paradigm of a subject knowing an object and making judgments about it, to the skillful use of objects which present themselves to Dasein as useable. "The kind of dealing which is closest to us is...not a bare

²⁵ Heidegger, *Being and Time*, 89

²⁶ Heidegger, *Being and Time*, 78

perceptual cognition, but rather that kind of concern which manipulates things and puts them to use.”²⁷

The World

What kind of “world” is Dasein “in”? Heidegger is quite clear that, phenomenologically, the world is not something different and separate from human being-in-the-world. “Ontologically, ‘world’ is not a way of characterizing those entities which Dasein essentially is *not*; it is rather a characteristic of Dasein itself.”²⁸ Heidegger means that the “world” is inseparable from what Dasein does, and that Dasein cannot do anything that is not in a “world”. This does not mean, however, that each individual Dasein is creating its world, and that everything depends on Dasein. This would miss what Heidegger means by “world”.

1. The “world” is *not* the totality of things, or the collection of all of the determinate, independently existing objects. We might call this the physical universe: the set of things that are just “out there”, whether we know about them or not, irrespective of what we do with them.
2. Neither is it a specialized domain of determinate objects, such as the “world of mathematics” or the “world of sports”.
3. Also, it is not the concrete world in which one dwells, with our particular familiar things and practices, such as the “fisherman’s world”, “the soldier’s world” or what is meant in the phrase, “he’s living in another world”.

Heidegger is talking about an ontological concept of the world. Ontologically, the “world” is “an organized pattern of practices and equipment that forms the background on the basis of which all activity and thought makes sense.”²⁹ The “world” mentioned in (3) above is the particular ontic realization of this ontological concept of world. Heidegger uses the term “worldhood” for this notion, meaning that which makes the world the sort of thing in which various things can appear.

Heidegger clarifies “worldhood” by working backwards from an analysis of the way things appear within the world. Ontologically, there are two main ways for entities in

²⁷ Heidegger, *Being and Time*, 95

²⁸ Heidegger, *Being and Time*, 92

²⁹ Dreyfus, *Being-in-the-World*, 249

the world to be. When we normally think of *things* we are thinking in terms of *presence-at-hand* (*Vorhandenheit*). A thing is present-at-hand when it is independent, just “there” before us, having innumerable properties, such as color, texture, weight and extension in geometrical space. If I think of this pen merely as a five-inch-long blue and silver cylinder that weighs two ounces, then the pen is present-at-hand. I can make definite judgments and statements about this thing, but it has been totally stripped out of its context. Thus, there is a more basic kind of being called *readiness-to-hand* (*Zurhandenheit*). When the pen is “to be used for writing” in conjunction with paper “to be written upon”, envelopes, a desk, a chair, *etc.*, it is ready-to-hand.

Ready-to-hand entities are called *equipment*. We always use items of equipment to do something; they don’t just lay around as mere present-at-hand things. The glass of juice on the table isn’t seen *as* a clear cylinder with orange liquid inside; rather, it is immediately experienced as “to be drunk from.” Furthermore, this equipment is always in a context with other equipment (table, plate, food, utensils).

Taken strictly, there 'is' no such thing as 'an' equipment. To the being of any equipment there always belongs a totality of equipment, in which it can be this equipment that it is. Equipment is essentially 'something in-order-to...'. A totality of equipment is constituted by various ways of the 'in-order-to-', such as serviceability, conduciveness, usability, manipulability.³⁰

Ready-to-hand equipment always exists in terms of some action, and it is most ready-to-hand *when we are using it*. The equipment is absorbed into our use of it. I don’t think about the stick in a car because I automatically find it when shifting needs to occur and all of my attention is on the activity of driving itself. The stick is “ready” to be used along with all the other interrelated equipment for driving, such as steering wheel, mirror, seat, turn signal, brake and accelerator. While driving, all of these things are available in such a way that I skillfully use them without ever thinking explicitly about their properties. “Being-in-the-world...amounts to a non-thematic circumspective absorption in references or assignments constitutive for the readiness-to-hand of a totality of equipment.”³¹

We normally concern ourselves directly not with items of equipment, but on the task we are involved in, the thing to be produced, *etc.*, for the work we are engaged in

³⁰ Heidegger, *Being and Time*, 97

³¹ Heidegger, *Being and Time*, 107

implies the entire referential totality.³² Heidegger distinguishes several different moments in this totality:³³

- The “with-which” is the item of equipment, a node in the network of available equipment. This is the car’s stick, or the craftsman’s hammer.
- The “where-in” is the practical context of use. For the driver, this is the car’s cockpit, for the craftsman, the workshop.
- The “in-order-to” is the assignment of the “with which” to the equipmental whole. It determines the kind of manipulability or serviceability that the equipment has.
- The “towards-which” is the goal of the work I have to do, the reason for using the “with-which”, “in-order-to” do something on this particular occasion, although no mentalistic interpretation should be implied with the words “goal” and “reason”. This might be getting to work on time, or building a dollhouse.
- The “for-the-sake-of-which” is the overall purpose of doing the work in terms of Dasein’s being. The world always “matters” to Dasein, and there is always something “for the sake of which” it does something, making sense of the action in terms of its existence. Thus, the driver wants to get to work to support himself, or else to *be* successful.

For example, I shift “with” the stick that is “in” the car “in order to” drive the car properly “towards” getting to work, all “for the sake of” my livelihood. The stick is far from an isolated present-at-hand thing for me! We must keep in mind that the above distinctions are not explicit references which are glued to a present-at-hand primitive, like use predicates applied to some thing-atom, or else discrete pointers to other atoms. The distinctions are made only to show the sophistication of the ready-to-hand entity’s engagement with our use of it in some context. As always, the ready-to-hand is a phenomenal whole, not an collection of present-at-hand qualities on some object.

The “for-the-sake-of-which” is the most important, because it is the broadest in terms of which other actions are undertaken. “Dasein always assigns itself from a ‘for-the-sake-of-which’ to the ‘with-which’ of an involvement.”³⁴ The “for-the-sake-of-which”

³² Heidegger, *Being and Time*, 99

³³ Dreyfus, *Being-in-the-World*, 92

³⁴ Heidegger, *Being and Time*, 119

is thus that wherein any involvement with any equipment occurs. For this reason, Heidegger identifies the for-the-sake-of-which with the “worldhood” of the world, “that in terms of which the ready-to-hand is ready-to-hand.”³⁵

Therefore, “there is no such thing as a side-by-sideness of an entity called 'Dasein' with another entity called 'world'.”³⁶ Phenomenologically, the world is not distinct from human being, because it is only in terms of this being that entities within the world become available for use. Neither Dasein nor the world can be independently distilled from being-in-the-world.

The world is always given in terms of human actions and purposes, and the entities within-the-world are equipment that Dasein uses and manipulates. Dasein’s world is in terms of what it can do in that world, and this holds even when the equipment is not man-made. Consider backpacking up a rugged canyon. Instead of mere rocks, streams and bushes, I see places to get through the canyon, prickly bushes to avoid, routes that would be easier than others, good handholds and footholds in the rocks that I might climb, and so forth. I look at the canyon walls and drainages with a map in hand, looking for the best route to the top of the mountain, or places that would offer good shelter. The natural environment always presents itself in terms of what I can do with it; it is available for my use. It is only when I step back from this activity, putting aside my concern with hiking the canyon, and effecting a general change in attitude, that I can see the canyon as beautiful scenery, immobile and independent of human activity. This ready-to-hand canyon has to “break down” so that the mountains can become present-at-hand things which I can just stare at, appreciating them as a visual spectacle independent from my existence.

Presence-at-hand is the normal way to understand the being of things, and yet most of the entities that we encounter and deal with in our everyday activities are ready-to-hand. How does the present-at-hand come about then? If the most basic experience of the pen is as “to be used for writing” in some wide context, surely that pen is just as basically a five inch long blue cylinder, if not more so? Heidegger definitely doesn’t consider the ready-to-hand object to be simply a present-at-hand thing with a subjective function predicate stamped on to it. This would miss the referential totality that is so important for the ready-to-hand. Actually, instead of constructing the ready-to-hand from

³⁵ Heidegger, *Being and Time*, 114

³⁶ Heidegger, *Being and Time*, 81

the present-at-hand, Heidegger believes that, ontologically, we can only get to the present-at-hand by decontextualizing ready-to-hand entities. For example, I have to stop using the pen as a pen, wrenching it from its totality of equipment, in order to put my attention into it as a thing with properties. To look at things as present-at-hand, we have to switch our attention from the task at hand, to the item of equipment. So doing, we strip it from its referential totality, “deworlding” it, as Heidegger would say.

In fact, it is very difficult to see things purely as present-at-hand. Even when I talk about the shapes, colors and physical features of the things on the table, I still can’t help seeing the cup as something to drink from, the chair as somewhere to sit, the pen as something to write with. The best I can honestly achieve is a deficient readiness-to-hand, because, in truth, the referential ties of these things to other equipment and to possible activities with them remain attached, even when I try to see just the present-at-hand features. It’s very hard to not see the chair as something that people sit on.

Heidegger calls this sort of deficient readiness-to-hand *unreadiness-to-hand*. It most commonly results when equipment breaks down or our work is suddenly complicated, and we are forced to switch attention from the work to the tool. Its involvement becomes obvious with its character of “too heavy for hammering” or “not connected to the machine in the right way.” Things stand out either because they are broken, they can’t be found; the referential totality is broken in some way, and the work can not continue smoothly. When the keyboard stops working correctly, I am no longer immersed in writing a paper, but rather turn my attention to the unready-to-hand keyboard and the computer in order to find what’s wrong with the electronic machine—paying attention to precisely what wasn’t present in my previous engaged use. “When equipment cannot be used, this implies that the constitutive assignment of the “in-order-to” to a “towards-this” has been disrupted.”³⁷ To see something as present-at-hand is thus for the ready-to-hand equipmental context to break down in the most extreme way, and for the tool in question to be totally deworldeed.

(Scientific praxis is akin to this type of deworlding, since it sees the entities and processes of the world as present-at-hand. The fact that it takes a change of attention, and a cessation of everyday involvement with the ready-to-hand, to see something as present-at-hand, does not mean that the scientific causal account in present-at-hand terms is in

³⁷ Heidegger, *Being and Time*, 105

anyway undermined, or that scientifically discovered entities like dinosaurs are dependent on human for their existence. It just takes a certain notion of objectivity in the theoretical praxis to even understand what this existence means. It is the ontological concept of objectivity, rather than the object itself, that is relative to scientific praxis, as will be discussed in the Appendix.)

The Anyone

Not only is the world always given in terms of human projects and action, it is also a world that is given to everyone. Dasein's world is a public world. "The world is the one that I share with Others. The world of Dasein is a with-world."³⁸ Things are not just ready-to-hand for me alone, but when they are ready-to-hand for me, they are ready-to-hand for others. When I come across a flashlight as something to grasp in order to illuminate something which frightens me, this same flashlight—the exact one that I grasp—is ready-to-hand in the same way for anybody else. When one is frightened, one can use the flashlight for illumination, and it doesn't matter if this "one" is me or you or my mother. I see the flashlight as something that anybody can use for its purpose; it is a public tool in a public world "Things are encountered from out of a world in which they are ready-to-hand for Others—a world which is always mine too in advance."³⁹

Dasein is always being-with other Daseins. Even when alone, Dasein is still alone with respect to others, and this being-alone is simply a modification of being-with-others. Being-with is not a relation of two independent subjects side-by-side. This is because the human subject is not isolated from others in its subjectivity, but is rather always action in a public, shared world. Just as being-in-the-world is not reducible to subject and world, neither is being-with-others reducible to a collection of independent subjects. I do not have to judge that there are already other people, basing their subjective existence on an analogy with my own case, as Bertrand Russell's argument goes.⁴⁰ Simply the need to establish an "argument" for the presence of other minds assumes the metaphysics of the subject by assuming people are isolated independent thinking things, each with their own private world. If we look at our everyday experience, however, we find that we always

³⁸ Heidegger, *Being and Time*, 155

³⁹ Heidegger, *Being and Time*, 154

⁴⁰ Russell, *Analogy*

relate to people in the understanding that they are people, and that this tree that I see and point out to my friend is *the same tree* that he sees. If a group is building a house, then everybody is building the same house, engaged in a common project. The things that matter to one worker imbedded in his situation also are given as mattering to others, immediately and without judgment of any sort.

The answer to the question, “Who is everyday Dasein?” is thus not me alone, but is “Anyone”, so to speak. “The ‘who’ is not this one, not that one, not oneself, not some people, and not the sum of them all. The ‘who’ is the neuter, the *Anyone [das Man]*.”⁴¹ As mentioned above, the flashlight is available to *anyone*. There are ways that *one* drives down the street, and there are ways that *one* behaves at a dinner party. When advertising says, “This suit is the right one for *you*,” it means that it’s right for *anybody*, and each Dasein that hears this message knows that it is being personally addressed. When I buy tickets for a concert, they are sold to *anybody*. I am standing line for them because that’s what *one* does. Even in the canyon all alone, the routes that I see available in the canyon walls are the kind of things that are available to whoever should want to climb them. Because being-in-the-world is being-with, Dasein is Anybody in its everydayness.

Being-with is not compromised by being-alone, or by the fact that I may use some object that no one else does. In using it, the fact that it is publicly usable for others is constitutive for its readiness-to-hand. Even if I hide things from other people, and ensure that no one else does what I do, the very action of hiding betrays the understanding that what I do can be done by others. To hide something from other people, to keep something secret, is to precisely to hide it *from others* in a *public world*. In its being-in-the-world, Dasein is always being-with-others.

Dasein, when dealing with equipment, does not do so as an isolated subject. “One’s own Dasein, like the Dasein of Others, is encountered proximally and for the most part in terms of the with-world with which we are environmentally concerned.”⁴² Furthermore, it does not do this as a unique individual I-self. Rather, it is lost in the common shared practices of the public world. In a similar fashion as, phenomenologically, the present-at-hand only emerges from a breakdown of the ready-to-hand, so does the individual self found in self-reflection only emerge through a breakdown of the Anyone. To consider what I am doing as an individual is to break out of the skillful flow of action

⁴¹ Heidegger, *Being and Time*, 164

⁴² Heidegger, *Being and Time*, 163

that Anyone undertakes with various totalities of equipment. “I” am not the center of all my actions, even though, at the same time, Dasein is “mine”.

Just as the ontical obviousness of the being-in-itself of entities within-the-world misleads us into the conviction that the meaning of this being is obvious ontologically, and makes us overlook the phenomenon of the world, the ontical obviousness of the fact that Dasein is in each case mine, also hides the possibility that the ontological problematic which belongs to it has been lead astray.⁴³

One possible objection is that everybody sees the world from a different perspective, and so my perspective on objects is always unique to me alone. Indeed, Husserl’s phenomenology is heavily perspectivist. From a Heideggerian standpoint, however, one’s “perspective” is a little like the present-at-hand features of objects in that it has to be freed from concerned coping activity in order to become available for observation. Just as the I-subject is a breakdown of the Anyone, my perspective is only noticeable as such after a breakdown, or pause, in my engaged dealings with publicly ready-to-hand equipment.

Being-in

In examining being-in-the-world, we first looked at the structure of the world and things within the world, then at “who” Dasein is everyday. Now we turn to the structure of “being-in”: the way in which Dasein understands, knows and speaks. Heidegger is trying to show how Dasein is different from other ready-to-hand or present-at-hand entities in the world, and this difference consists in its “being-in” some situation in which it is purposefully involved.

It should be clear that by “being-in” Heidegger is not insinuating that Dasein is inside a world-container in the way that some toy can be inside of a box; “being-in is distinct from the present-at-hand insiderness of something present-at-hand ‘in’ something else that is present-at-hand...Being-in is rather an essential kind of being of this entity itself.”⁴⁴ This sort of essential being-in a situation that matters is what Heidegger has in mind with the term *Dasein*—“being-there”. Dasein is always “there”, no matter where it goes. It is always in an immediate situation, with distinct possibilities for action in that situation.

⁴³ Heidegger, *Being and Time*, 152

⁴⁴ Heidegger, *Being and Time*, 170

Affectedness (*Befindlichkeit*) is the way in which Dasein finds itself. This denotes the “passive” aspect of Dasein, the fact that it just happens to be in some definite situation. “Existentially, affectedness implies a disclosive submission to the world, out of which we can encounter something that matters to us.”⁴⁵ There are different ways to describe this.

Dasein is *thrown*. *Thrownness* is “the facticity of being delivered over”⁴⁶ into some concrete situation. Dasein is always “thrown” into a particular situation that suggests definite possibilities for action. It is not a subject methodically constituting its world, in full control of the way it appears; rather, the situation in which it finds itself is a situation that was “already” there. For instance, I find myself at the front of a classroom having to give a presentation. I have a definite existential situation amid a world that I did not wish into being. The desks and walls and expectant faces are “already there” as I stand before them, and have been that way for a while.

Also, Dasein has a *mood*, which further delimits the sort of possibilities that it will encounter, or the way in which it will find itself in the situation. If I am angry, then I am “there” in the classroom much differently than if I am giddy. Mood affects the way we are thrown. It is thus misleading to think of mood as a subjective coloring of the objectively true world, because actually, we only know what sort of mood we are in based on how the world shows up! If I am angry then people “show up” as annoying or difficult, or equipment doesn’t work right and obstructs the work I want to get done. I don’t judge any of this to be the case; I can only report, “I am happy,” if I read my mood off of the world and the sorts of things that I can do in the world, rather than by some act of introspection. My possibilities are different if I am happy than if angry; I am (and the world is) “there” in a different way.

Lastly, the world shows up as “mattering” to Dasein. There are always things that present themselves as “needing to get done” or that are “important for....” The fact that I am in this classroom matters to me. It is not a random out-of-the-blue occurrence where I just sit there and stare at present-at-hand things and bodies; the people are “expectant” that I should do something. Affectedness is therefore the fact that Dasein is thrown into some situation that matters in some way and in some mood. “In every case Dasein, as

⁴⁵ Heidegger, *Being and Time*, 177

⁴⁶ Heidegger, *Being and Time*, 174

essentially having affectedness, has already got itself into definite possibilities....thrown possibility through and through.”⁴⁷

Since Dasein is “there” in some way, it can “understand” or interpret the way it is there. This understanding is a non-explicit understanding of the possibilities for action in the situation. “Dasein has always understood itself and always will understand itself in terms of possibilities.”⁴⁸ These “possibilities” are not beliefs about the world that it stores up in a database. If that was the case there would really be no situation that Dasein was “in”. It would be merely inside of the external world. Rather, it is knowing how to cope in definite domains,⁴⁹ acting skillfully on the possibilities which are disclosed in the situation into which it is thrown. We understand the world in terms of what we need to do—which is why the “for-the-sake-of-which” is the worldhood of the word. We are always engaged in some project, undertaking some action, and in this sense are pressing into definite possibilities for action that are always given in terms of our projects. In the classroom example, I will understand all of the people’s actions in terms of my project of giving a presentation, or being-a-part-of-the-class on the larger scale. Even the construction crew making noise outside is understood in terms of my projection of possibilities, namely as the possibility of the impossibility of my speaking clearly and intelligibly. They are an obstacle to me, but only because I am engaged in speaking about something which may be obstructed. Thus, Dasein is always the projection of possibilities and action on these possibilities.

Heidegger also talks about language as an aspect of being-in. Basically, his idea is that language is ready-to-hand equipment that we use to point out things in the public world. We can indeed break it up into grammars, rules, words and phonemes, for the purpose of scientific (linguistic) study, in the same way that we can break objects up into shapes, textures, colors and weights. However, language, as ready-to-hand, is not an internalization of an aggregate of these present-at-hand linguistic entities. Being able to speak a language is a skill like driving a car. If we are good at it, we don’t even notice that we’re using it. In the car we focus on where we want to be, while in language, we focus on the “about-which” of discourse; the actual linguistic details are not an issue, nor even present in experience. Like other equipment, language has its “where-in”, the

⁴⁷ Heidegger, *Being and Time*, 183

⁴⁸ Heidegger, *Being and Time*, 185

⁴⁹ Dreyfus, *Being-in-the-World*, 18

context that it's appropriate to use language one way and not another, its "toward-which" and "in order to", *etc.*

Furthermore, language is used in the public world. We talk as "one" would, using the correct grammar as "anyone" who speaks the language would, so that "anyone" would understand (even with the qualification that this "anyone" means "anyone who is interested in philosophy", or "anyone who went on that trip"—"anyone" is generic, and does not denote any actual person or group of persons). When I point things out using language, I point them out in the public world. I may point out a road sign that you didn't see, but this doesn't mean I am transferring information from my inside to your subjective inside. Both you and the road sign are outside in the same world, and you and I are involved in the same project of getting somewhere within-the-world. I merely call your attention to something that is available to you just as it is to me (just as it is to *anyone*). Language is used to point things out in public (even abstract mathematical entities), and is only used insofar as Dasein is "there", having something that matters, "for-the-sake-of-which" it speaks.

Being-in is that aspect of being-in-the-world through which Dasein finds itself in some specific world-situation and projects its possibilities in that world. It is the fact that Dasein somehow takes a stand, and interprets itself *through acting some way in some concrete situation*.

A Heideggerian Critique of Cognitivism

Cognitivist cognitive science removes the human being from its engagement in a concrete situation. Instead of focusing on skillful action within-the-world, cognitivism sees the subject as a manipulator of representations, and as an information processor. Howard Gardner lauds this as the great virtue of cognitive science:

The major accomplishment of cognitive science has been the clear demonstration of the validity of positing a level of mental representation: a set of constructs that can be invoked for the explanation of cognitive phenomena, ranging from visual perception to story comprehension.⁵⁰

If Gardner is right, then the major accomplishment of cognitive science has been a formalization of the metaphysics of the subject. Cognition is "a set of constructs": filters,

⁵⁰ Gardner, *The Mind's New Science*, 383

schemas, heuristics, plans and programs, which allow for the construction of a mental reality. The richness of experience is a reflection of the richness of the representational architecture inside the skull, whether this experience be visual, auditory, or of a more cognitive nature involving categorization, recall, *etc.* Outside in the world, there is some sort of basic input, such as the “features” of a visual stimulus (texture, contrasts, reflectance, distance, color), or the bare text of a story to be comprehended. This information, gathered at sensory surfaces, is processed at different levels, combined according to various heuristics, filtered with respect to frames, scripts, or expectations, both influencing and modifying representations of concepts and images. Such concepts, as well as beliefs, goals, desires and plans, then allow for action to be developed. That any variant of this general model (and there are many!) presupposes the metaphysics of the subject should be obvious by now.

Phenomenologically, however, humans are not disembodied subjects, but are rather situated and engaged with the world. Being-in-the-world is not built out of primitive features that we find in the world and then apply our subjective goals and desires to organize them; the world is something that is given only through and with respect to our concerned action within-the-world. Can we support something like being-in-the-world with an architecture based on subjective representation of an external world? A possibility is to say that being-in-the-world is “merely” our experience, the final result of computations on representations which ends up as conscious experience. Cognitive representations are for the most part unconscious and all information processing occurs quite rapidly. Therefore, one might argue, of course there are no “fragments” and “features” in experience, because these have already been integrated into consistent representations that we consciously experience. Although being-in-the-world is interesting as a “merely phenomenological” feature, one might argue, it could be managed with the appropriate kinds of computations. The *experience* of being-in-the-world, that is, of there not being a subject and objects, could occur only because, in reality, there *is* a representing subject which knows objects. All of this just happens so rapidly to be noticed in experience (Herbert Simon claims that everything cognitively interesting happens faster than ten milliseconds.⁵¹). Being-in-the-world would then be merely “in the head”,

⁵¹ Simon, *Studying Human Intelligence by Creating Artificial Intelligence*

somewhat like the empirical world that the Kantian empirical subject lives in after the transcendental subject has constructed it.

There are two general ways to suggest to why being-in-the-world should not be based upon the metaphysics of the subject, aside from the immediate fact that it seems really odd (whence commeth the ontological backflip from subject/object to being-in-the-world?). The first looks at why being-in-the-world might not be able to be constructed out of basic features and algorithmic rules. The second emphasizes how the cognitive researcher overlooks his own being-in-the-world in elucidating the representational system. I will outline this criticism.

Hubert Dreyfus has been an outspoken Heideggerian critic of cognitivist attempts to formalize skillful action, especially artificial intelligence.⁵² He maintains that we can't capture skillful behavior with rules for action. This is because there are no rules that will be applicable in all situations. In general, action-planning rules first require recognition of the context appropriate for their application (The notorious "frame problem" in AI); this proves incredibly difficult because there are always exceptions to the "normal" situations. Thus, the satisfaction conditions for the application of action rules are usually *ceteris paribus* rules: if X holds, all else being equal, do Y. Yet, there will be exceptions. Take the rule, if A is ice cream, then all else being equal, eat A. The "all else being equal" part is the real stickler to formalize. What if the ice cream is melted and I won't eat it then? To get a rule based system to recognize this exception, you have to explicitly specify the exception. These exceptions have to be expressed with more *ceteris paribus* conditions in order to handle the possibility that I will still eat the melted ice cream only if it's chocolate, and then only if my Aunt Hilda is not watching. The exceptions to rules have yet more conditions, *etc.* To capture the human ability to immediately recognize its situation, an endless recursion of rules would be needed, and they would have to be applied nearly instantaneously. It's hard to see how a symbolic information processor could ever allow humans to perform as well as they do in the great variety of situations that they do, either making subtle distinctions in the environmental situation, or overlooking them as confounding factors when appropriate.

Heidegger's position is, of course, that humans do not have to "recognize" a situation because they are always already *in* a situation. They do not have to assign

⁵² cf. Dreyfus, *Being-in-the-World*, and Dreyfus, *What Computers Still Can't Do*

possibilities for action to a barren present-at-hand landscape, because those possibilities are “already there.” A disembodied representational system always has to figure out what its situation is, since it is constructing a model of its situation. Even a continuously updated model still has to figure out what to do with input and how to update the model. A model will always will always require operation on some bare informational primitives, despite the phenomenological evidence that “in interpreting we do not, so to speak, throw a ‘signification’ over some naked thing which is present-at-hand.”⁵³

A private model of the situation has to specify not only all the rules for how to recognize and behave in that situation, but also all the contents of that situation. The amount of “common sense” content that such a system needs is enormous—just to manage things like walking around without hurting its hardware—let alone excelling at advanced skills like driving a car, playing chess, and managing a company. Doug Lenet’s CYC project has attempted to capture common sense in a huge database of propositions about the world, and still there are gaps in its abilities to perform actions that humans are quite adept at and are flexible at modifying when the need arises. The bigger that CYC’s representational model grows, the more unwieldy it becomes to search and access—and it doesn’t even have to deal with actually moving a body around. How much more complex (and unlikely) would a representational system be that had to maintain an up-to-date total model of its situation, as well as constantly be planning and executing action in that situation—all within Simon’s ten milliseconds, and inside our little skulls?

Since humans are always already in a situation, and they always have their “there”, it is improbable that they would be the sort of machines that had to internalize this situation in the form of explicit symbolic representations and rules, and still be able to be engaged with the world as effectively as they are. The representational homunculus with its collection of information about the world will always lag far behind the actual human who exists as being-in-the-world.

Furthermore, we who are studying cognition are also being-in-the-world, and we need to take this into account. How do we decide what the basic units of information should be? How do we decide what is a basic feature of the external world for the mind to operate on, and how do we decide what are the basic qualitative features out of which our experience is woven? As I wrote above, present-at-hand features, like color, weight,

⁵³ Heidegger, *Being and Time*, 190

texture, *etc.*, only emerge as a *breakdown* of our everyday being-in-the-world. Things are normally ready-to-hand, which means they are enmeshed in an equipmental context that is organized according to the ways I (or better, Anyone) can interact with it. In order to “merely see” something as having a certain color, or being a certain shape, or as being seen from a certain perspective, I must take some distance from my involvement with this thing. Present-at-hand features are always the “de-worlded” fragments of ready-to-hand equipment; they don’t just exist all by themselves as they are. Ontologically, the present-at-hand presupposes the ready-to-hand, since the former is a breakdown of the latter. My purposeful involvement is always suspended to some degree if I am just staring, either curiously or theoretically, at a present-at-hand object.

Thus, features like color and reflectance are not found in everyday experience. They have to be “freed” from their context of action. It is impossible to pull out “all” of the present-at-hand features from an object, and supply a complete list of predicates, because the object is not a composition of these in the first place; rather, it is always a phenomenal whole integrated with my use of the equipment.

When the scientist ontologically modifies the phenomena through an act of discrimination which frees present-at-hand features from his ready-to-hand equipmental context, how is he to reconstruct the original phenomena? For example, David Marr’s landmark study on vision assumes that there are basic features in the world, and that the correct images can be recovered through the application of various algorithms, including the “recovery” of 3-D images from the 2-D (or “2½-D”, counting stereoscopy) retinal input. The nervous system is something that judges distance based on “cues” that it receives, assembles edges from texture gradients, and so forth.⁵⁴ However, if the “whole” is always prior to the “parts” that are freed from it, how can any computation on these parts alone reproduce the whole? It’s like smashing a vase and then trying to get the same vase back by rearranging the shattered fragments. It never looks the same, and it won’t hold water too well. Likewise, if I fragmentize my own being-in-the-world by freeing present-at-hand features, can I reconstruct the experience of being-in-the-world with these features? The result of any arrangement of present-at-hand things is still something present-at-hand, no matter how fast, or how unconscious this arrangement may be.

⁵⁴ Marr, *Vision*

Since cognitivism presupposes a metaphysics of the subject, instantiating being-in-the-world in a cognitivist architecture is problematic, to say the least. Consider Jerry Fodor's claim that

perception presupposes a representational system; indeed, a representational system rich enough to distinguish between the members of sets of properties, all of which are exhibited by the same event.⁵⁵

The assumptions implicit in the above are: (1) perception is a faculty (independent of action) which relates a solipsistic subject to its world, (2) there are "sets of properties" that are simply "exhibited" by events in the external world, and (3) a complex "representational system" would enable perception by recognizing and arranging these properties. I have tried to suggest that, phenomenologically, each of these are questionable without even looking at the psycho-biological evidence. To make them, Fodor has to overlook his way of being-in-the-world, and having made them, he won't be able to create being-in-the-world. The human is something more than a collection of disembodied present-at-hand representations; in Heidegger's language, human being is "care".

Care

At all times Dasein is a phenomenal totality, not the summation of parts. This does not prevent us from examining it from different angles: the world, the Anyone and being-in. Heidegger draws all of these together under the concept of *care* (*Sorge*) to demonstrate in just what sense we can think of Dasein as a phenomenological unity.

There are many ways that entities exist, some as equipment, some as mere things, and some like Dasein. *Care* is the being of Dasein, just as readiness-to-hand is the being of equipment and presence-at-hand the being of mere things. Dasein is not ready-to-hand because entities can only be ready-to-hand *for* Dasein. Also, Dasein is not present-at-hand, a *subjectum*-thing or a simple object with properties, because of its intentional involvement in the world. Strictly speaking, things are present-at-hand only as a breakdown of the ready-to-hand, and thus also are present-at-hand only for Dasein.

⁵⁵ Fodor, *The Language of Thought*, 51

Dasein is something different from the present-at-hand and ready-to-hand things which appear within the world.

Whenever the world is disclosed, entities within the world have been discovered already. The discoveredness of the ready-to-hand and the present-at-hand is based on the disclosedness of the world.⁵⁶

Dasein is the kind of entity which can “discover” others, and discover them in ways that are important to it. Entities only appear in a world, that is, with respect to some “for-the-sake-of-which” of Dasein. Thus, it has a different sort of being than these entities. This is clear in Heidegger’s oft repeated definition of Dasein, “an entity for which, in its being, that being is an issue,”⁵⁷ which means that the human being has always got itself into some particular situation, and has interpreted itself to be something by behaving in a certain way, living a certain lifestyle. We might say that Dasein is self-interpreting, whereas other entities are interpreted with respect to this primordial self-interpretation of Dasein.

Heidegger’s notion of care is an attempt to unite the two themes that run through *Being and Time*, that 1) the human being projects itself into its possibilities for actions in the world, and 2) the world is a public world, “always already there”. One emphasizes the “active” role of Dasein in forming the world as it appears, while the other emphasizes the abandonment to a particular situation that the particular Dasein didn’t come up with all. I think one reason for this apparent duality is that Heidegger’s account of being-in-the-world is an attempt to dismantle the traditional subject-object division. Accordingly, his criticism thus sometimes focuses more on deconstructing the “subject” and other times more on the “object”:

Heidegger wants to weaken the notion that the world and all the things in the world are independent from human interaction with them. This is why he objects to the idea of a thing just existing present-at-hand with its various physical properties, in the independent material universe. Thus, the world is always a “for-the-sake-of-which”, a grand purpose of Dasein with respect to which various ready-to-hand entities can be made available for use. There is no *de facto* feature in the human “world” that is independent of human interaction with it—even scientific present-at-hand features appear only within a scientific understanding. Dasein always *projects* possibilities for action, and the world—

⁵⁶ Heidegger, *Being and Time*, 343-4

⁵⁷ Heidegger, *Being and Time*, 236

the rich referential totalities of equipment and all the matters of human interpretation and understanding—only appear as a result of this projection.

He simultaneously criticizes any notion of the subject as essentially an independent thinking *thing* which enters into relationships of knowledge with objects. There is no isolated subjectivity since human beings are always in a situation. This situation is not a product of the individual human being. Dasein's world, and all the entities within that world, are "always already there." Dasein is already "outside" in the world; it's not a subjectivity which has to get out from the inside. This world is a public world, a with-world, as Heidegger puts it, and the human being is *thrown* into it. It is always a shared world that Dasein acts in, and its actions are for a large part the result of socialization into set patterns of behavior that *anyone* follows when interacting with ready-to-hand objects. Heidegger also uses the term *facticity* when describing Dasein's thrownness into a particular situation that was "already" there.

In no way should we think of thrownness and projection along the lines the Kantian concepts of sensibility and understanding, the passive and active faculties of the mind. According to Kant, sensibility is the capacity of the mind to pick up raw data from the external noumenal world. Only the most basic sort of processing occurs when this sensible matter is arranged with the "forms" of space and time, which act like low level filters to get the data ready for the understanding. The understanding is that mental faculty which does the more complicated processing, parsing the world up with different categories of understanding (order, number, exclusion, *etc.*). The sensibility provides information to the understanding which processes it. This activity generates the representations by which the subject knows its world. (Sound familiar? The Kantian concepts outline rather well the metaphysical foundations of modern cognitivist cognitive science. Of course no one talks about "sensibility" and "understanding" today, but there is "feature detection" and passive pickup of "information" which is "processed" during "concept formation" and "computation" on "representations".)

Thrownness is not passive receptivity, because we are always thrown into a world of specific involvements, nor is projection action upon a meaningless present-at-hand plenum, or sensible manifold. And neither are faculties of the mind alone, but rather are descriptions of our embodied existential state as being-in-the-world. Being-in-the-world does not appeal to the metaphysics of the subject, because there is no care without a

world to be involved in, and there is no world if there is no caring Dasein to disclose it. With the concept of care, Heidegger can demonstrate how Dasein is both *thrown* and *projecting* as well as how these two really form a phenomenological totality.

Heidegger defines care with yet another densely compound phrase: as care, Dasein is “ahead-of-itself-being-already-in-the-world.”⁵⁸ Dasein is “ahead-of-itself” insofar as it is projecting itself, pressing into its projects, always seeing things in terms of what can be done with them. Also, it is “being-already” in a factual situation into which it is thrown. These two aspects are bound together because it is always a world of *possibilities* into which Dasein is thrown. Dasein is *thrown* into the world into which it *projects* itself. “Thrownness...belongs to an entity which in each case is its possibilities, and is them in such a way that it understands itself in these possibilities and in terms of them, projecting itself upon them.”⁵⁹

Whatever I am doing, I am in a situation. While river-rafting, there is a definite state of affairs that at that moment I don't control—I am rushing toward a rapid in a rubber raft, and I may be in danger if I don't position my boat well and paddle hard enough on the right side. The total river situation is emphatically “already there”, waves, rocks, holes and all. “Once entities have been uncovered, they show themselves precisely as entities which beforehand already were.”⁶⁰ At the same time, I experience the river in terms of what sort of moves I can make. Possible routes present themselves to me right out of the water; *I can't help* but see a tongue of water as a good place to be in order to run the rapid well. Rather than seeing a “recirculating hydraulic system ten yards downstream” I see “a nasty hole to be avoided; paddle hard!”. I don't judge the rapid to be that way; that's just how I immediately experience it. Everything is in terms of possibilities for action (action that “any” boater would take), and all these are subordinated to the project of rafting—the projective world within which all of these definite ready-to-hand entities are given. I am thrown into a definite situation which shows up mattering to me in a specific way, yet it shows up with specific ready-to-hand equipment, the rocks, waves, and good routes, as well as my boat, paddle and crew that all work together in the situation.

⁵⁸ Heidegger, *Being and Time*, 237

⁵⁹ Heidegger, *Being and Time*, 225

⁶⁰ Heidegger, *Being and Time*, 269

“Dasein exists as a potentiality-for-being which has, in each case, already abandoned itself to definite possibilities.”⁶¹ This means that we can’t just project whatever we want onto a stark reality (Sartre’s existentialism moves in this dangerous direction.). We find our possibilities in the same situation in which we find ourselves. All possibilities that might be projected are always possibilities for action among other people, in a definite cultural, historical and locational situation. “Existing is always factual,”⁶² Heidegger writes, meaning that we are always caught up in the flow of some definite situational gestalt, the features of the world and our behavior in that particular world being unified together.

Temporality has been implicit in this discussion of care. Dasein is “ahead of itself” as projective, and “already there” as thrown. Indeed, “the primordial unity of the structure of care lies in temporality.”⁶³ I will only mention this briefly, since this thesis isn’t explicitly about time, even though this is important for understanding care (Heidegger’s text is called *Being and Time*, after all.).

The “temporality” of care accounts for its unity. This temporality is “the unity of a future which makes present by having been.”⁶⁴ We could also say that existing is an activity in the present which sees the past in terms of the future. This “past” is the factual situation in which we find ourselves: a particular situation in the public world. Dasein always finds the situation and its involvement in the way of “having-been”. “Dasein, in existing, can never establish itself as a fact which is present-at-hand, arising and passing away ‘in the course of time’, with a bit of it passed already. Dasein never ‘finds itself’ except as a thrown fact....The primary existential meaning of facticity lies in the character of ‘having been’.”⁶⁵ This situation is always one in which we must act, however. It is a public world into which we have been socialized through years of experience dealing with people and equipment, and so we know how to act skillfully. We project “into the future” our possibilities for action, and we do this by actually behaving skillfully. “Projection is basically futural; it does not primarily grasp the projected possibility thematically just by having it in view, but it throws itself into it as a possibility.”⁶⁶

⁶¹ Heidegger, *Being and Time*, 315

⁶² Heidegger, *Being and Time*, 236

⁶³ Heidegger, *Being and Time*, 375

⁶⁴ Heidegger, *Being and Time*, 374

⁶⁵ Heidegger, *Being and Time*, 376

⁶⁶ Heidegger, *Being and Time*, 385

Care accounts for the unity of being-in-the-world, as well as for its various moments (the world, the Anyone, being-in). We are thrown into a public world in which “one” knows how to act effectively. In no sense, therefore, can there be simply a subject and simply objects for it to know. In no way can the action we take and the particular context of action be separated. To suppose these things overlooks the phenomenological evidence available to everyone. Dasein may interpret itself as a knowing subject in a world of objects, and so organize its action and projects (especially philosophical ones) in terms of this interpretation; but nevertheless, this same Dasein is always imbedded in a situation that it is continually acting within. Being-in-the-world, as care, is something that is always “before” the subject-object division. Even if we talk about ourselves in terms of a metaphysics of the subject, we only do so on the ontological basis of our being-in-the-world.

Care, as the way Dasein exists, is therefore what must be accounted for by a biological interpretation of Dasein.

Chapter 2: Autopoiesis

Biology is the study of life, but don’t expect biologists to agree on exactly what life is. At least vitalism has gone its way and few today believe that living things can be differentiated from the non-living through an *elan vital*, the strange non-physical substance that, a hundred years ago, living things were thought to contain. Yet the mere fact that biologist agree that living systems are mechanistic physical systems in no way means that there is an accepted definition that can capture all living things and exclude the non-living.

The most common approach, often found in biology textbooks today, is to provide a somewhat arbitrary laundry list of “characteristics of living organisms” such as metabolism, growth, reproduction, adaptation, *etc.*⁶⁷ This approach is usually too inclusive or too exclusive, and it doesn’t provide any real insight as to why one physical process, like metabolism in a cell, is a living process, whereas combustion in an automobile engine is not. We are left with a list of characteristics that things we recognize as living should share, but without knowing in the first place why they are living, that is, without knowing what is special about them which allows them to have these characteristics. Without an explanation of why one kind of organization of physical matter

⁶⁷ Purves, et al., *Life: the Science of Biology*, 1

is alive and another is not, there still remains something a bit mysterious, if not vitalistic in some respects, about the systems that we call living.

In the seventies, Chilean biologists Humberto Maturana and Francisco Varela tried to give such an explanation. They wanted a simple definition of life that would avoid any “ghost in the machine”. Thus, their biological definition of life first presupposes a strict materialism, appealing only to physical processes as well as the organization of physical matter, in its elucidation. In their theory, whatever else living systems may be, they are deterministic, mechanistic entities.

In addition, Maturana and Varela propose that life is essentially *self-organized*. Living systems are a class of complex and often chaotic self-organized systems in general (like the economy, weather, spin glasses in physics, *etc.*). According to their theory, life is a special type of self-organization that is completely self-referring and self-specifying, defining the identity of the living organism. They coined the term *autopoiesis* to denote this organization, from the Greek *αυτός*, “self”, and *ποιειν*, “to produce”.⁶⁸ This word and the theory behind it imply that, biologically, life is a physical system that produces itself.

Organization and Structure

Maturana and Varela have a theory about the organization of living system. This means that, although the approach is mechanistic, they are not interested in the specific components of living systems. They make a strong distinction between the *organization* of a system, be it living or otherwise, and its *structure*. The organization of *any* machine consists of “the relations that define a machine as a unity, and determine the dynamics of interactions and transformations which it may undergo as such a unity.”⁶⁹ The structure is “the actual relations which hold among the components which integrate a concrete machine in a given space.”⁷⁰ The organization of a machine is independent of the actual properties of its structural components, specifying only the functional relations which must hold between the components. It is possible to realize a machine in different structures, as

⁶⁸ Varela, *Principles of Biological Autonomy*, 13

⁶⁹ Maturana and Varela, *Autopoiesis*, 77

⁷⁰ Maturana and Varela, *Autopoiesis*, 77

long as the given structure in the given space is able to generate the relations constitutive for the machine's organization.

This distinction, from cybernetics, is easily illustrated with the concept of a Turing machine. A Turing machine relates a set of inputs to a set of outputs through a set of abstract machine states.⁷¹ Each state is a function of the input and current state which returns the next state of the machine and, optionally, an output. This organization can be realized by any structure as long as 1) we define what structural events count as inputs and outputs and 2) the structure generates the appropriate sequence of outputs for any sequence of inputs. Turing machines are most commonly realized in silicon-based computers. However, we can easily imagine a nation of people holding flags of different colors that they can wave. If we called some of these flags inputs and others outputs and each person waved hers in just the right order, then this group of flag-wavers could realize the same Turing machine that my computer is realizing while running Microsoft Word. The accompanying figure demonstrates the multiple realizability of the Turing Machine.

⁷¹ Technically, I will be describing a deterministic finite automaton here, a class of machines which are a subset of Turing machines in general. A Turing machine has a tape, or memory, from which it can read and on which it can write, and which it is able to navigate one memory-cell at a time. The state function thus tells the machine what to do with the tape based on the machine's state and the symbol on the tape. This allows the machine to "remember" the result of previous outputs for future computations, something the finite automaton can't do. The distinction between the two is irrelevant for the purposes of this paper, however.

A Turing machine organization is realizable by multiple structures

The abstract organization of a simple Turing machine....

Turing Machine	INPUT 0	INPUT 1
STATE 0	STATE 1, OUTPUT 0	STATE 0
STATE 1	STATE 1	STATE 0, OUTPUT 1

Realized in the structure of a vending machine that sells chips for 25¢ or salsa for \$1, but only one after the other...

Vending Machine	Put in quarter	Put in dollar bill
STATE 0	STATE 1, Dispense chips	STATE 0
STATE 1	STATE 1	STATE 0, Dispense salsa

And realized in the structure of a group of flag wavers that can only wave in the sequence (Blue* | (Red Green (Red* | Blue Purple)))*

[“*” ≡ wave ≥0 times ; “|” ≡ OR]

Flag-waving	Wave Red Flag	Wave Blue Flag
STATE 0	STATE 1, Wave Green Flag	STATE 0
STATE 1	STATE 1	STATE 0, Wave Purple Flag

The Observer’s Description

The Turing machine example shows that the uses we have for a machine are not a part of its organization, but rather depend on the larger environment in which they are defined by an observer. A vending machine is not a *vending* machine, per se, by virtue of its organization, but rather because of the way we define its inputs and outputs and situate them in the surrounding environment. Although we usually build machines for some purpose, to manufacture some product, for example, teleonomic notions are only proper to a larger domain within which an observer situates the machine. In itself, the machine is merely the deterministic movement through its states.

It's important to take the observer's action into account. A constant theme throughout the work of Maturana and Varela is that the observer, since he is able to interact with both entities and their environment, can establish relations between the two that are not contained in the entity itself. It will become necessary to sharply distinguish between descriptions of the actual operation of a system in itself, which Varela calls *operational descriptions*, and descriptions which pertain to relations between the entity and the environment, called *symbolic descriptions*. Only the observer can establish these latter sort of symbolic relations because only he can interact descriptively with *both* of them.

In short, the observer is able to make distinctions, such as what counts as an I/O surface for a realized Turing machine, and as such is important for dividing up the shape of the world. Furthermore, as observers of living systems, we observe the same sort of things that we are, and so it becomes important, in making descriptions and distinctions, to show how the observer could emerge from these living systems, capable of making descriptions. "The observer is a living system and an understanding of cognition as a biological phenomenon must account for the observer and his role in it."⁷² It is important, thus, to understand both what the observer *does* by making distinctions and establishing relations, as well as what he *is* as an autopoietic unity. In describing autopoiesis, I will mention the role of the observer when appropriate.

Ontology and Organization

This distinction between organization and structure bears a rough resemblance to the distinction Heidegger makes between ontological and ontic descriptions. Any example of any particular organization will be realized in some concrete structure, but the organization is nevertheless different from the structure. Similarly, the ontological determination of an entity is its general "form" and is not tied to one *particular* thing or another. An ontic description of experience is then like structure above in that it describes the actual realization of the ontologically determined entity.

For example, an ontological account of tools in general as ready-to-hand describes how we use them, how we experience them, and what is true of them insofar as they are

⁷² Maturana, *Biology of Cognition*, 9

tools, but it is an ontic matter whether this tool is a pen or a hammer and I am using it for writing or pounding. In the same way, a Turing machine defines the organization of a computer, but it is a structural matter whether this machine is realized in silicon or in rubber bands and Tinker Toys. In reality, there is no Turing machine pure and simple, but always some structural artifact that realizes this organization and gives concrete properties to the machine. Similarly, in concrete everyday experience, there are no such things as the “ready-to-hand” and a “for-the-sake-of-which” all by themselves, but always actual equipment (computers, cars, pipes) and actual projects (being a student at Stanford, being a Colombian sailor); our world is constituted by ontic entities that are ontologically ready-to-hand or present-at-hand, *etc.* Just as Maturana and Varela are interested in the organization of the living, and the structure of actual living things serves as an example, Heidegger is interested in the ontology of existence, and ontic entities like hammers and turn-signals are merely exemplary.

I mention this similarity between the different approaches to show the level on which the two accounts, the phenomenological and the biological, are to be related in this essay. The task is to establish that Heidegger’s *ontology* is a consequence of our autopoietic *organization*. More to the point, an ontological account, in the Heideggerian sense, is a description of what it is to *be* a certain organization. We exist in a certain way because we are organized in a certain way. The ontic details of experience, of the invariances in colors, object determinations, sensory-motor coordination, and so forth, would be better explained by an account of biological structure, and such is not my project here.

Autopoietic Organization

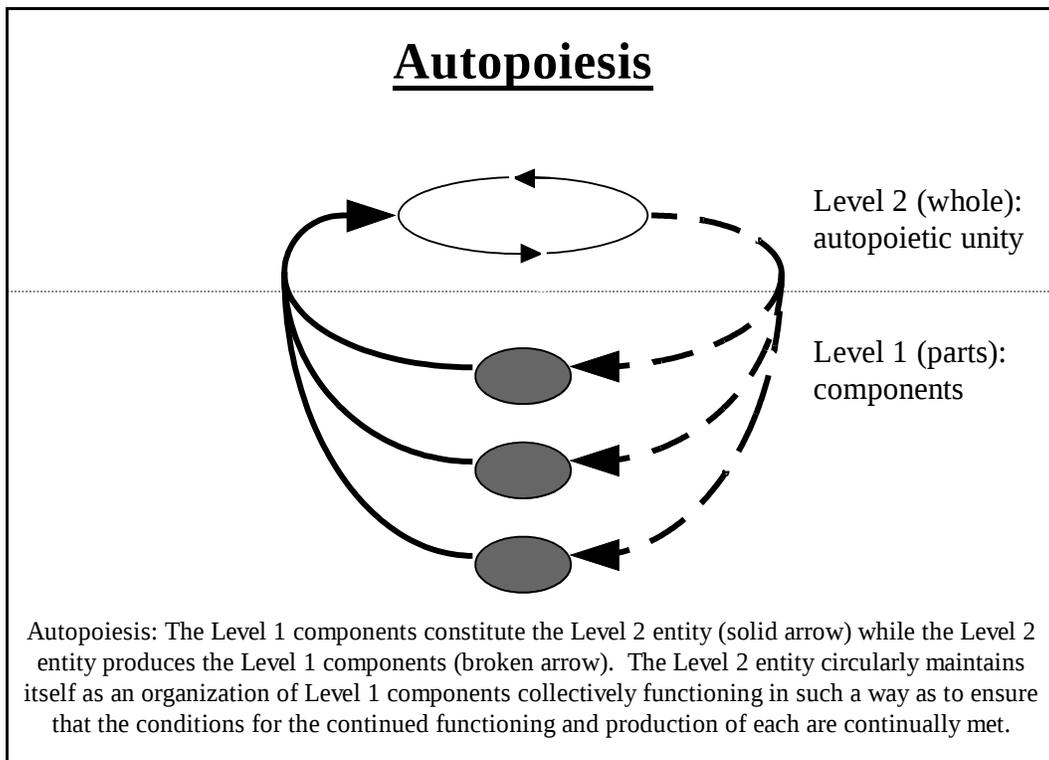
Autopoiesis is a theory about the organization of living systems, not about their structure. Accounts about, *e.g.*, how liver cells cope with toxins, photosynthesis, cellular mitosis, skeletal structure, the Meadow Lark’s niche, *etc.*, are accounts of the structures of living systems. Autopoiesis is thus a general paradigm for understanding how living systems work, and must necessarily remain silent on the structural details (although they serve exemplary purposes). Autopoiesis differs from other accounts of life because of its focus on its circular self-organization:

The living organization is a circular organization which secures the production or maintenance of the components which specify it in such a manner that the product of their functioning is the very same organization that produces them.⁷³

The *autopoietic organization* is defined to be a *network of processes of production, transformation and destruction of components*. The components,

1. *through their interactions and transformations, regenerate this same network, and*
2. *specify the autopoietic machine as a unity in the space of the components.*⁷⁴

Autopoiesis produces the components which function in concert to facilitate this same production. There is an interplay between two organizational levels, that of the autopoietic unity as a whole, and that of the components of this unity. The whole produces the parts, while conversely, the parts instantiate the whole, as the accompanying figure illustrates.



An autopoietic machine produces itself. In positive terms, the machine is realized in the given space of a set of components which function together to generate a network of concatenated processes. These interrelated processes in turn allow each component to

⁷³ Maturana, *Biology of Cognition*, 48

⁷⁴ Maturana and Varela, *Autopoiesis*, 79

continue functioning, or be produced. A single component does not necessarily produce itself by its own action; rather, it participates in the generation of the network of processes that produced it. Some of the components will be changed, created, or even destroyed by the actions of others. No matter what, however, the net result of the functioning of these components is that the ambiance needed for the continued functioning (and production) of components is continually provided. All this happens within the finite boundaries specified collectively by the functioning components themselves. Figuratively speaking, the system pulls itself up by its own bootstraps:

An autopoietic machine continuously generates and specifies its own organization through its operation as a system of production of its own components, and does this in an endless turnover of components under conditions of continuous perturbations and compensation of perturbations.⁷⁵

An autopoietic machine is organized so as to maintain its autopoiesis. Thus, when components change their role in the generation of the network of processes, the network compensates so as to secure its continued self-production. When the structure of an autopoietic machine is modified, there is a change in the way autopoiesis is realized, but there is not a change in the autopoietic organization itself.

Interactions with the environment trigger structural changes in the autopoietic machine. The system compensates for these perturbations, or deformations, deterministically based on the structural state of the system. If this change allows for continued autopoiesis, that is, if it allows the network of processes to compensate for the environmental perturbation and continue to produce the components which generate the network, then the machine retains its identity. If, however, the structure changes so that the autopoietic organization cannot be realized, then the system disintegrates.⁷⁶ This is called *death* in a living system.

Living Systems

All living systems are autopoietic. In fact, it is claimed that

⁷⁵ Maturana and Varela, *Autopoiesis*, 79

⁷⁶ Maturana, Introduction to *Autopoiesis and Cognition*, xx

Autopoiesis in the physical space is necessary and sufficient to characterize living systems.⁷⁷

Living systems produce themselves because they “transform matter into themselves in a manner such that the product of their operation is their own organization.”⁷⁸ The fact that matter flows through organisms does not violate the closure of autopoietic entities. There are many relations in living systems, such as thermodynamic and energetic relations, that are constitutive for the structure and not the organization.⁷⁹ In all of the interactions between an organism and its environment, including transfer of matter and energy, its autopoietic organization is the one variable always held constant—it functions in order to continue functioning—and if it fails to do this because it is unable to compensate for some deformation, then its organization disintegrates, and the organism dies.

The flip-side of the above assertion is that life is not bound to the carbon-based structure that it appears as on earth. If we could create an autopoietic system out of something else, then according to Maturana and Varela, it would be alive. Carbon-based organisms just happen to be our only example. I won’t pursue the implications further here.

Autopoiesis and Allopoiesis

There are many other organizations for matter. In a rock or crystal, for example, organization is defined by relations between *components* (its crystalline structure) rather than between *processes* of production which are supported through the change of relations between components. Another way to say this is, crystals are static, while autopoietic machines are dynamic.⁸⁰

Furthermore, autopoietic machines differ from other machines. The principle difference is that autopoietic machines produce themselves, while other machines both produce something *other* than themselves. Thus, they are called *allopoietic* ($\alpha\lambda\lambda\omicron$ = other). The accompanying table summarizes the ways autopoietic machines differ from allopoietic ones.⁸¹

⁷⁷ Varela, *Principles of Biological Autonomy*, 41

⁷⁸ Maturana and Varela, *Autopoiesis*, 82

⁷⁹ Maturana and Varela, *Autopoiesis*, 89

⁸⁰ Maturana and Varela, *Autopoiesis*, 80

⁸¹ Table adapted from Maturana and Varela, *Autopoiesis*, 80-81

Table: Comparison of the principle features of autopoietic and allopoietic machines

	<i>Autopoietic Machines</i>	<i>Allopoietic Machines</i>
Autonomy	Autonomous: the autopoietic machine is the product of its functioning. All changes in the system are subordinated to the maintenance of its own organization.	Not autonomous: the product of its functioning is something other than itself. It is produced by something other than itself.
Individuality	Maintains an identity independent of the observer by maintaining its own organization as an invariant through its functioning	Identity depends upon the observer since it does not define itself through its own functioning.
Boundaries	Specifies its own boundaries through the process of self-production.	Boundaries are specified by the observer, who specifies input and output surfaces.
Input/Output	No inputs or outputs; only compensations—internal structural changes—for external perturbations. There is no discrimination between outside and inside, since all compensations for perturbations are subordinated to the maintenance of the autopoietic organization.	Input and output surfaces are defined by the observer so that relations between inside and outside can be established for the functioning of the machine.

For example, the structural components of an airplane were not produced through the operation of the airplane. They were produced externally to it. Indeed, it may be organized as a concatenation of processes, but these processes do not produce the components which enable those processes. A more precise way to say this is that the network of processes in the airplane does not close in on itself, and it is open to processes external to the network which enable the realization of the network. The autopoietic organization is closed because it produces all of the components which enable this production.

Another great difference is that allopoietic machines are observer-dependent, unlike autopoietic ones. Since the organization of an allopoietic machine is open, an observer must determine what counts as inside and what counts as outside the machine. Contrariwise, an autopoietic machine automatically specifies its boundaries, and hence its

observer-independence, because all of its processes take place within these boundaries. In fact, the boundary is a component of an autopoietic machine, generated by its autopoiesis, and facilitating this autopoiesis by confining all the processes. This is clear in the case of the cellular membrane, which bounds all cellular metabolic processes, yet is maintained by these same processes as a whole. An allopoietic machine, however, has no intrinsic boundary. The boundary of a personal computer, for example, is not necessary for the integrity of the concatenation of processes which make up the computer. This boundary does not enable the processes which take place within it, nor was it produced by them; it is arbitrarily specified. An observer must define which processes are internal to the machine, and which are not part of it by specifying the input and output surfaces of the allopoietic machine.

An autopoietic machine has no intrinsic inputs or outputs. There are only deformations to its structure that are compensated based on the structure. There is no discrimination between inside and outside, or internal and external deformations, because the network of production, transformation and destruction of components is closed in on itself at all places. Thus, there is no coordination between an external inbound event and an outbound one. Furthermore, all such coordination lies in the descriptive domain of the observer. To describe an autopoietic machine as having inputs and outputs is to make a symbolic description which links up the activity of one entity (the autopoietic machine) to the external environment. Because the observer can interact with both machine and environment, he can establish regularities and specify input and output surfaces in his descriptive domain. There are no intrinsic input/output surfaces.

Of course, it is possible to treat an autopoietic entity as an allopoietic machine with inputs and outputs, as is commonly done with the neuron, for example, because it may be useful for us to understand the parts and processes of an entity that way. It's important to keep in mind, however, that the specification of inputs and outputs, as well as transfer functions between them, are observer-dependent symbolic descriptions. Inputs and outputs have no place in an operational description of an autopoietic machine. The neuron does indeed interact with its environment, but the activities that we symbolically call input at its collector surfaces and output at the end of its axon, are operationally just deformations on the neuron's structure which are compensated by the cell, thereby maintaining its autopoiesis. Since all of the changes that an autopoietic unity undergoes

are subordinated to the maintenance of its autopoiesis, there are, properly speaking, no inputs or outputs.

The Cognitive Domain

The structure of the autopoietic machine determines the interactions that it can undergo without disintegrating. The *domain of interactions* is defined as the set of deformations withstandable without loss of autopoiesis.⁸² The domain of interactions depends on the structure of the machine, not its circular organization. As its structure changes, so does the domain of interactions.

The *cognitive domain* is the domain of compensations that a system can make without loss of autopoiesis. The cognitive domain is so similar to the domain of interactions that Maturana and Varela often use the terms interchangeably. Sometimes they talk about the *descriptions* that an organism makes of its environment. A description is, from the perspective of the observer, just the sort of compensation that the system makes. For example, a neuron will “describe” the same electric shock differently than a striated muscle cell; the former will fire while the latter will contract. A cognitive domain is thus the set of these “descriptions” that an organism can make.

The radical consequence of this definition is that anything that is alive is a cognitive system: a system continually making descriptions of its environment.

A cognitive system is a system...[that] defines a domain of interactions in which it can act with relevance to the maintenance of itself, and the process of cognition is the actual (inductive) acting or behaving in this domain. *Living systems are cognitive systems, and living as a process is a process of cognition.* This statement is valid for all organisms, with and without a nervous system.⁸³

That last point is important: cognition is not restricted to the nervous system. “The nervous system expands the cognitive domain of the living system...it does not create cognition.”⁸⁴ It merely provides greater plasticity in the organism’s compensation for perturbations. Cognition is the creation of a closed domain of interactions and conduct within this domain. Thus, the human observer's cognition differs only in scope

⁸² Maturana and Varela, *Autopoiesis*, 118

⁸³ Maturana, *Biology of Cognition*, 13

⁸⁴ Maturana, *Biology of Cognition*, 13

and the type of interactions undergone, not in the nature of cognition.⁸⁵ *Cognition, rather than mental ratiocination, is the process of living in continuous interaction with the environment.* The processes that we normally think of as cognition (planning, problem solving, reasoning, perception) are just specialized classes of interactions, but there is nothing fundamentally different about them as far as the organism's organization goes.

Because they are cognitive systems, we can describe autopoietic systems as inferential systems. Their compensations for perturbations “predict” a class of interactions that the system can undergo with respect to further perturbations. If no interactions that are structurally specified (predicted) occur, then the system disintegrates.

Every interaction is a particular interaction, but every prediction is a prediction of a class of interactions that is defined by those features of its elements that will allow the living system to retain its circular [autopoietic] organization after the interaction, and thus, to interact again.⁸⁶

A liver cell “predicts” the sort of environment appropriate to a liver cell, that is, specifies a domain of interactions, and if suddenly put into the environment of a bone cell, it would die. As observers, we can see that living systems are phylogenically and ontogenically conditioned to undergo similar sequences of changes for similar sequences of perturbations, acting as if they followed a rule “what happened once will happen again.” In this way, they make inferences on what has happened towards what will happen. “The continued interactions of a structurally plastic system in an environment with recurrent perturbations will produce a continual selection of the system's structure.”⁸⁷

Strictly speaking, notions of inference and prediction belong in the observer's domain of description, as well as the correlation between past and present behavior. If present behavior is the same as past, this is accomplished without any reference to the past state. Operationally, the entity is just a sequence of compensations for deformations which specify a domain of interactions. *The system interacts, and if autopoiesis is maintained, then it interacts again; that is all.* Nevertheless, it is useful to note that, as inferential systems that move from state to state, they are always “ready” for certain interactions in each state, and that certain interactions must occur for each state if its going to be able to go to the next state and interact again.

⁸⁵ Maturana, *Biology of Cognition*, 9

⁸⁶ Maturana, *Biology of Cognition*, 10

⁸⁷ Varela, *Principles of Biological Autonomy*, 33

Structural Coupling

The autopoietic system is situated in the environment in such a way that the “predicted” sequence of interactions between the system and the environment will occur. Maturana and Varela say that autopoietic unities are *structurally coupled* with the environment, whether this environment happens to be a chemical solution or other living entities. “In the history of interactions of a composite unity in its medium, both unity and medium operate in each interaction as independent systems that, by triggering in each other a structural change, select in each other a structural change.”⁸⁸ Two systems are said to be structurally coupled if the compensation by one becomes a source of deformation for the other. When the latter compensates this deformation, it will be yet another deformation for the former to compensate, and so on, recursively. Both systems mutually select a sequence of structural changes by compensating the deformations caused by each other’s structural changes. The ontogenies of the two systems thus become interlocked.

The liver cell and the bone cell are making different “predictions” because they are structurally coupled with their mediums in quite different ways, and different sequences of interactions are selected through their respective couplings. Different histories of structural coupling (individual and evolutionary) produce different structures. Of course, each system is autonomous as a sequence of states organizationally independent from the outside. Nevertheless, the domain of interactions of the systems, as well as the way in which they continue to realize its autopoiesis, are altered as the structures of the systems are altered through continuous interactions with one another.

Structural coupling is the way in which systems lead each other about. Imagine two joggers side-by-side, each setting his pace on the other’s. When the run is finished, the first exclaims, “You were really going fast today—I didn’t think I would make it!” “I was fast?” replies the second, surprised, “I was just trying to keep up with you!” The two trigger changes in one another, maintaining their coupling together.

⁸⁸ Maturana, Introduction to *Autopoiesis and Cognition*, xx

Organizational Closure

There are systems that are not autopoietic, but are nevertheless closed like autopoietic systems. The nervous system is such an *autonomous system*. Autopoietic systems are, in fact, a subset of autonomous systems in general. Varela introduces the notion of *organizational closure* as the necessary and sufficient condition for autonomy: Every autonomous system is organizationally closed (Varela's "closure thesis").⁸⁹

A system is organizationally closed when its organization is defined by a network of processes that

- 1. recursively depend on each other in the generation and realization of the processes themselves, and*
- 2. constitute the system as a recognizable entity in the same space in which the processes exist.*⁹⁰

In autopoietic systems, the "processes" are processes of production. Other sorts of processes could be the physical rearrangement of elements, linguistic descriptions, computations, *etc.* All that is needed is that they be circularly concatenated, so that "the results of [the system's] processes are these processes themselves."⁹¹ The nervous system and the immune system are examples of non-autopoietic autonomous systems. Most so-called self-modifying computer programs, however, are not autonomous, because they still depend on another program to facilitate the modifications. For example, these sort of programs can be written easily in the language LISP, but they depend on the LISP interpreter to direct the changes; the interpreter is a meta-program running and operating on the "self-modifying" program, which is thus not truly self-referential or self-enclosed.⁹² Allonomous systems depend on some sort of information flow in or out for their operation, while autonomous systems are self-computing and self-contained.

There are several important features of an organizationally closed system:

1. It can be distinguished as an entity in the space of its components.
2. It can not discriminate between inside and out, because it is self-contained and self-referring.

⁸⁹ Varela, *Principles of Biological Autonomy*, 58

⁹⁰ Varela, *Principles of Biological Autonomy*, 55

⁹¹ Varela, *et al*, *The Embodied Mind*, 139

⁹² Hofstadter, *Gödel, Escher, Bach*, 692

3. It has no intrinsic inputs and outputs, only compensations for deformations on the system. Failure to do this results in loss of identity.
4. It generates a domain of interactions, as well as a cognitive domain, based on the interactions it can undergo without loss of its circular organization.

The Nervous System

The brain is a remarkable computer. It interprets imprecise information from the senses at an incredibly rapid rate.⁹³

This statement is a common one in cognitive science. The computer has been a guiding paradigm for cognitivist researchers from neuro-anatomy to artificial intelligence. Allen Newell is rather up-front about this, claiming that “the basic concepts of intelligent systems—representation, knowledge, symbols, and search—apply as much to machines as to people.”⁹⁴ This machine need not necessarily be a digital computer (The brain is held to do its computation mostly in parallel.), and one need not be as orthodox as Newell in the belief that cognition=algorithmic-computation-on-representations to endorse this cognitivist concept. Nonetheless, thinking about cognition along these lines leads to two general theses about the operation of the brain:⁹⁵

1. It is a processor of information picked up from outside.
2. It creates, manipulates, and stores representations of the outside.

However, both of these fall by the wayside if we consider brain phenomena to be phenomena of a closed network. In that case, we find that cognitivism has substituted a *symbolic* description for an *operational* one. The observer can indeed establish relations between the brain and the external world because he can interact with both, but it is a category mistake to expect that these same relations should be embodied in the operation of the brain itself. Before explaining just why cognitivist descriptions are not good operational descriptions, we will explain how Maturana and Varela conceive of its organization.

⁹³ Hinton, *How Neural Networks Learn From Experience*, 113

⁹⁴ Newell, *Unified Theories of Cognition*, 111

⁹⁵ Varela, *Principles of Biological Autonomy*, 238

The Neuron

The neuron is an autopoietic system. All of the changes that it undergoes are subordinated to the maintenance of its own autopoiesis (An uncompensated deformation leads to disintegration.). Its state of activity depends only upon its internal structure, which includes the structure of its membranes, branches, and so forth. The observer can describe the neuron as relating inputs to outputs through some neuronal transfer function, but these inputs and outputs are purely symbolic specifications, and they play no operational role in the neuron. Paul Churchland writes that “neurons are information-processing devices,”⁹⁶ and their “structure reflects what appears to be the neuron’s principle function: the processing of inputs from other cells,”⁹⁷ On the contrary, the neuron’s function is not to process inputs; its only “function” is to maintain autopoiesis. It is an “information-processing device” only if the observer treats it as an allopoietic machine. Churchland’s description is a symbolic one. This doesn’t mean that it is wrong, for symbolic descriptions can be useful sometimes. However, we can’t confuse such an account with the neuron’s operational “function”.

Each neuron is structurally coupled to its neighbors. Thus, the state of a neuron is related to the state of another only by result of compensation for deformation resulting from the other’s changes. Throughout the history of a neuron, its domain of interaction is altered as its structure is altered through continuous interaction with its environment. Through mutual structural coupling among billions of cells, a network is realized. No single neuron determines the properties of the network it helps to realize.

The Nervous System as a Closed Network.

The brain is a network of densely interconnected neurons that closes in on itself everywhere; therefore, any change in neural activity always leads to further changes in neural activity. Because of the network’s closure, there is never a change in neural activity that does not lead to another change, unless the network disintegrates and the brain dies. Of course, changes in the nervous system are subordinated to the autopoiesis of the organism of which it is a component (*i.e.*, to which its structurally coupled). The

⁹⁶ Churchland, *Matter and Consciousness*, 133

⁹⁷ Churchland, *Matter and Consciousness*, 130

brain helps the organism to remain alive, in continuous interaction with its medium, and the living organism keeps the brain functioning.

Changes result from deformations to the network. They may result from:

1. physical changes in single neurons (including changes in connectivity),
2. the changing state of the organism to which the network is coupled, such as when hormones flood the brain all at once, or
3. internal changes in the electrochemical state of the network.

However, the source of deformation is irrelevant for the nervous system as a closed network. All changes always lead, recursively, to more changes. There is thus no discrimination between external and internal causes of deformations to the system. This is true for “sensor” and “effector” (or “motor”) neurons, as well. Since they are integrated into the closed network, changes in sensor neurons lead to changes in effectors and changes in effectors lead to changes in sensors. Varela writes that we must not see such sensorimotor changes in the nervous system as being the product of external input:

That at this point an observer should see environmental elements intervening between the effector and the sensory surfaces of the organism, is irrelevant because the nervous system is defined as a network of neuronal interactions by the interactions of its component neurons regardless of intervening events.⁹⁸

Thus, the nervous system operates as if there was no difference between sensor, motor, or other neurons. The criticism of cognitivism relies on this fact. Since it is an organizationally closed network, *the nervous system can not distinguish between external and internal causes for change. There is no relevant distinction between outside and inside as far as the operation of the nervous system is concerned.*⁹⁹

Furthermore, there is no intrinsic localization of neural processes. The dense interconnections of its elements lead local changes to influence the sorts of states into which the network as a whole settles; thus, any properties of the network are always properties of the network as a whole. Brain phenomena are always emergent properties of the entire neural network. Of course, there are certain areas of the brain, the changes in which can be related by the observer to a class of events elsewhere. This results in specialization into an olfactory bulb, visual cortex, hippocampus, etc. However, these areas are not organizationally closed, and as parts of the whole network, can not be given

⁹⁸ Maturana and Varela, *Autopoiesis*, 127

⁹⁹ Varela, *Principles of Biological Autonomy*, 243

full operational responsibility for phenomena resulting from the network as a whole. Thus, after mutilation, or disconnection of areas of the brain, we are left not with distinct subsystems that were previously merely connected, but different networks that may have different holistic properties.¹⁰⁰

The great diversity of behavior that the nervous system is able to generate is a result of the dense interconnectivity of its abundant elements, not from any inherent specialization in the production of behavior. For example, there are about 10^{11} total neurons in the nervous system, with a ratio of approximately 10:10⁵:1 between sensor, interneurons, and motor neurons, respectively (as the observer describes them).¹⁰¹ There are thus countless ways to wire these all together. Changing the network's structure alters the patterns of dynamic states into which it is continually settling. Altering these states alters the patterns of activity triggered through structural change. Altering the activity thus alters the behavior which is produced "incidentally" to the operation of the nervous system as a closed network, the behavior which results from the fact that other elements (like muscles) are structurally coupled to the network. Through all this change, it is important to bear in mind that there is no operational distinction between inputs to and outputs from the nervous system; the nervous system is merely a sequence of electrochemical states. All changes that it undergoes, as well as the states that are available at any given time, are based on the network's structure.

Incidentally, the lack of input and output neurons is a principle theoretical difference between the brain and artificial neural net algorithms. Training techniques like Rumelhart's "back-propagation" rely on a distinction between input and output layers in the net, and the computation of errors against some "correct" external result.¹⁰²

An Autopoietic Critique of Cognitivism

Cognitivism holds that "representational knowledge governs behavior."¹⁰³ It conceives of the nervous system as a kind of computer that is able to build internal representations of the world to act on. In contemporary neuroscience, these representations are usually "implicitly" stored in connectionist architectures. All sorts of behavior then follow from these representations. For example:

¹⁰⁰ Maturana and Varela, *Autopoiesis*, 129

¹⁰¹ Maturana and Varela, *The Tree of Knowledge*, 159

¹⁰² Rumelhart, *et al.*, *Parallel-Distributed-Processing*

¹⁰³ Goldman-Rakic, *Working Memory and the Mind*, 77

The concept that an object exists continuously in space and time even when out of view and, more generally, the ability to form abstract concepts may depend on a fundamental capacity to store representations of the outside world and to respond to those representations even when the real objects are not present.¹⁰⁴

According to Maturana and Varela, there is *no* “fundamental capacity” to form and manipulate “representations of the outside world.” Only the observer has the capacity to establish these relations. Operationally, the nervous system is just a sequence of states that determine a domain of interactions, and representational entities play no role in the functioning of the nervous system. Christine Skarda, a neurologist that has taken a non-representationalist approach in her study of the olfactory bulb, points out that “the notion of representation does not accurately describe the neural mechanisms that actually play a role in producing behavior.”¹⁰⁵ This is because there is no way that the system can distinguish inside from outside, and thus can not have a representation *of* the outside inside of it. The domain of interactions of the nervous system comes about through its history of interactions. Since the nervous system is structurally coupled into the environment, its states can be mapped to states of the environment.¹⁰⁶ This does not mean, however, that the brain is representing the environment: all correlation between nervous activity and environmental activity is made by an observer.

Studies of learning, memory and recall especially appeal to the notion of representation. Learning would be the acquisition of representations, memory the storage of representations, and recall their activation. This is reminiscent of the way a computer works, writing data in RAM bit patterns that represent numbers, characters, instructions or graphics, and then reading this into the CPU’s memory registers for use. However, this computer analogy does not capture the operation of the nervous system. The brain is not like a computer which manipulates discrete, context-independent symbols, following programs to complete tasks. Rather, cognition is a “self-organized process of adaptive interaction with the environment.”¹⁰⁷

Operationally, learning is not the storage of symbolic tokens that represent some concept or thing. It is a change in the ability of the nervous system to synthesize behavior.¹⁰⁸ Learning is a modification of the domain of interactions of the organism, and

¹⁰⁴ Goldman-Rakic, *Working Memory and the Mind*, 70

¹⁰⁵ Skarda, *Explaining Behavior: Bringing the Brain Back in*, 189

¹⁰⁶ Varela, *Principles of Biological Autonomy*, 245

¹⁰⁷ Skarda and Freeman, *How Brains Make Chaos in order to Make Sense out of the World*, 170

¹⁰⁸ Maturana, *Biology of Cognition*, 45

any correlation between past and present behaviors is a relation established by the observer who has observed the sequence of interactions which lead to this modified domain. Memory is thus not the storage of information, but the fact that the organism can be modified to produce new behaviors.¹⁰⁹ Learning and memory result from plasticity in the organism's ability to compensate deformations; it is for this reason that a nervous system, as it enlarges the domain of possible interactions, facilitates adept learning and good memory. Similarly, recall is not an appeal to a stored symbolic representation, but the functional ability of the nervous system to create behavior that, from the perspective of the observer, is similar to previous behavior in a previous situation.¹¹⁰ In general,

The correspondence that the observer sees between the conduct of the organism and the environmental conditions with which this conduct appears to cope, reveals the structural coupling of the organism (nervous system included) to its ambiance as this structural coupling is conserved through philogenic and ontogenic selection. This correspondence, therefore, does not reveal any particular feature or property of the connectivity of the ambiance in its computation of the adequate conduct of the organism.¹¹¹

Studies of perception rely heavily on the representation and information processing paradigms. It is thought that the brain extracts information from the environment, such as color, texture, depth cues, *etc.*, and then makes a model of the outside world based on these raw primitives. Francis Crick holds that visual perception is a process through which the brain derives or computes three dimensional representations from two dimensional retinal input.¹¹² In the same vein, Churchland's concept of "sensory coding vectors" allow the nervous system to be a detection machine for qualia fingerprints.¹¹³ For example, the three types of cone cells on the retina are sensitive to the intensities of short, medium and long wavelengths of light, respectively. This defines a three-dimensional color space in which any color can be found. The case is similar with taste and smell, with even higher dimensionality, depending on the given feature detection apparatus. Even face recognition would be accomplished through a coding vector, plotting individual faces in N-space if there are N facial features that the nervous system is sensitive to.

The Heideggerian would have problems with this approach since it involves reducing perception to the coordination of primitive present-at-hand features that would

¹⁰⁹ Maturana, *Biology of Cognition*, 37

¹¹⁰ Maturana, *Biology of Cognition*, 45

¹¹¹ Maturana and Varela, *Autopoiesis*, 134

¹¹² Crick and Koch, *The Problem of Consciousness*, 125

¹¹³ Churchland, *Matter and Consciousness*, 147

somehow result in our understanding of our “there”. Dasein, as being-in-the-world, does not detect features, only the scientist can free present-at-hand features from the ready-to-hand equipmental context. Similarly, Maturana and Varela would say that in this case the observer must distinguish what features in the world he is interested in (*i.e.*, determine the components of the “sensory coding vector”), and then coordinate these with the activity he observes in the brain. The nervous system, however, does not pick up “information” about outside “features” in order to construct some qualia. To assume a sensory coding vector assumes both that there are natural observer-independent features in the world, and that the nervous system represents these after it gathers information through discrete inputs.

The actions of the nervous system are not direct functions of perturbations to it. Its compensations for these perturbations depend on the state of the system, and its changes merely realize the closure of the network. The state of the nervous system determines what will count as “information” for it, for no perturbation is in-itself informative. Therefore, the nervous system is not representing a world, but is presenting one, so to speak, by putting noise into form rather than getting information from the outside.

The environmental noise becomes objects through the nervous system closure.¹¹⁴...Perception and perceptual spaces constitute operational specifications of an environment, not apprehensions of features in an independent environment. An organism does not extract perceived distance as a characteristic feature of the environment, but generates it as a mode of behavior that is compatible with the environment through a process of invariant compensation of disturbances.¹¹⁵

It also follows that there are no real rules that the system is following, since such rules would need to presuppose some sort of informational primitive as an operand. The network is just maintaining states of relative activity, and whether this activity causes perception, motor impulses or abstract thought, is irrelevant for the system as a closed network. Only the observer can describe the system as if it were following rules because 1) he can coordinate activation states with external events, and 2) he has observed the history of interactions of the organism.

Maturana compares the operation of a living system to a pilot flying a plane without being able see outside. All he does is maintain certain values on the instrument

¹¹⁴ Varela, *Principles of Biological Autonomy*, 247

¹¹⁵ Varela, *Principles of Biological Autonomy*, 255

panel constant, or make some adjustments depending on the readings. When he steps out of the plane, he is amazed to be congratulated by all of his friends who tell him that he just flew the plane across the Atlantic Ocean, safely landing it during a fierce storm in a rugged, mountainous region. Such a difficult and daring undertaking *must* have required lots of planning, superb navigation skills, and detailed models of what was going on outside the plane, they all say. However, the pilot did none of that. He only remembers maintaining instrument readings within certain specified limits, and everything he did at any time was just a consequence of the overall state of the instruments—not anything like what his observing friends tell him he did!¹¹⁶

Higher Order Entities

The nervous system is but one example of autopoietic unities (neurons) structurally coupled together, forming a higher order, organizationally closed unity. The distinguishing feature of this type of autonomous system is that, insofar as it is to retain its identity, the contributing elements of the entity are constrained by the overall organization to contribute to the unity as a whole. The alterations of the components are subordinated to the maintenance of the identity of the whole entity, or that entity disintegrates, and with it, the ambient support for its components.

In the case of the multicellular organism, autopoietic cells are structurally coupled together to form a second-order autopoietic system. The organism is realized only as long as its constituent cells maintain their autopoiesis. Conversely, the autopoiesis of the organism entails the autopoiesis of its cells. The functioning of the organism makes “space” for its cells, ensuring the proper environment for each of the same cells which make this functioning possible. All of the different cells interact in such a way as to ensure that the proper environment is available to each type of cell to maintain autopoiesis.

When entities structurally couple, they may go through all sorts of changes together, yet through all the changes, this coupling is held constant. Similarly, in any organizationally closed entity that defines its own identity, it is the organization that is held constant throughout all of its structural changes. The coupling, or the organization, is not a feature of any element alone, but something which emerges from their interaction to

¹¹⁶ Maturana, *Biology of Cognition*, 51

acquire a sort of independence. The domain of phenomena generated is called a *consensual domain* and it is not reducible to the phenomena in a component's cognitive domain. The consensual domain is the cognitive domain of the higher order entity.

Every autonomous structure will exhibit a cognitive domain and behave as a separate, distinct aggregate. Such autonomous units can be constituted by any process capable of engaging in organizational closure, whether molecular interactions, managerial manipulations, or conversational participation.¹¹⁷

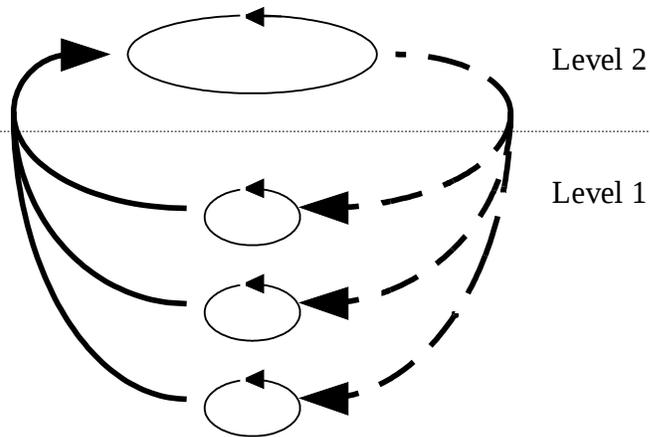
Organizational closure is thus not restricted to the organism, thus, but is also a feature of any system where the processes involved interdepend upon themselves, and define a unity in some domain. This holds for the weather, the economy, nations, corporations, and conversations. In all of these cases, the essential thing to grasp is that the entity generated in some space has an organization that is not reducible to the action of its components.

Maturana and Varela's principle contribution is the notion of an organization which mingles logical levels to produce an autonomous entities. Douglas Hofstadter shares a similar insight with his notion of a "strange loop" or *tangled hierarchy* which "occurs whenever, by moving upwards or downwards through the levels of some hierarchical system, we unexpectedly find ourselves right back where we started."¹¹⁸ This circular organization, or tangled hierarchy, is the key to understanding Maturana and Varela's thought, since everything else falls out of it. This general organization is applicable for cells, organisms, nervous and immune systems, economies, conversations and societies.

¹¹⁷ Varela, *Principles of Biological Autonomy*, 253

¹¹⁸ Hofstadter, *Gödel, Escher, Bach: An Eternal Golden Braid*, 10

Organizational Closure: A Tangled Hierarchy



The processes at Level 1 are all connected together to form an autonomous entity at Level 2 which then constrains the Level 1 processes. The interconnection and recursive applicability of these processes enables the processes to continue.

All systems are not necessarily autopoietic, and there is no firm agreement as to whether ant colonies, or the economy, for example, should be considered autopoietic. Stafford Beer¹¹⁹ and Michael Zeleny¹²⁰ think that societies are autopoietic while Varela won't commit, since it is hard to define the space in which they exist as well as in what sense they produce their components. Nevertheless, societies are organizationally closed. Each human being can indeed be a node in the network of interactions which allows the society to be organized.

Societies are autonomous unities which constrain the individual constituents of the society to act in a certain way insofar as the society is to retain its identity. This is just a further extension of the entanglement of logical levels that autopoiesis expressed originally: each component functions in concert with others to produce an identifiable unity which "makes space" for the functioning of components. A society can not be reduced to the ideas and actions of specific individuals, even though they collectively generate it. Sociologist Friedrich Hayek shares a similar idea, holding that societies are

¹¹⁹ Beer, Preface to Maturana and Varela, *Autopoiesis*

¹²⁰ Zeleny, *Autopoiesis, A Paradigm Lost*

the “result of human action but not of human design.”¹²¹ As always, there are emergent properties at the level of the whole that do not reduce to the properties of the parts.

Humans can also be observers of this same network they integrate. The observer then is able to give a symbolic description of his own operation. He can specify his own domain of interactions and interact with it as if independent. Furthermore, the praxis of observation becomes part of the observing organism’s domain of interactions which contributes to the realization of the societal entity, thus altering the way in which it is realized.

Language

Organizationally closed entities can be generated through linguistic interactions. This occurs because language is not information transfer between two independent organisms, but rather *orienting behavior* that coordinates the two organisms with respect to other interactions. This happens as follows:

1. When an organism compensates a deformation, we can call this compensation a *description* of the deformation, as mentioned before.
2. This description by one entity is a source of deformation for the next to compensate. For the second entity, the first’s description is *orienting behavior*.
3. These recursively generated interactions are called *communicative interactions*. They generate a *consensual domain*.¹²²
4. When the communicative interactions become standardized according to some logic, a *linguistic domain* is generated.¹²³

The linguistic domain as a domain of orienting behavior requires at least two interacting organisms with comparable domains of interactions, so that a cooperative system of consensual interactions may be developed in which the emerging conduct of the two organisms is relevant for both.¹²⁴

Linguistic behavior is a process of maintaining structural coupling between two speakers with respect to some class of interactions, thus generating a higher order

¹²¹ Hayek, *Rules and Order*, 20

¹²² Maturana, *Biology of Cognition*, 28

¹²³ Maturana and Varela, *Autopoiesis*, 120

¹²⁴ Maturana, *Biology of Cognition*, 41

conversation-unit. This conversation-unit is an organizationally closed domain of interactions brought forth with other speakers who have similar cognitive domains. Their descriptions enable further descriptions, recursively applied ad infinitum.¹²⁵ As long as this is successful, “communication” occurs, with the result that the linguistic interactions trigger a structural change in the organisms such that the domains of interactions of each are made similar. The warning, “Watch out, there’s a car coming!”, triggers a structural change in the listener’s nervous system such that he will react very similarly to the speaker’s reaction when the car is bearing down on them. The warning is orienting behavior rather than information exchange.

The “meaning” in language is not transferred from one entity to the next; it arises only with respect to the state of the listener’s nervous system at the time of communicative interaction. That is, the nervous system’s state is like a background of possible interpretations for linguistic interactions, because it specifies which compensations or descriptions are possible and which are not. Rather than transferring information or meaning, speakers are continually triggering changes in each other. Communicative interactions involve mutual compensation for each other’s deformations/compensations, and so continuous interaction is required to orient each other with respect to the same interactions, that is, bring about congruence in the respective cognitive domains. “Linguistic behavior is an historical process of continuous orientation.”¹²⁶

Thus, language is connotative, not denotative. It is orienting behavior, rather than information transfer. Also, the logic of language, its syntax, for example, is a property of the linguistic domain, and of the interrelation of communicative interactions, not of the individual organisms. Since the linguistic domain is not reducible to the individuals that realize it, neither is the syntax to be reduced in this way. Each speaker does not have an internal grammar in his head, along the lines of the Chomskian model. Since the linguistic domain arises from “recursive application of orienting interactions on the results of their applications”¹²⁷ linguistics is actually the study of the relations between these orienting interactions, rather than of representations and rules in each of the speaker’s heads.

¹²⁵ Maturana, *Biology of Cognition*, 50

¹²⁶ Maturana, *Biology of Cognition*, 34

¹²⁷ Maturana, *Biology of Cognition*, 42

The transitions from state to state as internal processes in any system are unrelated to the nature of the interactions to which they give rise. Any correlation between different domains of interactions [i.e., the organism's and the conversational unit's domains] lies exclusively in the cognitive domain of the observer, as relations emerging from his simultaneous interactions with both.¹²⁸

For example, when investigating the temporal structure of utterances, the linguist should not think that he is studying internal planning processes going on in the speaker's heads. Rather, he is investigating the regularities in the sequence of communicative interactions that have become standardized and structured throughout a history of structural coupling in the linguistic domain. Linguistics is the study of the structure of the linguistic domain, a higher order domain generated by but not reducible to individual speakers. It is not the study of a special, internalized cognitive, representational capacity. Varela suggests that, when thinking of language,

We leave aside the individual participant and see the process of conversation and understanding as a [sequence of] distributed, coherent events shared among participants, where meaning and understanding is relative to the recursive process of interpretation within the conversational unit.¹²⁹

The Observer as Organism

Language is the medium of the observer. His observations occur as sequences of interactions within a linguistic domain. The observer is an organism that can generate a *description* orienting it towards its own *description*, with which it interacts.¹³⁰ This means that the observer is able to orient himself with respect to his own linguistic behavior, treating this behavior as independent. The linguistic interaction of two organisms actually becomes something with which they can interact.

We can also say that the observer is self-conscious. This self-consciousness is not a direct apprehension of the self, whatever this might mean, and however it might possibly be biologically realized. Rather, self-consciousness is the process by which an organism describes its environment through behavior, and then generates a new description (new behavior) oriented with respect to that first description. It can generate descriptions of descriptions of descriptions, and so on, recursively operating on its interactions.¹³¹

¹²⁸ Maturana, *Biology of Cognition*, 34

¹²⁹ Varela, *Principles of Biological Autonomy*, 269

¹³⁰ Maturana, *Biology of Cognition*, 29

¹³¹ Maturana, *Biology of Cognition*, 29

An organism engages in linguistic interactions through the establishment of a linguistic domain. In the case of the self-conscious observer generating descriptions of his descriptions of his own behavior, this linguistic domain may have only one organism “in” it. This sort of organism can distinguish internally and externally induced changes, but it can do this only through the mediation of language. Strictly speaking, its nervous system does not make this inside/outside distinction. “Self-consciousness...is not a neurophysiological phenomenon, it is a consensual phenomenon emerging in an independent domain of interactions from self-orienting behavior and lies entirely in the linguistic domain.”¹³² Only in the linguistic domain is the organism’s interaction with its own states manifested as a distinction between “in here” and “out there”. Maturana and Varela are explicit about the linguistic nature of consciousness, as well as the fact that such a phenomenon arises only through the generation of a linguistic domain with other language users:

As a phenomenon of languaging in the network of social and linguistic coupling, the mind is not something that is within my brain. Consciousness and mind belong to the realm of social coupling. That is the locus of their dynamics.¹³³

Descartes’ supposedly direct apprehension of his soul thus has no biological basis. There is an abyss between the organism considered as a closed system maintaining its autopoiesis, and the concept of “myself” which emerges only through linguistic interaction. Also, this “myself”, since it is a result of linguistic interactions, exists “out there” in the linguistic domain, and not “in here” within my organism as a representation or soul or anything! We can only interact with ourselves by first going “out into the world” and participating in the generation of a linguistic domain, and then “coming back” to make descriptions of descriptions of descriptions, *etc.*

Human beings are simply autopoietic organisms that have evolved such structural plasticity so as to allow them to couple in the linguistic domain. This allows them to become observers, social actors, biologists and philosophers. In the linguistic domain, they can distinguish things like a self. They can also distinguish the concept of autopoiesis, of Dasein, and of how to relate the two....

¹³² Maturana, *Biology of Cognition*, 41

¹³³ Maturana and Varela, *The Tree of Knowledge*, 234

Chapter 3: Autopoietic Machines are Caring Machines!

“Care” is Heidegger’s term for the “being” of Dasein. It is an attempt to express, in a single, unified structure, the fact that humans exist simultaneously as “thrown” into a situation and as “projecting” themselves into a situation. The world is public, and its shapes have been formed through a vast history of interactions between people and their environs, and yet at the same time, each Dasein personally has something at stake in it. We are constrained by the world insofar as it is “always already there” (our historical, cultural and social position, our various involvements with people who are relying on us to perform in some way, the myriad threats and advantages inherent in the physical surroundings, *etc.*); nevertheless, all of these “constraints” are also our projections insofar as they are always have some import for our activity. Projection and thrownness are just aspects of the same unitary phenomenon of care.

The task at hand is to realize care in a biological substrate, and in doing so, show that Autopoiesis is a general paradigm for cognition which is not based on the metaphysics of the subject. This can be shown by demonstrating that a human autopoietic system is a system that “cares”—*i.e.*, that a self-organized biological system functions in such a way describable as care, in the Heideggerian sense. We recall that an accurate phenomenological account is of heuristic value to a scientific account of the human being. It doesn’t necessarily contribute anything positive to this account, but it does offer constraints that should be satisfied by a good scientific theory of the human organism. Phenomenological description is a little bit like data that ought to be taken into account by the explanatory theory. As is true in any accumulation of data, there are no raw findings that are uninformed by their manner of collection or the theoretical assumptions that anticipate their form. However, since multiple people can collect the same data, it gains validity. Phenomenology is similar; rather than being a subjective introspectionism, human beings are rather just asked to look carefully at how they exist in the everyday natural attitude, before abstract, theoretical activity, and before theoretical presuppositions about their existence. I think that most people would find something like being-in-the-world instead of a subject knowing objects. Therefore, I think it’s important to find something besides the metaphysics of the subject to ground our scientific understanding of cognition. With this phenomenological heuristic in mind, this chapter needs to show how something

like care can occur merely through the organization of matter and the concatenation of processes in a manner consistent with our general scientific world-view.

Here it is in a hairy nutshell: *“Care” is the organism’s participation in the realization of higher-order autonomous entities by generating a cognitive domain throughout an ontogeny of continuous interaction with the environment.*

We can unpack this by trying to answer three questions:

1. How can there be no subject/object or “in here”/“out there” distinction for the living organism? (What accounts for the totality of care?)
2. How is the organism’s world given in terms of the organism’s actions and possibilities? (What is projection?)
3. How is the organism’s environment “always already there”? (What is thrownness?)

Through answering these questions we can suggest a mapping of the specific aspects of Heidegger’s phenomenology, including the ready-to-hand, present-at-hand, worldhood, the Anyone and being-in. This mapping must remain merely suggestive, mainly because these aspects are not isolated things to be explained, but are rather features of care as a unity, as well as because of the different modes of explanation of the two approaches.

The table below provides a quick summary of the relevant Heideggerian phenomenology and Autopoiesis which will be useful as we go along.

Autopoiesis

- Autopoietic systems are self-organized: their components collectively generate the processes which produced them
- The structural state of an autonomous system specifies the way it will compensate perturbations to it. There is no input and output in its operation.
- The structural state indirectly reflects the history of interactions of the system with others.
- Cognition is the creation of a domain of interactions and continuous interaction within an environmental milieu.
- The nervous system does not form representations or do information processing.

Heidegger's Phenomenology

- As being-in-the-world: Dasein is continually active and engaged in a world of meaningful possibilities, experiencing the world in terms of action.
- Dasein is "projecting": the world is given in terms of possible action with respect to its particular projects.
- Dasein is "thrown": it is always already in a specific situation in a public world.
- Both thrownness and projection are aspects of a single, unified phenomena called "care".
- Being-in-the-world is not a relation of a knowing subject to an object of knowledge.

Phenomenological Unity and Organizational Closure

The human autopoietic system is organizationally closed. This means that it is a totally self-referring and self-organized network of processes which realize the same network through their functioning. The organism maintains its organizational closure by compensating deformations to the structural elements which support the production processes. Furthermore, the living organism specifies its own boundary in space (as a component) within which all of its processes of production take place. Deformation to the organism's structure may result from changes that occur within this boundary, or from outside of it. The organism is organized so as to compensate these deformations and retain its same (autopoietic) organization. If it cannot do so, it disintegrates (*i.e.*, dies). Even though the source of deformation can be external or internal, however, the organism itself can not discriminate its origin, because at all places its network of processes closes

back on itself. Operationally, it is merely a deterministic sequence of internal changes (compensations for deformations) which are subordinated to the maintenance of autopoiesis. Only the observer, who can interact separately with both the environment and the organism—with events on either side of the autopoietic boundary—is able to discriminate between external and internal perturbations to the system. Thus, Gordon Globus is right to say that “outside/inside is a derived duality provided by a more primary dynamical process.”¹³⁴ We must not consider the continuous interaction of the organism within its medium to be in any sense an internalization of the observer’s distinction between inside and out. The domain of descriptions of the observer cannot be confused with the domain of phenomena appropriate to the observed organism.

The organizational closure of the human organism accounts for the phenomenal totality of being-in-the-world. For Dasein, there is no division between subject and object, because there is nothing in “the world” that is uninterpreted, or that is not disclosed as something for Dasein to use in the projects which define it. Dasein always knows itself in terms of the world, and the world is always revealed in terms of Dasein. There can be no objects that are separate from and outside of Dasein, since that wherein they appear, the world, is always a “for-the-sake-of-which”, the existential “purpose” of Dasein. Objects that are seen as “outside” of and different from the subject, can only appear within-the-world, that is, with respect to Dasein’s existential aims. As Heidegger says, “the world is, as it were, already ‘further outside’ than any Object can ever be.”¹³⁵ It is “further outside” insofar as it is the presupposed ground for the disclosure of any present-at-hand or ready-to-hand object;¹³⁶ nevertheless, the world is at the same time the “closest” thing to Dasein because it is the existential purpose that informs everything it does. In fact, Heidegger goes so far as to say, “That inside which one primarily understands oneself has Dasein’s kind of Being. Dasein is its world existingly.”¹³⁷ In everyday activity, there is no division between the world and the subject, and not because the subject contains the world, but because it is engaged activity within-the-world.

¹³⁴ Globus, *Deconstructing the Chinese Room*, 388

¹³⁵ Heidegger, *Being and Time*, 417

¹³⁶ Even in the laboratory, where the objects of study are radically “deworlded” and studied as present-at-hand things with given qualities, they still appear only within the horizon of the scientist’s projects. Scientific objectivity is still a hermeneutic stance, as the scientist is still being-in-the-world. We will try to explore this more in the appendix.

¹³⁷ Heidegger, *Being and Time*, 416

Just as there is no inside/outside duality in the operation of the human system (and its nervous system as well), there is no division between the things “out in the world” and the purposes, goals and projects “inside” the subject. The phenomenal *structure* of being-in-the-world outlined in the above paragraph is of course too complicated to be explained by organizational closure alone; however, my only goal above was to account for the phenomenal *totality* of being-in-the-world. The human system (and its nervous system) is organizationally closed, with no references to the outside; the world that it specifies and its interaction within the world cannot be distinguished. Dasein has a world as long as it exists, which means, as long as it is interacting with entities within its world. Similarly, since we are closed systems, there are only properly independent entities, so to speak, when we specify them through interacting with them.¹³⁸

Furthermore, we are only alive insofar as we are interacting. Living is a process of continuous interaction within the environmental milieu. Regularities are established in these interactions, as well as in the patterns of neuronal activity in the organism’s nervous system, throughout a history of structural coupling. The observer may describe this as the apprehension and representation of independent entities, but the system itself is just continuous change which allows it to maintain its organization, and in doing so, to continue to change. A world comes to be for the organism only insofar as it is interacting with the environment.

Projection and the Cognitive Domain

Specifically, “Dasein is its world existingly” through the generation of a cognitive domain. The cognitive domain is the set of interactions that an organism can undergo without disintegration, based upon its structure. At any time, the structural state of the organism determines how it will compensate perturbations to it. There is no strict relationship between a determined input and output, or stimulus and response. Only the observer defines what counts as “information” and discrete units of input and output; furthermore, the total state of the organism selects its particular mode of compensation for deformations. Mid-century, Merleau-Ponty suggested this same process: “The organism itself measures the action of things upon it and itself delimits its milieu by a circular

¹³⁸ Maturana, *Biology of Cognition*, 40

process which is without analogy in the physical world.”¹³⁹ He described the living system as being like an organ that offered different keys at different times, thus constraining the kind of music which could be made.¹⁴⁰ There are always specific interactions which the organism is set up to undergo, just as Dasein always has got itself into a particular situation with particular possibilities. Dasein’s world is always given in terms of dealings with equipment (natural or man-made) and other Daseins: in terms of possible interaction with its medium. The cognitive domain is a domain of possible interactions and dealings.

The general point of Heidegger’s “being-in” is that Dasein is always in some situation, in some mood, and in some interpretive stance, so that there is always some manner in which the world is given. When reading a text, for example, Dasein is always in some situation—where “situation” includes not just the way the person is “feeling” at the moment, but also all past knowledge and personal and cultural biases that have been learned through a lifetime of embodied experience in a public world—and hence, a specific interpretation is given. This interpretation is not the application of subjective “impressions” to bare present-at-hand text; rather, phenomenologically, the interpretation is found in the text itself, as it were, not painted on by the reader. In general, Dasein’s constant interpretative activity takes place with respect to (and within) its total situation, or its “there (*Da*)”, as Heidegger puts it. In the same way, living systems have something like a “there,” as Maturana points out:

In general, the organization or structure of a living system (its nervous system included) define in it a ‘point of view’, a bias or posture from the perspective of which it interacts, determining at any instant the possible relations accessible to its nervous system.¹⁴¹

Dasein’s “there” is its “point of view” as a living system: being-in results from the nervous system’s specification of its possible interactions.

No doubt some of the specific aspects of being-in may depend on the *structure* of the nervous system, rather than its *organization*. For example, one’s “mood” is probably accounted for by hormonal “tuning” of the nervous system; the process through which the sudden introduction of chemicals to the brain globally alters the way the nervous system settles into states.¹⁴² This would be different from the “knowledge” implied by the nature of the connectivity between individual neurons, and the available states that these patterns

¹³⁹ Merleau-Ponty, *The Structure of Behavior*, 148

¹⁴⁰ Merleau-Ponty, *The Structure of Behavior*, 13

¹⁴¹ Maturana, *Biology of Cognition*, 21

¹⁴² Smolensky, *Information Processing in Dynamical Systems: Foundations of Harmony Theory*

imply, thus accounting for the relative stability of this “knowledge” through different moods. The cause of the deformation, however, is not discriminated by the nervous system as a closed network, and the net result of any of the above changes is always the structural specification of an overall “point of view”, as Maturana put it. For Heidegger as well, one’s “there” is given all at once, including mood and understanding indistinguishably, resulting in a particular interpretive stance which makes the world “show up” in some way.

What “shows up” are not bare present-at-hand informational primitives about objects, or about the features of objects, which allow the subject (or the brain) to reconstruct a viable mental model. This is because the human being is projecting what will be relevant to it, selecting its changes based on its structure, rather than on the “informational content” at the sensory surfaces. There is no inherent informational content, or sense data, or Husserlian hyle, because, for the nervous system as a closed network, there is no “outside” world that this would possibly come from. The noise that bombards our sensory surfaces has no meaning for the organism aside from the way that its structure selects its manner of compensation.

Recalling Churchland’s notion of a “sensory coding vector”, we see that we can not operationalize this idea of passive information pickup. The state of the nervous system discriminates what perturbations will be relevant and what will be disregarded, so there is no basic “visual information” or input that the brain has to “get right” in order to construct a viable “mental model”. Also, due to the dense interconnectivity of neurons, the relative activity of neurons in the brain has a tremendous influence in determining what is seen, meaning that vision can not possibly be the direct translation of sensory data. In fact, nearly 80% of the connections to the visual cortex come from other parts of the brain, rather than from the optic nerve, which is the only place where the neuronal network is perturbed by the impact of photons upon the retina.¹⁴³ For this reason, “perception should not be viewed as the grasping of an external reality, but rather as the specification of one.”¹⁴⁴ The nervous system “specifies” this “reality” through the maintenance of invariances in neuronal activity, acting as an “inferential” system where “what happened once will happen again.” By maintaining relative activation levels, the brain specifies what is treated like a constant object. Stable sequences of interactions with

¹⁴³ Varela, *et al.*, *The Embodied Mind*, 95

¹⁴⁴ Maturana, Introduction to *Autopoiesis and Cognition*, xv

the organism's medium are maintained, allowing it to exhibit an intentionality of sorts by becoming oriented with respect to particular classes of interactions. This is accomplished through structural coupling.

Thrownness and Structural Coupling

Structural coupling occurs when system A triggers a structural change in B which in turn triggers a change in A, and so on, reciprocally. The sequences of interactions between the systems become stable, recurring again and again, in roughly the same order, after much coupling in the same way (These stabilities may develop within the system's lifespan, but they can also be phylogenically passed on, as is the case with most differentiated cells in the body.). Structural coupling thus leads to certain states (and structural configurations) rather than others as a result of these selected sequences of interactions. For an autopoietic system, its "point of view" at any time is thus a result of continuous interactions with the systems to which it is structurally coupled. This means that the interactions which it can undergo, or which it "predicts" as an inferential system, are thus contingent on its mode of coupling.

The human organism is "thrown" into its situation because it is always caught up in some sequence of interactions with other systems, even non-autopoietic ones. The sort of interactions that appear possible come about from the particular ways in which it is structurally coupled with other entities, and because these sequences of interactions have become stabilized through historical participation in such interactions. Dasein learns how to deal with its world only through actual dealing; that is, through a long socialization process where it learns how to use equipment correctly, and how to behave appropriately in a social world. For Dasein as an autopoietic entity, the environment triggers certain structural changes at any moment, and these changes are dependent on all the other changes that have been triggered, with regards to their historical origin. The ontogeny of each Dasein—its history of structural coupling—determines its "point of view", or possible interactions.

The system has no direct reference to its past interactions; these are merely the historical reason for its particular "there". However, this does mean that, because it has been continually interacting, there are many sequences of interactions that are still

“pending” as long as the system is maintaining autopoiesis (=is alive). At any time, the system is engaged in particular coupling relationships that select certain changes and not others. This means that the interactions that the system actually undergoes are dependent not just on its internally specified possibilities for transformation, but on its total situation as a system structurally coupled with others. The fact that a living system is engaged in particular coupling relationships is the same to say that, at any moment, it is “thrown” into a situation, with commitments to action and involvements that are “always already there”.

Dasein is caught up in a sequence of interactions with the entities that it deals with such that they constitute a coupled unity, mutually triggering changes in one another and thus preserving structural coupling. “The coupling remains invariant while the coupled systems undergo structural changes selected by the coupling”¹⁴⁵

Such an invariance can be established with a non-autopoietic system,¹⁴⁶ and this accounts for the readiness-to-hand of equipment. Dasein is always engaged with its equipment, doing the right things without thinking about it. As long as it is using equipment skillfully, and the equipment is working correctly, the correct sequence of interactions occurs, without Dasein having to make any representations of what it is doing. When driving, Dasein is coupled to the total car-road system. This means that events in the situation (brake-lights) trigger a change in the human organism (foot-to-brake) which triggers a change in the car (slowing-down) which triggers another change (more or less brake). At all times, the possible actions that Dasein can take depend on the interactions with the car that it has undergone. Structural coupling is maintained because all of the “predictions” that Dasein makes (by *actually taking some action*, not by cogitative planning) are correct, in that the appropriate change in the car system occurs, and Dasein remains engaged with the car, driving skillfully. No judgments about the equipment is required by the human being, nor representations of rules for the use of plain present-at-hand things that it perceives. The equipment is used correctly only because it is constantly triggering changes in the human system, appropriate to the sequence of interactions selected by the coupling. Any “rules” can only really be observed as features of the entire Dasein-equipment system—as patterns of interactions between two systems, rather than as representations, or action-planning, within Dasein’s head.

¹⁴⁵ Maturana and Varela, *Autopoiesis*, 108

¹⁴⁶ Maturana and Varela, *Autopoiesis*, 108

If the equipment doesn't work correctly, there is a breakdown. The equipment becomes unready-to-hand: Dasein is still caught up in its projects, still experiencing the equipment in terms of its "for-the-sake-of-which", but the equipment does not flow smoothly with the situation. During a breakdown, the coupling is disrupted. This happens when some change in the human system is triggered by the situation, such that the human system "predicts" another interaction to result from its action according to the sequence of interactions selected by the coupling, but the expected interaction does not occur. The coupled Dasein-equipment system begins to disintegrate; however, this higher-order coupled system would tend to attempt to compensate this deformation since the "coupling is held invariant." We can speculate on how this happens:

The Heideggerian account of breakdown says that the ready-to-hand equipment becomes unready-to-hand: the "referential totality" becomes explicit and the ready-to-hand equipment tends to be experienced more and more as a mere present-at-hand thing. The key is that the interactions that took place automatically in the context of the structurally coupled human-equipment system suddenly become explicit to the human. This can only mean that the human, as an observer, has formed a description of its interactions, a new interaction that allows it to treat the former interactions as independent. Only through this process of description of description do independent present-at-hand entities arise for Dasein: its capacity to be an observer of its own interactions is the reason that the present-at-hand can appear "from out of" the ready-to-hand equipmental context. Breakdowns in a structurally coupled human-equipment system are thus handled (for whatever historical or evolutionary reason) in the following way: Dasein compensates the deformation caused by a "wrong prediction"—the disruption in the sequence of interactions of the coupled system—by making a description of its interactions. This triggers some other sequence of action, perhaps further descriptions, or perhaps further couplings with other equipment, in the attempt to stabilize the original coupled system, and maintain its coupling invariant. For example, in the Dasein-car system, if a tire blows, this will disrupt the normal coupling. A breakdown has occurred, and Dasein suddenly knows explicitly that something has gone wrong. It is suddenly aware of the car as a mechanical object that has a problem; it is making descriptions of its interactions with the car. These cause it to compensate in some way to attempt to maintain the integrity of the Dasein-car system, by perhaps braking and easing

to the side of the road. Making present-at-hand by describing its interactions with equipment seems to be one way in which the human system compensates breakdowns in the ready-to-hand entities to which it is structurally coupled.

Equipment is ready-to-hand because the human system is coupled with it, both systems mutually triggering transformations in one another, enabling a stabilized sequence of interactions to emerge. Dasein's purposefulness, or directedness, in its use of equipment seems also to be a consequence of this coupling, since interactions proceed in a definite, non-random, order, creating an intentionality, so to speak, in the entire coupled system. The different aspects of this directedness, or of "the referential totality" of the ready-to-hand (i.e., "towards-which", "in-order-to", "where-in") can be attributed to the different manners of coupling that Dasein maintains. Dasein is coupled to the entire car, but also to the stick, the wheel, the brake, *etc.*, where these lower-order couplings (Dasein-brake) are subordinated to the maintenance of the higher-order couplings (Dasein-car). (In a roughly similar way, the maintenance of the nervous system's organizational closure is subordinated to that of the organism.) When the coupling breaks down between Dasein and tire, and the "tire" becomes an explicit unready-to-hand object for Dasein to worry about, it is able to take appropriate action because it is still maintaining coupling with the car. Equipment is never totally present-at-hand, but is rather unready-to-hand, because there is always some higher-order coupling relationship that Dasein is engaged in; the breakdown in the lower-order system is a deformation that threatens the integrity of this higher-order coupled system. The tire is unready-to-hand only with respect to the project of driving the car.

There are still yet higher order coupling relationships. Just as the human-wheel coupling is maintained constant in order that human-car is maintained constant, so is human-car subordinated to the maintenance of still higher-order systems. The "towards-which" is a reference to a definite worldly project of Dasein's, such as maintaining the integrity of a corporate system, of a family unit, *etc.* The "for-the-sake-of-which" is Dasein's existential purpose, and we can think of it as the highest-order coupling in the nested coupled systems in which Dasein is involved; that is, it seems to be no less than the overall maintenance of Dasein's own autopoiesis within its medium, the loss of which leads to disintegration and death . We will return to the "for-the-sake-of-which" more later.

Dasein can be structurally coupled simultaneously into several systems: conversations, families, businesses, societies, and ecosystems. All of these systems are “always already there” in the sense described above: situations into which the organism is “thrown” insofar as various interactions are always “pending” in order maintain the coupling constant. Another way to talk about the “invariance of coupling” is to say that the coupled systems which Dasein helps to integrate are organizationally closed: they constitute autonomous unities that maintain an identity in some space through the interdependent processes that generate them.

Heidegger’s description of the world as “public” can be accounted for by the fact that individuals participate in the generation of higher-order organizationally closed unities. The conversation, for example, is an organizationally closed unity which is generated in the linguistic domain by linguistically interacting individuals, and yet, at the same time, selects the paths of structural change for the speakers. This can occur since the conversation as a unity exhibits a cognitive domain, specifying the sorts of deformations it can withstand without loss of unity. This means that it internally determines the way that it will compensate for perturbing events originating both outside the speakers and from the speakers themselves. The speakers do indeed generate the conversation, and yet the interactions which occur in the conversation cannot be reduced to the speakers; a conversation is a series of events distributed across speakers which guides the speakers in their ontogenic paths of structural changes. This explains Heidegger’s assertion that “communication is never anything like a conveying of experiences, such as opinions or wishes, from the interior of one subject to another.”¹⁴⁷ Communication only occurs with the generation of a higher-order organizationally closed entity. Individuals orient one another through their interactions, but this orientation is never a transmission of meaning-contents. “Meaning” exists at the level of the conversation generated by the individuals’ orienting behavior, not in each speaker’s head, in much the same way as the “rules” for the appropriate use of equipment are to be found in the actual sequence of interactions in the coupled system, rather than as represented in either of the systems independently.

Social phenomena are never reducible to the individuals which generate it, because such phenomena are features of a higher-order autonomous system into which

¹⁴⁷ Heidegger, *Being and Time*, 205

participating individuals are thrown. Not surprisingly, Heidegger says much the same thing: “Being towards others [is] an autonomous, irreducible relationship of being.”¹⁴⁸ This “autonomous, irreducible relationship” is explained by the invariant coupling between individuals, resulting in higher-order units that display their own domain of phenomena. We are not able to interact socially (nor self-reflectively) without the generation of these higher-order units which guide the change of the same individuals which generate them. Varela asserts that our individual mind can not be separated from the biosocial network at the next higher level.¹⁴⁹ Understanding is beyond the skull since it is dependent upon the mutually orienting interactions that individuals engage in with each other.

Furthermore, these higher-order organizationally closed unities are “always already there” and each Dasein is “thrown” into a certain position within it. Unities like societies retain their identity through the changeover of the component individuals which generate them through their interactions. Customs and social norms result from a stabilization of sequences of interactions between individuals. They are features of the system, rather than of individuals, and therefore, these sequences of interactions can be realized by multiple individuals. Maturana and Varela dub these multiply-realizable interaction patterns *cultural behavior*: “the transgenerational stability of behavioral patterns ontogenically acquired in the communicative dynamics of a social environment.”¹⁵⁰ By behaving in these ways, the organism is able to participate in the generation of society by interacting according to these norms and customs. Each organizationally closed unity has patterns of processes which are integrated to maintain the identity of this unity. A society is a unity which internally specifies the sequences of interactions that must occur for it to be the kind of society that it is.

Dasein is *Anyone* (*das Man*) because it participates in these kinds of interactions. It engages in couplings that were not determined by the individual organism, but rather were already specified in their general form as a sequence of interactions by the society, as cultural behavior. Thus, tools are public because society specifies how to use them. There is a “right” way to hold one’s knife and fork and a “wrong” way, and this sort of behavior is not up to the individual, but has been stabilized on the societal level. Behavior like this belongs to the *Anyone*. Dasein interacts in a way that has been specified

¹⁴⁸ Heidegger, *Being and Time*, 162

¹⁴⁹ Varela, *Principles of Biological Autonomy*, 270

¹⁵⁰ Maturana and Varela, *The Tree of Knowledge*, 201

beforehand through endless previous and similar couplings by other Daseins to knives, forks, and the given society. The sequences of interactions that accounts for the readiness-to-hand of equipment do not belong to the individual human system that participates, but belong rather to the higher-order system, and as such can be realized by many other human systems. By behaving like Anyone, Dasein participates in the generation of higher-order unities. It has to be socialized into this sort of behavior, which accounts for the “always already there” character of the social world in which the Anyone (everyday Dasein) lives.

As I have insisted previously, there is no contradiction between an insistence on an entity’s autonomy as well as on the fact that its operation is subordinated to the autonomy of the next higher level. All of the components of a higher-order entity function autonomously, compensating deformations to be able to interact again, and in so doing help realize the higher-order entity. Yet at the same time, the higher-order entity as a network of processes “makes space” for its components, ensuring the ambiance necessary for each specialized component to continue functioning. Each component is an autonomous sequence of transformations, yet since these transformations are also interactions with other systems, the environment of the autonomous system is what supports these interactions. Moreover, an autonomous system is not able to maintain its autonomy if it undergoes deformations it cannot compensate, so it’s important that the environment does not force these sort of deformations upon it. The functioning of the entire higher-order unit is thus required in order for the lower-order unit to be able to continue functioning autonomously, or else there will not be the appropriate ambiance for its continued operation.

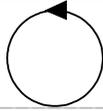
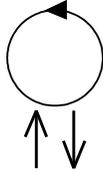
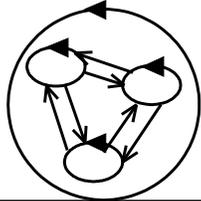
The situation is similar for all organizationally closed systems, be they cells or societies; only the constituting processes differ. The cell can only function as a physical autopoietic system as long as the organism which it helps integrate also functions as a physical autopoietic system, because the organism produces the cell by securing the conditions for its generation and continued autopoiesis. Similarly, people couple together in the linguistic domain, forming higher order entities, which then “reach down” and enable each person to interact in his appropriate linguistic role. For example, the commanding officer (CO) of a naval vessel is a necessary component of this vessel. Through his interactions with his officers and sailors, he participates in the generation of

the naval vessel as an organizational unit. The vessel-unity, however, is a network of interactions which are interrelated in such a way so as to make space for the CO-component in the linguistic domain. As soon as the organism that happens to be the CO ceases to engage in the appropriate interactions that help realize the vessel, structural coupling disintegrates, he loses his identity in the linguistic domain as a CO. (Naval vessels are structured so as to compensate such a deformation—another in the chain of command would become the functional CO—so that the vessel would maintain its identity.) In the same way, if the cell halts its structural coupling in physical space maintained by the organism's functionality, then it loses its identity as an autopoietic unity. In organizationally closed systems, *the autonomous functioning of the components in a given space generates the closed system, and at the same time, the system secures the ambiance which enables the continuing autonomous functioning of the components in their given space.*

Existenz and Living

That the autopoietic system is both autonomous and a member of a higher-order system, accounts for the fact that Dasein is both “projecting” and “thrown”. These are not independent concepts, but rather twin features of an organizationally closed autopoietic system that is coupled to other systems. This organizational closure is entirely self-organized; it “projects” its cognitive domain, yet at the same time, it maintains organizational closure only through continuous interaction with its ambiance, and as such it is “thrown” into particular sequences of interactions. We have thus accounted for the phenomenon of a care as a phenomenal totality that is both “thrown” and “projecting.” This result is summarized in the table below.

What is a Human Being?

Heidegger		Maturana and Varela
Phenomenologically, Dasein is care, a phenomenal totality,		Biologically, The human system is an organizationally closed autopoietic unity
which		which
is projecting possible actions within-the-world		compensates deformations based on its internal structure that specifies a cognitive domain
and		and
is thrown into a public world that is always already there.		through structural coupling, participates in the generation of higher-order organizationally closed entities.

The autopoietic system’s “point of view” is always restricted by its history of interactions and participation in the generation of higher-order entities. Thus, for an autopoietic system, “where it is going”—its possible interactions—is dependent on “where it has been”—its history of interaction with its milieu. The system undergoes constant interactions through projecting possible interactions based on its total history of interaction. This accounts for Heidegger’s definition of care in terms of temporality as “the unity of a future which makes present by having been.”¹⁵¹ “Making present” is the process of continuous interactions. These take place only because the system specifies the “future” ways it will interact based on its structure, which “has been” through continuous structural coupling.

Dasein’s existence is one of constant coping, or interpreting its world through taking concrete action. The same world that is “always already there” is always given in terms of the ways Dasein acts; it is thrown into the same possibilities into which it projects itself. Maturana and Varela conceive of the living system in a very similar way. In a single sentence, Maturana indicates this biological basis for the way Dasein exists:

¹⁵¹ Heidegger, *Being and Time*, 374

The organism is...in a continuous process of becoming that is specified through an endless sequence of interactions with independent entities that select its changes of state but do not specify them.¹⁵²

Living depends on interaction, and cognition is defined to be the process of continuous interaction. Likewise, Dasein is continuous coping activity in a world that is always disclosed as meaningful to it. Heidegger writes, “Proximally and for the most part Dasein is fascinated with its world.”¹⁵³ This can only come about when Dasein is thought of as being-in-the-world, and its way of existing as continuous interaction with its environment, where the complex patterns of interactions that emerge depend not upon either organism or environment separately, but on the synergy between them.

Since the Autopoietic paradigm can support something like Dasein, we don’t need to cast cognitive science in terms of the metaphysics of the subject. “Representation” and “information-processing” are the watchwords of the modern metaphysics of the subject. Jerry Fodor lays out rather clearly why this cognitive paradigm has seemed inevitable:

The only psychological models of cognitive processes that seem even remotely plausible represent such processes as computational....Computation presupposes a medium of computation: a representational system....We are thus provisionally committed to attributing a representational system to organisms.¹⁵⁴

However, Autopoiesis is a model of “cognitive processes” (where cognition is a fact of life in general) that does not depend on information processing, the kind of computation that Fodor has in mind, and autopoietic organisms do not need a representational system to keep operating. We are thus in no way “committed to attributing a representational system to organisms,” especially given the phenomenological problems with the type of metaphysics that such a system presupposes.

The process of cognition and of living is a dynamic process of continuous interaction which can’t be broken down into a subject-thing distinct from, and representing, its objects. “Dasein’s selfhood has been defined formally as a way of existing, and therefore not as some entity present to hand.”¹⁵⁵ This way of existing is the continuous interaction between the autopoietic system and its ambiance, rather than a concentration of activity in an solipsistic subject-thing. Moreover, there are no objects that the system knows as independent objects, for these “objects” are specified for the

¹⁵² Maturana, *Biology of Cognition*, 35

¹⁵³ Heidegger, *Being and Time*, 149

¹⁵⁴ Fodor, *The Language of Thought*, 27

¹⁵⁵ Heidegger, *Being and Time*, 312

organism by the exact same process of continuous interaction which defines it as a living unity. So whatever else the system may be, its primary way of relating to the world is not a knowing of an independent world of objects. As Maturana points out, for the living system, “there is no object of knowledge. To know is to be able to operate adequately in an individual or cooperative situation.”¹⁵⁶ “Knowledge” here is effective, situated action, in the same way that Dasein’s existence is concerned being-in-the-world.

Dasein is not present-at-hand, rather, present-at-hand objects emerge only because Dasein is being-in-the-world; therefore, we cannot conceive of cognition as a relation between present-at-hand subjects and objects. Present-at-hand objects are defined by an observer who makes descriptions in the linguistic domain of his interactive descriptions of its environs. To see an object as present-at-hand thus still involves interactions which are not present-at-hand—the activity of describing descriptions. Thus, grasping objects as present-at-hand is not a complete breakdown of being-in-the-world; on the contrary, it presupposes it because a specific hermeneutic stance is taken in order to understand the present-at-hand as present-at-hand. This “taking a stand” is observational behavior in the linguistic domain. At no point does the human autopoietic system truly become a subject knowing objects. Such a relationship only comes about in the linguistic domain—the interacting autopoietic unity always remains being-in-the-world. The self, the “I” in “I see the dog” is not some *thing* which perceives and knows a dog *object*. This “I” only emerges through linguistic behavior, a sort of descriptive recursion that orients a language user to its own interaction. Also, the dog can be described as a present-at-hand thing with different dog qualities, but again, these are distinctions made in the linguistic domain. In no way does this imply that our coupling with the dog is a collection and binding together of these qualities. On the contrary, only because we interact with it in a relationship of mutual triggering of changes, can we then make descriptions of these interactions, and isolate the dog as an independent thing. Both “I” and the “dog” are present-at-hand entities which must be distinguished in the linguistic domain; they have no operational reality in the operation of Dasein as an autopoietic system.

¹⁵⁶ Maturana, *Biology of Cognition*, 53

Further Problems

It seems that autopoietic machines are machines that can care. A Heideggerian might object that my analysis has been too general, that many of the features of autopoietic systems which are to account for the being of Dasein are also features of autopoietic entities like amoebas. Does an amoeba, or a cat, have Dasein, as Heidegger means it? It seems not—Heidegger feels that Dasein is specifically human being. Heidegger says that what makes Dasein distinctive as a being is that its very being is an issue for it; to the being of Dasein belongs an understanding of being. Does this, however, make it necessarily different from other autopoietic animals? Heidegger even says that “it remains a problem to define ontologically...how and whether the being of animals, for instance, is constituted by some kind of ‘time’,”¹⁵⁷ that is, whether or not the being of animals is care.

The analysis in this chapter would imply that, in general, all autopoietic systems “care”. Do cats and amoebas really exist the same way as Dasein? Do they have a “for-the-sake-of-which”? According to Maturana and Varela, there is *nothing* fundamentally different between the amoeba and the human being as far as their organization is concerned. They differ only their structure and thus in the plasticity of their domains of interactions (A nervous system allows enormous plasticity in the compensation for deformations.), as well as in the complexity of the interactions in which they can participate. As a result of this complexification, humans can generate a linguistic domain, and thus interact socially with other humans and themselves as self-conscious observers; they are systems capable of becoming observers, vastly unlike the amoeba. Are humans only humans because their structure enables the use of language, self-consciousness, and, as observers, the experiencing of the world as present-at-hand?

Heidegger would not like this result. He is adamant that the human being is not an *animal rationale*, that is, simply a biological thing that has the capacity for rational thought and language tacked on. As he says, humans are ontologically distinctive because they are ontological: Dasein always has an understanding of being which is presupposed for any of the activities it gets itself involved with. Thus, Dasein is not a thing with extra capacities that other things don't have. Dasein is always concerned about its own being, which is why the worldhood of the world is Dasein's “for-the-sake-of-which,” its

¹⁵⁷ Heidegger, *Being and Time*, 396

ownmost existential purpose. This “for-the-sake-of-which” is not a cognitive awareness that it stamps upon the world. Rather, concern for its being is the very medium in which Dasein moves through all its interpretative activity.

It seems however, that we can suggest how this “for-the-sake-of-which” can be accounted for biologically. All changes of an autopoietic system are subordinated to the maintenance of its autopoiesis. There only is a world when it is specified by the organism, and there only is an organismic unity as long as autopoiesis is maintained. Autopoiesis, as the necessary condition for continuous interaction, is thus the ground on which things exist for the system. For each Dasein, its autopoiesis is the ground for any sort of communicative behavior, or coupling with equipment and other Daseins. A concern for one’s being would then be, roughly speaking, a concern for maintaining one’s autopoiesis. Dasein’s “for-the-sake-of-which” is therefore its overall manner of coupling with its environment, a directed sequence of interactions that enables continued autopoiesis if realized, or disintegration if coupling is not maintained. Everything in Dasein’s world is disclosed with respect to its “for-the-sake-of-which”, just as every interaction of the organism is subordinated to the maintenance of its autopoiesis. Again, we must emphasize that both the maintenance of autopoiesis and the “for-the-sake-of-which” are not explicit representations that the organism has; they are rather the condition for the possibility of all involvement with things in the world: the necessary background of existence.

In his later writings, in *The Principle of Reason*, for example, Heidegger is concerned about “being” itself. Being, since it is not a being, is always the “ground” for any sort of being that we could ever interact with. Likewise, autopoiesis, the emergent self-organization peculiar to living things, is the ground for anything to “be” for the organism, and organizational closure in general the ground for anything to be for such a system. Furthermore, autopoiesis is in no way a property of a disembodied subjectivity, a cogitative process that happens “inside”, as it were; instead, autopoiesis only occurs as long as the organism is engaged with its environment through continuous interaction. The self, others, and all of the rich networks of distinctions which are made in the linguistic domain, only “exist” for the organism as long as autopoiesis is maintained. In the case of ‘being’ Heidegger would also maintain that it is not a phenomena of “consciousness” or anything created by a subject. Rather, ‘being’ provides a ground for any sort of particular

being, including the way in which we humans know ourselves; as such it is always already there, and always “outside” the knowing subject.

Heidegger also describes Dasein’s concern for its own being as a “being-towards-death” since death is “the possibility of the impossibility of any existence at all.”¹⁵⁸ This simply means that Dasein has a grounding understanding of what it means to be Dasein, constantly projecting into its possibilities, and that death is the end of this activity. Therefore, all of its actions are in some sense taken with respect to this “utmost possibility” of being. “Being-towards-death” can also be understood as the maintenance of autopoiesis, for, in failing this, the organism disintegrates. Heidegger says that when Dasein dies, it is no longer Dasein: “The *end* of the entity *qua* Dasein is the *beginning* of the same entity *qua* present-at-hand.”¹⁵⁹ Similarly, Maturana says that when an autopoietic system cannot compensate a deformation, it is defined by a different organization. Since it is not a autopoietic system any longer, it does not define its own boundaries; therefore, its new organization, as well as the boundaries of the corpse are defined by the observer as a present-at-hand thing. Dasein can only be a present-at-hand thing if so defined by an observer; for, if it loses autopoiesis, it has no way to define itself as an entity. Death is the transition from autonomy to allonomy, when the organism no longer is an autopoietic unity, but merely a unity in the observer’s descriptive domain. Death is the end of autopoiesis; it is also the end of Dasein, its “being-towards-death” or “for-the-sake-of-which”, and all interaction within a “world”.

Where does this get us? We have a conjecture about the material basis for the “for-the-sake-of-which”, or Dasein’s concern for its being, but the same problem remains from before. Under this explanation, an amoeba also is concerned for its being, and it has a “for-the-sake-of-which”. “There is” ‘being’ for anything that lives, as the autopoietic condition for the emergence of any patterns of interaction between structurally coupled systems. Thus, if, biologically, autopoiesis is all it takes to be Dasein, then, ontologically, Dasein would then be no different from other animals. From the way I have explained “care” above, not only is Dasein being-in-the-world, but so is anything that lives. The only thing that marks a difference between organisms is their particular structural realization of the autopoietic organization, and the complexity of interactions into which

¹⁵⁸ Heidegger, *Being and Time*, 307

¹⁵⁹ Heidegger, *Being and Time*, 281

they can enter; such a difference would be manifested phenomenologically, I suspect, ontically, rather than ontologically.

If the human autopoietic system differs from others only by its ability to support a linguistic domain (and thus become self-conscious and engage in abstract thought), does this mean that it follows from Autopoiesis that the human being is an *animal rationale*? I think not. The human being does not possess rationality as a subjective capacity; it is not a cogitating subject “inside” of a biological body. The human system is first and foremost an autopoietic system, and no matter what sort of interactions it may undergo, all of these interactions are subordinated to its autopoiesis. As such it is always already in a situation, and does not construct this situation from the ground up as the Cartesian subject does; it does not possess consciousness as a place to bind together different representations on the basis of which it could form beliefs and judgments about the world. *What is special about human beings is not endemic to their biological organization; it lies rather in the complex patterns of interactions and higher-order organizationally closed unities that humans can support.* Therefore, the human being is emphatically *not* animal plus something else. It is wholly an autopoietic system. Autopoiesis is a theory that says that cognition is not a special capacity of highly evolved nervous systems, but is rather the process of living itself. As such, it is a rejection of any notion that rational cognition is a special endowment, or inner capacity, of the human being (a notion that cognitivism still embraces); it does away with any sort of humanism which would make a special place for humans in the biological order. Therefore, Autopoiesis is a thorough deconstruction of the traditional concept of human subjectivity, for it does away with not only a solipsistic, cogitative subjectivity, but also its humanist chauvinism. Autopoiesis moves from *animal rationale* to an altogether new kind of animal—but still an animal.

To maintain that, nonetheless, the human being is still different from animals, seems to me to pay some slight homage to the ancient concept of *animal rationale*, even if the metaphysics of the subject seems removed from it. If Heidegger is going to claim that humans are essentially different from animals, then he is embracing some sort of humanism that cannot be biologically supported. I believe that his general idea of being-in-the-world holds true for any other living system, human or prokaryotic cell. A deconstruction of the metaphysics of the subject is the deconstruction of the concept of

the individual human subject, and, therefore, if we replace this metaphysics with something like being-in-the-world for humans, we must do likewise for other non-humans.

It seems, then, that Heidegger's Dasein is *not* fully compatible with Autopoiesis. However, I think this is not because there is something about the phenomenological human that can not be accounted for biologically, but on the contrary, because Heidegger wasn't careful enough with his phenomenology. Despite his thorough criticism of the metaphysics of the subject with the concept of being-in-the-world, Heidegger's existential analytic still retrains trappings of humanism. I won't spend too much time on this point below, and it will unfortunately remain somewhat unsupported, as it is outside the scope of this project to do it justice.

The place where this humanism surfaces is in Heidegger's notion of *authenticity*. According to Heidegger, Dasein can exist "authentically" or "inauthentically" in everything that it does. "Authentic" being-in-the-world means that Dasein understands its role in understanding being, and this enables it to "face death" "resolutely". "Authenticity" is a way of "being-towards-death" where Dasein understands this sort of being; that is, it understands what Dasein "really" is. This is to be distinguished from "inauthenticity", in which Dasein's "being-towards-death" is "covered up". An inauthentic Dasein is "falling" into a public world, where it takes up the Anyone's interpretation of itself, and always exists according to other people's standards, behaving as a member of the crowd, more or less. An authentic Dasein "loses" itself in the everyday ways of being prescribed by the Anyone.

Proximally and for the most part Dasein is not itself but is lost in the Anyone, which is an existentiell modification of the authentic Self.¹⁶⁰

Dasein becomes inauthentic when it is "lost". Suddenly, there is an "authentic" way for Dasein to "be itself" which does not involve falling into the behaviors of the Anyone. This Self is somehow more authentic than the Anyone, the distributed, public everyday self of Dasein. This almost implies that the "authentic" being is *not* in the everyday, since in the everyday, as Anyone, Dasein has fallen away from its authentic self.

Does this notion contradict the deconstruction of subjectivity that Heidegger himself undertakes? The analysis of everydayness demonstrated that usually as we go about our day, we are engaged with tools, people and projects. We are absorbed in

¹⁶⁰ Heidegger, *Being and Time*, 365

skillfully using equipment as Anyone would. (Meaning that we can only use equipment as such because we are coupled into patterns of interactions that are intersubjectively specified, not individually. All dealings and interaction go beyond an interacting individual because they have to be supported in a specific environment.) The self, or “I”, on the other hand, is not present in everyday acts within-the-world, but is rather a “breakdown” of the Anyone, where a self-object is made present-at-hand for judgment and description. Thus, even if I “break away from the crowd”, intending to “be myself”, I can only do this on the basis of being Anyone in the everyday.

Authentic being-one’s-self does not rest upon an exceptional condition of the subject, a condition that has been detached from the Anyone; it is rather an existentiell modification of the Anyone.¹⁶¹

Here Heidegger is pointing to the essential “publicness” of the everyday world, and the fact that the human is engaged in it, rather than being an isolated self. The self is based on this public being-in-the-world. This is rather contrary to what was said above, that everyday being in the world is a sort of fallenness, in which Dasein is inauthentic. In the citation immediately above, Heidegger claims that “authentic being-one’s-self...is...an existentiell modification of the Anyone”, which I think is a good description of everyday existence which does not appeal to the metaphysics of the subject. However, in the previous citation, he claims that “the Anyone...is an existentiell modification of the authentic self”, which looks blatantly contradictory to the other citation. In using terms like “authenticity” and “resoluteness” in “being-towards-death”, it seems that Heidegger is sailing close to a kind of subjective humanism, where a self-sufficient subject knows itself as itself without getting lost in the crowd.

I have treated “authenticity” very cursorily here, and *many* questions remain. It should be apparent, nonetheless, that it’s a part of Heidegger’s phenomenology that really can’t be given a biological grounding with Autopoiesis. There is no way to describe, in terms of an organism’s *organization* anything like an authentic or inauthentic being-towards-death. Perhaps we can talk about “being-towards-death” loosely as the maintenance of autopoiesis, as I said above. However, there is no way this maintenance of autopoiesis is authentic or not. The sorts of interactions that the organism enters into do not matter as far as its organization is concerned. They depend on the organism’s

¹⁶¹ Heidegger, *Being and Time*, 168 [Heidegger’s emphasis]

structure and the nature of the structural couplings in which it is engaged. As long as the organism is interacting, and as long as autopoiesis is maintained, it doesn't matter what these interactions are, whether they are somehow authentic or inauthentic. There's no meaningful biological distinction between someone going along with the crowd and someone valiantly doing his own thing. If there is any validity in Heidegger's concept of authenticity (which is definitely questionable—especially by those who find the notion of “authenticity” to be linked up with Heidegger's historical association with the Nazis) it would be most likely manifested as a distinction in the linguistic domain.

The two theories are thus not completely symmetrical. This seems to be because Autopoiesis rejects a “humans are special” attitude altogether by equating cognition with the process of continuous interaction, a process common to all living systems. Heidegger still remains slightly humanist by insisting that Dasein is purely human being that can be either authentic or inauthentic human being. I think that this aspect of Heidegger's thought, however, does not imperil his great observation that we exist as being-in-the-world rather than as an isolated subject knowing objects. This is an important observation, and, it seems, a valid phenomenological description of our situation. It is this being-in-the-world that I have tried to account for biologically. The way I have done this implies that all living systems exist as “care”: soldiers, scholars, simians and slugs are all being-in-the-world. While I have no problem with this result, I think that it means that “care” is used in this essay differently than Heidegger uses it. This is simply because: (1) “care” in the strict Heideggerian sense, is the being of Dasein and (2) Heidegger's Dasein is not an amoeba. This means that Autopoiesis is not, and cannot, be a complete explanation for Heidegger's phenomenology. This isn't a bad thing in any way, because Autopoiesis is an explanation for Heidegger's being-in-the-world.

My goal has simply been to show that, phenomenologically, the human being is being-in-the-world, and that, biologically, there is a way to support this phenomenology without appeal to the metaphysics of the subject. There remain further open questions about how to think about Autopoiesis; for example, what is its relevance to the empirical study of biology, and how do the copious laboratory results of cognitive science get reinterpreted under this paradigm? There also remain many phenomenological features of Dasein left unclarified in this essay. Consequently, there's a lot more that could be said about the relation between the two. One particularly interesting issue to explore would be

consciousness, a loaded concept with a long history that is becoming more and more important as researchers try to understand its neurophysiological basis. My effort here, however, has been only to demonstrate commonality between a different paradigm for cognition—self-organization instead of information-processing—and a different paradigm for subjectivity—being-in-the-world instead of the metaphysics of the subject. Indeed, there are differences between the Autopoietic account of self-organization and the Heideggerian account of being-in-the-world that cannot be reconciled, but the common ground that these two perspectives bring into view cannot be denied. If I have been successful here, the potential answers to the many questions still pending would not imperil the general suggestions that have been made here.

Appendix: Autopoiesis, Dasein, and Scientific Objectivity

This essay has attempted to give a biological basis for being-in-the-world. Since it's difficult to see how an information-processor could ever be being-in-the-world as it presupposes a metaphysics of the subject, I have proposed Autopoiesis as a general paradigm for the organization of living systems that makes it possible to conceive how, scientifically, living systems can be being-in-the-world. To accomplish this task, we had to make a distinction between empirical scientific and phenomenological descriptions of entities: the former is the description of *something*, and the latter is the description of *being* that something. This essay then started with a reevaluation of being a human entity (Dasein) and gave it a firm basis in a materialist scientific framework (Autopoiesis), thus showing that *how* we are (being-in-the-world) is a result of *what* we are (autopoietic systems).

I would like to briefly look at this from the reverse angle. Instead of seeing how Dasein is a biological entity, we can look at how biology is a practice of Dasein. Instead of seeing how being-in-the-world results (causally) from autopoiesis, we can look at how the elucidation of Autopoiesis is phenomenologically possible only on the basis of being-in-the-world. We can indeed describe Dasein scientifically in terms of what it is and what mechanisms make it possible, but we can also describe phenomenologically how this scientific description is possible.

In general, Dasein can understand itself (and thus the world in which it is engaged) in many different ways. As I emphasized earlier, there is always some *way* in which the world shows up in our engagement with it. Things do not have pure essences, independent from all human involvement, that we come across just as they are in themselves: rather entities always exist present-at-hand, ready-to-hand, or as care, for example, and this *how* of their existence always shows up for Dasein on the basis of its being-in-the-world. Likewise, when we look at things scientifically, Dasein has to have a certain understanding of what it means for things to exist as objects for scientific study, for the scientifically discovered world isn't the *way* it is all by-itself, independent of human scientific praxis.

More concretely, when we think about the world scientifically, we think of it objectively. We can ask what it is like by itself and how it works all on its own. Geology,

for example, studies the global forces that shape our earth, and that have been doing so long before humans thought about geology. The tectonic plates that float on a sea of magma are definitely independent of whatever humans might do. However, what is not independent is what it means to be “independent”. We can study objectively when doing science, learning a lot about objects and their relations, but *objectivity* itself is not something out there all by itself, but is rather a way of being that Dasein must understand before it can encounter the world objectively. In order to do geology, the geologist has to have an understanding of the earth as a present-at-hand object that has certain measurable properties and which is shaped by certain material processes. Scientific understanding, or *thematizing* as Heidegger puts it, is the way in which we understand the world as an objective domain of objects and forces.

Thematizing Objectifies. It does not first 'posit' the entities, but frees them so that one can interrogate them and determine their character 'Objectively'.¹⁶²

The passage is important. Heidegger says that we do not “posit” entities. This means that the scientific world is in no way an idealistic projection of the human subject. Some thinkers come dangerously close to this possibility by claiming that science is merely a particular discourse among other equally arbitrary possibilities, or that is a “choice” to see the world in some way. Dasein can’t just understand whatever it wants to, or order the world in any way it would like. Rather, anything that is discovered is always discovered as “already there”. The particular kind of understanding that Dasein has allows it to encounter a part of nature that was always already there.¹⁶³ When we understand things objectively, we experience these objects as being independent things that become thematic objects of study. For example, to look at a rock as a present-at-hand object of study, it has to be “freed” from the ready-to-hand equipmental context, where it is given in terms of our possible dealings with it. We switch from seeing it as “to stepped upon while walking down the path towards the mountain” to seeing it as “a granitic fragment with several quartzite intrusions”, that is, as a present-at-hand thing that has properties that have been there all along, and which are undeniably independent of whatever we happen to do with the rock. To understand things as such, they have to be “freed” from their

¹⁶² Heidegger, *Being and Time*, 414

¹⁶³ Dreyfus, *Being-in-the-World*, 263

everyday context of involvement, in order to be experienced as present-at-hand objects of study.

Now, when we study this rock as a present-at-hand thing, we understand that everything we discover about it is true for it, independent of our activities. It is *only* with this understanding of objectivity, or of presence-at-hand, that we can say “the rock is always *just* a piece of granite; he just happened to *experience* it as something to step on.” In the same way, we can talk about entities, like dinosaurs and distant galaxies, that were real things that existed independently of humans even learning anything about them; but at the same time, we, as interpreting human beings, have to have an understanding of objective being to say *anything* whatsoever about these entities. This holds for modern physics as well, for any sort of “observer effect” or randomness is thoroughly mathematicized and objectified—it is only in a very narrow sense that physics has “included the subject”, for the present-at-hand physical world is still a long way away from the ready-to-hand world. Hubert Dreyfus writes that “since we can understand [presence-at-hand], we can understand that [present-at-hand] entities would have been even if Dasein had never existed.”¹⁶⁴ This means that beings are independent of Dasein, but Dasein’s understanding of the being of these beings is not (*i.e.*, to Dasein’s being belongs an understanding of being).

But even the Real can be discovered only on the basis of a world which has already been disclosed. And only on this basis can anything Real still remain hidden.¹⁶⁵

Everything is given on the ground of the world, that is, with respect to Dasein’s existence and “for-the-sake-of-which.” We often talk about things left to be discovered. This may be ungathered evidence in a trial, uncharted features on a distant planet, or some necessary biological mechanism in the cell that hasn’t been discovered. Similarly, we can say now that DNA has always been around even when humans had no idea what microbiology was. To understand these sort of things, however, we need to understand what it means to be independent and objective. The world has to be disclosed to scientific activity as a present-at-hand plenum. Without this understanding, we can say nothing at all; all notions of independence are rendered meaningless. Just to talk of DNA before microbiology presupposes a notion of objectivity as a necessary condition to saying

¹⁶⁴ Dreyfus, *Being-in-the-World*, 257

¹⁶⁵ Heidegger, *Being and Time*, 247

anything whatsoever. Once again, this does not imperil the status of objectively discovered things, since we do not “posit” entities but rather “free” them for thematic study as entities always already there. It does mean, however, that if our understanding is different, entities will be given in a different way. (If our structure was different, the interactions which specify the world would be different.) Thematic understanding is thus not a privileged access to truth, but a clearing of a space for certain kinds of questions about the entities within that space. We say things about these entities which will be true or false (“The rock is granitic” is either true or false for the geologist’s specimen), but the truth or falsity of these questions only becomes possible when our understanding of being has cleared a space for the objective entities to show up.

This means that Autopoiesis cannot be an absolute ground for knowledge. The reason is that, even to begin with the theory, we had to assume a strict materialism for the arguments to be valid. We had to assume that the world was basically physical matter and energy that was organized in certain ways, before the premises of the theory could be laid and any implications drawn (The authors recognize this.¹⁶⁶) Autopoiesis, as an understanding of biological reality, can be only with an understanding of the universe as present-at-hand material. Understanding “the organization of the living” is a definite hermeneutic stance that Dasein takes. Therefore, when we use Autopoiesis to give a scientific-causal basis for everything that Dasein does, we only do this because we, as Dasein, understand what it means to give a scientific-causal basis.

This does not imply any vicious circularity. It’s not really the case that Dasein “creates” and objective world in order to describe how this objective world “creates” Dasein. Dasein does not create entities, but rather understands them in their being, and thus clears a space for them to appear as entities. Dasein takes an interpretive stance. The scientific account gives an objective causal basis for its objects of study. This difference is just another expression of the initial distinction between describing something and describing the being of something. We avoid any vicious circularity, therefore, since the way in which Dasein and Autopoiesis “create” one another is quite different, phenomenological on the one hand, and causally on the other. Of course there is some sense of circularity, in that each of the two accounts offer ways to understand the other, which is probably mutually beneficial. A good phenomenological account prompts us to

¹⁶⁶ Maturana and Varela, *Autopoiesis*, 122

look for better scientific explanations for the phenomenology; just as well, a good scientific account can prompt us to give better phenomenological descriptions (for example, perhaps, examining the notion of authenticity). In this way, what we know and how we know it constantly inform one another.

Applying this logic to Autopoiesis is interesting. First comes the assumption of a strict materialism: only mechanical processes are allowed. Then, the hypothesis that autopoiesis is the organization of matter that accounts for life. This eventually leads Maturana and Varela to claim that the organism does not know an independent world. Rather, all knowledge is always relative to the organism's domain of interactions, which reflects the individual's history of structural coupling.¹⁶⁷ The observer is an organism as well—what is true of living systems must also be true of the observer—so his knowledge is also relative to his structure and ontogeny. There is thus no absolute way to know the universe. This implies that even the assumption of a strict materialism is operative only in the linguistic domain. However, this implication only followed from the assumption of a strict materialism. Is this theory circular, then, threatening its own premise?

Maturana and Varela sometimes stress this circularity a bit much more than they need to, basing an entire relativist epistemology upon it. Maturana writes,

Matter, metaphorically speaking, is the creation of the spirit (the mode of existence of the observer in a domain of discourse), and...the spirit is the creation of the matter it creates.¹⁶⁸

While I like this in a loose, figurative sense, it seems to conflate two senses of “create”, the hermeneutic and the causal, mentioned above. I think we can better understand this apparent circularity by using this distinction, and applying the method of this entire essay. We can start with the phenomenological observation that Dasein has a certain understanding of being; thus it takes a certain hermeneutic stance which allows for the objective thematization of the world. This stance allows Dasein to understand the world scientifically, and hence biologically. This understanding of being is not independent of Dasein (*Objectivity* is different from objective objects.). Furthermore, if it was different, the world would “show up” differently (though of, course, the world that would “show up” would be the same world that was “always already there”). This is a brief phenomenological description of thematizing scientific praxis. Now, we can give a

¹⁶⁷ Maturana and Varela, *Autopoiesis*, 119

¹⁶⁸ Maturana, Introduction to *Autopoiesis and Cognition*, xviii

biological explanation for this same phenomenological description. This explanation would be something like Maturana and Varela's account of the emergence of the observer. This explanation accounts for the relativity of knowledge, or understanding, as well as the observer's ability to make scientific descriptions by interacting with others in the linguistic domain. There is no problem of self-refutation whatsoever. We simply have a phenomenological description of scientific explanation, and a scientific explanation for that same description of scientific explanation. (We could recursively reapply these two complementary modes of description to one another *ad infinitum*.) These two modes of human description will influence one another in their development, but this is not a logical paradox. It is simply the result of thinking about thinking.

Human beings can observe and interpret themselves in their world. This is a phenomenological fact to be scientifically explained, just as we can phenomenologically account for scientific explanation (an account which could also be scientifically explained, and so on.) We can talk about how we do this, what we find, but in all cases, as we do this, as we continue to interpret ourselves and our world in a hundred different ways, we continue to live, or exist, or interact, or maintain autopoiesis. Everything that humans do, they always do it within-a-world, even when they observe themselves and explain this world within which they find themselves. There is no absolute place to begin from, either phenomenologically or scientifically, because we are continually interpreting ourselves and our world in the very ways that we live.

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