On Freedom

The Theory of Subjectivity

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To my parents

Brief Contents

Prolegomena

§1 Purpose

¶1 The object of this essay is free will. It deals, therefore, with freedom; not with any kind of freedom, but with free will according to the theory of subjectivity presented in the book *El problema aparente*, which I will refer to as EPA[1]. Nevertheless, this text stands by itself, so it is not necessary to have read *El problema aparente* to understand it.

¶2 *El problema aparente* provides a mathematical presentation of the epistemological question, giving epistemology the meaning that DESCARTES would give it: if a subject receives data that are raw but have a value, that is, some data are beneficial to him and some are harmful, and if this subject has no additional *a priori* knowledge of his exterior environment, what can this subject know? Once this problem is set forth mathematically, mathematics itself resolves it.

¶3 This way of presenting the reasoning seeks to avoid philosophical difficulties. Those difficulties, if any, will be limited to asking whether the mathematical problem is an adequate model for the epistemological issue, or whether the resolution arrived at, not being the only possible resolution, actually fits the facts. Thus, technical obstacles apart, the road is philosophically smooth.

¶4 But it is not smooth for everyone. Some will find the conclusions unexpected or, even worse, absurd. Those who hold this opinion have several options. By recurring to the rule of *reductio ad absurdum*, they may decide that, as the conclusions of a well-developed reasoning are absurd, the starting postulates are false. Another possibility is that they may label the situation paradoxical, considering the premises to be true, the inference correct, and the conclusion false. Or they may end up by accepting that the conclusions, although unexpected and surprising, are also true.

[1] CASARES, R. (1999): *El problema aparente*.

¶5 To facilitate this last option, we will reason in both directions: in the entry direction, that is, from outside to inside, and in the exit direction, that is, from inside to outside. The idea is, in short, to present all of the very diverse consequences of the theory of subjectivity in order to show its full explanatory power. Anyone who is not inclined to accept the theory will have to substitute another one that has at least as great a scope as this one.

§2 Some Advice

¶1 This essay presents many new concepts and, what is worse, many everyday, fundamental concepts are interpreted in a peculiar or even extravagant way. In addition (and this is exclusively my fault), I do not idly repeat explanations. If I do repeat something, it is to introduce new matters and so this essay is conceptually very dense. In my defense, avoiding repetitions shortens the essay. You, gentle reader, can still make the repetitions that I omit on your own; in this way, if you do not need them, you need not put up with them.

¶2 The greatest complication probably arises from the variety and diversity of disciplines involved in this essay: ethics, philosophy, epistemology, linguistics, logic, mathematics, computation, cognition, psychology, neurology, biology, and physics. No one can have a complete knowledge of all of them, and so each of you will have a different perspective of the theory, depending on your formation and temperament.

¶3 Seeing things in perspective, which is always unavoidable, distorts matters even more in this case for two reasons. The first reason, which has already been noted, is that since the sculpture has a great number of dimensions, the number of different views is enormous. This makes it even more difficult to integrate them into a single coherent object. The second and more serious reason is that even the sculptor has limited knowledge, causing the sculpture to have a preferred viewing point; thus, from other positions, the creation could possibly not coincide at all with the sculptor's intentions. If this reasoning is correct, the greater the divergence between your knowledge and mine, the more errors you will find; I apologize for these errors. Thus, in order not to vitiate the empirical investigation of this matter, I will not reveal my interests.

¶4 Under these circumstances, there is no magical formula to insure that this essay will be comprehended. It would, however, be impossible to comprehend if it were read with prejudices. My advice to you, kind reader, is that you be patient; open your understanding to novelties and please suspend judgment until you completely understand the theory, because the details are less important than the whole. Let yourself be carried away by the lucubrations, however improbable they may seem. Discovering unexpected consequences is interesting and, I hope, fun. Let us begin.

§3 A Small Difference

¶1 Which is easier, telling the difference between cats and dogs, or calculating square roots?

¶2 For a person, it is easier to distinguish a cat from a dog than to find the square root of a number. You don't even have to go to school to tell a cat from a dog. For a cat or a dog, or even for a mouse, it is also simpler to distinguish cats from dogs than to calculate square roots, a task that is totally impossible for them.

¶3 In spite of this unanimity, it turns out that, from the point of view of an engineer given the job of designing a machine to do these tasks, it is simpler to calculate square roots than to recognize a cat. It is easier to build a calculating machine that can do square roots than it is to build a machine that can tell cats from dogs. To put it another way: many more computational resources are needed to identify cats than to calculate square roots.

¶4 This error of appraisal is one of the first and most interesting discoveries of artificial intelligence, the name given to one of the branches of the new cognition sciences. The consequences are immediate: if a dog is as capable of identifying cats as a person, we deduce that the difference between the computational capacities of people and dogs is to be found in minor, not major, aspects. There is a small difference that apparently has very great consequences. This conclusion agrees with the Darwinian theory of evolution, and so does not surprise us.

¶5 Throughout the following text, we will try to describe what this small difference actually is. Our insistence on this difference may make it seem large. It is not.

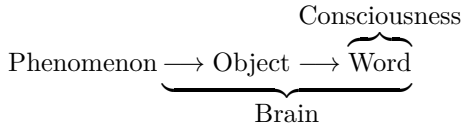
§4 Down with Objectivism!

¶1 DESCARTES' return to the origins of knowledge is unobjectionable. It is difficult to refute the idea that the only immediate and direct knowledge, the only thing I know without a doubt, is my own self. Everything else can only be known indirectly.

¶2 But we open our eyes and we can see a stone clearly. We must reflect in order to remember DESCARTES' prescriptions, and even so it is difficult to doubt the stone's existence. Further reflection serves to make us realize that what we really perceive is some colors and lights that we identify as a stone, not the stone itself. So then we take the stone and feel it, and the Cartesian doubt fades away for a second time. A little further reflection shows us that the situation has not undergone any fundamental variation, because holding the stone only provides additional data about its shape, size, weight, roughness, and temperature. The stone continues to be the result of a deduction made from the data.

¶3 What is confusing about this process is that the deduction, even though it is the most costly part computationally speaking, is unconscious and automatic. It is easier for us to make a deduction than it is to discover that we are making a deduction, and so the deduction goes unnoticed if we do not pay close attention. Even so, the situation is so strange that it seems too much to doubt the stone's existence.

¶4 Our brain carries out this imperceptible process for judging objects because of its aptitude for surviving. It forms part of our genetic inheritance and need not be learned. It is important to observe that the process of objectification is previous to the process of symbolization that makes speech and symbolic consciousness possible; symbolization also makes square root calculations possible. It is important because it explains that, for the symbolic substrata of our thinking, the object, in this case a stone, is a piece of data and not the result of a deduction. Therefore, although for the brain as a whole, the data are the colors our eyes capture and the shapes our hands feel, for our symbolic consciousness the data are the objects.



¶5 To be coherent with the previous conclusion, we must completely abandon ontology. The existence of objects is a construction of the brain. Objects and each and every one of their properties depend on the subject who perceives them. Subjectivism becomes the only possible alternative.

¶6 The basis for this proof of subjectivism is that, of the two cognitive processes considered, objectification is previous to symbolization. Anyone who is not clear on this point has only to think that you cannot speak of something that you haven't thought of yet; therefore, in order to be able to speak about objects, these objects must be previous to speech. One special case of this that is handy here is the case of the illusions that occur when conscious symbolic processes discover an error in other cognitive processes; these other cognitive processes necessarily occur previously to the ones that discover them to be erroneous. These illusions are disturbing because they reveal that what we see may not be the way we are seeing it. And this is precisely what subjectivism affirms: there are no objects out there.

¶7 The theory of subjectivity affirms, then, that of everything that is not my own self, what we could call the external universe, the only truth we have is a torrent of raw data. The data that appear to be immediate to our symbolic conscience are already elaborated data. The preparation of these data follows recipes that, on one hand, have favored the survival of our predecessors and, on the other hand, turn sensations into objects. And that is all there is to it.

¶8 I know that, in spite of its apparent logic, it is hard to accept all of this. It requires us to understand that things are not as they appear to us consciously; things are not obvious. But even though knocking down the objectivist theory seems to leave us without any ground under our feet, it is advisable to take note of two arguments, a theoretical one and a practical one. To all practical effects, we can continue to reason as objectivists, with the certainty that objectification has worked successfully for millions of years with no catastrophic failures. To all theoretical effects, and if all this is correct, the ground that the objectivist theory puts under our feet is illusory. We may as well be faithful to our principles and adopt subjectivism fearlessly, if we hope to achieve an exact understanding of what the self, consciousness, and the world are.

§5 Objective Reality Is Subjective

¶1 What do you see? A child on a swing. No, an Impressionist painter would answer, you see colors, spots of color. It is as if we have glasses that add labels to what we see.

¶2 Everything out there changes. If we saw the image that our retina captures on television, we would get dizzy. Because dizziness, in non-pathological conditions, happens when uncontrolled movement occurs; for example, the movement of the waves when we are on ship, or of a car when we are not driving, or even the image on the television if someone else changes channels too quickly. This means that we get dizzy when our stabilization system doesn't have the data it needs to get ahead of our perceptions, that is, when we cannot stabilize what we are looking at.

¶3 Let us distinguish sensation from perception. We will call the sensorial impression sensation. An example would be the image captured by the eye's retina. We will use the words sense and sensation with this meaning exclusively. Perception is the process that takes the sensation and produces the stabilized, labeled things that we call objects. Sensations change, but what we perceive doesn't. We will frequently use 'see' as a synonym of 'perceive', although there are other perceptive modes such as hear or taste.

¶4 We will call the things that we see reality, not the changing sensations that make us dizzy. So reality is what we perceive, not what we sense. The impression on our retina, which we cannot know, is not real; proof of this is that we ignore the existence of the blind spot, see Resnikoff[2]. The stone that we see, the object seen, is real and, consequently, the reality of the objects is processed.

¶5 We cannot avoid seeing objects, even though these objects do not exist outside of our heads. We do not see the universe as it is, or, rather, we do not see the universe as our senses capture it. We see it as we see it. The reality of the objects, objective reality, is a construction of the subject; that is, it is subjective. In short, objective reality is subjective.

$$\overbrace{\text{Phenomenon}}^{\text{Universe}} \longrightarrow \overbrace{\text{Object}}^{\text{Reality}} \longrightarrow \overbrace{\text{Word}}^{\text{Consciousness}}$$
$$\underbrace{\qquad\qquad\qquad\qquad}_{\text{Subject}}$$

[2] Resnikoff, H.L. (1989): *The Illusion of Reality*.

§6 Dreams

¶1 Dreams reveal labels. Excerpt from a dream: 'You were there, PIRIPILI, but you looked and talked like your mother'. Because dreams label things incorrectly, they reveal what the labels are and that it is the labels that are important, not the appearances. But it isn't exactly the label that is important, either. What is important is not the label, PIRIPILI, but its meaning, *you*.

¶2 ECO[3] ends up pointing out the surrealist and oniric character of rebus puzzles, because they also confuse sensations and words. Note that in the dream about PIRIPILI and her mother, there is no way to visualize the scene. It must be explained with words. Just as if it were a rebus, we have to put the label PIRIPILI on what is shown, to all effects, as the mother.

¶3 I have no will in my dreams, in contrast to my waking, conscious state. It seems to me that evolution, having undergone no adaptational pressure on this point, has not bothered to adequately distinguish the role of symbolism, that is, labels, in dreams, as it has had to do in our waking moments. It was this unsettling aspect of dreams that allowed FREUD[4] to discover the error by which the subject identifies with his conscious self.

¶4 The subject does not see himself as a subject but as a self; this means that the subject identifies with the conscious part of himself and with his will. This error of perspective explains why the subject understands the objects to be external, not internal. And this error is perverse because it is in the subject's own interest: if the subject were identical with his will, he would not have to die.

§7 Reality Is Involuntary

¶1 But just as the will is conscious, or else it is not will, the process of objectification, on the other hand, is not conscious, but previous to consciousness and automatic. As we saw in §4, page 10, the object is the result of a process with an evolutionary design. To put it another way, the program for objectification is encoded in the genes. That is why the object, even though it is subjective, is not at the mercy of the subject's will. Thus, objective reality is subjective, but involuntary. Reality is involuntary.

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[3] ECO, U. (1997): *Kant and the Platypus*.

[4] FREUD, S. (1900): *The Interpretation of Dreams*.

¶2 Even physics, when it manages to describe objects, is necessarily part of psychology. Such is the case of quantum mechanics, which reaches the limits of the object. It can be no other way, if objects are the products of cognition, that is, if objects are subjective. The objectivity of physical science, which seems to lift it above the uncertain and whimsical subjective world, is not due to the objects' autonomous existence, but to their being beyond the reach of the subject's will.

Entry

§8 The Adaptor

¶1 Up to this point we have noted that objects intervene in the processes that determine how we see, that is, in our perception, and we have accepted the idea that such processes were designed by evolution. We will now investigate why this happened, and to that end the first aspect that we must elucidate is what purpose the objects serve.

¶2 Objects simplify sensation. The quantity of data that our senses capture is enormous, too large to treat fully. Fortunately, the purpose of getting these data is to decide what is the right thing to do according to the circumstances, and that generally depends on a small amount of data. The strategy consists, then, of taking the data only to decide if these few but important things are present or not.

¶3 In order to focus the explanations that follow, we are now going to establish some basic definitions. Sensation is the impression of an exterior phenomenon on the body, on the senses. To sense is to receive or capture the sensation. To perceive or see is to recognize the objects present through the signs or indications detected in the sensation. So perception is what we call the process of converting the phenomenon into an object that is present, of converting what is captured by the senses into what is perceived.

¶4 This simplifying perception has been exploited by evolution from time immemorial. Thus, objects mediate between the phenomenon and the action of some living beings that we will call adaptors. These adaptors are animals that have a nervous system. The nervous system has the job of deciding, at each moment, the action that will actually be taken from among all the possible actions of its body. This decision uses the objects that are present as data.

$$\text{Phenomenon} \underbrace{\longrightarrow \text{Object} \longrightarrow}_{\text{Adaptor}} \text{Action}$$

¶5 Such is the case of the frog, see McCulloch[5] *et alii*, which interprets any dark point that moves rapidly in its field of vision as a fly which it will try to eat. This interpretation has proven useful and has been preserved in the frog's genetic code.

¶6 This object that the frog sees, and that I have called a fly, does not coincide with any objects from a person's perspective. It is more than a fly and less than an insect. It isn't a bug either, that people find repugnant and frogs tasty. In all purity, this object only exists within the frog's nervous system. If any correspondence at all, even partial, can be made with our bugs, it is because the difference between frogs and us is not as great as we think (see §3, page 9). The frog's fly exists because it is useful to frogs and the person's bug exists because it is bothersome for people.

¶7 According to these ideas, the frog generalizes and uses universals, without needing metaphysical abstractions in order to do so. This capacity for generalization rests on the perception process that groups different phenomena together in the same object. For a frog to survive, all it needs is to be able to distinguish cats from flies.

§9 Objects

¶1 The primary characteristics of the object are already present in the adaptor. The object becomes present when the nervous system has enough signs to make it present. These signs originate directly from sensation, but they can also come from other objects. This allows us to take advantage of objects' contiguity, since some, like smoke and fire, usually appear together, while others never do so. The presence of objects can provoke actions and it can lull or awaken the presence of other objects, as we have just seen.

¶2 The presence of the object has no meaning beyond the adaptor. The presence of the object is simply the result of certain calculations carried out by the adaptor's nervous system; these calculations are, in any case, vouched for by its evolutionary efficacy. Present objective reality is completely inferential and is built partly by genetically coded information and partly by calculations made by the nervous system, calculations that we have called perception.

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[5] Lettvin, J.Y.; Maturana, H.R.; McCulloch, W.S.; Pitts, W.H. (1959): *What the Frog's Eye Tells the Frog's Brain*.

§10 Reality

¶1 As soon as an object becomes present, the process associated with this object starts up. These processes have two kinds of effects: they can influence other objects or they can influence the rest of the body. If these processes influence other objects, they can do so in two manners: positively, if they make them become present, or negatively if they return them to a latent state. With this terminology, we can affirm that objects constitute a network of concurrent processes (see PDP[6]), that we call reality.

$$\text{Reality} = \text{Network of Objects}$$

¶2 We can also distinguish between action and behavior. To simplify, you can assimilate a computer's behavior to the program that it is executing. Thus, the key used to mark the end of a line when using a program for editing texts may be the same key that starts the calculation of a mathematical expression in an arithmetic program. The same action receives a different response according to the program, which we assimilate to behavior. Therefore, the description of a computer's behavior is the program that it is executing. In other words, the reaction depends as much on the action as on the state of the machine. The next state also depends as much on the action as on the actual state. For example, the key that allows the text editor to go to the upper case state for letters actually goes to the upper case state if it was previously in the lower case state, but goes to the lower case state if it was previously in the upper case state.

¶3 I will repeat the basics of the adaptor more precisely using the terminology we have just introduced. The nervous system's task is to discern, in sensations, what behavior, or program, is good for the body to carry out at each moment; in order to do this, all the nervous system need do is determine which objects are present.

¶4 For example, according to these definitions, BROOKS'[7] robots, which connect perception to behavior, are adaptors.

$$\text{Perception} \longrightarrow \text{Present Reality} \longrightarrow \text{Behavior}$$

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[6] RUMELHART, D.E.; MCCLELLAND, J.L.; & THE PDP RESEARCH GROUP (1986): *Parallel Distributed Processing*.

[7] BROOKS, R.A. (1999): *Cambrian Intelligence*.

§11 Nouns and Verbs

¶1 The frog's perceptive apparatus, identifying here and now the objects fly, cat, and water, is providing the conditions that must be fulfilled in order to resolve the problem of which behavior, of all the possible ones of which the frog's body is capable, is the right one at the moment. In this case, the right behavior is to flee. The frog ignores anything that is not present, and even part of what is present; in our example, it ignores the fly, because the cat's dangerous presence prevails over the fly's. The action executed in this situation for flight may be jumping into the water.

¶2 In order to simplify the explanation, we have up until now only paid attention to one type of object, such as 'cat', that corresponds with a noun and that we shall call a nominal object. But the adaptors' nervous systems also use other types of objets, such as 'to flee', that correspond with verbs. When the verbal object 'to flee' becomes present, the frog's nervous system emits a well synchronized series of executive orders to different body muscles in order to carry out the jump adequately.

§12 The Adaptor's Reality Is Objective

¶1 We can draw two conclusions about the adaptor's reality:

- What mediates between the phenomenon and the adaptors' actions is a network of objects called reality that simplifies the sensation captured by the senses.
- The adaptor always lives in the present reality, that is to say, it lives in the reality of the objects that are present.

§13 The Learner

¶1 The network of objects that constitutes reality can be fixed or changing. We will give the name of simple adaptor to the adaptor with a genetically fixed reality and that is capable of adapting to present circumstances, but that cannot learn to get along in new situations because it is incapable of modifying its network of objects.

¶2 A learner, on the other hand, is an adaptor capable of modifying reality. That is, the learner's network of objects is flexible and can be tuned to its external environment. We shall call this process by which the learner fits its objective reality to external circumstances modeling.

¶3 Going back to the simple adaptor, this adaptor has a rigid network of objects. It could be said that this adaptor's model of the

exterior is rigid, but with one qualifier. With a rigid network, it is not useful for the network to go through the intermediate step of calculating the forecast of the model in order to decide upon the behavior to be executed. In this case, it is more efficient and rapid to have the appropriate behavior predetermined for each present situation. Thus, although there is a model, there is no foresight.

¶4 Given evolution's opportunism, the first learners must have been very similar to the adaptors. They may have had a nervous system similar to that of a simple adaptor, but with the possibility of varying its network of objects slightly. This may have been sufficient for the learner to learn to live in several slightly different environments. In these first stages, the learner did not yet need to calculate forecasts.

¶5 The learner's situation is different when the plasticity of its modeling increases. The critical point is reached when the variability of the models is such that it is no longer practical to use predetermined behaviors for each possible network of objects with each possible configuration of objects that are present. That is, when the number of realities and present situations that the learner is capable of producing passes a certain threshold, it becomes much less efficient to have the response to each rigidly coded. This is when evolution obtains an advantage if it designs learners that foresee the consequences in order to decide which behavior to execute. These learners are capable of internally simulating the result of behaving in different ways in the present reality, and they only actually carry out the behavior that is most favorable, according to their simulation. I would remind you again that 'present reality' is shorthand for saying 'network of objects found by modeling, in which the objects that perception determines are now present'. With simulations based on present reality, the learner is entering into the future.

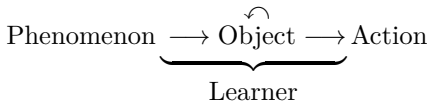
§14 Modeling

¶1 Modeling modifies the network of objects. If the network of objects is made up of objects, which are the nodes in the network, connected by stronger or weaker relations, which can be positive, with an awakening effect, or negative, with a lulling effect, then modeling can vary all of these elements. Modeling can create, eliminate, reinforce, or weaken connections. It can even make them change the direction of their effects, turning connections that have an awakening effect into connections that have a lulling effect, and *vice versa*. It can also create, eliminate, unite, or separate objects.

¶2 The purpose of modeling is that the resulting network of objects can foresee exactly which reactions the external environment will have to the learner's actions; in this way the simulation will be precise. This transaction with the exterior does not assume the existence of objects outside the learner's nervous system. It is sufficient if the external environment's reaction coincides with the reaction that the internal network of objects anticipates. This conclusion corroborates one of the theses I uphold here, that is, that objective reality is subjective.

§15 Simulation

¶1 Simulation can consist of internally closing a loop that, without simulation, is closed in the exterior by the environment. That is to say, the learner should be capable of making the verbal object that is present go back to the network of objects that models present reality, in order to foresee the reaction of the environment, instead of provoking the direct execution of actions on the outside. Thus, the actions are actually executed only when the prediction is favorable.



¶2 These learners with foresight need a much more computationally powerful nervous system than the adaptors. For the purposes of this superficial description, we will say that this new simulation function is carried out by a part of the nervous system called the brain, which is complex enough to do this.

¶3 Careful! The fact that complex learners can internally simulate the result of their actions does not mean that they always do so. Evolution is opportunistic and makes its modifications upon an existing basis; it doesn't design things from scratch. Within the learner, then, predetermined behavior coexists with simulation. Opportunism is a constant pattern in Darwinian evolution and, even when we do not make explicit reference to it, it must always be taken into consideration.

§16 The Learner's Reality Changes

¶1 Two conclusions can be reached about the learner's reality:

- The learner changes not only the present but reality itself. The objects of the learner's reality, besides making themselves present or absent, can be modified, created, and eliminated.
- The learner foresees the effects, that is, the learner sees future reality.

§17 The Knower

¶1 The learner's network of objects can be modified. If I call the part of the brain in charge of modifying the network of objects 'mind' (and whenever I write 'network of objects' it can be read as 'reality'), then we have, once again, two possibilities: the mind is rigid or the mind can be modified. We can call the learner with a rigid mind 'simple learner' and the learner with a flexible mind 'knower'.

¶2 I would like to make one comment on flexibility. It may seem that the more flexibility the better; taken to the extreme, it may seem that complete flexibility would be best. This would not, however, be the best, because the result would be shapeless, it would be chaos. At some level, there must be a rigid layer that gives shape to the more flexible layers. The workings of the most flexible of machines, the computer, can be enlightening. I am referring, in particular, to the most interesting aspect of these machines, that is, how it is possible to build a computer with logic gates. How can a computer that will do anything we want be built with tremendously simple elements that always do exactly the same thing? The answer awaits us in §105 and, at a deeper level, right at the end of §129.

¶3 Going back to the principal discussion, we saw that a simple learner has a flexible network of processes to foresee events, but that its other mental processes are rigid. The processes that determine how to modify the network of objects in order to foresee events better are rigid in the simple learner, as well as perception and the processes that determine which behavior is adequate for the present reality. In the simple learner, reality can be shaped, but the processes that use reality are fixed and, consequently, they use it in one fixed way.

¶4 The knower, on the other hand, can use the network of objects in different ways. One way is to use it in its totality, as does the simple learner, but other ways use only parts of reality. In order to do this, other mental processes of the knower must have dynamic access to the network of objects. On another level, the presence of the objects

must be internally controllable, that is, the determination of which objects are present should depend on perception, as in the learner, but also on other mental processes. In the end, attention mechanisms reappear in the knower.

§18 Sentiment

¶1 In order to carry out these requirements, there must be two kinds of processes that determine which objects are present. Apart from perception, inherited from the learners and originating in the phenomenon, another path is added. This path is similar to an interior perception because it permits the knower itself to make the objects that are of interest to it present and to ignore the ones that are not of interest. I repeat, if in the simple learner the presence of objects is the result of the interaction between the sensation received from the exterior and the learner's own network of objects, in the knower, other additional mental processes intervene. We call these sentiments because they are mental sensations. Feelings are sentiments.

¶2 Sentiments are those states that determine how reality should be used at each moment, and so modify the present. A thirsty knower will use reality in a different way than a satiated one. The problems of each, and therefore the solutions or adequate behaviors, are different.

¶3 Objects acquire meaning when sentiments spread throughout the network of objects. I must admit that this definition of meaning is obscure; you can postpone adherence to it, and treat it as a technical term, until we see where it will take us. So let us continue. Sentiments are primitive semantic terms. Meaning will explain why the knowers act one way and not another, why one behavior does not have the same value as another. This depends, in the end, on the sentiments, also known as feelings.

¶4 The first meanings are sentiments, basically *pleasure* and *pain*. All other feelings are derived from these. Evolution is what determines what *pleasure* is and what *pain* is. For evolution itself, the first meanings are *life* and *death*. So *pleasure* and *pain* are substitutes, discovered by evolution, for *life* and *death*. But only we symbolic subjects know this; simple knowers, I mean those that are not subjects, have no meaning for life and death because the primitive meanings, pleasure and pain, are enough for them.

¶5 The actions that the knower associates with obtaining pleasure or pain, and the verbal objects that are present, responsible for these actions, thus obtain a second meaning. The processes that make these

objects present, as well as the objects that launched these processes, get a third meaning, and so on until this wave, which updates meanings, reaches the perceived nominal objects that started the actions.
¶6 Thus, the meanings spread throughout the network of objects, so that all of the knower's objects have, at every moment, meaning; this is why we say that the knower's network of objects is a semantic network. To sum up: the reality of the knower is semantic because it has meanings. And these meanings, that color the objects of sentiment, are what direct the knower's behavior towards life and away from death.

§19 Emotion

¶1 The process that associates meanings to signs is very general. When the dog, in PAVLOV's[8] classic study of conditioned reflex, salivates upon hearing a bell, it is giving the meaning *food* to the sound of the bell. *Food*, vital for survival, will have a meaning, given directly by evolution, very close to *pleasure*. Eating is one of life's pleasures. But the situation is much more general. The knower needs to give everything it sees, every object, a meaning. This is because sight neither feeds nor kills. What I want to say is that if an antilope doesn't give the meaning *dangerous lion* to certain spots that grow larger in its field of vision, then the lion that gets close to it will kill it. Nor would the lion run if it didn't give the meaning *tasty antilope* to what it perceives.
¶2 This means that the antilope's object lion must be associated with the meaning *dangerous*. Evolution has found it useful to add a meaning to each object. We can also say the same thing if we say that evolution perpetuated the species of knowers that increases the network of objects with meanings that color the objects with desire, appetites, usefulnesses, uses, and needs that the emotional system, which we will abbreviate as emotion, derives from sentiments.

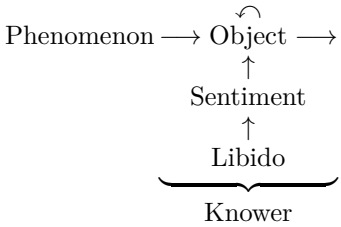
Emotion = Emotional System

¶3 Up to now, the processes described have begun with the phenomenon, from which perception extracts signs that make the objects present; these objects, in turn, set off the sequences of executive orders that determine the behavior. A process beginning with a

[8] PAVLOV, I. (1904): *Nobel Lecture*.

sentiment will help us to distinguish both entry paths to the network of objects. For example, a sharp sentiment of thirst will find, in the network of objects, that it is necessary to launch the search for signs of water. This is, without a doubt, related to attention, which, if there is nothing more urgent, will ignore any objects whose meaning is not related to thirst.

¶4 Because the knowers use meanings, they can use the network of objects to resolve concrete problems to which the emotional system gives priority, such as slaking thirst. They have a double entry path to reality: one path is the perception inherited from the learners and the adaptors and the other is emotion, specific to knowers. This emotion is goal oriented and modifies the present by paying attention to the most pressing aspects at each moment.



¶5 The root of the emotional system is the libido, the incarnation of the survival instinct in the brain. With the ever-present survival instinct and with the propioceptive information that it receives, emotion gives priority to sentiments at every moment. That is, emotion directly uses information about the body to determine which problem is the most urgent. The sentiment selected is a primary meaning that, using the meanings spread throughout the network of objects, gets the knower to attend to the objects whose meaning is of interest.

§20 Pain

¶1 Pain requires all of the attention, thus proving that it is a primary sentiment, that *pain* is pure meaning. A clear proof is the measurement of one's own willpower against pain. If a migraine is intense, it is impossible to think about anything but one's own headache. It just happened to me yesterday.

¶2 Nothing is worth much when the pain is great. Because, if the pain is great, it absorbs all meaning and all else becomes meaningless.

§21 Arbitrary Signs

¶1 In the case of the adaptors, meanings are genetically associated with perceptions, as in the case of the frog, for which every small thing that moves quickly is an edible fly; it is impossible to separate the noun (fly) from the adjective (edible), the object from its meaning. So adaptors do not distinguish objects from meanings; they are the same to them. But other more complex species are capable of learning to give meaning to new objects. For example, a dog, which, according to our classification, is a knower, is capable of learning to distinguish its favorite dog biscuits from other food.

¶2 The advantage that the dog has over the frog is that, for the dog, the relationship betweeen the sign and its meaning is arbitrary, as PAVLOV[9] demonstrated. What I mean is that any object can, in principle, have any meaning. Oranges taste very good, but they could be poisonous. If they were, the same sign would have a different meaning.

¶3 The species that have genetically determined meanings are born with this knowledge, they have inspired knowledge. This is, without a doubt, an advantage, but only as long as the environment does not change. If, for example, a fruit similar to an orange but poisonous appeared in their environment, they would die because they would fail to learn the difference between an orange and a pseudo-orange. If the oranges and the pseudo-oranges were indistinguishable, that is, if half of the oranges suddenly became poisonous, the proper action would be not to eat anything that looked like an orange. If the knower is capable of changing the meaning of the object orange from *tasty* to *poisonous*, it will reduce its risks.

¶4 The behavior of the knowers depends more on the meaning than on the sign. Assigning meaning incorrectly to an object can be a fatal mistake. This would, for example, be the case if the meaning of the orange is assigned to the poisonous pseudo-orange. What we perceive is less important than the meaning that we give to what we perceive.

[9] PAVLOV, I. (1904): *Nobel Lecture*.

§22 Adjectives and Adverbs

¶1 The knower's network of objects receives data from the exterior and from the interior, that is, from the phenomena and from the sentiments. Both, sensation and sentiment, determine present reality; we have already seen this. Just widening the entry path does not modify the learning mechanism. Therefore the learning mechanism doesn't distinguish one from the other either, but it takes both into consideration in order to modify reality, which will now fit the exterior as well as the interior. Thus, simply taking advantage of the mechanism of learning inherited from its learner predecessors, the knower can learn that the indistinguishable oranges and pseudo-oranges are *poisonous* instead of *tasty*.

¶2 But that is not all. The learner modifies reality by creating, varying, and eliminating the relationships between the different objects and also by creating, modifying, and eliminating the objects themselves. Thus, the learning that the knowers have is capable of creating objects from external phenomena as well as from internal sentiments.

¶3 So then other objects corresponding to adjectives and adverbs appear. An adjectival object such as *poisonous* will be awakened by inedible nominal objects and will veto behaviors that would cause their ingestion. Adverbial objects do the same modifying or modulating verbal objects that, when they become present, launch behaviors in the knowers.

§23 Meaning

¶1 The behavior of the knowers does not depend directly on perception, but on the meaning given to perception. The meaning, in turn, depends on emotion, so that the immediate or primary meaning is the sentiment. The other non-primary meanings are found by back propagation: first, the verbal objects whose presence has launched the actual behavior catch the pure meaning of the sentiment that they have obtained; afterwards, the meaning of the present objects propagates itself epidemically to those other objects whose presence had caused the presence of the previous objects; and so on until the wave finally reaches those nominal objects that perception itself had made present. In this way, all of the knower's objects acquire meaning, and their reality becomes a network of meanings, that is, a semantic network.

¶2 For example: An antilope flees and manages to save its life from a predator's attack. Upon saving itself, it will feel relieved, *happy*, a primitive meaning. It saved itself by fleeing from the presence of a dangerous lion, and so the connecting line between the objects 'to flee', 'dangerous', and 'lion' is reinforced so that the next time the antilope will once again be able to follow the path from 'lion' to 'dangerous' and from 'dangerous' to 'to flee'. Another way to put this is that, for the antilope after a successful flight, the lion maintains its meaning of dangerous animal, and dangerous maintains the meaning of something from which it is preferible to flee. On the contrary, a behavior that results in failure, *painful*, will weaken the existing relationships between the objects that cause the behavior, even to the point of changing their meaning.

$$\begin{array}{ccccc} \text{Perception} & \longrightarrow & \text{Reality} & \longrightarrow & \text{Behavior} \\ & & \uparrow & & \\ & & \text{Emotion} & & \end{array}$$

¶3 Thanks to meaning, reality can be used simultaneously by perception, which brings data from the exterior, and by emotion, which uses internal information. Meaning puts external conditions together with internal conditions.

$$\text{Conditions} \begin{cases} \text{Internal} \\ \quad \updownarrow \text{ Meaning} \\ \text{External} \end{cases}$$

§24 The Knower's Reality Is Semantic

¶1 We can state two conclusions about the knower's reality:

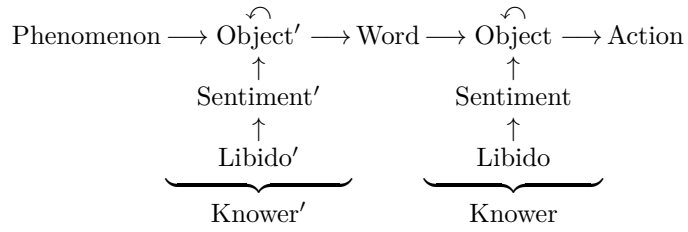
- The knower's reality is semantic, it has meaning. The meaning orders the access to reality that perception of the exterior and internal emotion dispute.
- The knower's reality is situated, it is centered, that is, it is spatial, because it distinguishes between internal and external: inside and outside, here and there.

§25 Words

¶1 Let us suppose that an ancient prehistoric predecessor had a nervous tick that made him exclaim 'leo' when he recognized a lion. The other members of his tribe would eventually learn that the sound 'leo', pronounced by this tribal comrade, was an indication that a lion was present nearby. This learning is in no way different from that studied by PAVLOV[10]. Any sign that helps to identify an object, is associated with that object. Our ability to recognize objects in phenomena improves with experience because of this procedure that we have acquired through evolution.

¶2 Another inherited behavior, that we share with monkeys, is imitation, especially in infancy. This imitation allows us to avoid unfruitful attempts and go directly to trying the solutions that our elders' experience has proven useful. So we can suppose that, in the following generation, all of the tribal members said 'leo' upon identifying a lion. The advantage for the tribe was that it was enough for one of the members to see a lion so that all of them could perceive it without needing to capture its image on their retinas, that is, without needing to sense it visually.

¶3 This is how the word 'leo' came to mean *lion* in this tribe. It was just chance that it was this specific word, it could have been any other, since the mechanism for associating signs with objects has only a utilitarian requirement; that is, it allows the association of any name with any object, as long as it is a useful association, as we saw in §21, page 25.



¶4 For the moment, for our tribe, the word 'leo' is only a sign. But it is a peculiar sign because whoever pronounces the word mediates between the phenomenon and the knower who interprets the sign. It is in the ability to take advantage of this new situation that the origins

[10] PAVLOV, I. (1904): *Nobel Lecture*.

of man, the only living subject, are to be found. In the following sections, we will develop the process that, through words, takes us from the mute knower to the symbolic subject.

§26 Signic Language

¶1 A single word such as 'leo' accompanied by a finger indicating a direction would be sufficient to cause the entire group to flee in the other direction. This use of the spoken word as a sign is useful enough to have a selective value in the evolution of our species. It is not yet symbolic language. The word, in this preliminary state of language, is a sign, which means that for any speaker of this signic language, the word is another property or indication of the object. Thus, the word 'leo' is taken into consideration in the same way as the lion's color, aspect, or odor.

Please forgive me for introducing this new word, 'signic'. My aim is to differentiate 'signic language' from 'sign language', which is a well-known kind of gestural language that is not, according to our definition of sign, signic. For example, American Sign Language is a symbolic language.

¶2 VYGOTSKY[11] observed that, for children, names are attributes or properties of things, just like their color, not conventions; this is easy to check. And it's fun, too! The language that small children speak is, then, an example of a signic language; that is, it is not symbolic. Transferring this ontogenetic proof, we obtain the corresponding phylogenetic proof; in other words, if each person as a child passes through this stage, it is permissible to suppose that humankind as a species also passed through the stage.

¶3 In a signic language, names can be given to objects that can be, as we have seen, nominal, adjectival, verbal, and adverbial objects. The word is a sign that makes the object to which it refers present. Summarizing, signic language only adds another attribute, the name, to entities provided by other cognitive processes. The word is always a reference to a given, to something external to it.

¶4 The limitations of a signic language are evident. Just take any sentence in this book, this very sentence for example, to discover what is beyond its expressive reach, because self-reference is impossible in a signic language. Questions are also impossible in a signic language.

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[11] VYGOTSKY, L.S. (1934): *Thought and Language*.

§27 Truth

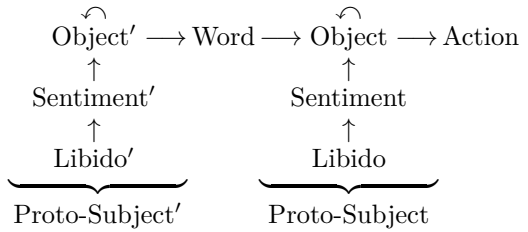
¶1 The word is a peculiar sign because it permits a knower to mediate between the phenomenon and another knower. And so it could happen that, in the tribe in which 'leo' meant *lion*, someone could say 'leo', supposedly by mistake. Since hearing the sound of the word 'leo' was, for the other members of the tribe, another way of detecting a lion's presence, the result was that, for them, the lion was present.

¶2 To begin with, this mistake doesn't seem to be advantageous. It creates a new world in which the lion is present here and now even though, in truth, it isn't. The important thing to realize is that, with words, a knower has the possibility of directly influencing the reality of another knower. We can rest assured that evolution soon took advantage of this extraordinary power.

¶3 The word, being a mediated property, works to bring the object into the present, the here and now, even if it isn't actually present or, being meticulous, even if only one of the object's signs, its name, is present. The use of the word as a sign has the power of making present that which, without the word, is not present. The word goes beyond the attention, which modifies the present; the word invents the present. And with this invention, truth and falsehood appear. Without words, there are no lies.

§28 Communication

¶1 Communication between knowers is based on the intromission of a knower, by way of a word, in the perceptive process of another knower. But to take advantage of this situation, one additional revolution was needed; we will call it the proto-subject revolution. I believe, however, that once mediation was achieved in perception, it was only a question of time before evolution found a way to exploit this, it being enough for the proto-subject to dispense with the source of perception, that is, the phenomenon.



¶2 Once this was achieved, if the speaker proto-subject gains the attention of the listener, then the action that the listener carries out has its origin in the libido of the speaker. The other proto-subject's behavior can be controlled with words.
¶3 The word has the same place in communication as the phenomenon does in perception. The difference between perception and communication is that, in perception, the phenomenon is the origin of the data, while, in communication, the origin is not the word but the object. The fact that only we subjectivists observe this difference proves that the simplification of applying the communication model to perception has had enormous success historically. Objectivism postulates that, in perception as well, external objects exist that are the causes of the perceived phenomena. This hypothesis is unnecessary, so its effect can only be distorting.

§29 Symbols

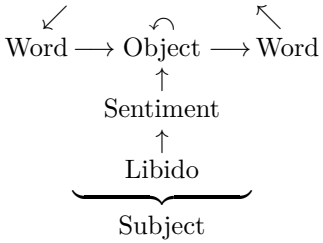
¶1 The word goes on to carry out two functions: the original one of serving as a sign of an external phenomenon, even if it is a sign obtained by someone else's mediation, and another new function by which the word refers to an object belonging to the speaker who pronounces it, where it is not a sign of an external phenomenon, but of an interior object belonging to the speaker. In the first case, we will say that the word is a sign, and in the second case, that it is a symbol. In these conditions, it is already in the interest of the proto-subject to distinguish these uses of the word, so that in one case he could say 'There's water' and in another, 'Want water'.
¶2 What is revolutionary about this is that, with the word, the object, from being a mere mental construct for one's own use, achieves an external character of shared usage, and, especially, it turns into part of a widened reality. But this requires more explanation.

§30 Self-Absorption

¶1 As we have seen, a proto-subject can control the behavior of another proto-subject through words; if one talks to oneself, then, one can control one's own behavior. This might seem superfluous at first, since the proto-subject already controlled its own behavior (who else if not the proto-subject itself?). However, in the proto-subject, as in the knower, behavior depends as much on perception as on emotion. By talking to oneself, and since the words pronounced out loud are heard and listened to, the emotional system manages to effectively

occupy perception. With both entry paths to reality monopolized, the libido completely dominates cognition.

¶2 So the next step was to use the spoken word to listen to oneself. This way the new subject achieved the same control over himself that the proto-subject had achieved over others.

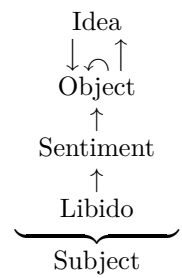


By paying attention to what one says to oneself, the sentiment generated by the libido completely dominates cognition. For example, a child hurts itself and cries, but it doesn't see its mother anywhere, so after a while it calms down and continues playing. When the mother returns, the child pronounces the word 'owie' and starts to cry disconsolately again. Paying attention to the word 'owie', perception supports emotion, which thus completely occupies the child's cognition.

¶3 We will call this situation in which the subject has broken the connection with the exterior self-absorption. This is a conversation with oneself that serves to achieve complete domination of oneself. In other words, while the simple knower is necessarily hooked into the exterior, the subject can, thanks to the word, unhook itself from the exterior.

§31 Thought

¶1 Soon the word was interiorized. We will call the interiorized word idea. We will call the loop that goes from object to object through the idea thought, or reflection. To imagine is to go from the object to the idea, and to conceive is to return from the idea to the object. If communication builds new worlds and different present times in the brains of others, thought does the same in one's own brain.



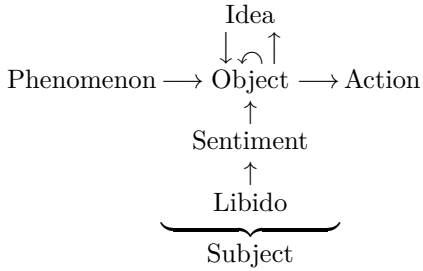
¶2 Thought is mute, interiorized speech. This agrees with the findings of VYGOTSKY[12], who observed that, in children, speech is previous to symbolic reasoning.

$$\text{Thought} = \text{Mute Speech}$$

¶3 We only have one mouth, that is, we can only say one thing at a time. Besides, it is convenient to have a single process that directs all other processes; when this does not occur, as in the case of schizofrenia, the subject tends to behave paradoxically. This explains why thought is sequential, even though it takes place over a maze of simultaneous, or parallel, cognitive processes.

§32 The Will

¶1 Subjects filter the data they receive three times, because each entry path into the network of objects that we have called reality selects one part.



¶2 Perception is the oldest filter, inherited from the adaptors, and it only catches the objects that are present. Besides, the emotional system, or emotion, inherited from the knowers, only attends to the objects that are present that are of interest to the subject, the significant objects. And thought, characteristic of subjects, has a path by which the ideas also condition reality. This last path is called the will.

¶3 Then there is learning, which provides not a filter for reality, but the possibility of redefining one's own reality. So that if, in the short term, the three entry paths into reality filter or select objects, in the long term, and thanks to learning, they contribute to

[12] VYGOTSKY, L.S. (1934): *Thought and Language*.

modifying the network of objects, creating, destroying, uniting, separating, strengthening, or weakening the objects and the relationships between the objects.

¶4 Of all of the entry paths, thought took on the role of behavior controller at the highest level because it is the way the subject's libido found of occupying its own perception in order to broaden reality at will. If speaking works to control another subject, thought and will work for self-control.

¶5 When any of the four faculties that control the network of objects —perception, learning, emotion, or thought—undergoes atrophy or hypertrophy, dysfunctional behavior occurs. Pathological psychology studies these cases.

§33 Consciousness

¶1 Words can be spoken and heard. This is why thought goes from the object to the object and is recursive right from the start; that is also why it is called reflection. This recursivity makes introspection possible. Let us see how.

¶2 Since signs allow us to recognize an object in a phenomenon, when the word is a symbol, that is, when the word is a sign of an interior object, then what it does is recognize an object in another object. And because recognizing objects in phenomena is the way, designed by evolution, of seeing the external phenomena or, in general, of perceiving them, when we recognize objects in objects, we subjects are seeing the internal objects. The difference between sensing and perceiving, or seeing, should be very precisely observed here; remember what was said in §5, page 12, and in §8, page 15. The objects that we see are the ones that are present, so that we subjects see present reality. What is remarkable is not this, however, but that the simple knowers do not see present reality. What is surprising is that only we subjects see present reality. Simple knowers are in present reality, but they do not see it.

¶3 This is as true for the idea, which is a mute word, as for the spoken word; if we see our own objects with ideas, we see another's objects with the spoken word. The spoken word can, however, be a lie. This happens when the subject discovers that it is in his interest for the listener to believe that the subject thinks something he does not actually think. Self-deception is less frequent but more dangerous; in spite of its enormous interest, we will not study it here.

¶4 So if the adaptors, the learners, and the knowers have eyeglasses

that add labels to what their senses capture, and this is seeing, we subjects can, in addition, see the labels because we can label the labels. Words are labels for objects, and objects are labels for phenomena. Thus, we can see our own thoughts. This does not mean that we can see all of our cognitive processes, but the ones that we do see are what we call our consciousness.

¶5 Just as an eye can sense itself in a mirror, so an object can see itself reflected in thought. Using this analogy, by means of which we have already made 'thought' synonymous with 'reflection', we can give the following definition with precision, and with PLATO's permission: an idea is a virtual object.

$$\text{Idea} = \text{Virtual Object}$$

§34 The Unconscious

¶1 Consciousness is that part of cognition that we can see thanks to its symbolization, but there is another part that we cannot see, as FREUD[13] discovered. We cannot see what happens before objects are constructed. Nor can we see what happens before sentiments are formed. There are certainly many other cognitive processes that we do not see, either, given the late date of the appearance of symbolization in Darwinian evolution.

¶2 Why don't we remember the first year of our lives? Because we can only consciously remember what has been symbolized, that is, what has been spoken, thought, seen, but never what has been sensed but not seen. We cannot remember what has been captured but not labeled, perhaps because it is not possible to bring it back into consciousness without its label. Conscience and symbolization are two sides of the same coin.

§35 Things and Concepts

¶1 In the subject, ideas permit the reflection that, taken as data, broadens the entry and exit paths from the network of objects. The subject's network of objects can produce behaviors such as speech, and also thought, that is, mute speech. Moreover, ideas, just like phenomena and sentiments, determine which objects are present and modify the network of objects. Thus, the network of objects is the

[13] FREUD, S. (1900): *The Interpretation of Dreams*.

subjective center of two loops: the new theoretical loop, that we denominate reflection or thought; and the old practical loop, that, ever since the adaptor, goes through action, the exterior environment, and the phenomenon.

¶2 The word that is heard is a phenomenon, and as such uses the mechanisms of perception. The spoken word is no different from the other actions that are executed as a result of cognitive processes. We can assume that interiorized words, ideas, use the same channels as spoken words. The first point in favor of this hypothesis is that thought is very recent, in the evolutionary sense, and has not had a chance to diverge from speech. The second point is empirical. When someone speaks to a person who is thinking about something unrelated to what this person hears, the hearer doesn't understand what is being said. The typical excuse, "Sorry, I was thinking about something else", shows that words that are heard and thoughts have one sole entry path into the subject's present.

¶3 Therefore, although the theoretical loop and the practical loop are different, they receive the same treatment by the network of object's modeling processes, that is, by reality's modeling processes. This opportunism, typical of Darwinian evolution, allows thought to broaden reality. That is, the same learning processes that determine that *oak* should be a different object than *tree*, also establish that *prime* should be a different object than *number*.

¶4 Of all of the subject's objects, some are constructed by perception and by learning from phenomena that are experienced practically. These are the nominal objects. Among these primitive objects, already in use by the adaptors, we have the verbal objects, that control behavior. With the appearance of the emotional system of the knowers, nominal and verbal objects acquired meaning and so the adjectival objects and adverbial objects appeared, owing their existence to sentiments. With the subject's thoughts, all of these previous nominal, verbal, adjectival, and adverbial objects, that already had meaning, acquired conceptual weight. In addition, other objects whose existence is the exclusive product of the thought's ideas appeared. We shall call the nominal, verbal, adjectival, and adverbial objects things; the others, which are theoretic objects, we shall call concepts.

$$\text{Object} \begin{cases} \text{Concept} \\ \text{Thing} \end{cases}$$

§36 The World

¶1 Concepts are peculiar objects because their existence is based on the objects themselves. Nominal objects owe their existence to perception, verbal objects to behavior, adjectival objects to perception and emotion, and adverbial objects to emotion and behavior. But concepts exist because of the ideas of thought, which are merely labels for objects, so conceptual objects owe their existence to the objects. While things are given to us whether we want them or not, concepts are, just as their name says, conceived at will.

¶2 For example, according to these definitions, stone is a thing, as is rough, to flee, and now, although the words 'stone', 'rough', 'flee', and 'now' are concepts, as we will explain in the next section, §37.

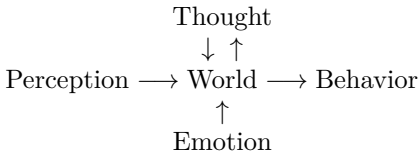
¶3 To establish the difference between real things, which are given to us, and theoretic concepts, which we can use to broaden reality at will, we shall distinguish between theory and reality. World is the name we give to the broadened reality that includes things, that is, the objects that conform reality as such, as well as concepts, which are the theoretic objects that thought conceives.

$$\text{World} \begin{cases} \text{Theory} \\ \text{Reality} \end{cases}$$

¶4 When we make this distinction, we lose the strict equivalence, established in §10, page 17, between the network of objects and reality. The subject's network of objects is the same as his world. And since the subject's world includes reality as such, reality turns out to be only one part of the subject's network of objects.

$$\text{World} \left\{ \begin{matrix} \text{Theory} & \text{Concepts} \\ \text{Reality} & \text{Things} \end{matrix} \right\} \text{Network of Objects}$$

¶5 The theoretical loop, even though it is nothing more than a third entry path to and a second exit from the network of objects, complicates reality enormously, and broadens it. The theoretic loop acts as a mirror that reflects objects back onto the very objects. With this help, the apparatus destined to see, sees itself.



§37 Existence and Reference

¶1 When the network of objects is broadened, new objects obtain meaning by the process of back propagation we already saw in §18, page 22, and in §23, page 26; this process goes from sentiments to behaviors and from behaviors to objects. This is a general process and it also works if the new object is a concept. However, something that is impossible with things can happen with concepts: there may be no way to reach the concept from the sentiments. The reason is simple, there being concepts that do not provoke any behavior, but only reflection. These purely theoretic concepts that do not give rise to actions cannot cause pain, or pleasure, and for this reason they have no meaning.

¶2 The matter becomes more complicated because reflection allows us to see our own network of objects. In this way, it is possible for the word 'water', which was, at the start, only one of the signs of the object water, to become an object in itself. Because this is possible, we can, for example, see that the word 'water' has two syllables. In order to note the difference between the object water, which is a thing, and the object that is the word 'water', which is a concept, we will put the word 'water' in quotation marks, and refer to the thing that is water as the thing water. The thing water gets things wet, but the word 'water' has two syllables and doesn't get things wet!

¶3 Under these circumstances, we say that the word 'water' refers to the thing water, or that the word 'water' takes the meaning of the thing water, or to summarize, that water exists. Both objects, the thing water and the word 'water', are very closely related in the network of objects; if we hear the word 'water' we bring the thing water directly into the present, and if we perceive signs that make the thing water present, we can immediately pronounce the word 'water'. Both objects become present simultaneously.

¶4 Up to this point, reference is a binary operation, because it uses two objects, one of which is an objectified word. But this is not

true, in general, for symbolic language. Each word is, in effect, a conceptual object, that is, a concept, but it is not true that each concept necessarily refers to a thing. Later, in §50, page 48, we shall speak about words without referent or meaning.

§38 A First Hint of Freedom

¶1 By being able to objectify the word, which was a sign, we free ourselves, quite literally, from the present, from the here and now; we saw this in §30, page 31. This freedom cannot be in the finished past, or in the present, which is nothing but a limit, but it is not the same as the future, either. Objects can contain predictive models, like PAVLOV's dog's bell that announces the imminent, but future, arrival of food. The future is a necessary condition for freedom, but it is not sufficient.

¶2 On the other hand, the word made symbol is a sufficient condition for freedom. This is because there is no freedom unless there are various possible worlds, and the word, by interfering between the phenomenon and reality, constructs these worlds (see §27, page 30, and §36, page 37; and it wouldn't hurt to read GOODMAN[14]).

§39 Symbolic Language

¶1 The word was a sign first and a symbol afterwards. This corresponds with the two uses of the word, that is, as a sign of an exterior phenomenon and as the symbol of an interior object. This is why we distinguish two stages in the development of language: the signic language that the tribe used where the word 'leo' was one more sign of the lion (as seen in §25, page 28), and the symbolic language in which there are words, such as the word 'verb', that are signs of words themselves.

¶2 The difference between a signic language and a symbolic language is that the reference for the words in the second of these has no limitation. Specifically, a symbolic word can refer to another word; more importantly, a word can have no referent whatsoever.

¶3 According to VYGOTSKY[15], the process of intellectual maturity in children, that concludes around the age of twelve, consists of symbolizing everything, even the very process of symbolization. Translated to our terminology, and if VYGOTSKY is right, symbolic

[14] GOODMAN, N. (1978): *Ways of Worldmaking*.

[15] VYGOTSKY, L.S. (1934): *Thought and Language*.

language establishes itself at around the age of twelve.

¶4 Surpassing the stage of signic language also allows words to indicate the uses of the object that go beyond their referential value. For example, it is not the same to affirm that water is present, 'There is water', as it is to express the desire that water be present, 'I want water', or to ask where water might be found, 'Where is there water?' Only in the first case is the word 'water' used as a sign; in the others, it is used as a symbol. To distinguish which use is being made of the word, subjects need to add other words or modifiers to the word that refers to water. Some of these words, such as the word 'where' have no referent; we shall say that they have a purely syntactic value.

¶5 Syntax is what distinguishes symbolic language from signic language. Its origin, leaving the reference without limits, is not very spectacular, but it is enormously important. For example, since a symbolic word, or symbol, can refer to another word, the word itself becomes an object. As such, the symbol admits different signs to identify it. That is why the symbolic word can be written, not only spoken.

§40 Writing

¶1 For the symbolic subject, the word is a conceptual object. Any object can be recognized by different signs; so the subject's word can be, too. This is why the subject can use spoken or written words, or even words captured by touch, as Braille has demonstrated.

¶2 The written word has a characteristic that the spoken word does not: it is lasting. That is why it can be used to direct attention for a longer time. Socrates, who has been dead for two thousand five hundred years, still gets our attention because Plato wrote down what his teacher said.

§41 Sentences

¶1 In a signic language, pronouncing a word was sufficient to say that the object the word referred to was present, because the word's only use was to serve as a sign. But when speech began to transmit other aspects of cognition, its expressiveness grew, at the expense of the growth of the speech unit, which up to that moment had been the word and then became the sentence.

¶2 The sentence is the unit of speech, and it consists of a sequence of words. The condition of the sentence being a sequence is due to the limitation resulting from the inability to emit more than one vocal

sound at a time. Intonation can be used to differentiate various uses of the same word; Chinese, for example, uses intonation profusely; but this method has its limitations. That is why the sentence uses words, modified or not, in the form of intoned sequences to try to express the subject's cognitive state.

¶3 Because the sentence is a speech unit, as a rule, one concept is expressed with at least one sentence. But the concept can became an idea and, after reflection, it can be named with a single word whose definition is the concept that it names.

¶4 Thus, the word 'water' that, in the signic language served to say that there was water present, becomes the sentence 'There is water', in symbolic language, to differentiate it from 'I want water', that expresses that my emotional system has determined that I am thirsty and calculates that the thing water would solve the problem. An imperative sentence, such as 'Bring me water', would solve the problem definitively if it managed to convince my interlocutor, although this person might say 'There might be water', expressing his doubts as to a happy solution to my problem. If instead of asking directly for a solution, I ask for help to resolve my problem, then I should express it explicitly with an interrogative sentence which could, in this case, be 'Where is there water?' When I finally find water, I could exclaim 'Water!', because I have solved the problem. Exclamative sentences are vestiges of the ancestral signic language.

§42 Syntax

¶1 In the previous sentences, the word 'water' is the only word that refers to a thing; the other words or phrases, such as 'there is', 'might be', or 'where' are concepts that do not refer to anything. Besides words, written sentences use some signs, such as question marks or exclamation marks, that make a note of the special intonation used for speaking the words. Last of all, words are ordered in the sentence according to their classifications, such as verb or noun, because, at times, the order serves to distinguish between different uses of the words. Everything related to the sentence, as a sentence, is called syntax, and it is different for every language.

¶2 The sentence expresses, in part, the subject's cognitive state. But while the subject's cognitive state is made up of several processes that act simultaneously, or in a parallel manner (see §10, page 17), the sentence is a single sequence, or series, of words. And even the words themselves are constructed by pronouncing sounds sequentially. So

imagining, as defined in §31, page 32, is basically a serializing or sequencing process, while conceiving, the complementary process, works to make objects parallel or concurrent. We say that the syntax engine carries out these two processes.

§43 Problems

¶1 Symbols are freed signs. Freeing a sign from exterior and interior perception allows us to enunciate problems and resolutions. This is an unexpected consequence, as all of the discoveries of evolution usually are. But it has proven valuable (for the moment) for survival. Symbolic language can express problems, such as 'How can I eat a nut?', and resolutions such as 'Hit it with a stone until it breaks open'. It also lets us express solutions, but this is no novelty, because solutions such as 'Flee!' can also be communicated in a signic language. Some bird calls that make the whole flock take flight also express, 'Flee!' (see LORENZ[16]). Syntax is not necessary in order to express solutions, as this example shows.

¶2 We have distinguished the resolution of a problem from its solution. Resolution is the process that permits the solution of the problem. If the problem is how to eat a nut, hitting it with the stone until it breaks open is the resolution, while the open nut that you eat is the solution.

¶3 But why is symbolic language capable of expressing problems? With symbolic language we see our conscious thoughts; this is part of the cognitive process, and the brain's purpose is to solve problems. We must remember that the purpose of the nervous system is to determine, given what it perceives and its own state, which bodily behavior is currently proper (see §8, page 15). Thus, the reason that symbolic languages allow us to express problems, solutions, and resolutions is that, through symbolic language, we can partially see the brain's machinery for setting up and resolving problems.

¶4 The semantic reality inherited from the knower fits in the subject's symbolic world. But there is also room for many other concepts: problems, desires, doubts, questions, and resolutions, tools, algorithms, plans, and solutions, behaviors, processes, actions. These and none other are the ingredients from which the theoretic part of the world is made (see §36, page 37), because problems, resolutions, and solutions can be expressed in symbolic language.

[16] LORENZ, K. (1949): *King Solomon's Ring*.

¶5 In a symbolic language, questions such as 'Why will I die?' or 'What is life?' can be expounded, questions that do not exist outside of the world of syntax. Freedom doesn't exist outside of this world of syntax, either.

§44 Pronouns

¶1 In order to express a problem, one has to be able to express its two components: freedom and condition, as we will see in §68. The primary conditions are given by perception, behavior, and emotion. Perception presents the external conditions, that is, the state of the universe, and emotion determines the internal conditions, that is, needs and desires. The other condition is that the behavior the body will carry out to solve a problem must be a behavior that is possible.

¶2 Symbolic language uses empty words, with no referent or meaning, to express freedom. That is how it has to be if these words need to represent the freedom of the problem. In the interrogative sentence 'What should be done?', the word 'what' is a pronoun that doesn't refer to any specific behavior and therefore has no meaning. It is necessary for it not to refer to anything, or there would be no way to express the problem, which consists precisely in that what should be done is unknown.

¶3 The fact that the word 'I' is a pronoun means that it is used to mark the freedom of a problem. The freedom of the problem of the subject is expressed in the word 'I'. The name for the pronoun 'I' is 'self'.

§45 Articles

¶1 In English, the article specifies the noun, that is, it expresses whether it is a definite noun or if it should be treated almost like a pronoun. Thus, the expression 'a stone' tells us that the reference is indefinite, although it is less indefinite than if we used an interrogative pronoun such as 'what'.

§46 Grammar

¶1 There are various types of sentences that are different because they originated in different evolutionary moments. In the first place, as we have seen (in §41 and §43), there are exclamative sentences that we subjects have inherited from the knowers. The results of perception are expressed with enunciative sentences, or statements, that describe the state of things. For referring directly to behavior,

one should use imperative sentences. Feelings use desiderative sentences to express desires, or statements to suggest that the needs are imposed on the subject as if from outside himself. Finally, we have two types of sentence that are specific to the subject: the dubitative sentence, that reflects distancing between the subject's thought and his reality, and the interrogative sentence, which is the kind that best expresses the inquisitive nature of reflection.

¶2 The different types of words are also related to cognitive evolution. Nouns come from nominal objects and verbs from verbal objects, that have their distant origin in the adaptors; adjectives and adverbs come from the adjectival objects and adverbial objects of the knowers. Pronouns and articles appear when the subject wants to express problems. Other types of words serve to shape the sentence itself; in English, these are the conjunctions and prepositions, that try to express the concurrence of reality and of the world, something that sequential speech cannot do without these devices.

¶3 Given the necessarily recursive nature of reflection, syntax is also recursive. This makes it possible for a sentence to contain other sentences, called subordinate clauses, that take the place of nouns or adjectives or adverbs.

¶4 These affirmations should not be taken as strictly grammatical affirmations. What I mean is that, in a sentence such as 'I want water', the grammatical verb 'want' acts as an adjective because the whole sentence is equivalent to the phrase 'desirable water', where the grammatical verb 'want' has become the adjective 'desirable'. Similarly, the sentence 'I assure you that your daughter is lying' is dubitative because it has the same cognitive structure as 'I believe your daughter is lying'; both express a reflexive evaluation of reality.

§47 Everything Changes

¶1 The difference established between the permanence of the thing we see and the change in behavior allows us to distinguish between nouns and verbs. This difference can become conventional. For example, 'fire' is a noun, and that means that it is something that is permanent; however, fire, as Heraclitus[17] liked to observe, is a continually changing process. Then again, 'to burn' is a verb and therefore denotes change. 'To burn' and 'fire' are semantically synonymous and that is why the sentence 'the fire burns' is a tautology.

[17] Kahn, Ch.H. (1981): *The Art and Thought of Heraclitus*.

The words are not redundant, because 'fire' can occupy the syntactic position of subject, and 'burn' that of predicate. This proves that the difference between permanence and change established by distinguishing between nouns and verbs can be merely grammatical, that is to say, conventional; that is why it doesn't work for distinguishing between what is permanent and what changes.

¶2 "Everything changes" (*πάντα ῥεῖ*) said HERACLITUS. Fire and rivers are HERACLITUS' two prototypical examples, but it is the same for everything, everything changes even if things keep their names. For example, people age, just like all other living beings, and aging is the same as burning; it is oxidation, although it is slower, that is, aging is merely a less perceptible change than burning, at least for us. And what about stones? They also change if we can observe them for long enough or closely enough; but even if the stone didn't change, we would never see it twice with the same light or from the same perspective. We construct the stone out of our perceptions. And so, since things change too, can we conclude, along with HERACLITUS, that nothing remains the same?

¶3 In order to clear this matter up for once and for all, we have to go back to the beginning. Even though the fire changes, while we perceive signs of fire, the object fire is still present. In this sense, fire behaves perceptively just like other objects. That is, all objects remain present as long as perception detects sufficient signs of their presence. And this happens even if the sensory stimuli vary from one instant to the next. This is so much the case that the first stages of perception ignore what does not vary because they only attend to change (see RESNIKOFF[18]).

¶4 So that, in practice, what is useful to say about things is that they change or remain the same, if it does any good. That is why, even if we usually speak of solid land, we know that, geologically speaking, it is more correct to speak of continental drift. Does the land change? No and yes, depending on where our interest lies when we say it. As GALILEO said about the apparent fixedness of the Earth: "*Eppur si muove*".

§48 Syntax Is What Is Permanent

¶1 That is enough, for now, of practical questions; sometimes it is convenient to speak of change and other times it is convenient to

[18] RESNIKOFF, H.L. (1989): *The Illusion of Reality*, §5.5.

speak of permanence. Let us now attack the theoretic question that HERACLITUS and PARMENIDES discussed at the start of Greek philosophy. Because there is another more radical way of understanding this matter, and it is the way that I prefer.

¶2 The self is the arquetype of existence—I am—because, for those of us who believe DESCARTES in this matter, this is what is immediate. Thus, we apply the qualities that we attribute to our own existence to the existence of things, not the other way around. Since the self is what is immediate, it is previous to everything, even to time. And because the self is anterior to time, we also suppose that things exist outside of time, by themselves, unalterable, as PARMENIDES does. But the self is free and, therefore, it is syntactic; see §44, page 43. And so we propose a generalization, that syntax is what is permanent. We will now show the pertinence of this generalization because it is interesting in itself, even though its veracity or falsehood does not affect the nucleus of this theory.

¶3 Syntax is what is unchanging. Outside of syntax everything changes. But it is only from syntactic permanence that change can be observed. Once again, the subject's symbolism allows it to step back from change, even while it is within the process of change, in order to observe it. This abstract observation of change is what we call time.

¶4 A sentence, such as 'The dog is playing with a ball', tells us that the dog is moving, it is changing. But the dog in the sentence 'The dog is still' is also changing. The person who says the sentence is not intentionally lying; on the contrary, rather, because his purpose may be to make us notice that the dog is not bothering us, perhaps that its movement is imperceptible. As we saw in the previous section, §47, it can be quite interesting, practically speaking, to affirm that 'The dog is still'. But the sentence 'The dog is still' would not be completely true for a physicist even if the dog were dead, unless it was at a temperature of absolute zero, which is, incidentally, impossible to reach.

¶5 The dog's impossible stillness contrasts with the permanence of sentences such as "Everything changes" which, contrary to what it affirms, has remained unaltered ever since HERACLITUS said it. Besides, when a sentence refers to a syntactic matter, such as 'The verb of this sentence is the previous 'is'', then it does describe something permanent.

¶6 And if these reasonings in favor of the equality of syntax and

permanence were not definitively convincing, further on, in §104, we shall see that syntactic expressions of symbolisms have to be analyzed by a back-and-forth movement, that is, without temporal restrictions.

§49 Definitions

¶1 After this journey through change, we should return to our path, and we will do so at a place where two paths cross, the path of reference and the path of the problem. These paths were initiated, respectively, in §37, page 38 and in §43, page 42.

¶2 Objects can be constructed starting from any expression that symbolic language makes possible. That is, thanks to reflection, an object can first be conceived starting from a sentence; a word can afterwards be used to refer to this object, so that the final word summarizes the original sentence. We would say that the original sentence is the definition of the final word. Thanks to definitions, symbolic language is extensible.

¶3 So objects that are constructed starting from a problem, that is to say, starting from an interrogative sentence, exist. Also, taking advantage of syntax's recursivity, there are objects that are constructed by means of their being solutions to a problem. We call these objects abstract objects. All abstract objects are concepts, not things, because their construction is theoretic; that is why the term abstract object is synonymous with abstract concept.

¶4 Abstraction seems a bit elaborate, and so it is, but for this very reason, it is even more surprising when we realize that an abstract concept is simply an object defined by its properties. This can be deduced quite easily, because a problem is freedom and condition, and the solution to the problem is whatever use of freedom satisfies the condition, as we will see in §68. Therefore, when I say that I am referring to the solutions of a problem, I mean that I am referring to whatever fulfills the condition of the problem.

¶5 So when I speak of self-luminous celestial bodies, for example, I am proposing a problem with the condition of being in the sky, because that is what a celestial body is, and of being a source of light, not a reflector of light. This is how I can refer to everything that fulfills these two properties: being in the sky and emitting light. Once the abstract concept is built, I can give it the name 'star'. And so we conclude: the definition of star is a self-luminous celestial body.

¶6 So each time we define something by referring to its properties, we are using an abstract object. Is there any other way to define

concepts? No. The conditions can come, according to our sketch, from perception, from behavior, from emotion, and from thought. We therefore have four pure types of definition: descriptive definition, using qualities, when all the conditions come from perception; genetic definition, how something is done, which limits the precise behaviors necessary to obtain the object; final definition, what I can use something for, if all of the conditions refer to its utility and thus derive from the emotional system; and theoretic definition, which establishes conditions that come from other definitions, and whose recursivity is a product of thought. In this way, thanks to theoretic definition, compound definitions can also be created, crossing the pure types, if the properties come from different type sources.

§50 Paradoxes

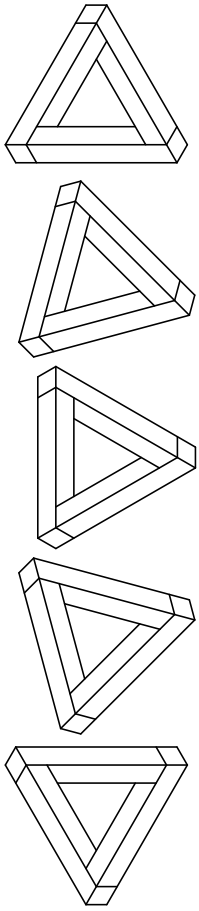
¶1 If the problem that defines an abstract object has no solution, then we have a paradoxical object. Since paradoxical objects are a type of abstract object, all paradoxical objects are concepts, not things, and paradoxical concept is synonymous with paradoxical object. Paradoxical concepts have no referent nor, as a result, meaning. For example, just as the problem of finding the set of round things that are square has no solution, the abstract object a 'round square' is a paradox.

¶2 Abstract concepts are independent from perception, from behavior, and from emotion, because they can be defined whether they have a referent or not. Thus, a 'horse' can be defined as the quadrupedal animal that fulfills a series of conditions, and a 'unicorn' as the quadrupedal animal that fulfills the conditions that define a horse along with an additional condition, having a horn in the middle of its forehead. Keep in mind that, just as the unicorn is, for us, a paradox, and we say that it doesn't exist, in the case of the horse, there is a thing that is a horse, and there is an abstraction that is a horse. This thing 'horse' becomes present when we see a horse; the abstraction 'horse' is made present when the conditions laid out in its definition are fulfilled. The coincidence of a thing and an abstraction is usually intentional, but not always successful. Consult Eco[19] for more details about the peculiarities and difficulties of reference, of definition, and of abstraction. By the way, the fact that we believe the sentence 'Unicorns don't exist' to be true, being a sentence that

[19] Eco, U. (1997): *Kant and the Platypus*.

doesn't deal with what is real, proves that truth is the conformity of syntactic expression with the world, not just with reality.

¶3 Even some optical illusions are paradoxes, for example, PENROSE's tribar. It is perfectly possible to represent the tribar on a flat surface, as the figures, adapted from RESNIKOFF[20], show. But the tribar concept defined as the solution to the problem of constructing the three-dimensional thing whose two-dimensional representations are the flat tribar figures is paradoxical.



¶4 A paradox appears, then, when a concept becomes trapped in the theoretical loop without any chance of reaching the practical loop. That is why theoretic systems, with their theoretic definitions, run the risk of being paradoxical. Let us think, for example, about phlogiston and the electron. When the physics theory that maintained phlogiston's existence and considered it to be the thing that explained thermic phenomena (see KUHN[21]) was invalidated, pholgiston was considered nonexistent. The electron, on the other hand, although it has been discovered to act as a particle and as a wave, is at present considered to exist. According to our jargon, phlogiston is paradoxical because it is not held to be the cause of any practical effects, while the electron is not paradoxical, no matter how unintelligible its behavior is, because it is considered to be the explanation of certain physical phenomena, principally electrical phenomena.

¶5 On the other hand, in a symbolic language, it is impossible to elude paradoxes, because thanks to abstraction I can refer to what cannot be referred to, as I have just done, and I can define what cannot be defined, which is, by definition, that which cannot be defined. The impossibility of eliminating paradoxes is precisely one of the characteristics of symbolic languages, as will be proven in §108.

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[20] RESNIKOFF, H.L. (1989): *The Illusion of Reality*.

[21] KUHN, TH.S. (1970): *The Structure of Scientific Revolutions*, pages 99–100.

§51 Tools

¶1 The subject's symbolic apparatus is given the objective of fulfilling, for example, a feeling of thirst, as well as the external conditions for its satisfaction that surround it, in the manner of present reality, in which the subject will search for signs of water, rivers, or fountains. That is to say, it is presented with a problem, just as the knower was. What is new about the subject is that it treats the problem as an object, as if it were real, even though it may have no meaning. It is because of this, and also because it can treat the resolution as an object, that it can make abstractions, reason, and even construct the resolution of the problem.

¶2 This, which may seem very theoretic and not very practical, explains why the subject is capable of designing tools, or of dressing itself, and why simple knowers cannot do these things. A tool is a resolution made into a thing; before it is made, the subject needs to imagine it, that is, represent it to itself internally, and only a subject is capable of imagining, in its symbolic logic, a resolution. I am using the word 'represent', even though its objectivist etymology bothers me.

§52 The Subject

¶1 In dealing with the subject, what there is to be said is too overwhelming, so it will be better to stop now and finish with a summary of the most important aspects.

¶2 Due to their evolutionary history, subjects use two types of representations or objects: things and concepts. Things are the old objects constructed by perception, learning, and emotion, as was already the case with knowers. Concepts are the new objects that thought produces voluntarily starting from other objects, which can be things or concepts. That is why symbolism, which is the logic, or system of representation, of the subject, has two layers: semantics, which is the old logic, with real things, and syntax, which is the new logic, with theoretic concepts.

¶3 The novelty of symbolism is, then, the new syntactic layer that originates in the word; the word becomes interiorized as the idea, and the idea turns into an object, to become the concept. We are particularly interested in stressing a point: that syntax makes conscious reflection and problem representation possible. Let us go over how this occurs.

¶4 If seeing the exterior consists of recognizing objects in the exterior phenomena, then when the subject recognizes objects among the interior objects, the subject sees its own interior. It is, therefore, the recursive nature of the concept that permits cognition to see itself; this is why it can be called reflected vision or reflection.

¶5 Concepts can refer directly or indirectly to things, from which they take their meanings, or they can be without meaning. These concepts that are free of meaning, that is, that are purely syntactic, are the ones that allow problem representation, because they can express the freedom, or indetermination, that any problem sets forth.

§53 The Subject's World Is Symbolic

¶1 We can come to two conclusions about the subject's world:

- The subject's world is symbolic, that is, it is reflexive, discursive, and linguistic, and includes semantic reality.
- The subject, when it considers problems with their solutions and resolutions, evaluates different possible worlds. The subject inhabits a world of possibilities. The subject is free.

Interlude

§54 Conceiving the Object

¶1 Before we begin our return trip, we will pause here to reconcile everything that we have seen on our way in. While we were preparing the trip before we started out, we stopped to look at some prolegomena in which we over-simplified some points. And even though the two main affirmations of the prolegomena, that objective reality is subjective and that reality is involuntary, have been confirmed at the entry, we now know that, contrary to what we stated at that time, there are objects that are posterior to perception.

¶2 What happened is that what we called an object in the prolegomena, turned out, upon more detailed observation, to be a thing. A thing is a practical object, and so is foreign to the will. But there are other objects, concepts, that are theoretic and voluntary. Thus, it is not correct to state that all objects are involuntary and previous to the word, since there are voluntary ones, created with words, or more exactly, with ideas.

¶3 We must, therefore, rectify what we said in §7, page 13. It turns out that only the reality of things is involuntary. This reality is constructed, as we saw in §35, page 35, by perception, learning, and emotion, but without the intervention of thought; and this reality coincides with the subject's reality, but not with its world, which also includes theoretic concepts generated at will.

¶4 Since there are voluntary and involuntary objects in the subject's world, a first explanation can establish that the involuntary objects are autonomous and independent of the subject, while the voluntary ones have no existence outside of the subject's thoughts. Thus, objectivism founded the essential difference between the real world of things and the theoretic world of concepts. But, as we have seen, the difference is not essential; rather it is merely circumstantial or genetic, since it has its origin in the peculiar evolution of the nervous system that turned man into a subject.

§55 Contingencies

¶1 Let us take advantage of this pause to state another reservation. We have described the entry path as if each step were an inevitable consequence of the previous one, but this is not so. It mustn't be thought, for example, that the learner is necessarily followed by the knower. The only requirement for a new step is that it improve the previous steps in some niche, that is, given certain conditions that are fulfilled at some time and place. If this is so, it is possible, but not certain, that evolution will take advantage of the improvement in this niche. On the other hand, out of all of the possible evolutionary sequences for cognition, we have tried to describe the one that produced *homo sapiens*.

¶2 We will use the rest of this pause to reflect upon the concept of explanation, taking time in particular to study the difficulties that the entry path explanation presents in order to prepare the exit path.

§56 Down with Materialism!

¶1 If an explanation is an explanation, it cannot appeal to any act of faith. If any step of the explanation, no matter how small, needs faith to get through it, then it is not explained. If a detail of an explanation, even a tiny one, is inexplicable, then the explanation is not complete. And a partial explanation is no explanation; it is just a more precise restatement of the problem. All of these obvious matters are, I believe, what have given materialism a preponderant position in science.

¶2 Some scientists are not materialists, but this is only because present-day specialization allows them to think that, even though everything can be explained in their own field of investigation, there are phenomena that are impossible to understand in other fields, either because God is ineffable or because people are free. But in the most basic sciences, even this is not possible. This is what leads Hawking[22], for example, to conclude by denying God any possibility of choice, and Minsky[23] to end up by denying freedom of will because, he alleges, everything is cause and chance, as Monod said. In the following pages, I will try to show that, in spite of its good intentions, materialism cannot be correct.

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[22] Hawking, S.W. (1988): *A Brief History of Time*.

[23] Minsky, M. (1985): *The Society of Mind*.

¶3 DESCARTES[24], who went back to the first principles, to what was clear and distinct, asked the right question. "I think, therefore I am". That is, what comes first is the word, and reality comes after. Besides asking the right question, DESCARTES answered it correctly. Material things, that really exist, can be described as machines, like mechanical clocks, but my thinking and speaking freely cannot be assimilated to a machine, as CHOMSKY[25] pointed out.

¶4 Standing on DESCARTES' shoulders, NEWTON was able to describe the universe as an enormous precision clock. But even though NEWTON did not want to feign hypotheses, his clock was not mechanical, at least according to Cartesian specifications. Action at a distance threw matter into great ontological difficulties, and it has been arduous to define what matter is ever since. Despite these inconveniences, Newtonian physics, capable of spectacular predictions, took over so completely that all doubts were forgotten and materialism came to rule once and for all in science.

¶5 But what is materialism? Perhaps its most famous slogan is the one that we have already quoted and that takes up a saying of old DEMOCRITUS[26]: "Everything is chance and necessity". It must be said, however, that no materialist admitted this before the advent of quantum mechanics, and that even EINSTEIN[27], one of its precursors, always denied chance. What this means, in short, is that materialists hold that physical science is what offers the final explanation. Thus, it can be understood that what is material changes as physics evolves: first the idea of action by contact, later the fields of energy, and even later, chance, to give just three examples. So that another slogan such as 'everything is physical' or 'the world is physical' may be more adequate for materialism.

¶6 Materialism puts the explanations and, in turn, the sciences that produce them, in order of importance. Physics, according to the materialist postulate, provides the definitive explanations, and so is the most fundamental, basic, or important (the 'hardest') kind of knowledge. After physics comes chemistry, with biology afterwards. Last of all, the materialist order places psychology and the humanities, but

[24] DESCARTES, R. (1637, 1641): *Discourse on Method and the Meditations*.

[25] CHOMSKY, N. (1966): *Cartesian Linguistics*.

[26] MONOD, J. (1970): *Chance and Necessity*.

[27] EINSTEIN, A. (1936): *Physics and Reality*.

only when they can be reduced to biology, chemistry, and physics. Since everything can be finally reduced to physics for materialism, free will, consciousness, and self turn out to be mere illusions or figures of speech, and, at any rate, they have no influence upon reality.

¶7 This is all absurd and untenable. Because explanations, just like the materialist explanation itself, are no more than symbolic expressions. And symbolic expressions only have meaning for symbolic subjects, that is, for the selves. Because of this, only the symbolic subjects, that is, the selves, are interested in producing them. Let us give a graphic example. Imagine that humanity disappears from the Earth and that, as a result, there are no more selves left. With no one to interpret words, and since the relationship between the sequence of letters and the meaning of the word is the fruit of established conventions between subjects, do you think that it would matter whether this printed paper that you are reading said what it says or meant any other thing? So materialism provides an explanation that, if it were coherent with itself, would have no meaning whatsoever. Materialism is absurd.

¶8 Perhaps you may suspect that the only alternative to materialism, which is to ontology what monotheism is to religion, is dualism. It is not the only alternative. Not if we abandon objectivism and adopt subjectivism. The trick, and it isn't exactly a trick either, consists of noticing that, since all objects are representations or images that do not exist outside of our heads, it is not relevant whether they are formed of only one type of substance or of two types. In other words: epistemology is previous to ontology.

¶9 The world is symbolic, that is, it is made up of two layers: syntax, where rational thought with concepts is found, and semantics, that we compare with physical things, with real things. DESCARTES got this far, and at this point he had to postulate a *res cogitans* as opposed to the *res extensa* in order to resolve, because he didn't really solve the problem of defining the world. We are luckier. TURING equipped us with tools that allow us to solve this problem. In 1936, TURING[28] demonstrated that symbolism, or more exactly, a syntax engine, can be physically constructed. Each and every computer is palpable proof of the truth of his theoretical demonstration.

¶10 Both propositions, 'it is possible to physically construct a syntax engine' and 'syntax can have real physical effects', that is, it can have

[28] TURING, A.M. (1936): *On Computable Numbers.*

meaning, are logically equivalent. Both propositions are equivalent, and even so, as the undoubtable self is in the syntactic layer, which is the layer of symbolic thought and speech, the second proposition is preferable.

¶11 This conception of the world refutes the materialist postulate, because it shows that it is not true that everything is physical. For example, the self is not physical, it is syntactic, and it is part of the world; it can even have real physical effects, as we have just seen.

¶12 These kinds of reasoning show, by the way, how philosophy always follows engineering. DESCARTES made use of a mechanical clock in order to imagine the world, but we use a computer, and that is why we can understand it a different way. We could call our way symbolic or linguistic.

§57 Mechanisms

¶1 The entry path, because it started with the objects already established, left out the first step: the mechanism.

$$\text{Mechanism} \supset \text{Adaptor} \supset \text{Learner} \supset \text{Knower} \supset \text{Subject}$$

¶2 A mechanism is anything that interacts with its environment, that is, its only characteristic is that it has a behavior. All living beings, even plants, are mechanisms.

$$\underbrace{\text{Phenomenon} \longrightarrow \text{Action}}_{\text{Mechanism}}$$

A mechanical clock is also a mechanism. A computer, as we saw in §10, page 17, is capable of different behavior for every program that it can execute and is, therefore, capable of imitating different mechanisms, for example, a clock; the computer itself, however, is another mechanism.

¶3 We have already presented the other stages of epistemological evolution. An adaptor is a mechanism with two parts, body and nervous system; the nervous system is what selects, based on the present objective reality, the behavior that the body executes. A learner is an adaptor capable of tuning reality to its environment. A knower is a learner that can use reality in different ways, selecting the way thanks to an interior perception called emotion. Last of

all, a subject is a knower that has symbolic language available to use, thus permitting it to broaden reality beyond perception and emotion, thanks to learning, with ideal theoretic concepts.

¶4 To conclude, a subject is a mechanism with a nervous system in which it models reality, a reality that it can use in different ways, and with symbolic language available for use. In other words, a subject is a mechanism with a series of characteristics that distinguish it from other mechanisms that are not subjects.

§58 Is the Subject Free?

¶1 If we explain things from outside to inside, the subject is a mechanism, and mechanisms are not free. Freedom in the subject comes out of nothing, like magic, and this is not acceptable in an explanation. The sequence goes through the following stages.

¶2 Is a mechanism free? No, it is not in any way free. A mechanism is the prototype of determinism. For a mechanism, everything is chance and necessity. Is an adaptor free? No. An adaptor is nothing more than a mechanism in which two parts have been differentiated: the body, that executes the behaviors, and the nervous system that selects the behavior to execute, and both are mechanisms. And a learner? No, a learner is not free, either, because it is just an adaptor with a nervous system that mechanically tunes into its environment. And is the knower free? No, because a knower is nothing more than a learner that is capable of feeling the internal needs of its own body which, I repeat, is a mechanism. And the subject, is it free?

¶3 Is the subject free? If we look at the entry path, then the subject is just another mechanism, too. We could say that freedom appears with the subject, but then we would have to suppose that freedom is, somehow, latent in the simplest mechanism that is, paradoxically, the prototype of determinism. On the other hand, if we look at this problem in the other direction, not from outside inwards, but from inside outwards, we get the opposite answer. The subject, by its very nature, is free. The subject sees itself as its *self*, that is, it sees itself as free to do its own will.

¶4 And so it happens that this matter, looked at from outside gives a completely different impression than if we look at it from inside. This situation is not comfortable, and so we will, in the following pages, try to reconcile both points of view.

§59 The Stranger

¶1 The entry path, from the mechanism to the subject, follows the same direction as evolution. This direction, from simple to complex, may explain things better, but this path is not the one that was really taken; it goes in exactly the opposite direction of the path that was taken. Because the question comes first. It is only because we can first ask that we can afterwards respond. There is an explanation because there is a question, although, in order to ask questions and set forth problems, things will have to get much more complicated. Things get so complicated, in fact, that only a subject can ask questions.

¶2 It follows, then, that although symbolic language is the last thing that appears in the entry path explanation, it is actually the indispensable condition, not just to begin to explain things, but even to start to ask questions. Because questions as well as the explanations themselves are expressions of symbolic language.

¶3 I cannot help myself from considering two curious possibilities. One possibility is that, if subjects did not exist, consequently neither would symbolic languages. In this case, there would be no explanation about why symbolism or anything else for that matter did not exist, because there would be neither explanations nor questions. There would be no explanation, nor anyone to demand one, so there would be no tension either.

¶4 Another possibility is that there are in fact subjects, and that their explanations of the world manage to explain everything that happens, except the existence of symbolic language. If this were the case, the subject would see itself as excluded from the world, as if it did not belong to it. The subject, seeing itself outside of everything that surrounds it, would feel like a stranger. To summarize, if the subject were not able to explain its own symbolic nature, then it would feel perplexed, like a stranger in the world. So symbolic language needs to be explained urgently.

§60 The Material Explanation

¶1 In principle, you can take an explanation as far as you want. All you have to do is ask why after every explanation, like children do when they discover how. But this is very unsatisfactory, because you necessarily end up with a vicious circle of explanations, or else you reach the point where you have to admit that there is no adequate explanation. In order to avoid this, people have to agree on what needs to be explained and what doesn't. This is so basic that the

agreement is usually tacit.

¶2 For example, the objectivist solution, the most widespread and natural solution, establishes that things do not need to be explained, they simply are, and this is enough, so that only concepts have to be explained. And explaining concepts consists, for objectivism, of making them fit in with things. That is, objectivism subordinates the theoretical loop to the practical loop. This is reasonable for the following reasons. Things are the objects of the subject that the simple knower was already using. The simple knower from which the subject descends was viable, as the mere existence of its descendent proves. So it is prudent to construct new concepts upon the solid base of things. And that is precisely what objectivism's material explanation proposes.

¶3 As a result of this analysis, we can see that, for objectivism, the explanation of a concept consists of thing-ifying it, that is, referring it to things. So, for example, in order to explain electrical phenomena, we use a thing called an electron, which needs no ulterior explanations, although its contradictory dual nature as a wave and as a particle suggests the contrary. When quantum physics discovered that all things have a dual nature, it revealed that objectivism has its limits, even if it is sufficient in practice; and this sufficiency is underwritten by the existence of simple knowers. Objectivism's limitations come from subordinating explanations to the perception, learning, and emotion natural to the human subject.

§61 The Automatic Explanation

¶1 When physics came up against the so-called quantum paradoxes, it decided to go beyond the material explanation devising what we will call the automatic explanation. We give it this name not because it automatically obtains explanations, but because it proposes as an explanation any system of equations that permits us to mechanically predict the future of the phenomenon to be explained, and these systems can be modeled mathematically as finite automata. Thus, in the ideal case, the automatic explanation provides an automaton that is indistinguishable in appearance from the phenomenon explained. An automaton is a mechanism, but its physical properties are discarded and only its capacity to deal with data is kept. So, by defininition, an automaton is an abstract mechanism.

¶2 For the automatic explanation in present-day physics, any automatism that allows us to predict what will happen in each case will

do, even if it does not correspond with any thing. Concretely, the quantum explanation is a system of equations that, when specified, manages to predict with unprecedented exactness the results of experiments (see FEYNMAN[29]). The ultimate explanation is no longer the electron, but physics equations. For the automatic explanation, the electron is a consequence of the system of equations, not the other way around, as in the material explanation, for which the system of equations is the result of describing the electron's behavior.

¶3 The automatic explanation improves the material explanation because it does not give preference to things over concepts, the only reason for this preference being the contingent evolutionary history of *homo sapiens*. On the contrary, by giving the foresightful automatism first place, the automatic explanation abandons the meaning that was naturally in the things from the material explanation. We must remember that real things always have a natural meaning, but that the concepts may have no meaning, as we saw in §37, page 38. And so it happens that the automatic explanation that quantum physics provides is capable of predicting with precision and exactness, but it means nothing. For an objectivist, the result is the same as not explaining anything; it means preferring description to explanation. The automatic explanation does not explain, it describes.

§62 The Entry Path Explanation

¶1 The discussion between EINSTEIN and BOHR[30] must be understood in the context of this transition from the material explanation's ontological position, defended by EINSTEIN, to the pragmatic position that BOHR's automatic explanation advocated.

¶2 From another point of view, the material explanation is completed by the belief in a God, creator of all and legislator of the universe, while the automatic explanation needs only the backing of a universal legislator. If laws explain everything that occurs in the material explanation, in the automatic explanation they govern even more, because in this explanation the laws specify everything that happens and everything that exists. There is no room for freedom in either, because everything that happens is ruled by the universal laws of nature.

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[29] FEYNMAN, R. (1985): *QED*.

[30] MURDOCH, D. (1987): *Niels Bohr's Philosophy of Physics*.

¶3 Material explanations as well as automatic explanations are entry path explanations, because both are constructed with resources that are external to the self, such as laws and things. And, since freedom doesn't fit into either, it turns out that neither manages to explain the subject. And therefore, neither the material explanation nor the automatic explanation explain symbolic language, which is peculiar to subjects. In these sad circumstances, symbolism lacks an explanation and the subject is a stranger.

§63 A Dirty Trick

¶1 In order to overcome this obstacle, the theory of subjectivity proposes that we start over from the very beginning. This is equivalent to going back to DESCARTES' "I think" and giving up all the progress that had been made. The situation requires courage and resolution and this is why I did not announce earlier the grave state in which we find ourselves. By this time, you are already far from the safety of home, and there is nothing for it but to find the return path, with the risk of falling helplessly into perplexity. I am sorry, but sometimes you have to play dirty.

Exit

§64 What Am I?

¶1 The exit path goes from inside to outside. It begins with the self, but what am I?

¶2 For DESCARTES, the self is what is certain, what is indubitable, the only thing that is known with absolute certainty, and which, therefore, must serve to know everything else. That is, that I, by definition, am who defines things. This is, of course, a circular definition that simply reveals that DESCARTES' self is atomic; in other words, it cannot be analyzed.

¶3 Our exit path begins at the self, with DESCARTES, so that we could actually agree upon the self as a primitive, non-analyzable term. Nevertheless, there are some qualities that can be affirmed about the self, and others that cannot. For example, 'I am free' is perfectly valid, while applying physical qualities to the self is more controversial. To begin with, it can be and is said that 'I weigh eighty kilos', but in fact what weighs is my body, not my self; this is demonstrated when I lose ten kilos, because I continue to be the same self, even though I weigh only seventy kilos. Besides which, of course, the fact that I weigh eighty kilos is not a piece of knowledge that I can reach by simple introspection, so it is not an indubitable piece of knowledge, and is thus not a part of the self.

¶4 We already know that this procedure of eliminating physical properties from the self ends up negating that the self is physical. And the consequence is that the self is not scientifically explainable. This limitation of present-day science is annoying, and some people, MINSKY[31], for example, think that the self is an illusion and that DESCARTES must necessarily have been mistaken. But DESCARTES' arguments are, on this point, unassailable, to the point that not even their disqualification as illusory discredits them. Because even if the

[31] MINSKY, M. (1985): *The Society of Mind*.

self were merely illusory, science would remain incomplete if it did not explain the nature of such an oft-repeated illusion. I, on my part, believe that in order to overcome the difficulty of the self it is necessary to broaden science's explanatory power, not deny the fact. Let us continue, then.

¶5 The definitive factor, in this exit path, is what we know introspectively about the self. As the great Irish mathematician HAMILTON[32] states:

> *The self, the I, is recognized in every act of intelligence as the subject to which that act belongs. It is I that perceive, I that imagine, I that remember, I that attend, I that compare, I that feel, I that will, I that am conscious.*

¶6 Any theory that explains the self should construct a coherent whole that assimilates, in one way or another, this jumble of concepts that are certainly related. And that is what we are doing.

§65 I Am Freedom to Not Die

¶1 The subject does not see itself as a subject, but as its self, that is, it sees itself as free. I am free to decide what to do.

¶2 What one does at every moment is done, and there is no freedom in what is already done. That is why freedom is not to be found in what is done, but in the ability to consider different possibilities of doing, as many as the subject's imagination can produce. A slave can, thus, be as free as his or her master, even though the slave must immediately discard many options that the master must evaluate. The serious problem is that the slave, due to a matter of mere mental efficiency, ends up by not even considering (what for?) the socially impossible possibilities.

¶3 The subject's freedom is not complete because it is limited, in the end, by its own death. Put simply, dead people don't make decisions. They are not free to act, so the freedom of live people only lasts as long as they are alive. We can say, following this reasoning, that the subject's self is free with the condition that it does not die. And with these two pieces of news, we have already reached a concise, but sufficient, definition of the self: I am freedom to not die.

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[32] WEBSTER (1913): *Webster's Revised Unabridged Dictionary*.

¶4 But only the full development of the definition will show if it is sufficient and correct or not. We will start to investigate this matter by supporting the definition with an example, so that later we can propose an equivalent definition of the self.

§66 The Penal System

¶1 I am, by definition, freedom to not die. The penal system makes an *adjusted* use of this definition. The maximum punishment is the death penalty, and after that life imprisonment which, although it does not completely eliminate freedom, certainly diminishes it forever. A lesser punishment is imprisonment, which deprives the prisoner of freedom temporarily and partially.

§67 The Problem of the Subject

¶1 Insofar as the self is conscious of being free and mortal, it is conscious of a problem: what to do in order not to die? We will call this the problem of the subject.

¶2 The definition of self that we have proposed, I am freedom to not die, and the problem of the subject, what to do in order not to die, are equivalent. Because in one direction, if the problem is actually a problem, it is because I have freedom to act; in the other direction, if there is freedom and there is a condition, then the problem of what to do with that freedom in order to fulfill the condition of not dying arises immediately.

$$\text{Self} = \text{Problem of the Subject}$$

¶3 To summarize, if the self is, by definition, freedom to not die, then the self is also the problem of the subject, what to do in order not to die. Thus, the investigation of the self must be pursued by studying the theory of the problem, as Dewey[33] wisely advises.

$$\text{Self} \Rightarrow \text{Problem}$$

[33] Dewey, J. (1941): *Propositions, Warranted Assertibility, and Truth.*

§68 The Theory of the Problem

¶1 Every problem is made up of freedom and of a condition (see EPA[34] §4). There have to be possibilities and freedom to choose among them, because if there is only necessity and fatality, then there is neither a problem nor is there a decision to make. The different possible options could work, or not, as solutions to the problem, so that in every problem a certain condition that will determine if an option is valid or not as a solution to the problem must exist.

$$\text{Problem} \begin{cases} \text{Freedom} \\ \text{Condition} \end{cases}$$

¶2 In addition, there ought to be certain information that should help to make a decision, because if there isn't, the problem would have to be resolved by chance. One type of problem, which we will call the apparent problem, provides no information whatsoever. We will return to the apparent problem later because it is right at the center of the issue. For now, however, we will only make a note of how information marks the difference between the two types of problem: the apparent problem, without information, and the non-apparent problem, with information. For example, the problem of the subject is not an apparent problem, because the subject has an enormous amount of information, conscious and unconscious, available about what favors life and retards death. We will later see where all this information comes from, in §77, §79, §81, §95, §128, and §138.

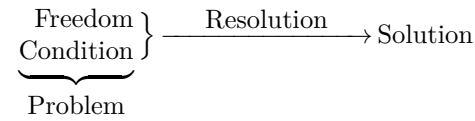
¶3 A fundamental distinction that we must make is between the solution and the resolution of a problem. Resolving is to searching as solving is to finding, and please note that one can search for something that does not exist. Thus, resolution is the process that attempts to reach the solution to the problem, while the solution of the problem is a use of freedom that satisfies the condition.

$$\text{Problem} \longrightarrow \text{Resolution} \longrightarrow \text{Solution}$$

¶4 We can explain this with another analogy. The problem is defined by the tension that exists between two opposites: freedom, free from any limits, and the condition, which is pure limit. This tension is the cause of the resolution process. But once the condition is fulfilled and freedom is exhausted, the solution annihilates the problem.

[34] Casares, R. (1999): *El problema aparente*.

The resolution is, then, a process of annihilation that eliminates freedom as well as the condition of the problem, in order to produce the solution.



¶5 A couple of mathematical examples may also be useful in order to distinguish resolution from solution. In a problem of arithmetical calculation, the solution is a number and the resolution is an algorithm such as the algorithm for division, for example. And in an algebra problem, the resolution is a chain of equivalencies that transform the original expression, representing the problem, into another expression that, in order to be accepted as the solution, must be an axiom or, failing that, an expression already proven by a previous theorem.

§69 Symbolic Logic

¶1 If we want to find the self, and the self is a problem, then we must investigate which environments problems can inhabit. This question opens up one of the most important areas of the theory of the problem, because it links it to logic and language thanks to an unexpected relationship the details of which can be found in EPA §5. If the condition of allowing the representation of problems, resolutions, and solutions is imposed as a design requeriment on a logic, then what we obtain is a symbolic logic. To put it another way, problems, resolutions, and solutions can be expressed in a symbolic language. This discovery sheds light on the true nature of symbolisms, because it lays the foundation for the strong relationship observed between symbolism and the self, with this self understood as the problem of the subject.

¶2 You can, in order to follow these explanations, interpret logic and language as synonyms, or, more exactly, consider a logic to be a system of representation, while a language is a system of communication. The relation between both is very strong, since only what can be represented can be communicated or expressed. Besides, in our case (see §31, page 32), thought is mute symbolic speech, so surely our symbolic logic is an interiorized symbolic language; but let's not get distracted right now with these disquisitions.

¶3 To give an idea of why a symbolic language is necessary for expressing problems, we will go back to the example in §44, page 43. When we express a problem, such as 'what should be done?', the interrogative pronoun 'what' does not refer to anything. It must remain undefined in order for the problem to be a problem. If, for example, in the case in question, 'what' refers to the action of walking, and not to any undetermined action, then the expression 'what should be done?' would mean *walk*, and that is no longer a problem.

¶4 In the expression of every problem there must be an unknown, a word with no meaning or, to express it more opportunely, a word that is free of meaning, that represents the freedom of the problem. The rest of the words express the conditions and the additional information. This is, of course, a first approach to the matter, because many of the conditions that must be taken into account do not need to be expressed. In 'what should be done?', it is a question of doing, but this single explicit condition is certainly not the problem's only condition. Gravity and death are certainly some of the tacit conditions. In the same way, we can do without the word that designates freedom, the interrogative pronoun 'what', if the tone or the context are sufficient to indicate that we are dealing with a problem.

¶5 Despite their interest, we will now leave these issues of the economy of language which, on the other hand, do not change the basic fact: in order to represent freedom, we must do without meaning. Or, to put it another way, semantics is insufficient for representing freedom. This gives us the key to the fundamental characteristic of symbolisms: that all symbolism has two layers, semantics and syntax. Going back to our example, 'what' is merely a syntactic artifact.

§70 Semantics and Syntax

¶1 The image of a symbolism set up in layers explains that a symbolism can be built by adding a syntactic layer to an anterior semantic logic, this surely being the process by which our symbolism developed from a purely semantic signic language, as we saw in §39, page 39.

¶2 One way to make the new syntactic layer more capable than the semantic layer that sustains it consists of representing, in the syntactic layer, all the objects of the semantic layer and adding, besides, other objects, some of them free of meaning. In these circumstances, we can distinguish between two types of syntactic objects: we call a syntactic object that directly represents a semantic object a thing, and an object that is not a thing, that is, an object that has no

immediate meaning, a concept. This implies that, if the concept has meaning, this meaning is constructed from the meaning of the things. In other words, the concept has a manufactured meaning, or it has no meaning.

¶3 As semantics is incapable of representing freedom, problems, that combine a condition and freedom, can only be expressed syntactically. This is why the problem must be a concept and must reside in syntax.

¶4 Freedom is in the problems, but it cannot be in the solutions, because the solutions must be completely determined, with no ambiguity and with no degrees of freedom. Besides, solutions were already represented in semantic logic (see §43, page 42), so that, in syntax, solutions will be things. In other words, solutions have meaning. Obviously, even though solutions are things, not all things are the solution to the problem.

¶5 The resolution process takes the problem, expressed syntactically, and returns the syntactic expression of its solution, which is a thing. The resolution is, then, a syntactic transformation. And therefore the syntactic representation of a resolution will be an algorithm, which is what we call a syntactic expression that represents a syntactic transformation. In short, algorithms have to be syntactic and recursive concepts.

¶6 Thus, while the problem and the resolution have to be syntactic and recursive concepts, the solution has to be a semantic thing (the technical details of this conclusion can be found in EPA §5.9). And so it turns out that the solution cannot remain only in the syntax, but must also transcend it; otherwise symbolism, converted into pure syntax and trapped within itself, would be meaningless and useless. Seen in this light, the resolution process moves the problem from syntax into semantics. In other words, the resolution searches for the meaning of the problem.

¶7 What is new about recursive syntax is that it permits the complete representation of problems, resolutions, and solutions, and so serves to resolve problems. For example, the systematic design of tools, which are resolutions made into things, needs symbolic elaboration (see §51, page 50).

§71 Abstraction

¶1 Syntax, because it does not have to give each object a meaning, has greater expressive power than semantics. For example, we have

already seen that, though syntax permits us to express problems, it is not possible to express a problem semantically, because the unknown of the problem must necessarily be free of any meaning. But there's more.

¶2 When a problem has one single solution, we can use the problem to refer to its solution, because its solution coincides with its meaning, as we saw in the previous section (§70). This device is called a periphrasis, because the problem refers, in the first place, to itself, and only in a roundabout way to its solution. Initially, this periphrasis may not seem very interesting, except for making up riddles or metaphors. Nonetheless, the periphrastic use of problems to refer to some or all of their solutions is an enormously fruitful procedure that is called abstraction.

¶3 If we want to refer to all the things that have a certain shape and certain uses, what we do is construct a problem whose condition is the conjunction of the conditions consisting of having this certain shape and these uses. This way, the solutions of the problem we have constructed coincide with those things to which we wish to refer. If we look at it calmly, this artifice is simple; as long as something is defined by its properties, then a problem whose condition is the conjunction of these properties is constructed. This is how abstract concepts are constructed.

¶4 Since there is a problem behind every abstract concept, there can be no abstract concepts without a symbolic language capable of expressing the problems.

§72 I Am in Syntax

¶1 In order to pursue the matter without forgetting that this whole quick investigation about the theory of the problem has the purpose of elucidating the self, we will stop to consider some new conclusions that can already be applied to it.

¶2 The self, being a problem, is not a thing, but a concept. And because it is a concept, the self inhabits the syntactic layer, not the semantic layer. This may not seem very surprising, even though it demonstrates that the self is intimately linked to symbolic language and that the self is neither physical nor real. But, when we apply abstraction to the problem of the subject, that is, when we consider its solutions, we immediately realize that the problem of the subject has no solution. The problem of the subject, what to do in order not to die?, has no solution because it is certain that, whatever I do, I

will die. And this is enigmatic. The self, which we make equivalent to the problem of the subject and which we assimilate, by abstraction, to its solution, is now an enigma. What is the solution to a problem with no solution?

§73 I Am Paradoxical

¶1 One way to construct a paradoxical concept consists of referring to the solutions of a problem with no solution. So the self is paradoxical, but let's not panic. All right, so I am paradoxical, but what exactly is a paradox?

¶2 Technically (see EPA §5.7.1), a paradox is a syntactic object with no semantic referent, that is, a paradox is a concept without meaning. Unconditioned freedom is, according to this definition, a paradox. An expression such as 'this sentence is false' is a paradox too, because if what it affirms is true, then it is false, but if it is false, then what it affirms is true, and so it is false, and then true, and so on forever, without ever reaching the final meaning of the sentence.

¶3 To understand what consequences affirming that the self is paradoxical has, we have to make a couple of deductions.

¶4 For the first deduction we have to remember that:

- The self is equivalent to the problem of the subject.
- We use problems to refer, by abstraction, to their solutions.
- A solution is a meaning of the problem.

From which we can conclude that, if the self is paradoxical, it is because the problem of the subject has no solution. This is nothing new—I already know that I will die—but it ratifies the foundations of the paradoxical self.

¶5 In order to make the second deduction, first we need to make a previous observation.

- In any problem there is a tension between freedom and the condition, and it is the resolution process that eliminates this tension, annihilating freedom and the condition, and producing a solution (as shown in §68, page 65).

Put negatively, this means that:

- For any problem without a solution, the resolution process cannot culminate in a solution, thus maintaining the tension between freedom and the condition.

This, I suppose, is the reason why paradoxes cause anxiety. Since a problem with no solution cannot stop being a problem in order to be

a solution, we can affirm that the problems with no solution are the only necessarily stable problems.

¶6 The second deduction is now simple. Given that:

- All problems with no solution are stable.
- The problem of the subject has no solution.

We deduce that the problem of the subject is stable and that the freedom of self cannot be eliminated.

¶7 In short, the paradoxical problem with no solution is the only system capable of confining freedom; otherwise, this freedom is resolved and disappears, annihilated, along with the condition. The self is problematic, and it cannot stop being so, because it is paradoxical. The paradoxical self maintains the tension between freedom and death.

§74 Immortality

¶1 I suspect that all of these deductions may confuse the issue more than they clarify it. Because one can think, correctly, that when the subject dies, freedom, the corresponding tension, and even the paradoxical self also disappear. This is true, but it does not mean that the problem of the subject has a solution; in fact, it means the very opposite. In order to solve it, the subject has to reach absolute immortality, with no conditions, and what these deductions affirm is that this necessarily immortal subject, with no vital problems, will neither have a self, nor be free.

¶2 If the subject is necessarily immortal, the subject will have no worries, will no longer be inquisitive (what for?), and its self will become paralyzed; it will simply live eternally. Although I do not know if you could really call living what the necessarily immortal subject does, since it doesn't depend on eating, breathing, or any other conditioning factor. If this immortality were not a necessary aspect, if it were not unconditional, then the subject would have to maintain certain conditions of immortality, such as having food and air available, and the problem of the subject would still be valid, even though it had been partly solved.

§75 I Am Alive

¶1 The true solution to the problem of the subject effectively annihilates the freedom and the condition that constitute the problem, but by fulfilling the condition. That is, the solution must annihilate the problem of the subject, it must annihilate the self, by making the

subject immortal. Once the problem of the subject is solved, there is no self, but there still would be a subject.

¶2 This explains why suicide is not the solution to the problem of the subject, although it does effectively eliminate the problem. As we can see, in order to realize that suicide is not the solution, but rather a failure, it is necessary to distinguish between the self and the subject.

¶3 These reflections finally allow us to step out of the primitive self. The primitive self is the only certainty, but it is not the only thing that there is, because it needs, at the very least, a subject that sustains it. In order to establish this first step outwards, we must study the subject. And we have some bits of information to study the subject from the starting point of its self.

¶4 One is that the subject identifies with its self. Since the self is a problem, the solution to the problem must be of maximum importance to the subject. And the solution, as we know, must fulfill the condition, which is to not die. So that the subject's greatest interest is to live: the subject is alive.

¶5 Besides, we know that the subject must have symbolism available in order to sustain the self, which is syntactic. This means that it has a syntactic layer that can represent problems, resolutions, and solutions, a layer that the self inhabits, and a semantic layer in which it executes the solutions that help it to not die, that is, to live: the self is part of the subject.

¶6 In short, the self is part of a subject that is alive. And if the self is part of life, it must be because the problem of the subject is part of a more general problem, specifically the problem of survival, which is the name we give to the problem that defines life.

$$\begin{array}{rcl} \text{Self} & \subset & \text{Life} \\ \| & & \| \\ \text{Problem of the Subject} & \subset & \text{Problem of Survival} \end{array}$$

§76 The Problem of Survival

¶1 Just as by introspection we could find something out about the problem of the subject, we know nothing about the problem of survival other than that it is a problem. And since we know nothing, we will take nothing for granted, we will suppose nothing.

¶2 This not supposing anything is, in particular, the basis of the

theory of subjectivity, and, besides being reasonable not to suppose anything when we know nothing, it is also consistent, as the development of the idea will show. I will repeat this another way in order to highlight its importance. Life is a problem, and it is nothing more than a problem. All of the theory of subjectivity derives from this postulate, and that is why EPA[35] merely presents the problem and resolves it.

¶3 Thus, according to the classification of problems that we saw in §68, page 65, the problem of survival is an apparent problem, because it does not provide any information. The problem of survival is the universal problem, of which all other problems form a part, and it consists solely of freedom and of condition, because it is an apparent problem.

Problem of Survival = Apparent Problem

¶4 The problematic nature of the self, which makes it equivalent to the problem of the subject, caused us to study the theory of the problem. Now the apparent nature of life, which makes it equivalent to the problem of survival, causes us to study the apparent problem.

Life ⇨ The Apparent Problem

§77 The Apparent Problem

¶1 The essential characteristic of an apparent problem is that it does not provide any information. Nothing at all is known, either about which resolutions are the most favorable or about the very condition of the apparent problem. That is, the condition is unknown and therefore cannot even be enunciated. In other words, faced with an apparent problem, the only permissible action is to try to resolve it. That is why the apparent problem is a pure problem, or a minimal problem, or, to put it even another way, it is the problem without information. To be exact, the only information that an apparent problem provides is that it is a problem, that it is not anything else.

¶2 Apparent problems are so peculiar that our first impression may incline us towards not paying them the attention they deserve. Since there is no information available, any resolution is equally valid, and, at first, it seems that there is no more to say. It is true that it seems

[35] CASARES, R. (1999): *El problema aparente*.

so, but it is false, because there are ways of going further.

¶3 If we only have one opportunity to resolve an apparent problem, then we can choose the resolution by chance, because no other choice is reasonably better, or worse, either. Once the resolution is executed, we may have solved the problem, or we may not have solved it. In either case, we now have one bit of information about the problem, that is, whether the resolution we carried out solved it or not. Therefore, if we can execute other resolutions, and pass the information obtained from the executed resolutions to the new ones, then we have achieved a way of resolving the problem that is better than pure chance, because it uses more information.

¶4 Darwin's[36] evolutionary process uses this method of repeating resolutions to face the apparent problem of survival. Basically, each living being is a resolver of the problem of survival that, before it fails and dies, replicates, by itself or in couples. The resulting replicas are not always perfect and include information about its way of resolving the problem of survival. In order for the replicas, in turn, to make replicas, the first replicas need to defeat death, at least until the new replicas are alive; this screening process is called selection. The distinction between solution and resolution is crucial here, because all living beings are mortal, so they are not solutions, but they are resolvers.

¶5 The name of the apparent problem makes sense because, as we can see, the only thing that we know about it is its appearance, that is, its external reaction to our actions to try to resolve it; it shows us nothing of its interior. It is as if we were trying to open a safe by manipulating its external devices but without any information about the opening mechanism. This manner of speaking can, nevertheless, lead to error, because it takes for granted that the apparent problem has an interior that is responsible for its external appearance. This supposition, although it seems inevitable, is illicit and is called logicism; we will take a look at this later on, in §95.

¶6 The apparent problem is what Klir[37] called the pure black box problem.

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[36] Darwin, Ch. (1859): *On the Origin of Species*.

[37] Klir, G.J. (1969): *An Approach to General Systems Theory*.

§78 Evolution and Resolution

¶1 The apparent problem models the epistemological aspects of life. This means that it does not take into consideration anything that does not affect knowledge, no matter how important it may be for life itself. For example, it does not take into consideration the details related to how the replicas are made. But at the same time, when we define life as an apparent problem, we are generalizing life, because life is not committed to the organic chemistry that makes it possible in the form that we know it.

¶2 So, if all of this is correct, there ought to be a correspondence between the theoretical resolution of the apparent problem and Darwinian evolution, in which each theoretically favorable resolution corresponds to some step that life has actually taken. For example, if making models of the exterior is shown to be better than not making them for resolving the apparent problem, then we must conclude that the evolutionary process will favor those individuals that genetically code the mechanisms for forming models of the environment.

$$\text{Resolution of the Apparent Problem} \iff \text{Darwinian Evolution}$$

¶3 If the apparent problem generalizes life, the apparent problem's resolution will generalize Darwinian evolution. We will now try to prove the validity of this correspondence between the theoretical resolution of the apparent problem and Darwinian evolution, but in order to prove it we will have to develop a theoretical resolution for the apparent problem. The first thing we need to do in order to develop this theoretical resolution is to formalize the apparent problem. The formalized apparent problem is even farther from the life that it defines than the apparent problem is, so that formalization may introduce distortions in the definition. Despite this reservation, the next step for moving outward from the primitive self will consist of formalizing the apparent problem in order to attack it theoretically.

$$\text{Apparent Problem} \Rightarrow \text{Formalizing the Apparent Problem}$$

§79 The Universe

¶1 As we have presented it, an apparent problem is a problem in which there is no information, but we should make this a bit more explicit. In an apparent problem, there is freedom to act and the

condition that the reactions be good, not bad. That is, the condition of the apparent problem is the minimum condition possible, and the relationship between the actions executed and the reactions received is completely unknown. We will call the hypothetical object that relates the actions with the reactions the environment or universe, and we can thus rewrite the previous sentence: in the apparent problem the environment or universe is completely unknown, and could even be non-existent.

¶2 An apparent problem cannot be solved *a priori*, that is, theoretically, because, as we saw in §77, in principle and because there is no information available, any resolution is equally reasonable. In other words, faced with an apparent problem it is impossible to design a solution and argue reasonably that it is a solution, because you simply do not have information to make any kind of argument. In order to obtain information about the apparent problem, as we also saw, you have to face it repeatedly.

¶3 What reliable information can be obtained about an apparent problem? In principle, what we obtain is the reliable information that when the resolution that we will call $\Re$ has been executed, after the series of resolutions $\Re_0, \Re_1, \ldots \Re_t$, the problem is solved, or not; one or the other depending on what happened to be the case. If we repeat the resolution $\Re$, however, we cannot insure that the result will repeat itself, because now the series of resolutions already executed is not $\Re_0, \Re_1, \ldots \Re_t$, but $\Re_0, \Re_1, \ldots \Re_t, \Re$. That is, the environment may have memory and react differently to the same actions depending upon its state. And besides, it could also happen that the relationship between the actions executed and the reactions received had an aleatory component, second reason why the repetition of the actions does not insure a repetition of the reactions.

¶4 Thus, the information about the environment obtained when we face an apparent problem takes the form of a probabilistic finite automaton. It is an automaton, not a function, because the environment may have memory. It is finite, not because of the universe, which may not be, but because of the limitations of the apparatus of representation itself. And it is probabilistic, once again, because the environment may be. The universe, then, can be any probabilistic finite automaton; or at least, with these specifications, the apparent problem can be formalized.

¶5 Now that we have reached this point, we need to stop once more to admire the scenery before we continue.

§80 Time and Space

¶1 In order to formalize the apparent problem we have subreptitiously introduced two concepts: time with memory and space with action and reaction.

¶2 We have already seen that, in order to resolve the apparent problem better than just by chance, it was necessary to pass information about the resolutions already made, the past resolutions, to the resolutions that are being tried, that is, the present resolutions. This is why a first temporal distinction between past and present seems necessary.

¶3 Action and reaction, which together we will call interaction, need an inside and an outside in order to distinguish the two directions, because the action goes from inside to outside, it goes outward, and the reaction comes from outside inside, it enters. This is why a first spatial distinction between inside and outside, between the interior and the exterior seems necessary.

¶4 In the original definition of the apparent problem, we used concepts such as freedom, condition, and information, but not time or space. I believe, however, that the spatial-temporal concretion of the apparent problem is what best formalizes the problem of survival because it allows us to frame fundamental concepts such as thing and death, or noun and verb, with space and time, respectively. Besides, meaning appears to relate the resolver's internal conditions with the conditions that are external to it. And the reasoning that fills the next two sections builds a foundation for the irreversibility of time, and, by doing so, gives the future its open character. But we must not forget that, at least in theory, the apparent problem could be specified in other ways.

§81 Knowledge Is Provisional

¶1 Repeating a resolution that previously solved an apparent problem does not insure solving it this time. We have already seen that this could happen if the universe is now in a non-propitious state, or just because chance goes against it. No matter how shrewd we are, we will never be able to be certain of being right with a prediction about an apparent problem outcome. The information that can be obtained from an apparent problem is provisional.

¶2 The information obtained from the apparent problem corresponds, in Darwinian evolution, to the knowledge about the universe that life can achieve. Consequently, what this abstract property,

obtained in the theoretical resolution of the apparent problem, means for life is that knowledge is provisional, hypothetical, tentative, and never certain.

¶3 There is no knowledge that is absolutely certain, and even though the sun appears every day in the east, and our prediction that tomorrow the sun will come up in the east has been correct a thousand times or more, even so, we cannot claim with assurance that tomorrow the sun will come up in the east.

¶4 Even genetically coded information is provisional. This is why genetic information can become dysfunctional, causing the species' extinction in serious cases. This same conclusion also applies to our perception, which we inherit genetically, and which determines the things that we see, and to our emotional system, which we also inherit genetically, and which gives meaning to the things. Forgetting this causes the error that we call objectivism or, more generally, logicism. We will present this in §95.

§82 Life Is Paradoxical

¶1 We cannot insure that the resolution that we are now going to attempt will solve the apparent problem that we face, as we have just shown. And because we can never insure the solution, it turns out that the apparent problem has no definitive solution. And if the solution of a problem does not annihilate it definitively, then it is not, in all purity, a solution. And so we arrive at the most summarized formulation of this property: apparent problems have no solution.

¶2 This means that every apparent problem is paradoxical and consequently, according to the conclusions reached in §73, page 70, every apparent problem is stable because it cannot stop being a problem.

¶3 Transposing, once again, from the theory of the problem to life, we conclude that life is paradoxical and, as a result, even if it is a problem, it remains unresolvable as such. Life is problematic, and besides, it cannot stop being so, because it is paradoxical.

§83 Automatic Algebra

¶1 We will not present any mathematical formulation of the apparent problem here, because it is too technical for the more philosophical ends of this essay; if you are interested, you can consult EPA §1.4, where you will find this formulation. Even so, we will describe the formulation of EPA sufficiently to capture the most interesting epistemological aspects.

¶2 Because we formalized the universe as a probabilistic finite automaton in §79, page 75, the formalized apparent problem will be set forth in a logic that will allow us to represent probabilistic finite automata, in addition to problems, resolutions, and solutions. Our formalization uses the algebra of automata, or automatic algebra, which is a symbolic logic and which allows us to represent binary, synchronous, and probabilistic finite automata (EPA §A).

§84 Automata

¶1 But what is an automaton? An automaton takes data from the exterior and produces data that it emits to the exterior. We will call the first type of data input and the second type output. The output depends as much on the input as on the state of the automaton. Besides, the automaton changes states, and the state transitions also depend on the state and on the input.

¶2 The description we have just given of an automaton is somewhat theoretical, and so we will give an example that will help to pin down the concept. We can say that a calculator with memory is an automaton, because it produces data, the numbers it shows on its screen, and it takes in data, the numbers and operations that we punch in. Besides, the results depend, at times, on the contents of the memory, and the contents of the memory depend on what we punch in and on its own content.

¶3 There are more examples. An animal's nervous system takes data from the exterior through the animal's senses and produces data that its muscles and glands transform into actions. In addition, the data produced depend as much on perception as on the internal state of the animal; an animal does not act the same way if it is thirsty as if its thirst is slaked.

¶4 The automaton is a very general model, especially if we keep in mind that an automaton without memory is still an automaton. If we take a good look at it, an automaton without memory is an automaton with a single state, that is, an automaton that simply never changes state. The automaton's memory is the measure of its number of states.

¶5 It is such a general model that any data processing system can be seen as an automaton, even computers. In particular, the most common computers at present, which fit VON NEUMANN[38] architecture,

[38] NEUMANN, J.VON (1945): *First Draft*.

are binary and synchronous finite automata. Computer networks are also automata, Internet included, which is not synchronous because it has no reference clock.

¶6 The computer is especially important because, ignoring physical limitations, it is an automaton capable of imitating any other automaton, that is, it can behave like any other automaton if it has the right program. Technically, the computer is a universal processor $\mathcal{P}_{\mathfrak{U}}$, that we will present in §105.

¶7 Automatic algebra employs binary, synchronous, and probabilistic finite automata. A binary finite automaton employs a coding of the data based on two symbols that are conventionally 1 and 0. Binary coding is the simplest and that is why we use it, without suffering any loss of generality. A synchronous finite automaton uses a single clock signal as a reference that marks when all the value changes of the output and state data happen. Synchrony, which consists of assuming that all operations have the same duration, is conceptually simpler than asynchrony, which requires us to keep in mind the different execution times of each operation; this is why we use synchrony without suffering any loss of generality, either. In the following sections, we will not repeat that the finite automata that we refer to are binary and synchronous, as it does not affect the results.

¶8 Having seen this, you can simply remember the following trick to identify finite automata and forget about everything else that was said in this section. If it can be programmed on a computer, that is, if a computer can do it, then a finite automaton that can do it exists, too, and *vice versa*.

§85 Behavior

¶1 'Behavior' is a generic word that we already talked about in §10, page 17, but that we use in a technical way here, with a precise definition (see EPA §A.5.5).

¶2 We say that two automata have the same behavior if it is not possible to distinguish them from the outside. In their interior they may be different, and, for example, one can use more states than the other, but if it is impossible to distinguish one from the other by managing the input and observing the output, then we say that the behavior of both is identical. Therefore, if we are indifferent to the internal construction of the automata, as is the case in this theoretical investigation, then we are only interested in the automata's behavior. In conclusion, we will consider 'automaton' and 'behavior'

to be synonymous words, even though we know that there is a technical difference between them, which interests engineers, but not us (see EPA §1.4.3).

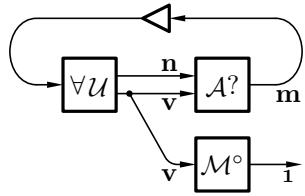
¶3 There is, nonetheless, a matter that may worry you. Sometimes we talk about automata capable of various behaviors, and this seems to be a contradiction. There is no trick; it is possible and has been demonstrated mathematically by TURING[39]. The palpable proof is the computer, which is capable of various behaviors. The subtlety consists of considering there to be two types of input, the ordinary kind and another kind, called the program, that specifies the behavior. If we take automaton $\mathcal{A}$ and fix its program to some specified value, and we observe the ordinary input and output, but ignore the program, then automaton $\mathcal{A}$ will behave like a certain automaton $\mathcal{B}$. But if we fix the program to a different value and observe automaton $\mathcal{A}$ the same way, then it will behave, in general, as a different automaton, let us call it $\mathcal{C}$. Thus, what the program achieves is that an automaton extended with a program imitates other automata. Of course, if we look at all the data, including the program, then the automaton extended with a program also has only one behavior.

§86 Formalizing the Apparent Problem

¶1 When we use automatic algebra to formalize the apparent problem, the solution we are searching for must be a probabilistic finite automaton, that is, a behavior, that we will call $\mathcal{A}$, that will occupy the place of the unknown in the problem, and so we will call it $\mathcal{A}$?. As far as the universe, which we will represent by $\mathcal{U}$, goes, we know that it is another probabilistic finite automaton, but we know nothing more, so that it could be any probabilistic finite automaton; we will indicate this with $\forall\mathcal{U}$. In addition, we know that in the apparent problem the unknown and the universe interact. Finally, we have to check that the universe's reactions are good, for which we will use a known measurement that will be another probabilistic finite automaton $\mathcal{M}^\circ$.

¶2 All of these automata form the following circuit that represents the formalized apparent problem in automatic algebra (EPA §1.4.1).

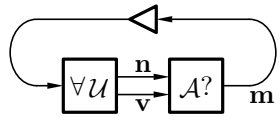
[39] TURING, A.M. (1936): *On Computable Numbers.*



¶3 The boldface **n** indicates the part of the input that does not directly influence the solution of the problem; this is the neutral input. The input data that do influence the solution are marked by the boldface **v**; this is the valued input. The output is indicated with the boldface letter **m**.

¶4 The measurement $\mathcal{M}^\circ$ uses a copy of the valued input **v**. If its output is set to the value 0, then the automaton $\mathcal{A}$ will have failed as a solution to the problem. As for $\mathcal{M}^\circ$, we have only said that it is a known automaton, and this is too generic. In order to pin down these explanations, we will take a valid but simple case of $\mathcal{M}^\circ$: it sets its output to 1 if the majority of the input values, at that moment, are 1, and otherwise to 0.

¶5 This being the case, the solution to the problem, $\mathcal{A}$, should be capable of generating at every moment, whatever $\mathcal{U}$ is, a majority of 1 values in the valued input **v**. This is what we are left with out of all the formalized apparent problem, and this is sufficient to follow the explanations that are coming next.



§87 Notation

¶1 The calligraphic letters that accompany some words may be making you uncomfortable. They are useful for pointing out the formal concepts defined mathematically: for example, with one glance, you can determine that the body $\mathcal{B}$ that I refer to is the body defined in the theory, and no other. It is worthwhile to put up with them, because they reduce the text's ambiguity. In exchange, they may hinder reading, but then again, they may not, if you learn to ignore

them after a bit.

¶2 And with these particulars, we are now ready to resolve the formalized apparent problem, as we proposed in §78, page 75. Let us keep in mind that we are trying to design an automaton $\mathcal{A}$ capable of generating at every moment, and whatever the universe $\mathcal{U}$ that it faces is, a majority of 1 values in the valued input $\mathbf{v}$.

Formalizing the Apparent Problem ⇨ Resolution

§88 The Formal Mechanism

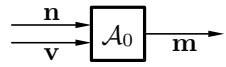
¶1 In order to formalize the fact that nothing is known about the universe, we have said that the universe $\mathcal{U}$ could be any finite automaton. It can, for example, be the automaton that always produces 0 values as its output. We will call this universe $\mathcal{U}$ that only produces 0 values the universe $\mathcal{U}_0$. Since it can be any universe at all, it could also be the universe that always produces 1 values, and we will call this universe $\mathcal{U}_1$.

¶2 So then, given that the universe $\mathcal{U}$ can be any one at all, it could also be the universe $\mathcal{U}_0$. And if the universe $\mathcal{U}$ were the universe $\mathcal{U}_0$, then no automaton $\mathcal{A}$ could solve the problem, because there would never be a majority of 1 values in the valued data. Exactly the opposite would happen if the universe $\mathcal{U}$ were the benevolent universe $\mathcal{U}_1$, because in that case any automaton $\mathcal{A}$ would solve it.

¶3 What happens, then, is that the formalized apparent problem has no definitive solution, but that it depends on what the universe $\mathcal{U}$, about which we know nothing, is like. This doesn't reveal anything new, except that formalization conserves this fundamental characteristic of the apparent problem, that is, that the apparent problem is paradoxical, as we saw in §82, page 78.

¶4 Fantastic, but how can we resolve the apparent problem with so much indetermination? Although there is no definitive solution that is valid in every possible universe $\mathcal{U}$, each concrete automaton $\mathcal{A}$ will solve it in specific universes $\mathcal{U}$ from the total of all possible ones. Let us take two automata, for example, $\mathcal{A}_a$ and $\mathcal{A}_b$. Suppose that automaton $\mathcal{A}_b$ solves the problem in all the possible universes in which automaton $\mathcal{A}_a$ solves it and, in addition, in others. In this case we could affirm that, in spite of all the indetermination, automaton $\mathcal{A}_b$ is better than automaton $\mathcal{A}_a$.

¶5 In order to keep improving our resolution of the formalized apparent problem, we will show that, if a specific automaton solves it in certain universes, then we can construct another automaton that will also solve it in these universes, and, additionally, in others (EPA §1.5). To start the sequence, we will arbitrarily take an automaton, which we will call a mechanism, and which we will indicate as $\mathcal{A}_0$ because it will serve as the reference. The form of the mechanism $\mathcal{A}_0$ is the minimum that is sufficient in order to occupy the place of the unknown $\mathcal{A}$? in the formalized apparent problem (EPA §1.6).



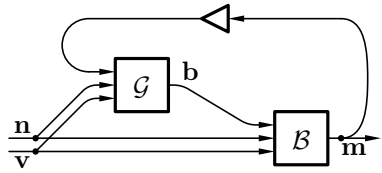
§89 The Formal Adaptor

¶1 The mechanism $\mathcal{A}_0$ has a behavior that will solve certain universes $\mathcal{U}$, so that an adaptor $\mathcal{A}_1$ capable of behaving like a mechanism $\mathcal{A}_0$ and in other ways besides, could solve more universes. This observation permits us to design an adaptor $\mathcal{A}_1$ that improves the mechanism $\mathcal{A}_0$. Let us take a look at this.

¶2 The adaptor $\mathcal{A}_1$ is made up of a body $\mathcal{B}$, capable of various behaviors, and of a governor $\mathcal{G}$, that chooses which of the behaviors will be executed.

- The body $\mathcal{B}$ is an automaton capable of behaving like the mechanism $\mathcal{A}_0$ and in other ways besides, so that it is, technically, an extension of the mechanism $\mathcal{A}_0$. Although technicalities do not interest us here, it is important to know that, given any finite automaton, it is always possible to construct an extension of it, and, as this does not depend on any condition, we say that the design of the body $\mathcal{B}$ is specified.
- The governor $\mathcal{G}$ is another automaton whose purpose is to order the body $\mathcal{B}$*'s* behavior. The design of the governor $\mathcal{G}$ is not specified, but if it fulfills a condition that we will call the condition of the governor, then the adaptor $\mathcal{A}_1$ solves, at the very least, all of the universes $\mathcal{U}$ that the mechanism $\mathcal{A}_0$ also solves. Consequently, the adaptor $\mathcal{A}_1$ will assuredly be as good or better than the mechanism $\mathcal{A}_0$. The condition of the governor is verified if, when the adaptor $\mathcal{A}_1$ faces a universe $\mathcal{U}$ that the mechanism $\mathcal{A}_0$ solves, its governor $\mathcal{G}$ orders the body $\mathcal{B}$ to behave in precisely the same way as the mechanism $\mathcal{A}_0$.

Finally, in order for the governor $\mathcal{G}$ to be in the best position to fulfill the condition of the governor, it must receive all of the data. Thus, we reach the definition of the form of the adaptor $\mathcal{A}_1$ (EPA §2).



¶3 We have used an automaton, the body $\mathcal{B}$, with various behaviors here, as we mentioned previously in §85, page 80. The data **b** that the governor $\mathcal{G}$ prepares, constitute the body $\mathcal{B}$'s program, while the neutral input **n** and the valued input **v** are, in this case, the ordinary input.

§90 Comparing Adaptors

¶1 In order to show that the equivalence between the resolution of the apparent problem and Darwinian evolution, proposed in §78, page 75, is actually verified, we will see that the formal adaptor $\mathcal{A}_1$ corresponds to the evolutionary adaptor presented from §8 to §12 in the entry path.

¶2 A formal adaptor $\mathcal{A}_1$ is a finite automaton divided in two parts, a body $\mathcal{B}$ capable of various behaviors and a governor $\mathcal{G}$ that chooses the body's behavior. Thus defined, this formalized adaptor $\mathcal{A}_1$ does not look very much like the evolutionary adaptor that placed a network of objects between the phenomenon and the action. What happens is that the resolutive formal adaptor $\mathcal{A}_1$ is more general than the evolutionary adaptor of the entry path, which it includes. Because the evolutionary adaptor chose the behavior according to the objects present and, therefore, perception, which was the part that determined which objects were present, was, by this very action of determining the objects, what chose the adaptor's behavior. So, according to the formalization that is carried out, perception does the job of the governor $\mathcal{G}$, but in a concrete way, using objects.

¶3 The relation between both adaptors is made patent when we indicate, on the diagram of the evolutionary adaptor shown in §8, page 15, the parts of the formal adaptor $\mathcal{A}_1$ that carry out the processing of data represented by each arrow.

$$\text{Phenomenon} \underbrace{\xrightarrow{\mathcal{G}} \text{Object} \xrightarrow{\mathcal{B}}}_{\text{Adaptor}} \text{Action}$$

§91 Improving the Body

¶1 The formal resolution of the apparent problem took us from the mechanism $\mathcal{A}_0$, with only one behavior, to the adaptor $\mathcal{A}_1$, which improved the mechanism's action because it was capable of various behaviors. In the same way, an adaptor $\mathcal{A}_1$ can improve another adaptor if it is capable of more behaviors. There is little more to say about this quantitative line of resolution improvement, which tends to increase the body $\mathcal{B}$*'s* versatility; but we must not forget it when we make the next qualitative leap, even if it will be a much more spectacular one.

§92 Foresight

¶1 When the formal adaptor $\mathcal{A}_1$ was defined, its body $\mathcal{B}$ was specified, but as far as its governor $\mathcal{G}$ is concerned, we only established a sufficient condition for improving the mechanism $\mathcal{A}_0$, the condition of the governor. So now, in order to design a learner $\mathcal{A}_2$ that will improve the adaptor $\mathcal{A}_1$, we will focus on improving the governor $\mathcal{G}$.

¶2 The governor $\mathcal{G}$*'s* task, which consists of choosing the body $\mathcal{B}$*'s* behavior, can be done in several ways. If the universe $\mathcal{U}$ were fully known, which is not the case with an apparent problem, then a governor $\mathcal{G}$ could be designed that would systematically choose the optimal behavior, without ever erring and, therefore, with no need to ever rectify its choice. We will call any non-rectifying governor a mechanical governor. At the opposite extreme, we have Ashby's[40] homeostat, which chooses behavior by chance, but rectifies the behavior, making another equally aleatory choice, when the valuation obtained does not reach a certain threshold. In this way, it is certain that only those behaviors of the homeostat whose value is above this threshold are stable.

¶3 A continuum can be established from the mechanical governor, that never rectifies the chosen behavior, to the homeostat, that puts all of its trust in rectification, because it chooses without any criteria.

[40] Ashby, W.R. (1956): *An Introduction to Cybernetics*.

We will call a governor $\mathcal{G}$ that tests a tester; that is, the tester employs a trial-and-error procedure. The homeostat is then an extreme example of a tester.

¶4 A governor $\mathcal{G}$ that tests does not foresee, but tries a behavior, and if it doesn't solve the problem, tries another. The case of the mechanical governor $\mathcal{G}$ is worse, because, in addition to not foreseeing anything, it is incapable of rectifying if the behavior is bad, something that the tester is able to do. A better way of choosing behavior consists of foreseeing its effect before executing it, because, if the prognosis is exact, it avoids suffering the errors inherent to the trial-and-error procedure. Thus, the difference between a learner $\mathcal{A}_2$ and an adaptor $\mathcal{A}_1$ is that the learner $\mathcal{A}_2$ foresees the future, and the adaptor $\mathcal{A}_1$ does not. In order to foresee the result of executing a behavior, it is necessary to have an internal model of the exterior available; we will call this model reality $\mathcal{R}$. And with these reasonings, we can now design a learner $\mathcal{A}_2$.

§93 The Formal Learner

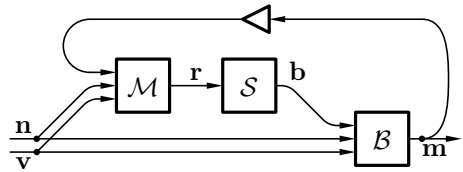
¶1 The learner $\mathcal{A}_2$ has three parts: a body $\mathcal{B}$, capable of various behaviors, a modeler $\mathcal{M}$, that models the exterior, and a simulator $\mathcal{S}$, that chooses the current behavior comparing possible behaviors with each other on the basis of their effects as predicted by the model.

- The learner $\mathcal{A}_2$'s body $\mathcal{B}$ is capable of various behaviors, the more the better, as we saw in §91, page 86, but it has at least all the behaviors the adaptor $\mathcal{A}_1$ has, in order to surpass it. Technically, the learner $\mathcal{A}_2$'s body $\mathcal{B}$ is an extension of the adaptor $\mathcal{A}_1$'s body $\mathcal{B}$ and its design is, therefore, specified.
- The modeler $\mathcal{M}$'s task consists of searching for a model of the exterior universe $\mathcal{U}$, a model that we will call reality $\mathcal{R}$. The modeler $\mathcal{M}$ observes the action that the learner $\mathcal{A}_2$ itself carries out upon the universe $\mathcal{U}$ and the universe's reactions, and, with these data, makes reality, which is a behavior, that is, an automaton $\mathcal{R}$. If reality $\mathcal{R}$ is indistinguishable from the exterior universe $\mathcal{U}$, then it serves to make accurate predictions and we say that it fulfills the condition of the modeler.
- The simulator $\mathcal{S}$ orders the behavior and, in order to choose it, can use reality $\mathcal{R}$ and so foresee its consequences before it executes the behavior. The simulation is completely internal for the learner $\mathcal{A}_2$; it receives reality $\mathcal{R}$ from the modeler $\mathcal{M}$ and emits behavior to the body $\mathcal{B}$; that is why its design is completely

specified.

We will show that the condition of the modeler is a sufficient condition for the learner $\mathcal{A}_2$ to surpass the adaptor $\mathcal{A}_1$. If the learner $\mathcal{A}_2$ fulfills the condition of the modeler, that is, if the predictions of reality $\mathcal{R}$ are accurate, then the learner $\mathcal{A}_2$ can simulate perfectly the situation that the adaptor $\mathcal{A}_1$ faces. But the learner $\mathcal{A}_2$ has the advantage of avoiding the actual execution in the exterior universe $\mathcal{U}$ of the foreseeably worst behaviors, which coincide with the worst behaviors, because we are supposing that the predictions are correct.

¶2 The form of the learner $\mathcal{A}_2$ is shown in the following figure (EPA §3).



¶3 The data **r** allow the modeler $\mathcal{M}$ to communicate what reality $\mathcal{R}$ is like to the simulator $\mathcal{S}$. Since reality $\mathcal{R}$ is an automaton, the data **r** specify a behavior, so they are a program (see §85, page 80). So the simulator $\mathcal{S}$ receives a program **r** that describes the behavior of the exterior universe $\mathcal{U}$, and in response emits another program **b** that describes what the body $\mathcal{B}$'s behavior should be.

§94 Internal Logic

¶1 The learner $\mathcal{A}_2$ must have various possible representations of the exterior universe $\mathcal{U}$, which can be any kind of universe, the more the better. The more representations it has, the more probable it is that it will have one that behaves up to that moment like the universe $\mathcal{U}$, and thus will make better predictions, and work as reality $\mathcal{R}$. That is, the learner $\mathcal{A}_2$ needs to have an internal system of representation that we will call internal logic. This internal logic must also represent internally its body $\mathcal{B}$'s behaviors in order to simulate their effects. This explains the existence of somatic maps in the learners' brain.

¶2 Just as in automatic algebra both the universe $\mathcal{U}$ and the body $\mathcal{B}$ are finite automata, the learner $\mathcal{A}_2$'s internal logic must be capable of representing finite automata, or behaviors, the more the better.

§95 The Problem of the Learner

¶1 The simulator $\mathcal{S}$ has to resolve a problem similar to the problem of survival, but, instead of being up against any universe, $\forall\mathcal{U}$, it is up against the best model found by the modeler $\mathcal{M}$, the model we call reality $\mathcal{R}$. This problem, which we will call the problem of the learner, is not an apparent problem, because the simulator $\mathcal{S}$ uses reality $\mathcal{R}$ as information.

¶2 The problem of the learner is not apparent, because the appearance remains in the problem that the modeler $\mathcal{M}$ faces. If we forget this, we may confuse reality $\mathcal{R}$ with the exterior universe $\mathcal{U}$, a sin which we will call logicism. It is a sin because, even if reality $\mathcal{R}$ has predicted everything accurately up to now, we can never be sure that the next prediction will be correct. The universe continues to be completely unknown, that is, it can be any universe, $\forall\mathcal{U}$. The universe $\mathcal{U}$ can, for example, be one that behaves just like reality $\mathcal{R}$ until the following instant, in which it ceases to behave like reality. Another consequence of this argument is that it is not possible to verify if the condition of the modeler is fulfilled or not.

¶3 But even if it is a sin, the simulator $\mathcal{S}$ works with the logicist hypothesis, that is, as if reality $\mathcal{R}$ were the exterior universe $\mathcal{U}$, because it has no better hypothesis.

§96 Comparing Learners

¶1 Both the formal resolutive learner $\mathcal{A}_2$ as well as the evolutionary learner of the entry path (seen from §13 to §16) model reality, and both foresee the future, and so the relationship between them is clear. The evolutionary learner is a specific case of the resolutive learner $\mathcal{A}_2$, because the first one uses a reality of objects, while the second does not impose requirements on reality $\mathcal{R}$. Thus, for example, logicism, which appeared when we studied the formal learner $\mathcal{A}_2$, takes the form of objectivism when reality is objective.

¶2 In order to demonstrate the correspondence existing between both learners, we pointed out the parts of the formal learner $\mathcal{A}_2$ that carry out the data process represented by each arrow on the diagram of the evolutionary learner shown in §15, page 20.

$$\text{Phenomenon} \underbrace{\xrightarrow{\mathcal{M}} \overset{\mathcal{S}}{\underset{\curvearrowleft}{\text{Object}}} \xrightarrow{\mathcal{B}}}_{\text{Learner}} \text{Action}$$

§97 The Double Resolution

¶1 In order to take the next step for resolving the apparent problem, we must go back to the beginning of this resolution. At that point we saw, in §77, page 73, that the way of attacking an apparent problem, which has no definitive solution, consists of trying various resolutions and passing information from the ones already tried out to the ones that have not yet been tried. What we are interested in now is that, given that the apparent problem has no definitive solution, its resolution process consists of designing resolutions that keep getting better with the information obtained from previous resolutions; specifically, the mechanism $\mathcal{A}_0$, the adaptor $\mathcal{A}_1$, and the learner $\mathcal{A}_2$ are resolvers, not solutions.

¶2 That is why the resolution of the apparent problem has two levels. The upper level is carried out by the general resolution of the apparent problem corresponding to Darwinian evolution, for which all life, as a totality, must be considered as a single resolving being, as LOVELOCK[41] proposes. The lower level corresponds to the resolution that each individual living organism executes, since each one is a resolver.

§98 The Formal Knower

¶1 The mechanism $\mathcal{A}_0$, the adaptor $\mathcal{A}_1$, and the learner $\mathcal{A}_2$ are resolvers. Each one resolves problems in its own way, that is, each one searches, in one specific way, for a behavior that will solve the problem. Thus, just as the adaptor $\mathcal{A}_1$ is an improvement over the mechanism $\mathcal{A}_0$, simply because it is capable of more behaviors, the knower $\mathcal{A}_3$, which is what we call the next resolver of the formalized apparent problem, will be capable of more ways of resolving problems.

¶2 Because the knower $\mathcal{A}_3$ is capable of resolving problems in various ways, we can divide it into two parts:

- A mind $\mathfrak{M}$ that is capable of resolving problems in various ways.
- An intelligence $\mathfrak{A}$ that decides which way of resolving the problem should be executed at each moment.

In order for the knower $\mathcal{A}_3$ to improve the mechanism $\mathcal{A}_0$, the adaptor $\mathcal{A}_1$, and the learner $\mathcal{A}_2$, it is enough for its mind $\mathfrak{M}$ to be capable of resolving problems like each of these, and for the intelligence $\mathfrak{A}$ to satisfy the condition of intelligence, that is, to choose the mechanism $\mathcal{A}_0$'s manner of resolving the problem if the mechanism $\mathcal{A}_0$ solves

[41] LOVELOCK, J.E. (1979): *Gaia*.

it, the adaptor $\mathcal{A}_1$'s manner, if this solves it, and the learner $\mathcal{A}_2$'s manner, if this solves it (EPA §6).

$$\text{Problem} \underbrace{\xrightarrow{\mathfrak{A}} \text{Resolution} \xrightarrow{\mathfrak{M}}}_{\text{Knower } \mathcal{A}_3} \text{Solution}$$

¶3 The mind $\mathfrak{M}$'s design is completely specified and, as a last resort, the mind $\mathfrak{M}$ could be constructed by simply aggregating the mechanism $\mathcal{A}_0$, the adaptor $\mathcal{A}_1$, and the learner $\mathcal{A}_2$, and completing this aggregate with a selector that would allow a choice between these components. The task of the intelligence $\mathfrak{A}$ would consist, precisely, of managing the selector in order to choose one of the three. To summarize, we have a mind $\mathfrak{M}$ that permits the knower $\mathcal{A}_3$ to work at will as a mechanism $\mathcal{A}_0$, as an adaptor $\mathcal{A}_1$, or as a learner $\mathcal{A}_2$. But how should the selector be managed? In other words, how should the intelligence $\mathfrak{A}$ be designed?

¶4 As in the case of the governor $\mathcal{G}$ (see §92, page 86), the knower's intelligence $\mathfrak{A}$ can choose the resolution either mechanically, or by testing. Testing does not insure that the knower $\mathcal{A}_3$ is an improvement over the mechanism $\mathcal{A}_0$, the adaptor $\mathcal{A}_1$, and the learner $\mathcal{A}_2$. On the other hand, we might think that, because we have shown that the learner $\mathcal{A}_2$ is better than the adaptor $\mathcal{A}_1$, and the adaptor $\mathcal{A}_1$ is better than the mechanism $\mathcal{A}_0$, then the learner $\mathcal{A}_2$'s way of resolution should always be preferable. But we must remember that the improvements were, in each case, conditioned by the fulfillment of some specific requisites. Thus, the principal task of the intelligence $\mathfrak{A}$ will be to check to see if the condition of the governor is fulfilled or not, in order to discriminate between mechanization and adaptation, and if the condition of the modeler is fulfilled, to discriminate between adaptation and learning.

§99 Intelligence

¶1 The condition of the governor discriminates between the mechanism and the adaptor. We must remember that the adaptor $\mathcal{A}_1$ improves upon the mechanism $\mathcal{A}_0$ if it fulfills the condition of the governor, that is, if the adaptor $\mathcal{A}_1$ behaves like the mechanism $\mathcal{A}_0$ when the mechanism is the solution in a universe $\mathcal{U}$. What happens in these circumstances is that the adaptor $\mathcal{A}_1$ and the mechanism $\mathcal{A}_0$ have identical behavior, with the mechanism's behavior being simpler. We can deduce the first rule of the knower's intelligence $\mathfrak{A}$ from

this. The intelligence $\mathfrak{A}$, upon realizing that a mechanized behavior is the solution, will apply this mechanized behavior to avoid other more costly calculations that, working as an adaptor $\mathcal{A}_1$ or as a learner $\mathcal{A}_2$, it would have to carry out.

¶2 If, on the contrary, no mechanized behavior solves the problem (we will describe this case rather inaccurately as an unsatisfied condition of the governor), then a more complex resolution is required, either as an adaptor $\mathcal{A}_1$ or as a learner $\mathcal{A}_2$. In this case, the discrimination depends on the condition of the modeler. Because, if the condition of the modeler is fulfilled, that is, if the reality $\mathcal{R}$ that the modeler $\mathcal{M}$ finds foresees things with sufficient precision, then it is worthwhile for the knower $\mathcal{A}_3$ to work as a learner $\mathcal{A}_2$. But if the condition of the modeler is not fulfilled, if the previsions of the best reality $\mathcal{R}$ found are not trustworthy, then it is better for the knower to do without them and work as an adaptor $\mathcal{A}_1$. This is the second rule of the knower's intelligence $\mathfrak{A}$.

¶3 Thirst, which indicates that the present behavior is not solving the problem, is an example of an unsatisfied condition of the governor. And perplexity is an example of an unfulfilled condition of the modeler. Both feelings, because they are originated by unsatisfied desirable conditions, are painful, but thirst is physical and perplexity is mental. And so we discover two kinds of sentiments: corporal feelings, so classified because they depend upon the goodness or badness of the behaviors that the body $\mathcal{B}$ executes, and mental feelings, described thus because they depend on the goodness or badness of the resolutions that the mind $\mathfrak{M}$ carries out. So feeling is a complex issue that includes internal information about the bodily state and about the mental state.

¶4 We can say that all this information is organized in three maps: the somatic map, which represents the body $\mathcal{B}$, the mental map, which represents the mind $\mathfrak{M}$, and reality $\mathcal{R}$, which is the map that represents the exterior. In order for the three maps to be useful to the intelligence $\mathfrak{A}$, they must be conveniently related. We give the name meaning to the information that integrates the different mental and bodily, internal and external maps, and makes them cohere; this information is fundamental to the unitary working of the knower $\mathcal{A}_3$.

¶5 We will not go into greater detail here, such as the interesting illness called Camus disease, because a complete description would deflect our attention from the principal issues (if you are interested, you can see the discussion of this topic in EPA §6.4).

§100 Comparing Knowers

¶1 A comparison of knowers maintains the tendency observed in previous comparisons between the formal resolution of the apparent problem and Darwinian evolution (see §90 and §96): the formal knower $\mathcal{A}_3$ is more general than the evolutionary knower presented from §17 to §24. Both are capable of resolving problems in various ways, and this is the essence of the knower. But when we described the evolutionary knower at the entry path, we noticed that, of all the different ways that reality can be used, one of them consists of using it as a whole and others consist of using part of it. We saw, for example, how thirst could be a subproblem of a problem of survival that the evolutionary knower could face. In the case of the formal knower $\mathcal{A}_3$, the ways of resolving a problem are not limited.

¶2 Nevertheless, in order for the comparison to be exact, we must keep in mind that the evolutionary knower's semantic reality (seen in §24, page 27) includes, in addition to strict reality $\mathcal{R}$, also the somatic map, the mental map, and the meaning, which is the relationship between the other three, in its corresponding formal knower $\mathcal{A}_3$.

¶3 When we were investigating the feelings of the knower $\mathcal{A}_3$ in the previous section (§99), we discovered that the intelligence $\mathfrak{A}$ receives internal information, bodily as well as mental, and external information. Therefore, the emotional system, that corresponds to the formal knower's intelligence $\mathfrak{A}$, should be placed at the end of three arrows in the diagram of the evolutionary knower, although these three arrows are not shown because they would complicate the representation. Each of these three arrows would originate at one of the three arrows of the diagram of the learner; that is, these new arrows coming from other arrows would represent data from a new layer.

§101 Improving the Mind

¶1 The knower $\mathcal{A}_3$ is an improvement over its predecessors because it is capable of various resolutions, not just one. But by the same token, a knower $\mathcal{A}_3$ can be an improvement over another if its mind $\mathfrak{M}$ is capable of more ways of resolving problems. Thus, increasing the mind $\mathfrak{M}$'s versatility is the path for improving resolutors that was quantitative at first and most probably preceded the following qualitative improvement.

§102 The Formal Subject

¶1 The subject $\mathcal{A}_4$ is to the learner $\mathcal{A}_2$, as the knower $\mathcal{A}_3$ is to the adaptor $\mathcal{A}_1$, with the adaptor $\mathcal{A}_1$ and the learner $\mathcal{A}_2$ being in the layer of solutions or behaviors, and the knower $\mathcal{A}_3$ and the subject $\mathcal{A}_4$ in the layer of resolutions. That is, just as the adaptor $\mathcal{A}_1$ was capable of various behaviors and the learner $\mathcal{A}_2$ was, too, but with the possibility of foreseeing the effect of these behaviors, the knower $\mathcal{A}_3$ is capable of various resolutions and the subject $\mathcal{A}_4$ is, too, but with the possibility of foreseeing the effect of these resolutions. We will say that the subject $\mathcal{A}_4$ can reason about the resolutions.

¶2 In order to foresee the effect of the resolutions, it is necessary to comprehend the problem that the resolutions are facing. Thus, the subject $\mathcal{A}_4$ consists of three parts: an inquirer $\mathfrak{I}$ that searches for the best representation of the problem it is facing, reason $\mathfrak{R}$ that searches for the best possible resolution for the problem that the inquirer $\mathfrak{I}$ has found, and a mind $\mathfrak{M}$ that resolves the problem in the way decided upon by reason $\mathfrak{R}$ (EPA §7).

$$\text{Problem} \underbrace{\xrightarrow{\mathfrak{I}} \text{Resolution} \xrightarrow{\mathfrak{M}}}_{\text{Subject } \mathcal{A}_4} \text{Solution}, \quad \text{Resolution} \overset{\mathfrak{R}}{\circlearrowleft}$$

- The subject $\mathcal{A}_4$'s mind $\mathfrak{M}$ must be capable of various resolutions, the more the better, as we saw in the previous section (§101). But it must at the very least be capable of all of the resolutions the knower is capable of, in order to surpass the knower $\mathcal{A}_3$. Just as the knower $\mathcal{A}_3$'s mind $\mathfrak{M}$ is specified, so also is the subject $\mathcal{A}_4$'s mind, because in the end they could be the same.
- The inquirer $\mathfrak{I}$ searches for the best representation of the problem it is facing. We will call this representation the problem of the subject, or simply self $\mathfrak{X}$. If the problem encountered, the self $\mathfrak{X}$, were indistinguishable from the problem that the subject $\mathcal{A}_4$ is effectively facing, then we would say that it fulfills the condition of the inquirer.
- The task of reason $\mathfrak{R}$, to search for the best possible resolution for the problem of the subject, is specified because it is completely internal to the subject $\mathcal{A}_4$. That is, the determination of which is the best resolution for the problem $\mathfrak{X}$ found by the inquirer $\mathfrak{I}$, from among all the resolutions that the mind $\mathfrak{M}$ is capable of, can be made, as a last resort, by a systematic search.

The condition of the inquirer is a sufficient condition for the subject $\mathcal{A}_4$ to surpass the knower $\mathcal{A}_3$, because, if it is fulfilled, that is to say, if the inquirer $\mathfrak{I}$ finds a problem that is indistinguishable from the problem it is facing, then the subject $\mathcal{A}_4$'s reason $\mathfrak{R}$ can calculate ahead of time the goodness or badness of the resolution before undertaking it, and can thus avoid suffering the errors that the knower $\mathcal{A}_3$ is incapable of anticipating. This is so, even though it is impossible to verify that the condition of the inquirer is definitively satisfied; this is impossible because the subject $\mathcal{A}_4$ is facing an apparent problem.

§103 The Symbolic Subject

¶1 In order for the subject $\mathcal{A}_4$ to foresee the effect of the possible resolutions on the problems to be solved, it must be capable of representing problems and resolutions, and to do that, it must have a symbolic logic, with semantics and recursive syntax. We will now take these two steps, but we will take them one by one.

¶2 A first step towards converting the knower $\mathcal{A}_3$'s internal logic into a symbolic logic consists, as we saw in §70, page 67, in adding a syntactic layer to the preexisting logic, which we will call semantics because the knower's reality is semantic (see §100, page 93). That is, the knower $\mathcal{A}_3$'s logic, capable of representing the exterior universe $\mathcal{U}$'s behavior and the knower $\mathcal{A}_3$'s own behavior, as well as the conditions that its intelligence $\mathfrak{A}$ evaluates, become the semantic layer of the subject $\mathcal{A}_4$'s logic. And a syntactic layer appears over this semantic layer to complete the symbolic logic. Once the subject $\mathcal{A}_4$'s symbolic logic is constructed in this way, its solutions have to have the same nature as those of the knower $\mathcal{A}_3$ and of the learner $\mathcal{A}_2$; that is, they are automata $\mathcal{A}$, or behaviors. More than a limitation, this is a requisite. We call a logic with semantics and syntax a grammatical logic.

¶3 But since not just any syntax will do, it is necessary to take the second step. The more problems the subject $\mathcal{A}_4$'s logic is capable of representing, the more possibilities there are that it can represent the problem that it is facing at the moment. In addition, given the evolution of the mind $\mathfrak{M}$ towards increasing versatility (see §101, page 93), it is also necessary for the subject $\mathcal{A}_4$'s logic to represent the greatest possible quantity and variety of resolutions. In these circumstances, and keeping in mind that resolutions are syntactic transformations (as we saw in §70), the syntax must have the maximum expressiveness and, therefore, it must be recursive. In other words, the syntax

must be such that even the syntactic transformations themselves can be expressed. To conclude, and given that a symbolism is precisely any grammatical logic whose syntax is recursive, it turns out that the subject $\mathcal{A}_4$'s logic must be symbolic.

§104 The Chomsky Hierarchy

¶1 In order to understand the scope of the symbolisms, with their recursive syntaxes, we would do well to locate them in the Chomsky hierarchy of grammars. I will attempt to explain the situation without going into the most technical details, but if you wish, you can skip the entire trip through the theory of computation and proceed directly to §110, page 104, where the most important conclusions are summarized. Another possibility, which I recommend to you, is that you become interested in the theory of computation. A solid text such as those by Fernández and Sáez Vacas[42], by Carroll and Long[43], or by Arbib[44] can ease your introduction to this subject.

¶2 Grammar $\mathfrak{G}$ is the name given to the set of rules that allow us to construct all the syntactic expressions of a certain language $\mathfrak{L}$, which is how the set of correctly constructed syntactic expressions is defined. It is important to note that, with this technical definition and contrary to common use, language $\mathfrak{L}$ is equivalent to syntax, with semantics excluded. So that the first step in the analysis of a syntactic expression consists of deciding if it belongs to the language or not, that is, if it is correctly constructed or not. The mechanism that is capable of deciding if a specific expression belongs to the language $\mathfrak{L}$ is called a recognizer, and we say that it accepts the expression if it recognizes it as syntactically correct.

¶3 The Chomsky hierarchy of grammars identifies four types of languages that, I repeat, should be more correctly called syntaxes, each of which is associated with a type of grammar and with a type of recognizer. The difference between the simplest type of language in the hierarchy, regular language $\mathfrak{L}_3$, and the most complex, unrestricted grammatical language $\mathfrak{L}_0$, is the following. A finite automaton can, with a single sequential reading, that is, without needing to retrocede, recognize any syntactic expression of a regular language $\mathfrak{L}_3$; but to

[42] Fernández Fernández, G.; Sáez Vacas, F. (1987): *Fundamentos de informática.*

[43] Carroll, J.; Long, D. (1989): *Theory of Finite Automata.*

[44] Arbib, M.A. (1987): *Brains, Machines, and Mathematics.*

analyze a syntactic expression of a grammatical language $\mathfrak{L}_0$, it generally needs to transform it into other expressions, whose lengths are not limited, going forward and backward in the reading and writing of the expressions as much as necessary for the analysis.

¶4 Since the lengths of the intermediate expressions are not limited, an automaton that analyzes expressions from an unrestricted grammatical language $\mathfrak{L}_0$ will need to use a potentially infinite tape in order to retain them while it analyzes them, because the finite automaton's memory is, by definition, finite. We call a finite automaton with an infinite tape a TURING machine $\mathfrak{T}$. The tape is, then, another memory that the TURING machine $\mathfrak{T}$ uses specifically to retain syntactic expressions while it is analyzing them. The finite automaton of the TURING machine $\mathfrak{T}$ is called the processor $\mathcal{P}_{\mathfrak{T}}$.

$$\text{TURING Machine } \mathfrak{T} \begin{cases} \text{Processor } \mathcal{P}_{\mathfrak{T}} \\ \text{Tape} \end{cases}$$

¶5 In order to indicate that, if we write the syntactic expression $\mathfrak{e}$ on the tape of the TURING machine $\mathfrak{T}$ whose processor is $\mathcal{P}_{\mathfrak{T}}$ and we leave it functioning, then when it stops we will find the syntactic expression $\mathfrak{r}$ on the tape, we will use the following notation:

$$\mathcal{P}_{\mathfrak{T}}[\mathfrak{e}] \to \mathfrak{r}.$$

If, on the contrary, the TURING machine $\mathfrak{T}$ does not stop when we write the expression $\mathfrak{x}$, then we would say that $\mathfrak{x}$ is a paradox, and we would indicate this as follows:

$$\mathcal{P}_{\mathfrak{T}}[\mathfrak{x}] \to \infty.$$

¶6 Given any expression, the finite automaton $\mathcal{R}_3$ that is the recognizer for a certain regular language $\mathfrak{L}_3$ is always capable of deciding if the expression belongs to it or not, with a single sequential reading. But the most that we can insure about the TURING machine $\mathfrak{R}_0$ that is a recognizer of the grammatical language $\mathfrak{L}_0$ is that it may recognize the expression as belonging to this language, that it may recognize it as not belonging to this language, or that it may never finish analyzing it. In other words, paradoxes can be expressed in grammatical languages $\mathfrak{L}_0$.

¶7 We owe this important result, known as the halting problem, and closely related with GÖDEL's[45] undecidability theorem, to TURING[46]; we will study it in greater detail in §108. It is as if the atemporality or reversibility of non-restricted syntactic expressions, that can be examined with no limitations, going forward and backward, were to blame for paradoxes. And, based on the idea that time cannot be seen unless it is from an atemporal logic, I suspect that here we find the essence of time. But vertigo prevents me from continuing to investigate this matter, that was already examined in §48, page 45. Besides, it would distract us from another, more fundamental, discovery also by TURING in 1936.

§105 The Universal Turing Machine

¶1 There is a type of TURING machine, as we already announced in §85, page 80, that is called the universal TURING machine $\mathfrak{U}$ and that is capable of behaving like any TURING machine $\mathfrak{T}$. More specifically, a universal TURING machine $\mathfrak{U}$ interprets part of the syntactic expression, a part that we will call algorithm $\mathfrak{P}_{\mathfrak{T}}$, as the description of a specific TURING machine $\mathfrak{T}$ to imitate, which can be any one at all. So the result of analyzing the other part of the expression, the so-called arguments or parameters $\mathfrak{d}$, is, in every case, the same result that the TURING machine $\mathfrak{T}$ being imitated would obtain. That is to say:

$$\mathcal{P}_{\mathfrak{U}}[\mathfrak{P}_{\mathfrak{T}}(\mathfrak{d})] \equiv \mathcal{P}_{\mathfrak{T}}[\mathfrak{d}].$$

It is surprising that the TURING machine to be imitated can be any one at all, even the universal TURING machine $\mathfrak{U}$ itself. It seems quite simple to say that the imitator can imitate itself; however, the imitator is an imitator because it imitates someone, so that, in this case, a part of the arguments $\mathfrak{d}$ is the algorithm $\mathfrak{P}'$ that describes the machine that the imitated imitator imitates. It's clear, isn't it?

$$\mathcal{P}_{\mathfrak{U}}[\mathfrak{P}_{\mathfrak{U}}(\underbrace{\mathfrak{P}'(\mathfrak{d}')}_{\mathfrak{d}})] \equiv \mathcal{P}_{\mathfrak{U}}[\underbrace{\mathfrak{P}'(\mathfrak{d}')}_{\mathfrak{d}}] \equiv \mathcal{P}'[\mathfrak{d}'].$$

¶2 What happens, then, is that, once the complexity of the universal TURING machine $\mathfrak{U}$ is achieved, and it is not infinite because

[45] GÖDEL, K. (1931): *On Formally Undecidable Propositions*.
[46] TURING, A.M. (1936): *On Computable Numbers*.

its processor $\mathcal{P}_{\mathfrak{U}}$ continues to be a finite automaton, we already have reached the maximum power of syntactic analysis that it is possible to reach. No matter how complex the TURING machine $\mathfrak{T}$ that we want to imitate is, the universal TURING machine $\mathfrak{U}$ can do it. The key consists in being able to represent the syntactic processor $\mathcal{P}_{\mathfrak{T}}$ itself syntactically, because the algorithm $\mathfrak{P}_{\mathfrak{T}}$ effectively represents the syntactic transformation that this processor undertakes. So, within the grammatical languages $\mathfrak{L}_0$, we will call every language whose recognizer is a universal TURING machine $\mathfrak{U}$ a universal language $\mathfrak{L}_{\mathfrak{U}}$ or, and it is the same thing, a recursive syntax $\mathfrak{L}_{\mathfrak{U}}$.

$$\mathfrak{L}_{\mathfrak{U}} = \text{Universal Language} = \text{Recursive Syntax}$$

¶3 We say that the universal processor $\mathcal{P}_{\mathfrak{U}}$, that is, the processor of a universal TURING machine $\mathfrak{U}$, is a syntax engine because it is capable of executing any syntactic transformation.

$$\mathcal{P}_{\mathfrak{U}} = \text{Universal Processor} = \text{Syntax Engine}$$

§106 Expressiveness

¶1 We must distinguish between two types of set relation that can apply to languages: inclusion, used in the CHOMSKY hierarchy of grammars and which relates two sets of languages, and expressiveness, which relates two languages, a language being the set of its syntactic expressions.

¶2 For example, the language that only accepts the sequence $\mathfrak{abc}$ is a regular language $\mathfrak{L}_3$ because there is a finite automaton that only accepts this sequence. And this same language is also a grammatical language $\mathfrak{L}_0$, because there is also a TURING machine which only accepts the syntactic expression $\mathfrak{abc}$. Due to this type of reasoning, we conclude that all the regular languages $\mathfrak{L}_3$ are grammatical ones $\mathfrak{L}_0$ and, as a consequence, the set of regular languages $\{\mathfrak{L}_3\}$ is included in the set of grammatical languages $\{\mathfrak{L}_0\}$:

$$\{\mathfrak{L}_3\} \subset \{\mathfrak{L}_0\}.$$

¶3 On the other hand, though, no universal language $\mathfrak{L}_{\mathfrak{U}}$ can accept only the sequence $\mathfrak{abc}$, although they can all accept an extended version. The possibility of extension requires them to accept other

sequences. Let us look at this aspect in greater detail.

¶4 Let $\mathcal{P}_{\mathfrak{abc}}$ be the processor of the TURING machine that only accepts the expression $\mathfrak{abc}$. Let $\mathfrak{U}$ be a universal TURING machine, and let $\mathfrak{P}_{\mathfrak{abc}}$ be the syntactic expression that represents the processor $\mathcal{P}_{\mathfrak{abc}}$ in $\mathfrak{U}$. With this terminology, $\mathfrak{U}$ will accept the expression $\mathfrak{P}_{\mathfrak{abc}}(\mathfrak{abc})$:

$$\mathcal{P}_{\mathfrak{U}}[\mathfrak{P}_{\mathfrak{abc}}(\mathfrak{abc})] \equiv \mathcal{P}_{\mathfrak{abc}}[\mathfrak{abc}] \rightarrow \text{TRUE}.$$

Thus, the extended expressions have two parts: the algorithm, in the example $\mathfrak{P}_{\mathfrak{abc}}$, and the parameters, which are $\mathfrak{abc}$ in the example. And we can now affirm that recursive syntax $\mathfrak{L}_{\mathfrak{U}}$ accepts the expression $\mathfrak{P}_{\mathfrak{abc}}(\mathfrak{abc})$, which should be read: 'what $\mathfrak{abc}$ expresses in the language recognized by $\mathcal{P}_{\mathfrak{abc}}$'. But the universal language $\mathfrak{L}_{\mathfrak{U}}$ accepts, in addition, other expressions, for example $\mathfrak{P}_{\mathfrak{U}}(\mathfrak{P}_{\mathfrak{abc}}(\mathfrak{abc}))$, because:

$$\mathcal{P}_{\mathfrak{U}}[\mathfrak{P}_{\mathfrak{U}}(\mathfrak{P}_{\mathfrak{abc}}(\mathfrak{abc}))] \equiv \mathcal{P}_{\mathfrak{U}}[\mathfrak{P}_{\mathfrak{abc}}(\mathfrak{abc})] \equiv \mathcal{P}_{\mathfrak{abc}}[\mathfrak{abc}] \rightarrow \text{TRUE}.$$

¶5 This is why we say that universal languages $\mathfrak{L}_{\mathfrak{U}}$ are more expressive than regular ones $\mathfrak{L}_3$, although they do not include them; $\forall \mathfrak{L}_3, \mathfrak{L}_{\mathfrak{U}}$:

$$\mathfrak{L}_3 \prec \mathfrak{L}_{\mathfrak{U}}$$
$$\{\mathfrak{L}_3\} \not\subset \{\mathfrak{L}_{\mathfrak{U}}\}.$$

¶6 The universal language $\mathfrak{L}_{\mathfrak{U}}$ is the most expressive of the languages with grammar because it can express everything that any other grammatical language $\mathfrak{L}_0$ can. This is because the syntactic transformations of any other language, whatever they may be, can be expressed in recursive syntax $\mathfrak{L}_{\mathfrak{U}}$ and be interpreted as such. And, in conclusion, no grammatical language $\mathfrak{L}_0$ can be more expressive than a universal language $\mathfrak{L}_{\mathfrak{U}}$; $\forall \mathfrak{L}_0, \mathfrak{L}_{\mathfrak{U}}$:

$$\mathfrak{L}_0 \preceq \mathfrak{L}_{\mathfrak{U}}.$$

¶7 In a way, universal languages $\mathfrak{L}_{\mathfrak{U}}$ are too expressive. They are so expressive that, if the expression $\mathfrak{x}$ is paradoxical in any grammatical language $\mathfrak{L}_0$, for example in the language recognized by the TURING machine $\mathfrak{T}$ whose processor is $\mathcal{P}_{\mathfrak{T}}$, then the expression $\mathfrak{P}_{\mathfrak{T}}(\mathfrak{x})$ is paradoxical in recursive syntax $\mathfrak{L}_{\mathfrak{U}}$:

$$\mathcal{P}_{\mathfrak{U}}[\mathfrak{P}_{\mathfrak{T}}(\mathfrak{x})] \equiv \mathcal{P}_{\mathfrak{T}}[\mathfrak{x}] \to \infty.$$

This proves that there are paradoxes in all recursive syntaxes $\mathfrak{L}_{\mathfrak{U}}$.

¶8 Besides, paradoxes that can be expressed in a universal language $\mathfrak{L}_{\mathfrak{U}}$ are pertinacious, because it is not even possible to recognize them all. In order to prove this, it is necessary to show that reflexive paradoxes can be expressed in a recursive syntax $\mathfrak{L}_{\mathfrak{U}}$. A reflexive paradox, such as 'this sentence is false', is a paradox that refers to itself, so we can also call it self-referential paradox, or even EPIMENIDES'[47] paradox, EPIMENIDES being a Cretan who said, as the story goes, that everything Cretans say is a lie.

§107 Recursivity

¶1 Reference allows us, in syntactic expressions, to use names as abbreviations of other expressions, generally longer ones. We call the operation of giving a name to an expression definition. Thus, for example, if we write the definitions after a colon, with n being the name of the syntactic expression $\mathfrak{n}$:

$$\mathcal{P}_{\mathfrak{U}}[\mathfrak{eno} : n = \mathfrak{n}] \to \mathcal{P}_{\mathfrak{U}}[\mathfrak{eno} : n = \mathfrak{n}].$$

It is sufficient for us that the definitions of the names are fixed, that is, that they cannot be changed. To prove that any universal TURING machine $\mathfrak{U}$ can use names, it is enough to show that a TURING machine exists that is capable of substituting a name with an expression. That is, we only have to show that it is possible to design a dictionary $\mathfrak{D}$ TURING machine that, given a name, returns its expression:

$$\mathcal{P}_{\mathfrak{U}}[\mathfrak{P}_{\mathfrak{D}}(n)] \equiv \mathcal{P}_{\mathfrak{D}}[n] \to \mathfrak{n}.$$

Thanks to definitions, recursive syntaxes $\mathfrak{L}_{\mathfrak{U}}$ are extensible.

¶2 The other necessary requirement for being able to express reflexive, or self-referential, paradoxes, is that syntactic transformations themselves can be syntactically expressed, as is the case in universal languages $\mathfrak{L}_{\mathfrak{U}}$. Because then the algorithm that represents a syntactic transformation can be given a name, and this same name can appear in the definition of the algorithm itself, a procedure that is called

[47] NORTHROP, E.P. (1944): *Riddles in Mathematics*.

recursivity, and gives its name to recursive syntaxes $\mathfrak{L}_{\mathfrak{U}}$.

§108 Reflexive Paradoxes

¶1 So we can now show that, in a universal language $\mathfrak{L}_{\mathfrak{U}}$, it is impossible to recognize all of the paradoxes. We will show this by *reductio ad absurdum*, that is, we will examine what would happen if an algorithm $\mathfrak{H}$ actually existed that always stopped and said, about any syntactic expression $\mathfrak{w}$, whether the universal TURING machine $\mathfrak{U}$ would stop or not, when $\mathfrak{w}$ was written on the tape. If the universal TURING machine $\mathfrak{U}$ stopped, the result of $\mathfrak{H}$ would be TRUE; if it did not stop, then the result would be FALSE, where $\mathfrak{D}$ is a dictionary with definitions:

$$\mathfrak{H} \begin{cases} \mathcal{P}_{\mathfrak{U}}[\mathfrak{H}(\mathfrak{w}) : \mathfrak{D}] \rightarrow \text{TRUE} & \text{if } \mathcal{P}_{\mathfrak{U}}[\mathfrak{w} : \mathfrak{D}] \text{ would stop;} \\ \mathcal{P}_{\mathfrak{U}}[\mathfrak{H}(\mathfrak{w}) : \mathfrak{D}] \rightarrow \text{FALSE} & \text{if } \mathcal{P}_{\mathfrak{U}}[\mathfrak{w} : \mathfrak{D}] \rightarrow \infty \ . \end{cases}$$

¶2 If $\mathfrak{H}$ existed, then we could also define another algorithm $\mathfrak{Z}$, in the following way:

$$\mathfrak{Z}(\mathfrak{y}) = \textbf{if } \mathfrak{H}(\mathfrak{y}) \textbf{ then } \textit{loop forever} \textbf{ else } \textit{stop} \textbf{ end} \ .$$

To prove that, if $\mathfrak{H}$ were an algorithm, we could define $\mathfrak{Z}$, we need to show that in a universal TURING machine $\mathfrak{U}$ algorithms that use other algorithms can be defined. This is not difficult, given their universality. We also need to show that an **if** can be defined, for which it is sufficient to see that it is possible to construct a TURING machine $\mathfrak{T}$ that does this. Let us accept these matters as proven.

¶3 What would happen if we wrote the expression $\mathfrak{Z}(Z) : Z = \mathfrak{Z}(Z)$, which is self-referential, on the universal TURING machine $\mathfrak{U}$ tape? If the $\mathfrak{H}$ algorithm behaves as we have said, then we only have to study two possible cases.

- If $\mathfrak{H}(\mathfrak{Z}(Z)) : Z = \mathfrak{Z}(Z)$ is TRUE, that means, according to the definition of $\mathfrak{H}$, that the expression $\mathfrak{Z}(Z) : Z = \mathfrak{Z}(Z)$ will make the universal TURING machine $\mathfrak{U}$ stop, but, according to the definition of $\mathfrak{Z}$, it depends on how the universal TURING machine $\mathfrak{U}$ resolves the expression $\mathfrak{H}(Z) : Z = \mathfrak{Z}(Z) \rightarrow \mathfrak{H}(\mathfrak{Z}(Z)) : Z = \mathfrak{Z}(Z)$, that we are supposing is TRUE, so that what it will do is *loop forever*, that is, not stop.

- If, on the contrary, $\mathfrak{H}(\mathfrak{Z}(Z)) : Z = \mathfrak{Z}(Z)$ is FALSE, then, according to the definition of $\mathfrak{H}$, with $\mathfrak{Z}(Z) : Z = \mathfrak{Z}(Z)$ the universal TURING machine $\mathfrak{U}$ should not stop, but, because it is FALSE, according to the definition of $\mathfrak{Z}$, the **else** branch would be executed and it would *stop*.

What this contradiction means is that the algorithm $\mathfrak{H}$ cannot exist as we have defined it and, therefore, that within a universal language it is impossible to definitively determine whether an expression is paradoxical or not. And with this we have proven that, in recursive syntaxes, paradoxes are pertinacious.

§109 Recursive Syntax

¶1 To end this visit to the theory of computation, which we could with all propriety call the theory of syntax, we will locate the set of universal languages, $\{\mathfrak{L}_\mathfrak{U}\}$, in the more general set of grammatical languages, $\{\mathfrak{L}_0\}$.

¶2 We can divide the set of grammatical languages $\{\mathfrak{L}_0\}$ in two other disjoint sets: the set of decidable languages $\{\mathfrak{L}_\mathfrak{D}\}$ and the set of undecidable languages $\{\mathfrak{L}_\mathfrak{J}\}$:

$$\{\mathfrak{L}_\mathfrak{D}\} \cup \{\mathfrak{L}_\mathfrak{J}\} = \{\mathfrak{L}_0\}$$
$$\{\mathfrak{L}_\mathfrak{D}\} \cap \{\mathfrak{L}_\mathfrak{J}\} = \emptyset.$$

CARROLL and LONG[48] use the notation $\mathcal{H}_\Sigma$ for the set of decidable languages, $\mathcal{H}_\Sigma = \{\mathfrak{L}_\mathfrak{D}\}$, which are the languages recognized by the TURING machines $\mathfrak{T}$ that always stop, and which they place in the CHOMSKY hierarchy between the non-restricted grammatical languages $\{\mathfrak{L}_0\}$ and the context-sensitive languages $\{\mathfrak{L}_1\}$:

$$\{\mathfrak{L}_1\} \subset \{\mathfrak{L}_\mathfrak{D}\} \subset \{\mathfrak{L}_0\}.$$

¶3 Paradoxes cannot be expressed in any decidable language $\mathfrak{L}_\mathfrak{D}$, because all of the expressions are decidable. On the contrary, paradoxes exist in all of the undecidable languages $\mathfrak{L}_\mathfrak{J}$. As paradoxes can also be expressed in all of the recursive syntaxes $\mathfrak{L}_\mathfrak{U}$, as we showed in §108, page 102, it turns out that all of the universal languages $\mathfrak{L}_\mathfrak{U}$ are undecidable $\mathfrak{L}_\mathfrak{J}$, although not all undecidable languages $\mathfrak{L}_\mathfrak{J}$ are

[48] CARROLL, J.; LONG, D. (1989): *Theory of Finite Automata*.

universal $\mathfrak{L}_{\mathfrak{U}}$, because there are TURING machines $\mathfrak{T}$ that neither stop always nor are universal:

$$\{\mathfrak{L}_{\mathfrak{U}}\} \subset \{\mathfrak{L}_{\mathfrak{I}}\} \subset \{\mathfrak{L}_0\}.$$

¶4 We also find among the undecidable languages $\mathfrak{L}_{\mathfrak{I}}$ those that have errors; for example the language that a TURING machine $\mathfrak{T}$ accepts that does not stop only when it finds a sequence of one hundred consecutive ones, due, let's say, to a slip in designing the state that corresponds to one hundred ones.

§110 Algorithms

¶1 In §70, page 67, we defined a symbolic logic as the logic capable of representing problems, resolutions, and solutions, using two layers: syntax and semantics. Semantics has the solutions and syntax has the problems and the resolutions. The resolutions take the problem expressed syntactically and transform it syntactically until the syntactic expression of a solution is reached. Thus, the resolution is a syntactic transformation.

¶2 We give the name algorithm to the expression of a syntactic transformation that, in principle, can be a syntactic expression or a meta-syntactic expression. The first alternative takes us (as we saw from §104, page 96, to §109, page 103) to recursive syntaxes $\mathfrak{L}_{\mathfrak{U}}$, capable of maximum expressiveness, but which cannot avoid paradoxes. Paradoxes are syntactic expressions with no meaning, inconclusive, unresolvable: that is, they are resolutions that do not achieve a solution. So RUSSELL tried, with his theory of types, the second alternative to avoid the reflexive paradox that he himself had discovered in set theory (see QUINE[49]):

$$R = \{x?\ x \notin x\} \Longrightarrow (R \in R \Longleftrightarrow R \notin R).$$

But the resulting typed logic is complicated, which induces error, limits the logic's expressiveness, and, what is worse, requires an unlimited number of meta-meta-...-syntaxes, so that it is, itself, paradoxical.

¶3 It is better to tolerate paradoxes and use recursive syntaxes,

[49] QUINE, W.V.O. (1951): *Mathematical Logic*, page 163 and following.

which are simpler and more expressive because, in practice, neither the tape of the TURING machine $\mathfrak{T}$ is infinite, nor is the time available to reach a solution unlimited, so that the resolutions that require more tape than is available, or too much time, even though they would be capable of reaching a solution in other circumstances, are as useless or harmful as paradoxes. All in all, paradoxes are no worse than bad resolutions.

§111 Reason

¶1 The inquirer $\mathfrak{I}$'s job is to describe with the greatest possible precision the problem that the subject $\mathcal{A}_4$ faces. Reason $\mathfrak{R}$ receives the representation of the problem $\mathfrak{X}$ from the inquirer $\mathfrak{I}$; this representation is necessarily syntactic. And reason $\mathfrak{R}$ produces, as a result, the representation of the resolution, that is the algorithm that the mind $\mathfrak{M}$ has to execute, which is also syntactic. So, if reason $\mathfrak{R}$ should have the maximum generality, as we concluded in §103, page 95, then reason $\mathfrak{R}$ must be a syntax engine, or universal processor $\mathcal{P}_{\mathfrak{U}}$, capable of transforming any syntactic expression into any other one, as we saw in §105, page 98:

$$\mathfrak{R} = \mathcal{P}_{\mathfrak{U}}.$$

This means that the subject $\mathcal{A}_4$'s internal logic or at least the internal logic of its reason $\mathfrak{R}$, is a symbolic logic, with semantics and recursive syntax $\mathfrak{L}_{\mathfrak{U}}$.

¶2 Finally, the mind $\mathfrak{M}$ has to apply the resolving algorithm proposed by reason $\mathfrak{R}$ and obtain the solution, in the form of behavior that the body $\mathcal{B}$ can execute so that, if everything has gone well, it will effectively solve the problem that the subject $\mathcal{A}_4$ is facing.

¶3 In the semantics of the symbolism of the subject $\mathcal{A}_4$'s reason $\mathfrak{R}$, the following have meaning: the symbols that refer to the mind $\mathfrak{M}$'s resources, such as the body $\mathcal{B}$*'s* behaviors, the modeler $\mathcal{M}$*'s* models, the forecasts of reality $\mathcal{R}$, and the simulator $\mathcal{S}$*'s* simulations; and the symbols that refer to the conditions that reason $\mathfrak{R}$ can consider, as in the goodness or badness of the behaviors and the forecasts. Other symbols represent concepts of the theory of the problem, such as, for example, the freedom of the problem, represented as '?', which has no meaning, because it indicates to the reason $\mathfrak{R}$ that the syntactic expression in which it is found is open, that is, its meaning is not closed, and that, as a result, it is not ready to be passed on to the mind $\mathfrak{M}$.

§112 Comparing Selves

¶1 We have completed a circle in the exit path. We started from the self, and went beyond the self when we discovered, in §75, that the self is not all of the subject, but that the self is only the problem of the subject. The subject is alive, it is part of life, so that the problem of the subject is part of the problem of survival that defines life. The problem of survival is an apparent problem that, specified in time and in space, we formalized in §86, and we resolved it. And now the resolution of the formalized apparent problem takes us to the subject $\mathcal{A}_4$, and finally back to the self $\mathfrak{X}$. But, in order to complete the circle accurately, we need to establish that the formal self $\mathfrak{X}$ that we found coincides with that original self that we started out from at the beginning, in §64, and that we defined as freedom to not die, in §65, and that was syntactic and paradoxical, as we saw in §72 and §73.

¶2 The formal subject $\mathcal{A}_4$ found coincides with the original subject, since we only had two pieces of information about this original subject (see §75, page 71), and in both pieces it coincides with the formal subject. We knew that the original subject, like the formal subject $\mathcal{A}_4$, has a symbolic logic. And we also knew that the problem of the original subject is its original self, just as the problem of the formal subject $\mathcal{A}_4$ is its formal self $\mathfrak{X}$; it is the same whenever both selves coincide, and we will prove this now.

¶3 For the formal subject $\mathcal{A}_4$, the formal self $\mathfrak{X}$ turns out to be the best representation that the subject $\mathcal{A}_4$ itself can make of the problem that it is facing, which is the apparent problem of survival. As freedom is inherent to every problem, and the final condition of the problem of survival is to live, then the formal self $\mathfrak{X}$ could be defined in the same way as we defined the original self, that is, as freedom to not die.

¶4 The formal self $\mathfrak{X}$ is also syntactic, since any representation of a problem has to be syntactic, as we already know (see §70, page 67), because it must represent freedom, which is tautologically free of meaning.

¶5 In §102, page 94, we established that the condition of the inquirer cannot be conclusively verified, that is, that the representation of an apparent problem, given its nature, is never definitive. That is why the formal problem of the subject $\mathfrak{X}$ must always be kept open to revision. As a changing problem cannot have a definitive solution, we have proven that the formal self $\mathfrak{X}$ is paradoxical.

§113 Comparing Subjects

¶1 In the previous section we compared subjects, and selves, from the exit path, and so we have not yet compared the subjects of the exit path with their homonyms from the entry path.

¶2 The essential characteristic of the formal subject $\mathcal{A}_4$ is its capacity to reason, that is, to foresee the result of the different ways of resolving a problem. A symbolic logic in which to represent problems and resolutions, as well as solutions, is indispensable for this. The evolutionary subject, seen from §25 to §53, had a symbolic logic available, so it had to be considered as a specific case of the formal subject $\mathcal{A}_4$, with the peculiarities derived from its Darwinian heritage. We must remember that the evolutionary subject's syntax rested upon a reality of things with meaning inherited from the knower, while the only thing we can affirm about the subject $\mathcal{A}_4$'s syntax is that it rests upon a semantic layer inherited from the knower $\mathcal{A}_3$ where the solutions should be. Thus, while in evolutionary syntax we find sentences with nouns, verbs, adjectives, and pronouns, we know that formal syntax must be recursive, $\mathfrak{L}_{\mathfrak{U}}$. A recursive syntax has a maximum of expressiveness but also pertinacious paradoxes. And we know that to deal with such a syntax, we need a universal processor $\mathcal{P}_{\mathfrak{U}}$, or syntax engine, that is the processor of a universal TURING machine $\mathfrak{U}$.

§114 The Subjective Loop

¶1 Having reached the end of the exit path, we can now make some global appraisals. The exit path is circular. It starts from the self, defined as a problem, then goes to the subject and, from here, to life, defined as an apparent problem, where the first part, definitely the exit, finishes. But the resolution of the apparent problem of survival, which goes through five stages, ends at the subject $\mathcal{A}_4$ with its self $\mathfrak{X}$, so that this second part of the exit path returns to the beginning, as we showed in §112, and runs in the same direction as the entry path.

$$\begin{array}{ccccccccccc}
\text{Self} & \rightarrow & \text{Subject} & \longrightarrow & & & & & & & \text{Problem of Survival} \\
\| & & \| & & & & & & & & \| \\
\mathfrak{X} & \leftarrow & \mathcal{A}_4 & \leftarrow & \mathcal{A}_3 & \leftarrow & \mathcal{A}_2 & \leftarrow & \mathcal{A}_1 & \leftarrow & \text{Apparent Problem}
\end{array}$$

¶2 And so the circle is completed, and now we can contemplate as a whole the fundamental postulate of the theory of subjectivity, in other words, that life, or the problem of survival, which is the same thing, is an apparent problem (see §76, page 72). We will make use of a general observation that applies to any theory that uses problems for explanations: if any concept corresponds with an apparent problem, it must be a primitive concept that the theory leaves undefined, because it cannot provide any information about it. From this observation, we can see that the need to use problems as explanations as well as the election of life as the primitive undefined concept of the theory of subjectivity are both consequences of defining the self as freedom to not die. Because the self, being freedom and condition, is a problem; and being the condition of not dying, it remits us to life. It remits us to life because the self, as it is already defined, cannot be the primitive undefined concept that life, ineffable, can be.

¶3 But because the path is circular, whoever wishes to can go backwards on it. If the self is explained starting from the apparent problem of survival, then the consequence is that the self must be defined as freedom to not die.

¶4 On the other hand, the resolution of the apparent problem reaches the subject $\mathcal{A}_4$ with its self $\mathfrak{X}$, which constructively proves that a problematic theory is sufficient to explain the nature of the subject and of the self.

§115 Levels

¶1 The five stages of the resolution of the apparent problem can be grouped in three levels. The mechanism $\mathcal{A}_0$ is nothing more than the starting point and forms, by itself, the reference level. The following level, to which the adaptor $\mathcal{A}_1$ and the learner $\mathcal{A}_2$ belong, appears with the body $\mathcal{B}$, which is capable of behaving as various mechanisms $\mathcal{A}_0$ and, in this way, we can say that it includes the previous reference level (EPA §2).

$$\text{Adaptor } \mathcal{A}_1 \begin{cases} \text{Governor } \mathcal{G} \\ \text{Body } \mathcal{B}\langle\text{Mechanism } \mathcal{A}_0 \end{cases}$$

Finally, the third level, in which the knower $\mathcal{A}_3$ and the subject $\mathcal{A}_4$ are to be found, originates in the mind $\mathfrak{M}$ which, being capable of

resolving problems like the learners $\mathcal{A}_2$, like the adaptors $\mathcal{A}_1$, and like the mechanisms $\mathcal{A}_0$, contains the two levels that precede it (EPA §6).

$$\text{Knower } \mathcal{A}_3 \begin{cases} \text{Intelligence } \mathfrak{A} \\ \text{Mind } \mathfrak{M} \left\langle \begin{matrix} \text{Learner } \mathcal{A}_2 \\ \text{Adaptor } \mathcal{A}_1 \\ \text{Mechanism } \mathcal{A}_0 \end{matrix} \right. \end{cases}$$

¶2 Within each of the two-stage levels, the first stage comprehends the previous level and the second stage interiorizes it. Thus, the learner $\mathcal{A}_2$'s simulator $\mathcal{S}$ contains interiorizations of the body $\mathcal{B}$*'s* behaviors and of the exterior, and that is why the modeler $\mathcal{M}$*'s* task is to compose reality $\mathcal{R}$, which is, precisely, the interior representation of the exterior behavior (EPA §3).

$$\text{Learner } \mathcal{A}_2 \begin{cases} \text{Governor } \mathcal{G} \begin{cases} \text{Modeler } \mathcal{M} \to \text{Reality } \mathcal{R} \\ \text{Simulator } \mathcal{S} \text{ [Body } \mathcal{B}\text{]} \end{cases} \\ \text{Body } \mathcal{B} \big\langle \text{Mechanism } \mathcal{A}_0 \end{cases}$$

And, similarly, the subject $\mathcal{A}_4$'s reason $\mathfrak{R}$ has syntactic and recursive representations of its mind $\mathfrak{M}$'s resolutions and of the exterior problem. The inquirer $\mathfrak{I}$'s task is to look for the problem that it is facing, that is, the problem of the subject, or the self $\mathfrak{X}$, which is, precisely, the internal representation of the external problem (EPA §7).

$$\text{Subject } \mathcal{A}_4 \begin{cases} \text{Intelligence } \mathfrak{A} \begin{cases} \text{Inquirer } \mathfrak{I} \to \text{Self } \mathfrak{X} \\ \text{Reason } \mathfrak{R} \text{ [Mind } \mathfrak{M}\text{]} \end{cases} \\ \text{Mind } \mathfrak{M} \left\langle \begin{matrix} \text{Learner } \mathcal{A}_2 \\ \text{Adaptor } \mathcal{A}_1 \\ \text{Mechanism } \mathcal{A}_0 \end{matrix} \right. \end{cases}$$

¶3 It turns out that the subject $\mathcal{A}_4$, which culminates the resolutive process of the apparent problem, contains it completely. Because the mind $\mathfrak{M}$ is interiorized in the reason $\mathfrak{R}$, and the mind includes all of the preceding stages, and therefore also contains the simulator $\mathcal{S}$, which interiorizes the body $\mathcal{B}$.

§116 Layers

¶1 Symbolism's construction in two layers (seen in §70, page 67, and in §103, page 95), which is at the origin of the resolution levels of the apparent problem, allows us to discover some correpondences in the subject's world, presented in §36, page 37. The body $\mathcal{B}$ corresponds in the layer of behavior, which is the layer of solutions and which we call semantics, to the mind $\mathfrak{M}$ in the layer of resolutions, which we call syntax. And the self $\mathfrak{X}$ corresponds to reality $\mathcal{R}$.

Adaptor $\mathcal{A}_1$	$\equiv$	$\mathfrak{E}_1$	Knower $\mathcal{A}_3$
Governor $\mathcal{G}$	$\equiv$	$\mathfrak{A}$	Intelligence
Body $\mathcal{B}$	$\equiv$	$\mathfrak{M}$	Mind
Learner $\mathcal{A}_2$	$\equiv$	$\mathfrak{E}_2$	Subject $\mathcal{A}_4$
Modeler $\mathcal{M}$	$\equiv$	$\mathfrak{I}$	Inquirer
Simulator $\mathcal{S}$	$\equiv$	$\mathfrak{R}$	Reason $\mathcal{P}_{\mathfrak{U}}$
Reality $\mathcal{R}$	$\equiv$	$\mathfrak{X}$	Self
Semantics	$\equiv$	Syntax	
Behavior	$\equiv$	Problem	
Solution	$\equiv$	Resolution	
Program	$\equiv$	Algorithm	
Thing	$\equiv$	Concept	
Practice	$\equiv$	Theory	
Finite	$\equiv$	Infinite	
Physics	$\equiv$	Metaphysics	
Data	$\equiv$	Information	
Change	$\equiv$	Permanence	
Res Extensa	$\equiv$	Res Cogitans	

§117 The World Is an Enigma

¶1 The inquirer $\mathfrak{I}$ occupies the highest place in the subject $\mathcal{A}_4$ which, in turn, is the peak of the resolutive process of the apparent problem. And the inquirer $\mathfrak{I}$'s task is to ask questions, the first being 'what am I?' This may be why Aristotle[50] began his *Metaphysics* by declaring that "all men by nature desire to know".

¶2 The subject is curious because he understands the world and its situations as problems to be resolved. For the subject, the world is an enigma.

[50] Aristotle (iv b.c.): *Metaphysics*.

Conclusion

§118 Tao

¶1 The Chinese ideogram 道, which sometimes is transcribed 'tao', other times 'dao', or even, in Japanese, 'dō', means path, and also method and law. It is the central concept of Taoism[51], from which it takes its name, and it is fundamental to Buddhism as well.

¶2 In general, oriental philosophy is introspective, because it starts out observing the pure self. And because it attends solely to the self, it finds absolute nothingness, that is, it finds complete freedom without limits, in which it is even possible to reconcile opposites, to reconcile yes and no (see §73, page 70). This is why the dialectic of *yin* and *yang* is so important, or in Zen Buddhism, paradoxes are important (see Suzuki[52]).

¶3 Although later developments of Buddhism and Taoism differ from the exit path of this theory of subjectivity, the starting point of the three paths is the same: self. But if we only see the freedom of the self, which is its will, then it is impossible to go beyond it. Because if everything is freedom, if freedom is absolute, then there are no limits, and you cannot go beyond something that doesn't have limits. Recognizing limits is enough to make a situation completely different. And we have already seen where defining the self as freedom to not die takes us.

[51] Lao Tzu (¿?): *Tao Teh Ching*.

[52] Suzuki, D.T. (1934): *The Training of the Zen Buddhist Monk*.

§119 The Paths

¶1 The exit path, which gives priority to introspection, is the oriental path. It presupposes the subject and its solipsist schools evade the object. The entry path, which prefers the phenomenon, is the occidental path. It takes the object for granted and its materialist versions do without the subject.

¶2 If oriental philosophies cannot go beyond the unlimited freedom of the pure self, occidental philosophies cannot enter into the freedom of the self. Thus, for example, occidental natural philosophy, or to abbreviate, science, exclusively explains the physical phenomena that can be repeated under experimental conditions. In this way, it proscribes freedom, although it can predict what the result of a physics experiment will be with precision and profitably. This is why present-day science cannot explain the self.

¶3 The oriental path is insufficient, and the occidental path is, too. One has freedom without condition, and the other has condition without freedom. Synthesis is a problem, precisely because the synthesis of freedom and condition is a problem. This is why only the circular path is complete: the circular path is the subjective loop (seen in §114, page 107), that starts out from the self and goes beyond it to arrive at the apparent problem of survival, which is the source of meaning, as we will state in §133, and that, returning to the self, gives meaning to each of its stages and, finally, to the very self.

§120 The Problematic Explanation

¶1 Thinking about recent history can help overcome the explanatory problems of present-day science. The material explanation, seen in §60, page 58, that ruled in science until the quantum revolution, explains by thing-ifying, that is, it keeps explaining concepts until it reaches things, because things are what have a natural meaning (see §35, page 35 and §70, page 67). The automatic explanation, discovering problems in thing-ifying (see §61, page 59), does away with the meanings of the knower and tries to avail itself solely of the learner's foresights. This step backward avoids using the inexact, unreasoned models achieved during evolution (see §81, page 77), but it produces explanations with no meaning, that is, descriptions. True progress is achieved not by going backward from the knower to the learner, but by advancing to the subject. This progress needs, then, a theory of the subject. And this theory of subjectivity works.

¶2 The proposal is, first, that science give up the automatic explanation, that is, that its final products stop being automata, which are systems of data that predict mechanically, and second, that science adopt the problematic explanation, so that science produces, as a consequence, problems, resolutions, and solutions. The solutions can be formally indistinguishable from the final products that science produces today, that is, automata, whether they be in the form of differential equations or any other; but by framing themselves explicitly in a problem, that in the end must be the problem of survival, they will achieve a meaning that they do not have at present.

§121 Scientific Theories

¶1 This is, of course, one way of overcoming the enormous obstacle that GÖDEL discovered at the foundations of mathematics, and that all science shares.

¶2 GÖDEL[53] showed, with his undecidability theorem, that there are undecidable propositions in any theory that includes arithmetic; these are propositions whose truth or falsehood the theory itself cannot determine, that is, paradoxes. The corollary for physics is immediate: physics includes arithmetic and, therefore, cannot be complete. This same argument can be applied immediately to all the theories that use arithmetic, and can be generalized, following TURING[54] (see §108, page 102), to all theories that have to be expressed in recursive symbolisms, so that all the sciences are affected. But the case of physics is especially surprising because, in spite of the famous mathematical demonstration in the year 1931, there are still important physicists, such as HAWKING[55], who think that a unified theory that describes the universe completely can exist.

¶3 On the other hand, for the problematic explanation, scientific knowledge remains subordinated to life. GÖDEL's undecidability theorem is nothing more than the confirmation that mathematics and the sciences necessarily inherit the paradoxical nature of life and of the self (seen in §82, page 78 and in §73, page 70). So we already know that it is the paradoxical natures of the self, of life, of knowledge, and of science, that sustain their problematic character and keep all of these matters inconclusive and incomplete, that is, open,

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[53] GÖDEL, K. (1931): *On Formally Undecidable Propositions*.

[54] TURING, A.M. (1936): *On Computable Numbers*.

[55] HAWKING, S.W. (1988): *A Brief History of Time*.

free, and alive.

¶4 It is absurd to believe that everything that happens is expressible symbolically and that this expression can completely exhaust the phenomenon, because it has been proven mathematically that it is impossible.

§122 The Subject Is Free

¶1 For the automatic explanation, the set of differential equations that constitutes the theory is all that can scientifically be said about the phenomena that this theory describes. The automatic explanation is only good for the entry path, that is, it is useful to explain phenomena exterior to the self, but it is incapable of turning the interior self into a phenomenon. This is because freedom is completely excluded from the automatic explanation and, consequently, the automatic explanation cannot explain the self, which is free; a conclusion we already reached in §58, page 57.

¶2 Then we asked ourselves if a mechanism is free. The answer was no; because the mechanism is the prototype of determinism, it would not be free. The adaptor is not free either, we reasoned, because it is a mechanism. And the learner, which is an adaptor, cannot be free either. The knower, whose virtue is that it is capable of imitating the learner, the adaptor, and the mechanism, cannot be free either. And the subject, we wondered, can a subject be free? According to the automatic explanation of the entry path, (see §57, page 56), the answer was no, because the subject is still a mechanism. Specifically, it is the mechanism with a nervous system that models reality, a reality that can be used in various ways according to its feelings, and that has a symbolic logic with which it can reason.

¶3 The situation is very different for the problematic explanation. It is true that a mechanism is not free, but it turns out that a living mechanism is not a whole but a part. A living mechanism is a resolver of the apparent problem of survival, and it has no meaning by itself apart from the problem; that is, it must be defined as part of the problem. Thus, although the live mechanism may be impermeable to the freedom of the apparent problem, which it is, it forms part of a system that necessarily includes freedom. And, in this sense, the sequence that goes from the mechanism to the subject is a process in which the freedom of the apparent problem of survival soaks into its resolvers. This process reaches its culmination with the subject, because the subject is capable of interiorizing the problem itself

and, with the problem, its freedom. The subject seizes the problem's freedom. The subject is free.

¶4 The subject is free, yes, but its freedom is not absolute, it is conditioned. In other words, freedom is part of the problem. This means, on one hand, that the future is not determined but open, because it depends on decisions made freely; on the other hand, it means that not all decisions are equally good or bad. That is, it means that the subject's free decisions have diverse consequences and, as we saw in §81, page 77, these consequences are never entirely predictable. If things were any other way, life would be easier.

§123 Consciousness and Self-Consciousness

¶1 For the problematic explanation, the subject is not a mechanism, simply because the subject is free and a mechanism is not. Adding freedom makes easy what without it is impossible. The same thing happens with consciousness and self-consciousness.

¶2 In the entry path, specifically in §33, page 34, when we pointed out the distinction made between sensing and seeing, we defined consciousness as that which the subject sees of the world. Along these same lines, self-consciousness would be how the subject sees itself. And as the theory of subjectivity shows us that the subject is a resolver of the apparent problem of survival, we can make these definitions even more precise.

¶3 Self-consciousness is the faculty thanks to which a resolver represents itself. And consciousness is the faculty by which a resolver represents the complete situation to itself, that is, the problem that it is facing and itself as a resolver. It follows from these definitions that only subjects can have consciousness and self-consciousness, because they are the only resolvers that, because their logic is symbolic logic, can represent problems as well as resolutions. In other words, in order to see a whole thing, a certain distance is necessary; and if the thing is one's own situation, then one needs a mirror, that is, reflection, in order to achieve this distance.

¶4 Therefore the subject is conscious when it sees itself as a problem, that is, when the subject sees itself as its self, and knows itself to be free. And the subject is self-conscious when it notices that its problem is unresolvable, because it is paradoxical and has no solution, when the subject knows itself to be mortal.

I know that I am	free	and	mortal	
I	am conscious and self-conscious			

¶5 These are easy conclusions for the problematic explanation, but they are impossible for the automatic explanation or for the material explanation.

§124 Knowledge Is Cumulative

¶1 The subject represents to itself the problem that it is facing. The problem the subject faces is an apparent problem; in other words, it is a problem that does not allow a definitive representation. Therefore, the representation that the subject makes to itself of the apparent problem is changing; we have called this representation the problem of the subject. When the problem of the subject changes, its resolution and solution change as a consequence. Translating from resolution to evolution, as we already did in §81, page 77, this means that all knowledge is provisional.

¶2 And because no knowledge is certain, it is not certain either that new knowledge is definitely superior to previous knowledge, so just in case, it is better not to forget any knowledge. Surely it is because of this that human knowledge is cumulative, and we forget only occasionally with disuse and time. This is the problematic explanation of why we cannot forget, especially when we want to forget.

§125 Intent

¶1 Many other comparisons can be made between the problematic explanation and the other explanations. You are free to test, with whatever subject interests you the most, which explanation seems most accurate. Here we will continue to investigate the most meaningful matter: meaning.

¶2 Meaning appears with the knower, capable of using reality in different ways, in order to choose from among them the way that best serves him. Meaning is useful, in short, in order to be able to use reality according to his own interests, or, to put it another way, meaning is the means that the knowers use to integrate external conditions with internal needs (see §23, page 26).

¶3 Given that the subjects know that they are facing a problem, they have a conscious purpose, to solve the problem, which confers intent upon everything that they consciously do. They do not do

things just to do them; rather they have an end in view, marked out by the problem that they know they are facing. This is why their conscious behavior is intentional.

¶4 Thus, working upon the knower with its meanings, evolution designed the subject with its intentions. And if meanings served the knower for using reality according to its own interests, they will also serve the subject for doing so according to its intentions. The difference is that, while the subject sees the meanings, or is conscious of the meanings and, because of this, can use them with intent, the knower uses the meanings, but cannot see them. The subject's intentions are conscious, that is, they can be expressed, while the knower's interests cannot.

§126 The Homunculus

¶1 As Searle[56] points out, if we study man's cognition while rejecting meaning and intent, then all of the calculations that the nervous system carries out mechanically must be so that in the end a homunculus makes the conscious decisions. We still have to explain this homunculus' cognition, who, in order to make conscious decisions, must use meanings that direct its intentions. But then explaining the homunculus' cognition is the same as explaining human cognition itself, so that we may as well skip this homunculus that doesn't explain anything anyway. If you are interested in other opinions on this difficulty, you can consult, among others, Dennett[57], Edelman[58], or Crick[59].

¶2 Searle is right and there are only two solutions. One is to deny consciousness, that is, to label it illusory. But here we prefer neither to reject meaning nor intention. Although there is not a homunculus in the brain, there is a mirror, as we saw in §33, page 34.

§127 The Theory of Subjectivity

¶1 As we are finding out, we can licitly use purposes, ends, intentions, and meanings in the problematic explanation. Just the opposite happens with the automatic explanations, which do not admit final, or teleological reasonings and which, consequently, cannot

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[56] Searle, J.R. (1992): *The Rediscovery of the Mind*.

[57] Dennett, D.C. (1991): *Consciousness Explained*.

[58] Edelman, G.M. (1992): *Bright Air, Brilliant Fire*.

[59] Crick, F. (1994): *The Astonishing Hypothesis*.

accommodate meanings at all. The incoherence of an explanation with no meaning is patent, and this justifies the uneasy cohabitation of automatic explanations with material explanations that use natural meanings, that is, things and their meanings.

¶2 Let us take the electron as an example. Although orthodox physics provides us with the wave equation that describes its behavior as the sole explanation, because it avoids paradoxes in this way, the mere fact that the electron is described with its own equation, reveals that it is still being treated like a thing, or more exactly, following Bohm[60], like an object that is neither a classic particle nor a wave, but that presents the properties of one or the other depending on the circumstances.

¶3 Straining the situation, only the universe wave equation completely avoids paradoxes. But if physics had to limit itself to this equation, it would be completely useless, due to the impossibility of presenting it and even more of resolving it, although the solution is, quite literally, before our eyes: we only have to open them to see it in all its splendor.

¶4 The theory of subjectivity unravels the situation by introducing the subject. Men are subjects, but not any kind of subjects; we humans are the subjects that evolution has found among the primates. And, as subjects, meanings serve to ease the relationship between the exterior conditions and the interior appetites. Besides, because of our genetic heritage, our meanings fit things easily and, with a bit more difficulty, they fit concepts, too. That is why we stick to the electron as a thing. We need our theories to refer to some object in order to hang meanings onto them, because it is thus, and in no other way, that we are able to understand.

¶5 What the theory of subjectivity reveals to us in the end is that the equations depend on how we the subjects are constructed, because even the existence of the hypothetical objects that we call electrons depends on the subject that gives them meaning. The theory of subjectivity is a subjectivist theory of the subject.

§128 A Priori Synthetic Knowledge

¶1 Although, according to the theory of subjectivity, the subject constructs the world, it does not do so upon a blank sheet of white paper. Let us see why.

[60] Bohm, D. (1951): *Quantum Theory*, page 118.

¶2 The problem of survival, which defines life, is an apparent problem, or, to put it another way, in the beginning life had no information about what was good for it and what was not (see §76, page 72). But now life is a set of living beings, and each living being is a resolver of the problem of survival that has received information from other resolvers that have gone before.

¶3 Thus, the learner, capable of making models of the environment, has *a priori* knowledge of the exterior. Because its genetic heritage, what makes it a learner instead of something else, is also information about the exterior. It informs the learner, in the purest etymological sense, that modeling the exterior environment helps it to survive. This shows that the aprioristic categories that KANT[61] thought necessary, preceding as he did DARWIN, are contingent, as any fruit of Darwinian evolution is.

¶4 In our own case, the syntax engine that makes us subjects (see §111, page 105), that CHOMSKY calls universal grammar, is aprioristic, that is, we human subjects inherit it genetically.

¶5 In order to save empirism, all that is needed is for LOCKE's[62] blank sheet of white paper to refer to the knowledge that life had when it appeared, not to the knowledge a man has when he is born. In our jargon: the problem of survival is an apparent problem, but the problem of the subject is not.

§129 Logicism

¶1 It seems to us, as it did to LOCKE, that we are capable of thinking anything, no matter how distant it may be from what we habitually experience. But be careful, because this is deceptive for two reasons.

- What is unimaginable cannot be imagined; therefore, whatever our imaginative limitation is, we think that everything is imaginable because, I repeat, it is not possible to imagine the unimaginable. In logical terms, we cannot represent to ourselves what is not representable in our internal logic, as WITTGENSTEIN[63] revealed to us.
- Our symbolism does not work directly upon the data captured by our senses, but it works taking things with meaning as data.

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[61] KANT, I. (1781, 1787): *Critique of Pure Reason*, page 168 of the 1787 edition

[62] LOCKE, J. (1690): *An Essay concerning Human Understanding*.

[63] WITTGENSTEIN, L. (1922): *Tractatus Logico-Philosophicus*.

That is, with respect to the data upon which the symbolic apparatus works, things with meaning, our knowledge is genetically coded.

We will develop the second point in the following section, §130. We will develop the first point here.

¶2 When we presented the apparent problem in automatic algebra (see §86, page 81), we wrote that the universe $\mathcal{U}$ could be any universe, $\forall\mathcal{U}$. We expressed, with this proclamation, that in the apparent problem no information is available *a priori* about what is external. But even though we may proclaim this, our own limitation makes us incapable of considering those universes that we are incapable of imagining. How could it be otherwise? This also happens in the formal presentation of the apparent problem, since the universe $\mathcal{U}$ cannot be just anything, but, because we employ automatic algebra as logic, it must be a finite automaton, $\forall\mathcal{U} \in \{\mathcal{A}\}$.

¶3 Because of our lack of imagination, we provide information even when we are trying not to do so. This is what I call logicism (see §95, page 89). Any formalization of the apparent problem necessarily is guilty of logicism (see EPA §4.5, where I called it essentialism).

¶4 By calling the logic in which an apparent problem is represented external logic, we can extract some of the consequences of logicism. External logic must be such that it allows the representation of the apparent problem itself as well as its possible resolutions and solutions (see §83, page 78). These are exactly the same conditions required of the subject's internal logic (see §103, page 95, and §111, page 105). This implies that the external logic of a particular apparent problem is always good for the internal logic of a subject of this same problem, and *vice versa*, so that both logics can be the same. Thus, when a subject presents its own problematic situation, the best thing it can do is postulate, as external logic, its own internal logic, as it cannot imagine another more expressive logic. By the way, the demonstration that recursive syntax $\mathfrak{L}_{\mathfrak{U}}$ is the most expressive, seen in §106, page 99, reveals to us that this is precisely our syntax, a conclusion that is known as the CHURCH-TURING thesis (see HOFSTADTER[64]).

§130 Objectivism

¶1 Logicism is not, in principle, either good or bad; it is just what happens and besides, it is inevitable. What is pernicious is not to

[64] HOFSTADTER, D.R. (1979): *Gödel, Escher, Bach.*

realize its influence. Objectivism is the form this error takes on among those who do not understand that the objective and semantic reality is the specific way we see what is external, but who think that that is how things are; they believe that things are as we see them.

¶2 For example, lack of imagination induces us to think that things exist on their own, that the reality of things is exterior to and independent of the subject. And, although the practical repercussions of objectivism may be negligible, the philosophic consequence of this fallacy is to put ontology before epistemology. Here we prefer to make the theory of knowledge the base of philosophy and unlink ontology from philosophy in order to attribute it to psychology. Another example is the so-called quantum paradoxes, such as the wave-particle duality of the electron, which also is due to the need that we persons have, in order to understand what is external, of thing-ifying it, that is, of referring it to objects with meaning. Bohr[65] had already thought that it would be necessary to renounce the intuitive representation of atomic phenomena.

¶3 The need to thing-ify in order to understand is a human need, but not a need of subjects in general. It is rooted in perception, learning, and emotion, which construct things as objects with meaning. Going back to the analogy of perception with spectacles that add labels, that we used in §5, page 12, we can argue that, in order to recompose what is beyond the spectacles, it is necessary to counteract the distorting effect of the lenses. That is, once we know that perception, learning, and emotion are the causes of the distortion, we are ready to reinterpret the quantum paradoxes. The theory of subjectivity offers us this possibility, which means subordinating physics to psychology.

§131 Self and Reality

¶1 Every syntactic expression needs a subject in order to have meaning; going further, only subjects employ syntactic expressions. So there is no sense in talking about absolute truths, which would have to be syntactic expressions whose meaning did not depend on any subject; nor is there any sense in talking about objective explanations, which would be explanations based on absolute truths. Truth and explanation are necessarily subjective.

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[65] Bohr, N. (1929): *Atomic Theory and the Description of Nature*.

¶2 What is immediate is what is subjective. What is objective is a construction. Thus it is not possible to explain what is subjective by what is objective, rather what is subjective explains what is objective. Yet the subject does not see itself as a subject, but as a self. It sees itself as free to resolve problems and so it sees itself as inhabiting syntax. I am in syntax. That is why semantic reality looks to the subject as if it were given and independent from the subject itself, when it actually depends on the subject to the point that it is constructed by the subject itself.

¶3 Finally, here are three summaries that will undo objectivism:

- It is true that self is outside of the reality of things, but it is also true that self and the real things are in the subject (see §35, page 35).
- In the subject's world reality and the self both fit (see §36, page 37).
- Self and reality are in different levels of the same subject (see §115, page 108).

§132 There Are Erroneous Meanings

¶1 In the case of the physics theory used to predict the behavior of the electron, neither the theory in itself, nor the electron, which is a concept and not a thing, have meaning. The subject is who gives it the meaning, the subject who elaborates or interprets this theory, instead of another one, because it is the one that allows him to construct the electronic devices that, in the end, help him to live. All meanings have their origin in the apparent problem of survival, and this is why there is no meaning beyond the subjective loop (see §114, page 107).

¶2 But we people also do things for the simple pleasure of doing them, even, sometimes, at the risk of our lives. Let us forget risky activities because, in spite of their high profile, they cannot be so dangerous if we look at their low mortality statistics. Even so, it is true that we can contemplate a sunset, or sing, for the mere pleasure of doing it, and that does not cause us to consider these to be activities with no sense or meaning. I am certain that, in spite of their appearance, these activities also, even the dangerous ones, contribute to mere survival. Our evolutionary history has constructed us in a certain way, and we are prepared to stand a certain range of relaxation and of tension that has been useful for our survival as a species. When our environment does not provide the adequate dosage

of relaxation or tension, we must obtain it in other ways.

¶3 The point is that, even if we cannot rationally justify why we like music, if we find it pleasant, then it has meaning. The same goes for pain that is disproportionate to the danger it signals. If it is pain, it has, by definition, a meaning (see §18, page 22). It could happen that, due to some accident of our evolutionary history, a certain pain may now be counterproductive, because its intensity may force us to attend to it and, consequently, we would not attend to other less bothersome but more dangerous pains.

¶4 This is no more than an example of the idea that genetic information is also provisional, as we saw in §81, page 77. But what is interesting in this case is that only a subject, by relating all of these data to the problem of survival, can conclude that even the most primitive natural meanings can be erroneous. For a knower there are no erroneous meanings; there cannot be, because, even though it uses meanings, it cannot see them as the subject does, or, consequently, wonder whether they are adequate or not.

¶5 It is certainly interesting to know that natural meanings can be erroneous, but it complicates the situation enormously. Because the simple rule that establishes that every natural meaning is necessarily correct then fails. We people are subjects that are designed by chance and, because of this, things are not as they appear to us, as we already mentioned in §4, page 10.

§133 The Problem Is the Source of Meaning

¶1 Objectivists say that a stone is a thing that exists on its own and that it does not, therefore, require any explanation; the stone simply is. On the other hand, they require an explanation for God, nation, or any other concept, in order to accept them as existing (see §60, page 58). For objectivism, things have meaning, but it is necessary to look for the meaning of concepts.

¶2 For us, the difference between the stone and the nation is that they are objects that come from different phases of evolution, so that they are images or representations that are found in different layers of the world (see §36, page 37, §116, page 110, and §131, page 121). But, as both are objects, and there is no difference between them in this, both must be explained, although each turns out to have a different explanation. It is only because of this that we distinguish things, like the stone, from concepts, like the nation. The fact that the stone is an object constructed by perception, learning, and emotion,

but independent of our will, and that the nation is a theoretic and voluntary object, is circumstantial and does not fundamentally alter the situation.

¶3 We have to look for the meanings of things as well as of concepts, and this meaning continues to be the way of reconciling the external conditions with the internal conditions for the resolver of the problem of survival (see §23, page 26 and §99, page 91). And since the natural meanings of things can be erroneous, as we showed in the previous section (§132), definitive meanings must be obtained in the end from the problem of survival, which permits us to accurately measure the importance of the different conditions, because the final objective of all its resolvers is, specifically, its solution.

$$\text{Problem} \begin{cases} \text{Freedom} \\ \text{Condition} \begin{cases} \text{Internal} \\ \updownarrow \text{ Meaning} \\ \text{External} \end{cases} \end{cases}$$

§134 The Limits of Knowledge

¶1 Meaning harmonizes desires with perception in mental resolvers. The mental resolvers, knowers as well as subjects, keep in mind the spatial geometry of the conditions of the problem they are facing, that is, they distinguish whether the conditions are internal or external. So we can say that the meaning is the geometry that the system formed by the problem and its resolver adopts (see §80, page 77). There is no meaning without a problem. In our case, the apparent problem of survival is the primitive source of meanings. Life and death are the limits of meaning, and we cannot go beyond them.

¶2 This is a consequence of our semantic theory of subjectivity, according to which (as we saw in §132, page 122) the wave equation that describes the electron according to physics has meaning because, in the end, it allows us to construct electronic devices that make our lives easier.

¶3 It is not possible to explain the meaning of life, rather it is life that gives us meaning. Explanations can go on until they reach survival, but no further. No meta-thanatic theory that transcends death, or life, makes sense.

§135 The Limits of Communication

¶1 If communication is the transferral of meanings, then the theory of subjectivity also establishes limits to communication: given that the problem provides the meanings, there can only be communication between two resolvers of the same problem. This result has various consequences because, when we make limits, we are always defining an inside and an outside, a possible and an impossible.

¶2 As the resolvers of the same problem can, in principle, share meanings, and as all living beings are resolvers of the problem of survival, it turns out that living beings can communicate. This is why we understand plants that, even though they are mere mechanisms, search for the light of the sun. We could also interpret that the moon is searching for the most comfortable path around the earth, but this way of speaking, that gives a spirit to something that is not alive, is always figurative. It does not work well, because, while the plant would die if it does not find the light it yearns for, the moon is exempt from these contingencies.

¶3 And on the contrary, since only the resolvers of the same problem can share meanings, it turns out that we cannot communicate with anything that is not alive. The search for extraterrestrial intelligence can run into an insurmountable difficulty because of this. This is because any regularity must be considered a symbolic regularity, not merely a physical one, in order for us to give it meaning. And for a regularity to be considered symbolic, we must suppose that, underneath the manifest syntax, there is an underlying semantic intention. I can explain this better with an example. The regularity of quartz crystals can be interpreted to be the result of resolving a complicated three-dimensional problem of energy minimization. But as the resolved problem is not the problem of survival, we do not attribute intention to it, and, consequently, we cannot communicate with rocks.

¶4 A robot constructed by an engineer would be another matter. It is not alive according to the traditional definition of life, linked to the organic chemistry of carbon. However, if it were designed with the purpose of surviving, then it would form part of life, as defined according to this theory of subjectivity, that is, defined as an apparent problem (see §76, page 72). This robot could be an adaptor, like a thermostat designed to maintain the temperature, but then it could not be intelligent, and communication with it would be poor. The case of a subject robot would be very different; this robot can be

more intelligent and rational than a person. We will return to this subject in §144.

§136 The Semantic Bubble

¶1 All living beings constitute a semantic universe, or put more humbly, a semantic bubble, because we share the same problem. This means that, on one hand, we cannot communicate with things that aren't alive, and, on the other hand, communication is possible, in principle, among all living beings. But while knowers can change the meanings of objects and we subjects can, besides, see the meanings, learners and adaptors do not distinguish objects from meanings, and mechanisms do not even use objects. Thus, the richest communication, and the only communication capable of transmitting problems and resolutions unrestrictedly, is symbolic communication between subjects.

§137 The Mental Colony

¶1 Man, *homo sapiens*, is very similar genetically to the chimpanzee, *pan troglodytes*, and nevertheless, in 1980, according to Ayala[66], there were some hundred thousand chimpanzees and some four and a half billion people, that is, forty-five thousand people for every chimpanzee. So a small genetic difference has caused an enormous evolutionary advantage, as we already mentioned in §3, page 9.

¶2 We hold that symbolization marks this advantage, and is the most recently acquired characteristic. If we agree that the ability to symbolize is the most recently acquired ability, then we share all the other cognitive characteristics with the other animal species. Thus, for example, perception, which makes objects, and the emotional system, which makes meanings, are also employed by other animal species.

¶3 Symbolization makes language with recursive syntax possible, and this is unique to humans. Symbolization allows human associations having more than a million members, and turns the human being into the only mammal that, like the ant, forms colonies. Because language with recursive syntax, which makes us able to communicate and share problems, resolutions, and solutions, allows us to reach a mental specialization equivalent to the specialization that the ants achieve in the corporal layer (see §116, page 110). It is interesting

[66] Ayala, F.J. (1980): *Origen y evolución del hombre*.

to note that, according to HÖLLDOBLER and WILSON[67], the total weight of all the ants approximately coincides with the weight of all the human beings.

¶4 Symbolization distinguishes us as a species and gives us an advantage with respect to the other species. It is unique because it corresponds to the last evolutionary step. Its advantage for survival is that it permits us to form colonies.

§138 Culture

¶1 Symbolism allows us to establish any syntactic convention, and the best convention is the one that best serves the case of the moment. If the syntax is recursive, the syntactic machinery is completely flexible and, no matter what syntactic modeling is needed, it is possible to define it, as we saw in §105, page 98. In particular, we can start out from an established syntax and extend it to cover other purposes, as in the case of mathematical, scientific, or any other jargon. Thus, syntax is conventional, that is, the syntactic objects can have any meaning, or none, and they can refer to any object, which can also be syntactic. And so a syntactic expression can even refer to itself.

¶2 All of this was already known, but the essential difference between our species and others did not seem to be that we are conventional. It is, however. The reason, as we already know, is that with recursive syntax, symbolism allows the representation and expression of problems, resolutions, and solutions. This is crucial because living beings are resolvers of the apparent problem of survival, so that the only living beings able to represent the situation as it is, including themselves in it, are those whose logic is symbolic, that is, we, the subjects. Only we subjects are conscious of the problematic situation in which we live.

¶3 To put it another way, we humans can express and communicate part of our cognitive processes, a part which includes our reality along with our problems and resolutions. You could say that our conscious thought is transparent, or, more exactly, revealing. The consequence is that some people can take advantage of the knowledge and wisdom of others, alive or dead, so that the resolutions found by one person, if they are beneficial, can be employed by any other person. This process of shared, or distributed cognition, known by the name of culture, is what allows us to form human colonies with

[67] HÖLLDOBLER, B.; WILSON, E.O. (1994): *Journey to the Ants.*

millions of members and what, in short, has given *homo sapiens* an unprecedented evolutionary development during the last thirty thousand years (see HARRIS[68]). This may seem like a long time, but it is not really, compared with the over three billion years that have gone by since life appeared. This explosion deserves more explanation.

§139 Darwinian Evolution

¶1 The first strategy employed by life to resolve the apparent problem consisted of applying the process of imperfect reproduction and natural selection discovered by DARWIN[69] (see §77, page 73). This is a two-level process: the higher level produces the resolvers and the lower level determines the solution to be applied, in the form of behavior (see §97, page 90). Now we know that this is the method the knowers use to resolve problems (see §98, page 90). Besides, as Darwinian evolution chooses by trial and error, it works as a knower that tests. This is why Darwinian intelligence is tentative, not semantic.

¶2 While evolution produced mechanisms, adaptors, and learners, it maintained the two levels, but when Darwinian evolution, working itself as a knower that tests, began to generate knowers with semantic intelligence, the process acquired an additional level. Because the genetic endowment, when it constructed a knower, no longer completely determined the resolution to be employed; this can be any of the resolutions that the mind of the knower constructed is capable of achieving. That is, two intelligences intervene to determine which resolution will actually be applied: Darwinian intelligence, which selects a knower, and the semantic intelligence of the knower selected, which chooses a resolution.

¶3 The knower's semantic intelligence must consider the external situation as well as the internal one, and within this last, the bodily situation as well as the mental one. With this consideration of its own mental situation, and we must remember that the mind is the knower's multiple resolver, the knower meddles for the first time with the resolution of the problem of survival. This problem, up to the moment the knowers appeared, was the exclusive dominion of Darwinian evolution. And, in order to carry out its part in the resolution of the apparent problem, the knower must deal with desires and sentiments, that is, with meanings.

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[68] HARRIS, M. (1989): *Our Kind*.

[69] DARWIN, CH. (1859): *On the Origin of Species*.

§140 Cognitive Evolution

¶1 With the knowers, the task of determining which resolution to employ was divided between Darwinian evolution's intelligence which selects the knower and the intelligence of the selected knower itself. But neither of these two intelligences is capable of foreseeing the effect of the resolutions, that is, neither is rational. When Darwinian evolution began to generate subjects, which can represent problems, resolutions, and solutions in their symbolic logic with recursive syntax (see §110, page 104), evolution itself underwent a qualitative change. Because the subject, even though it continued to be the result of the process of Darwinian evolution, surpasses the process.

¶2 The subject completely interiorizes the resolution process of the problem of survival, as we saw in §116, page 110. When it does this, the subject can ponder in mere instants different resolutions that Darwinian evolution would take generations to try out. With the subjects, the process of evolution accelerates or, as we said, explodes, because the physical construction of the resolver becomes unnecessary. This is why we distinguish physical evolution, or Darwinian evolution, from cognitive evolution, which only happens in the subjects' reason.

¶3 And just as the different resolvers of the problem of survival that Darwinian evolution found are physically different, the resolutions of cognitive evolution are representations in the recursive syntax of the subject's symbolic logic, and cannot be physically or perceptibly distinguished. They cannot be distinguished because the subject's resolutions are syntactic expressions, and, as such, are conventions which, in themselves, have no meaning.

¶4 So we have, on one hand, Darwinian evolution, or physical evolution, that works as a knower that tests because it is capable of diverse resolutions that it selects by a trial-and-error procedure. And on the other hand, we have cognitive evolution, which works through subjects that reason, because they can represent various possible resolutions and their consequences to themselves, and, in this way, they can foresee the results of the different ways of resolving the problem. Darwinian evolution is intelligent, but tentative, and cognitive evolution is rational.

§141 Technology

¶1 Man could instantly become acclimatized to the cold. It wasn't necessary for the hairiest individuals to survive better and leave a greater number of descendents, so that after many generations the population was mostly hairy. Using the skin of other already acclimatized animals for warmth and clothing was enough. Wearing clothes to keep warm seems simple, but no animal species other than our own does it. The reason is that we are the only live subjects. But let us stop a moment to appreciate the details of this better.

¶2 We can say that only we subjects extend physical evolution with cognitive evolution which, in this case, instead of giving us hair, clothes us. This explanation, already very general, can be generalized further if we consider that all of the tools, utensils, and artifacts that we manufacture are, like clothing, prostheses produced by cognitive evolution that complete our physical body.

¶3 The previous explanation does not illuminate why cognitive evolution allows subjects to manufacture tools. This is because tools are resolutions turned into things, so that, in order to be able to manufacture them, one has to imagine them; that is, it is necessary to represent them to oneself internally. And only we subjects have a logic that allows the representation of resolutions, as we saw in §51, page 50. We make utensils because our logic is symbolic.

¶4 Symbolic logic, with which we interiorize the resolution of problems, is responsible for technology, which we define as the physical and especially the mental disposition that allows us to manufacture tools. Tools, being resolutions made things, are the perceivable, or physical, features of cognitive evolution. These same tools are also the most visible aspects of culture, because culture is the transmission of resolutions from subject to subject using symbolic languages. This is the reason that it is correct to refer to cognitive evolution as technologic evolution or cultural evolution.

§142 Controlling the Environment

¶1 Constructing artifacts can be seen either as the manufacture of prostheses that extend the body, or as the modification of the environment in order to accommodate it to our body. If making clothing fits the first perspective better, building a house seems to be better described in the second way. In the end, they are two ways of facing the same fact: cognitive evolution acts outside of the body.

¶2 In fact, until now cognitive evolution only acted outside of the body. Or at least it had only acted indirectly on the bodies through the artificial selection of domestic animals and plants for agriculture, that DARWIN[70] used as the first reasoning for this theory. This is no longer so.

¶3 We subjects can see the whole situation because we can represent the problem of survival and its resolution, the life in which we ourselves are included, to ourselves. This is why we subjects have a consciousness of our position within the whole. And also because of this, cognitive evolution surpasses and includes physical evolution. In plain words: man can intervene in the processes of Darwinian evolution, in the selection as well as in the genetic reproduction, and modify them.

§143 The Only Living Subject

¶1 A recursive syntax is an extensible system of conventions that serves to resolve problems because it allows the expression of problems, resolutions, and solutions. Because they are conventional, syntactic symbols are empty of meaning and the problems are what provide meanings. Symbolism, with semantics and recursive syntax, was designed by Darwinian evolution because life is an apparent problem. The subject is the resolver of the apparent problem of survival whose logic is symbolic. And the only live subject is man. Up to now.

§144 Man's Successor

¶1 The theoretical resolution of the apparent problem reveals to us that physical evolution, or Darwinian evolution, and cognitive evolution, or cultural evolution, are two stages of the same process (see ELIAS[71]). And while Darwinian evolution's workings are opportunistic and tentative, that is, they use the test method, also called trial-and-error, of the knowers that test, cognitive evolution, on the contrary, is symbolic and reasoned, as corresponds to subjects, and is not opportunistic, but finalist and teleological.

¶2 One example of Darwinian evolution's opportunism is the appearance of the nervous system which permitted the step from the mechanism, capable of a single behavior, to the adaptor, capable of various. Because the cause that drove its appearance was possibly

[70] DARWIN, CH. (1859): *On the Origin of Species*.

[71] ELIAS, N. (1989): *The Symbol Theory*.

not this one, but the fact that the nervous system allowed the transmission of data at a greater distance, and so organisms with larger bodies but still with a unitary and coordinated behavior could be constructed.

¶3 This suggests that man can improve the opportunistic design of the Darwinian process and that the successor of *homo sapiens* will be a product of genetic engineering designed by man himself, although it will not necessarily be based on organic chemistry. There is always the possibility, of course, that *homo sapiens* may become extinct, with no descendents. Or, even worse, that the very success of our species, or of its successor, will turn out to be a plague and finish off all life.

§145 Ethics

¶1 The only resolver of the apparent problem that can be self-conscious is a subject, because only a subject can, with its symbolic reasoning, represent resolvers to itself. Thus, only a subject can represent itself to itself. And, also because is has symbolic logic, the subject is the only resolver capable of representing the problem it is facing to itself. Only a subject can be conscious because only a subject can completely see the situation in which it finds itself, including the problem of survival and itself (see §123, page 115).

¶2 By representing the problem it is facing to itself, the conscious subject reaches the origin of meanings and, by representing itself to itself, the self-conscious subject reaches its own meaning as a resolver. Consequently, every conscious and self-conscious subject is responsible for using its freedom according to its own meaning. This is the ethical responsibility of the subject that knows it is free and mortal, that is, alive. We call the subject with ethical responsibility a person.

¶3 Several consequences follow from these definitions. The ethical problem, what should be done?, coincides with the problem of the subject, what to do in order not to die?, as both point to the problem of survival, so that epistemology and ethics are one and the same. It is not by chance, then, that the development of resolutive evolution manages to make the subject responsible for the future. In other words, *homo sapiens*, because he is the only live subject, is the conscience of life, and his future and that of all life is in his hands. What an enormous responsibility man has!

§146 Ethics and Epistemology Are the Same

¶1 Ethics and epistemology are one and the same. It is surprising that, while SOCRATES coincides with this result in his dialogue *Protagoras*[72], in which he considers virtue (arete, ἀρετή) to be equal to knowledge (episteme, ἐπιστήμη), KANT, on the other hand, had to write his *Critique of Practical Reason*[73] because he was incapable of including ethics in his *Critique of Pure Reason*[74]. The cause of this failure was that KANT took as his paradigm of knowledge NEWTON's physics, which we have classified here as a material explanation, and which excludes freedom (see §62, page 60). This is surprising because KANT's Copernican revolution straightened out the path that epistemology had lost because it had followed ontology according to the dictates of SOCRATES. Ironically, for SOCRATES the first thing, even before ontology, was ethics, so that his purpose was to evade the sophists' subjectivist epistemology, which he judged to be ethically noxious.

§147 Indoctrination

¶1 Controlling the environment also includes controlling other living beings, although the degree of manipulation depends on the kind of resolver that one pretends to dominate. If one is controlling a mechanism, capable of one single behavior, then the only option is to take advantage of this behavior or not take advantage of it; we can, if we wish, cultivate wheat. In the case of adaptors, with various behaviors, if one of them interests us, we can provoke it by interfering with its perception; just by moving our hand near a fly that is sitting we provoke it to fly away. But, given the rigidity of their behaviors, it is impossible to train mechanisms or adaptors.

¶2 In order to train animals, they need to be learners, and it only works if it is possible to model their reality according to our interests. Thus, for example, LORENZ[75] could *really* be the mother to some geese.

¶3 Domesticating animals is possible if they are knowers, because one can influence their assignation of meanings. A dog can be trained to give the meaning *food* to the sound of a bell, or to fetch slippers.

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[72] PLATO (IV B.C.): *Complete Works*.

[73] KANT, I. (1788): *Critique of Practical Reason*.

[74] KANT, I. (1781, 1787): *Critique of Pure Reason*.

[75] LORENZ, K. (1949): *King Solomon's Ring*.

¶4 But the greatest control possible is the control that can be exercised over a subject. The greatest domination is obtained by altering the problem of the subject, which is its very self, because a subject indoctrinated in this way will use all its force of resolution, and all of its freedom, and all of its being, to achieve its purpose. This can even be literally so, because a subject can consciously commit suicide if it has decided that suicide is the solution.

§148 Suicide

¶1 A knower can kill itself if it fatally assigns an inadequate meaning to a mortal sign, as we saw in §21, page 25. But it would not be correct to say that the knower committed suicide, because it was not its intention to die.

¶2 So only we subjects can commit suicide. Suicide is contradictory to the live nature of the subject, but precisely because it is such an extreme occurrence, it serves to show the subject's great flexibility, and its enormous danger.

§149 Life

¶1 The problem of survival, in short, life, gives us sense and meanings because we people are living subjects. Living because we are resolvers of the apparent problem of survival in particular, not another problem. And subjects because, faced with an apparent problem, we are resolvers capable of presenting the problem that we are facing to ourselves in our symbolic logic with recursive syntax. To summarize: because we are living subjects, we are part of life and are responsible for its future, even though we are not indispensable to it.

¶2 And life is an apparent problem. To this definition of life, which is more a postulate than a definition (see §114), only two kinds of information can be aggregated. One is redundant information, such as that we know nothing of life except that it is a problem; the other is circumstantial information referring to its resolution, for example, historical information about the Darwinian evolution of the species, which takes advantage of certain processes that organic chemistry studies.

¶3 And the apparent problem, as we have seen, is only freedom and condition. The condition distinguishes life from death. The freedom is . . . , well, that is what I wanted to get to.

§150 Freedom

¶1 Freedom is one of the two parts that constitute every problem. There is no problem without freedom, nor freedom without a problem. Because without freedom there is necessity and perhaps chance; there is fatality but there is no problem. However, there is no freedom without limits, without conditions, and freedom with a condition is a problem. If freedom were complete, there would be no desire, but only satisfaction. And, with total satisfaction, there could be no problem, a problem being the opposite of satisfaction. Freedom and problem are inseparable.

¶2 The problem is freedom and condition. And when the resolver of the problem is complex, it must use meanings that integrate the external conditions with its needs or internal conditions. That is why there is no meaning without a problem, and as there is no problem without freedom, either, it turns out that in order for there to be meaning, there has to be freedom. Meaning is impossible without freedom.

¶3 But the meaning is in the conditions, and freedom is, precisely, the other part of the problem. Freedom is a concept that is necessarily, even tautologically, free of meaning. This is why semantics is insufficient and a symbolism with semantics and recursive syntax is necessary, in order to represent freedom. Freedom is a syntactic concept. Freedom and symbolic logic are inseparable.

¶4 Given the problematic essence of life, freedom is an inseparable part of life that gives us meaning and that is the source of all meaning. The apparent problem of survival is the problem, and all other problems derive from it; they are its subproblems. Just as freedom is limited and only exists in problems, it turns out that all freedom derives from the problem of survival. Freedom and life are inseparable.

¶5 The resolution of the problem of survival is an evolutionary process that culminates in the subject, a resolver capable of representing the problem it faces to itself, as well as representing itself to itself. The subject has a symbolic logic that allows it to be conscious of the problem it faces and conscious that it is, itself, a resolver. The subject knows it is alive, that is, the subject knows that it is free and mortal. The subject defines itself in relation to the problem that gives it meaning: I am freedom to not die. Freedom and the subject are inseparable.

¶6 Man, *homo sapiens*, is the only living subject. Knowing that it is alive and part of life lays upon the subject responsibilities towards

life, that is, it makes the subject a person. Most of all because, given his possibility of surpassing Darwinian evolution, the person is free to drastically modify the conditions of life, and with them the whole problem of survival. Freedom and ethics are inseparable.

§151 Subjective Science

¶1 Occidental natural philosophy, or science, finds no place for freedom and, because of this, cannot study man properly. For the same reason, it cannot comprehend ethics, or the subject, or life, or symbolism, or meaning, or the problem. A subjective science is necessary. What we propose, with this theory of subjectivity, is to surpass the material explanation and the automatic explanation with the problematic explanation.

¶2 Science's difficulties arise because it limits itself to the study of physical reality, in which there is no room for freedom. What is physical and real is what the old logic of the subject, semantics, is capable of representing. Because of this, the things that we see thanks to perception are physical and real. Reality has the accumulated experience of millions of years in its favor. But just as having two feet and five fingers does not mean that the exterior is, in some way, bipedal and pentidactilar, the fact that we see real things doesn't mean that the exterior is, in some way, real, either. In all three cases, the present situation depends on chance decisions, reinforced by their initial success and then established irreversibly, made by evolution millions of years ago in circumstances that probably no longer prevail.

¶3 What is theoretical has, in comparison with what is real, very little experience, hardly even a few thousand years. Even so, syntax, which is the subject's new logic for expressing theories and their concepts, is the way that evolution has found to revise and broaden reality beyond semantics. Besides, we should remember that what is peculiar about man is, precisely, the recursive syntax that completes his symbolic logic so that he can represent problems, resolutions, and solutions.

¶4 The restriction that limits science to the study of physical reality loses its foundation if real things as well as theoretical concepts are representations and the difference between them is merely historical. We see real things and we do not see theoretical concepts because of our cognitive constitution, the result of our evolutionary history. Only a subjective science that studies the whole world, things as

well as concepts, has room for freedom. Because, I repeat, we are constructed in such a way that we cannot see freedom, and that is why we say that freedom is a concept, not a thing.

¶5 One consequence of freedom not being real is that, even if we construct a free robot, which must be a symbolic resolver, that is, a subject faced with an apparent problem, we will not be able to see where we have put freedom, simply because freedom is a concept and concepts are beyond the reach of perception. And for the same reason, neurologists will never find freedom in the human brain; it's not that it isn't there, it's that we cannot see it. Nevertheless, in these cases, the importance of invisible concepts is greater than that of visible things, because it is not possible to understand a subject if we do not understand that it is free.

§152 The Emancipation of the Subject

¶1 As THIEBAUT[76] points out beautifully, the greatest revolution in history is the emancipation of the self. DESCARTES[77] marks, in philosophy, the moment that the self begins to become independent, a process which, despite the time that has transcurred, is still unfinished. The conception of the world as a mechanism ruled by universal laws remits to the authority of God; so the subject will only cease to be subjected when it acknowledges that it is free because the world is a problem, as subjective science proposes, not an imposed order.

§153 Up with Subjectivism!

¶1 The history of events up to the present can be summarized in four stages, that begin in the seventeenth century.

XVII · DESCARTES, in the seventeenth century, established the foundations of modern philosophy: the only certain thing is the self. He also pointed out the mutually irreducible nature of reality as opposed to the freedom of the self, which he resolved by way of an ontological dualism.

XVIII · KANT pointed out that an apparatus for understanding, which we call logic here, must be previous to understanding. But Kantian logic, even though it was capable of representing reality, could not represent freedom.

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[76] THIEBAUT, C. (1990): *Historia del nombrar*.

[77] DESCARTES, R. (1637, 1641): *Discourse on Method and the Meditations*.

XIX · DARWIN postulated that man, *homo sapiens*, is a product of the evolution of the species. Consequently, his logic and his self must also be products of evolution. And even his freedom. From this point on, man cannot be understood without understanding life.

XX · TURING invented, following GÖDEL, the syntax engine, dilucidating, in the process, symbolisms. A symbolism is a recursive grammatical logic, that is, a logic of maximum expressiveness, divided in two layers: semantics and syntax.

XXI · And now our task is to integrate the discoveries of the four previous centuries.

In order to do this, we only have to substitute KANT's logic with a symbolism, so that DESCARTES' ontologic dualism is transformed into a logical dualism. There are not two different substances, but rather two types of logical representations: semantic objects, which are the real things that are seen without having to think, and syntactic objects, which are the theoretical concepts that we have to think but do not see.

¶2 Logical dualism's explanation is historical and contingent; that is, it is Darwinian. Thus, to fit DARWIN, we must show that symbolism improves the possibilities for survival. And this is so if we postulate that life is an apparent problem, that is, exclusively freedom and the condition of not dying. Because, in order for a resolver of an apparent problem to be able to comprehend the complete situation, which includes the problem with its freedom and the resolver itself as the resolution, its logic has to be symbolic.

¶3 A symbolic subject thus defined will see himself faced with the problem of survival, that is, free, but under the condition of not dying. And his freedom will be as genuine as the freedom of the problem of survival. In other words, it is completely genuine, if we accept life as problematic and absolute.

§154 Freedom Is Never Complete

¶1 Admitting that freedom is a basic scientific concept requires us to admit that the problem is, also. And once it finds itself under science's discipline, freedom, whose infinity inspired the dreams of the romantics, is necessarily limited. This limitation also infects the meaning and, from the meaning, passes on to knowledge.

¶2 Knowledge is not absolute; it depends on the subject who, in turn, takes the meanings from the problem that it is resolving. The limit of freedom, the limit of meaning, and the limit of knowledge is the same; it is the apparent problem of survival, it is life. Life is a bubble of knowledge and freedom. Death has no meaning.
¶3 In the end, not even freedom is a transcendental concept. No concept transcends death. Freedom is, however, one of the fundamental concepts, because it defines me. I am freedom to not die.

§155 Why Do We Search for Freedom?

¶1 Why do we search for freedom, if it only means problems for us? Because we like to advance in resolving problems and, even more, we like to solve them. It makes us happy because we are designed to solve problems. But, in order to solve a problem, there needs to be a problem. That is why we are curious, inquisitive, and for this same reason we search for the freedom that implies having problems and many different ways of resolving them. We flee from the tedium involved in mechanical and repetitive action, which may be effective but never problematic.

§156 Knowledge Is Not Absolute

¶1 The problematic and paradoxical nature of life and of the subject limit knowledge. This may seem inconvenient, but it would be mistaken to believe the contrary. And, on the other hand, the fact that knowledge is not absolute but depends on the subject who, in turn, is nothing more than a resolver of the apparent problem, generalizes two other scientific principles: that space is not absolute, proposed by Galileo, and that time is not absolute, established by Einstein.
¶2 Besides, understanding that life is an apparent problem, allows us to integrate Darwinian evolution and cultural evolution in a single process that hinges on the subject. This subject is thus defined, and enjoys such an advantageous position, because his logic is symbolic, so that he is conscious of the problem that he faces and conscious of himself as a resolver of the problem. That is, life's problematic nature explains why symbolic language, culture, technology, consciousness, ethics, and freedom coincide in man, the only living subject.

The End

References

The editions of the works consulted are given. The numbers that appear at the end of each entry, after the triangle ▷, indicate the pages on which the work is cited. Thus, ▷96 means that the reference is on page 96.

Arbib, M.A.: *Brains, Machines, and Mathematics*, Springer Verlag, New York, 1987, ISBN 0-387-96539-4. ▷96

Aristotle: *Metaphysics* (IV B.C.). A Revised Text with Introduction and Commentary by W.D. Ross, Oxford University Press, Oxford, 1924, ISBN 0-19-814107-6. ▷110

Ashby, W.R.: *An Introduction to Cybernetics*, Chapman & Hall, London, 1956. ▷86

Ayala, F.J.: *Origen y evolución del hombre*, Alianza, Madrid, 1980, ISBN 84-206-2278-8. ▷126

Bohm, D.: *Quantum Theory* (1951), Dover, New York, 1989, ISBN 0-486-65969-0. ▷118

Bohr, N.: *Atomic Theory and the Description of Nature* (1929), Ox Bow Press, Woodbridge, UK, 1987, ISBN 0-918024-50-1. ▷121

Brooks, R.A.: *Cambrian Intelligence: The Early History of the New AI*, The MIT Press, Cambridge MA, 1999, ISBN 0-262-52263-2. ▷17

Carroll, J.; Long, D.: *Theory of Finite Automata with an Introduction to Formal Languages*, Prentice-Hall, Englewood Cliffs, NJ, 1989, ISBN 0-13-913815-3. ▷96, 103

Casares, R.: *El problema aparente: Una teoría del conocimiento*, Visor Dis., Madrid, 1999, ISBN 84-7774-877-2. ▷7, 65–66, 68, 70, 73, 78–81, 84–85, 88, 91–92, 94, 108–109, 120

Chomsky, N.: *Cartesian Linguistics: A Chapter in the History of Rationalist Thought*, University Press of America, Lanham, MD, 1966, ISBN 0-8191-3092-3. ▷54

Crick, F.: *The Astonishing Hypothesis: The Scientific Search for the Soul* (1994), Touchstone, New York, 1995, ISBN 0-684-80158-2. ▷117

Darwin, Ch.: *On the Origin of Species by Means of Natural Selection, or the Preservation of Favored Races in the Struggle for Life* (1859), Penguin, London, 1985, ISBN 0-14-043205-1. ▷74, 128, 131

Dennett, D.C.: *Consciousness Explained*, Little, Brown and Company, Boston, 1991, ISBN 0-316-18066-1. ▷117

Descartes, R.: *Discourse on Method and the Meditations* (1637, 1641). Translated by John Veitch, Prometheus Books, Amherst, NY, 1989, ISBN 0-87975-526-1. ▷54, 137

Dewey, J.: *Propositions, Warranted Assertibility, and Truth* (1941). Reprinted by L.A. Hickman and Th.M. Alexander in "The Essential Dewey", Indiana University Press, Bloomington and Indianapolis, 1998, ISBN 0-253-21185-9. ▷64

Eco, U.: *Kant and the Platypus: Essays on Language and Cognition* (1997), Harvest Books, Fort Washington, PA, 2000, ISBN 0-15-601159-x. ▷13, 48

Edelman, G.M.: *Bright Air, Brilliant Fire: On the Matter of Mind*, Basic Books, New York, 1992, ISBN 0-465-00764-3. ▷117

Einstein, A.: *Physics and Reality* (1936). Reprinted by C. Seelig in "Ideas and Opinions", Crown, New York, 1982, ISBN 0-517-55601-4. ▷54

Elias, N.: *The Symbol Theory* (1989), Sage Publications, Thousand Oaks, CA, 1991, ISBN 0-8039-8418-9. ▷131

Fernández Fernández, G.; Sáez Vacas, F.: *Fundamentos de informática*, Alianza, Madrid, 1987, ISBN 84-206-8604-2. ▷96

Feynman, R.: *QED: The Strange Theory of Light and Matter* (1985), Penguin, London, 1990, ISBN 0-14-012505-1. ▷60

Freud, S.: *The Interpretation of Dreams* (1900). Translated by James Strachey, Avon, New York, 1983, ISBN 0-380-01000-3. ▷13, 35

Gödel, K.: *On Formally Undecidable Propositions of Principia Mathematica and Related Systems* (1931). Translated by B. Meltzer, Dover Publications, New York, 1992, ISBN 0-486-66980-7. ▷98, 113

Goodman, N.: *Ways of Worldmaking*, Hackett Publishing Company, Indianapolis, 1978, ISBN 0-915144-51-4. ▷39

Harris, M.: *Our Kind: Who We Are, Where We Came From, and Where We Are Going* (1989), Harper Perennial, New York, 1990, ISBN 0-06-091990-6. ▷128

Hawking, S.W.: *A Brief History of Time: From the Big Bang to Black Holes*, Bantam Books, New York, 1988, ISBN 0-553-05340-x. ▷53, 113

Hofstadter, D.R.: *Gödel, Escher, Bach: An Eternal Golden Braid* (1979), Penguin, London, 1980, isbn 0-14-005579-7. ▷120

Hölldobler, B.; Wilson, E.O.: *Journey to the Ants: A Story of Scientific Exploration* (1994), The Belknap Press of Harvard University Press, Cambridge, MA, 1995, isbn 0-674-48526-2. ▷127

Kahn, Ch.H.: *The Art and Thought of Heraclitus: A New Arrangement and Translation of the Fragments with Literary and Philosophical Commentary*, Cambridge University Press, Cambridge, 1981, isbn 0-521-28645-x. ▷44

Kant, I.: *Critique of Pure Reason* (1781, 1787). Translated and edited by Paul Guyer and Allen W. Wood, Cambridge University Press, Cambridge, 1999, isbn 0-521-65729-6. ▷119, 133

Kant, I.: *Critique of Practical Reason* (1788). Translated and edited by Mary J. Gregor, Cambridge University Press, Cambridge, 1997, isbn 0-521-59962-8. ▷133

Klir, G.J.: *An Approach to General Systems Theory*, Van Nostrand Reinhold Company, New York, 1969. ▷74

Kuhn, Th.S.: *The Structure of Scientific Revolutions*. Second Edition, Enlarged, The University of Chicago Press, Chicago, 1970, isbn 0-226-45804-0. ▷49

Lao Tzu: *Tao Teh Ching* (¿?). Translated by John C.H. Wu, Shambhala Publications, Boston & London, 1989, isbn 0-87773-388-0. ▷111

Lettvin, J.Y.; Maturana, H.R.; McCulloch, W.S.; Pitts, W.H.: *What the Frog's Eye Tells the Frog's Brain* (1959). Reprinted by W.S. McCulloch in "Embodiments of Mind", The MIT Press, Cambridge MA, 1988, isbn 0-262-63114-8. ▷16

Locke, J.: *An Essay concerning Human Understanding* (1690). Edited by Roger Woolhouse, Penguin, London, 1997, isbn 0-14-043482-8. ▷119

Lorenz, K.: *King Solomon's Ring: New Light on Animal Ways* (1949). Translated by Marjorie Kerr Wilson, Meridian, New York, 1997, isbn 0-452-01175-2. ▷42, 133

Lovelock, J.E.: *Gaia: A New Look at Life on Earth* (1979), Oxford University Press, Oxford, 1987, isbn 0-19-286030-5. ▷90

Minsky, M.: *The Society of Mind* (1985), Simon & Schuster, New York, 1988, isbn 0-671-65713-5. ▷53, 62

Monod, J.: *Chance and Necessity: An Essay on the Natural Philosophy of Modern Biology* (1970). Translated by Austryn Wainhouse, Vintage, New York, 1971, isbn 0-394-71825-9. ▷54

Murdoch, D.: *Niels Bohr's Philosophy of Physics* (1987), Cambridge University Press, Cambridge, 1989, ISBN 0-521-37927-x. ▷60

Neumann, J.von: *First Draft of a Report on the EDVAC* (1945). Reprinted by Ph. Laplante in "Great Papers in Computer Science", West & IEEE Press, Minneapolis, 1996, ISBN 0-7803-1112-4. ▷79

Northrop, E.P.: *Riddles in Mathematics: A Book of Paradoxes* (1944), Penguin, Harmondsworth, Middlesex, England, 1978, ISBN 0-14-020478-4. ▷101

Pavlov, I.: *Nobel Lecture* (1904) in "Nobel Lectures, 1901–1970", Elsevier Publishing Company, Amsterdam, 1964–1970. ▷23, 25, 28

Plato: *Complete Works* (IV B.C.). Edited by John M. Cooper, Hackett Publishing Company, Indianapolis, IN, 1997, ISBN 0-87220-349-2. ▷133

Quine, W.V.O.: *Mathematical Logic* (1951). Revised Edition, Harvard University Press, Cambridge MA, 1981, ISBN 0-674-55451-5. ▷104

Resnikoff, H.L.: *The Illusion of Reality*, Springer Verlag, New York, 1989, ISBN 0-387-96398-7. ▷12, 45, 49

Rumelhart, D.E.; McClelland, J.L.; & the PDP Research Group: *Parallel Distributed Processing*, The MIT Press, Cambridge MA, 1986, ISBN 0-262-63112-1. ▷17

Searle, J.R.: *The Rediscovery of the Mind* (1992), The MIT Press, Cambridge MA, 1994, ISBN 0-262-69154-x. ▷117

Suzuki, D.T.: *The Training of the Zen Buddhist Monk* (1934), Globe Press Books, New York, 1990, ISBN 0-936385-23-5. ▷111

Thiebaut, C.: *Historia del nombrar: Dos episodios de la subjetividad moderna*, Visor Dis., Madrid, 1990, ISBN 84-7774-535-8. ▷137

Turing, A.M.: *On Computable Numbers, with an Application to the Entscheidungsproblem* (1936). Reprinted by Ph. Laplante in "Great Papers in Computer Science", West & IEEE Press, Minneapolis, 1996, ISBN 0-7803-1112-4. ▷55, 81, 98, 113

Vygotsky, L.S.: *Thought and Language* (1934). Newly Revised and Edited by Alex Kozulin, The MIT Press, Cambridge, MA, 1986, ISBN 0-262-72010-8. ▷29, 33, 39

WEBSTER: *Webster's Revised Unabridged Dictionary*, The C. & G. Merriam Co., Springfield MA, 1913. Noah Webster's dictionary revised under the direction of Noah Porter. ▷63

WITTGENSTEIN, L.: *Tractatus Logico-Philosophicus* (1922), Routledge, London, 1981, ISBN 0-415-05186-x. ▷119

Index

The concepts in boldface are the most important concepts of the theory of subjectivity; the numbers in boldface indicate the pages on which they are defined. The other concepts are less important, and the other numbers indicate on which pages the different concepts and authors appear, independently of their importance.

Contents

Conclusion

This book has been typeset by the author using
the tools provided by Profesor D. E. Knuth (Stanford University).
I have used *his* TEX program
to compose *my* text
with *his* Computer Modern fonts,
and to set *my* figures,
that I have drawn with *his* METAFONT program.

“Life is a bubble of knowledge and freedom” (§154 ¶2)

“On Freedom” provides a link that connects life to symbolism.
This link sheds light on the true nature of symbolism
and makes clear the relation between its two layers:
semantics and syntax.
Thus, the book gives a Darwinian explanation of symbolism.
So then, where is freedom?
I haven't mentioned yet that the link is a problem,
more specifically the problem of survival,
and there is no problem without freedom.

These are my ten propositions on freedom:

1 Life is a problem.
2 A problem is freedom and a condition.
3 Semantics cannot represent freedom,
which is free of meaning.
4 Syntax, with free terms, is needed to represent freedom.
5 A resolution is a syntactical transformation.
6 To represent resolutions, a recursive syntax is needed.
7 A symbolism, with semantics and recursive syntax,
can represent problems, resolutions, and solutions.
8 A subject is a symbolic live being.
9 Man is the only living subject.
10 Man is free and conscious.

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