

Chapter 1

The Organized Being

§ 1. Introduction

The foundations for the material presented in this book have been previously laid down in the author's earlier work, *The Critical Philosophy and the Phenomenon of Mind* [WELL1], hereafter abbreviated as *CPPM*. The book before you now arises from the desire and need both for a more summary treatment of the earlier material and for a top-down exposition of the systematic architecture of the phenomenon of mind. The presentation of the theory in *CPPM* was that of a voyage of discovery and deduction in which the fundamental principles and laws of mind were uncovered and, in a manner of speaking, unearthed by beginning with observable phenomena and progressing down layer by layer to find the underlying principles for understanding these various phenomena. Because this "mental physics" of mind is a new and still nascent science, it was necessary in that work to introduce the basic definitions of the technical terms used in the theory. It was also necessary to present in full the underlying metaphysics that grounds our understanding of the objects and proper reasoning in this science, without which no *first principles* of a science can be obtained. An apt metaphor for describing that work is: *CPPM* adopted the viewpoint of the explorer venturing for the first time into the wilderness to learn what was out there. Similarly, this book is written from the viewpoint of the pioneer working to tame that newfound country.

The central concern of *CPPM* lay with finding our first principles. The central concern in this book is in applying these principles to the study of mind and brain. Accordingly, the methods and first principles from *CPPM* are stated and used in this book, not deduced and justified. I must ask for the reader's indulgence for this method of presentation in order that this book might turn out to be a much shorter treatise than was possible in its forerunner work. It is my hope that by this indulgence and through his understanding of what can be done with the new theory, the reader's comprehension of the difficult material in *CPPM* will be made easier by this work.

I refer this new theory as **mental physics** because the name aptly describes the intent. This intent is not to try justifying mental laws and principles from a basis in the already-established science of physics. It was shown in *CPPM* that such a basis is not possible because physics has nothing in its laws and paradigms capable of dealing with mental phenomena as a science should. Indeed, the Critical metaphysics in *CPPM* can anchor the foundations of physics but physics can not anchor the foundations of psychology and neuroscience. By calling it 'mental physics' I mean for us to understand this science as a science that can do for psychology and neuroscience what physics already does for the nature of dead matter. This is to turn psychology and neuroscience

into proper *mathematical* sciences of mind and brain.

The theory presented here has some relationship to both structuralism and functionalism but is not synonymous with either. **Structuralism** is a method of inquiry predominantly concerned with the description of structures. We define **structure** to be a system of self-regulating transformations such that: (1) no new elements engendered by their operation breaks the boundaries of the system; (2) the transformations of the system do not involve elements from outside the system; and (3) the system may have sub-systems differentiated within it, these sub-systems having particular transformations from one sub-system to the others within the overall system. We define **structuring** as the act of putting into effect the operation of one or more of the self-regulating transformations in the structure. We define a **system** as a set of interdependent relationships constituting an object with stable properties, independently of the possible variations of its elements.

Functionalism is the view that what makes a mental state whatever it is, be it an 'emotion' or a 'cognition' or etc., is the functional role it occupies. For example, what makes a mousetrap a mousetrap is simply that it traps mice. Functionalism has been historically associated with scientific materialism and attempts to define states in terms of what these states do. Psychology has used the term from the viewpoint that behavior and mental phenomena can be explained as an organism's strategies for adapting to its biological or social environment.

Theoretical neuroscience has come to recognize that neither structuralism nor functionalism by themselves are capable of producing the sort of hard-based findings needed for a science of mind and brain. Theorist Stephen Grossberg of Boston wrote:

[The] relationship between the emergent functional properties that govern behavioral success and the mechanisms that generate these properties is far from obvious. A single [neural] network module may generate qualitatively different properties when its parameters are changed. Conversely, two mechanisms which are mathematically different may generate formally homologous functional properties. The intellectual difficulties caused by these possibilities are only compounded by the fact that we are designed by evolution to be serenely ignorant of our own mechanistic substrates. The very cognitive and learning mechanisms which enable us to group . . . ever more complex information into phenomenally simple unitized representations act to hide from us the myriad interactions that subserve these representations during every moment of experience. . . The simple lesson that the whole is greater than the sum of its parts forces us to use an abstract mathematical language that is capable of analyzing interactive emergence and functional equivalence. [GROS1]

We define **functioning** as the structuring activity whose structure constitutes the result or the organized event. In mental physics structuralism and functionalism are combined as a synthesis with structure and function standing as coordinate concepts united in the idea of the organization of the system. **Organization** is the interconnected and reciprocally determining functional totality

of an Organized Being. It is one of two **functional invariants** of the Organized Being.

The central object of mental physics is the Organized Being. An **Organized Being** is the model of an organism, especially that of a human being, in which the phenomenon of mind is held to exist and to which the definition "organized being" is held to apply. **Organized being** means an Object in which its parts (in terms of the two modes of existence, called *Dasein* and *Existenz*) are possible only through their interrelation in the whole and in which each part must be regarded as being combined in the unity of the Object in reciprocal determination as an effect of the other parts and, at the same time, as a cause determining the other parts. The implications and meaning of this definition will become progressively clearer to you as we go.

One of the fundamental acroams¹ of mental physics is that the division of an Organized Being in terms of "mind" and "body" is no more than a logical division we employ to understand the Organized Being as a whole. "Mind" and "body" are coordinate ideas and neither can be made subordinate to the other. It is not objectively valid to regard "mind" divorced from "body" nor is it objectively valid to regard "body" divorced from "mind." The long-standing practice in neuroscience of regarding "mind" as an epiphenomenon *caused by* "body" is a false doctrine. We must treat both ideas on equal and even footing and not give any ontological preference to one over the other. Metaphysically, **epistemology takes precedence over ontology** in the theory of mental physics. No theoretical idea that reverses this priority can be objectively valid and any doctrine resulting from such an idea will inevitably fall into error. The phenomenal Object of mental physics is the Organized Being – specifically, the human being – and both "mind" and "body" are no more than logical descriptors of this Object.

§ 2. The Organized Being Model

Because the mind-body division is objectively valid only as a logical division and never as a real division, particular care must be taken in how we deal with "body" and "mind" as Objects. In our epistemology-centered theory we draw an important distinction between the terms "Object" and "object." An **Object**² is that in the concept of which everything we think about it is united. In a judgment an Object stands only as the subject of the judgment. Different predications can be made about an Object but the Object can never be the predicate of a judgment. An Object is that which has no contradictory opposite. Rather, contradictory opposites are united in an Object. For example, the ideas of "existence" and "non-existence" are converted from contradictory terms to merely contrary terms under the concept of an Object we can call *existentia* (existence-in-general;

¹ An acroam is a fundamental principle of mental physics. Our acroams were deduced and developed in the earlier work, *CPPM*.

² This word corresponds to the German word *Objekt*.

the word comes from the Latin *ex-sistere*, "to come forth"). The ghost of Hamlet's father exists as a character in Shakespeare's play but does not exist as a spirit that haunts the countryside of Denmark. *Existentia* means "the placing of something (in Nature) with all its predicates."

Knowledge of any Object always involves a "what this is knowledge of" and concepts of "what is known of it." In technical terminology, "what this is knowledge of" is called the matter of the knowledge and "what is known of it" is called the form. The matter of an Object is called the **object**³; the form of an Object is called its **representation**. Figure 1.2.1 illustrates these distinctions between an Object, its object, and the representation of the object.

Matter and form refer to the two poles in the meanings of the word "existence." When we say something "exists," this judgment always carries a reference to a "what" (what exists) and to a "how" (how it exists). The distinction is an important one and therefore we use the German words *Dasein* to mean existence in the sense of "what exists" and *Existenz* to mean "how it exists." *Dasein* announces the matter of existence of an Object while *Existenz* designates the forms of appearances of the object and its formal relationships with other objects. Reciprocally, **matter** is the representation of the *Dasein* of something in terms of the composition of one's cognitions of it. **Form** is the representation of its *Existenz* in terms of its connections (*nexus*) in a manifold of cognitions of that object. The *Dasein* of an object can never be used in the predicate of a judgment; the *Dasein* of an object can only be used as the subject of a predication. All predicates predicate only the form.

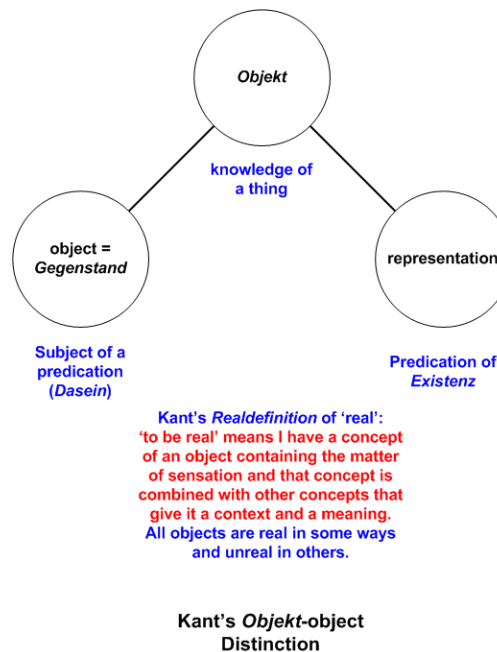


Figure 1.2.1: Diagram of the relationships for Object, object, and representation.

³ The term "object" corresponds to the German word *Gegenstand*.

These terms are epistemological and are the foundational basis for the ideas of "system" and "model" as these latter ideas are used in science. The definition of "system" presented above contained under it the idea of an object. A **model** is a representation that mirrors, duplicates, imitates, or in some way illustrates a pattern of relationships observed in data or in nature. In general, the connotation of the notion of "representation" is *practical* and *primitive*. That of a "model" is *theoretical* and *speculative* and models are deduced from scientific experience. The notion of "representation" belongs to the acroamatic foundations of our science while the notion of "model" belongs to science proper in its rational and deductive scientific explanations, i.e. to its theories and hypotheses.

Figure 1.2.2 below illustrates our definition of a system in terms of its object and its model. It is instructive to compare this illustration with that of the Object in Figure 1.2.1 above. In general, a **science** is a doctrine constituting a system (of knowledge) in accordance with the principle of a disciplined whole of knowledge. In an epistemology-centered system of metaphysics, that which we call **Nature** is an Organized Being's "world model" of "all-that-exists." It is an idea of form and denotes *Existenz*. Nature denotes the dynamic whole in representation. We call the object of Nature "the world" or "the universe." Just as Nature denotes *Existenz*, world (or "the universe") denotes *Dasein*.

When applied to a specific object, the Nature of that object is the objective representation of all its characteristics and relationships with other objects. When we speak of the "nature of a thing" we mean the principle of its *Dasein* so far as it is internally determined according to general laws. Every science has its **topic**, which stands as the general object of the science. In mental physics our topic is the Organized Being.

Under the general idea of a model we distinguish two classes of models: the qualitative model

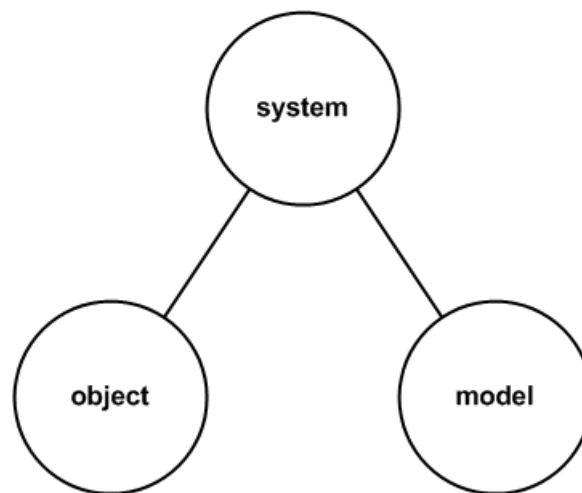


Figure 1.2.2: Diagram of the relationships for system, object, and model.

and the quantitative model. A **qualitative model** is a model resulting from an analysis of the identity of the constituents of a system. A **quantitative model** is a model resulting from an analysis estimating the amount or numerical value of parameters describing each of the constituents of the system. A qualitative model gives us the pieces making up the set of objects and interdependent relationships that in composition give us the parts of the system as an organic whole. These models are often non-mathematical and come out of the findings of laboratory experiments. Many biological and psychological models are of this sort. The development of a qualitative model is a necessary precursor to the development of a quantitative model because the latter is applied to the former. Quantitative models are inherently mathematical and are aimed at saying very precise things about the system. They do so by augmenting the qualitative model with precise relationships that apply to and among the constituent objects of the system. A key task for a quantitative model is to deliver to us the ability to make testable predictions about phenomena not previously observed.

Because "mind" and "body" are, in a manner of speaking, two sides of the same coin (the Organized Being), we must first establish the qualitative model for how to represent them in a manner that has real objective validity. It is at this point where we must discuss the notion of a "substance." **Substance** is the notion of the *Dasein* of an object persistent in time. Substance implicates nothing whatsoever concerning the *Existenz* of that object. (The notion that implicates something about the object's *Existenz* is called the notion of **accident**). In logical terms, the notion of substance merely supplies the object as the subject of a predication and this notion can not be used as the predicate of a predication. For example, I can say to you, "Einstein *says* all motion is relative," (present tense) and you can understand me while at the same time understanding you cannot invite Einstein to go out for coffee with you (because Einstein is dead). We can make all the following predications of the substance called "Einstein" together without contradiction: "Einstein *was* a pacifist"; "Einstein *is* a great scientist"; "Einstein *will be* an important figure if you take a History of Science course next semester." The ability to make valid predications like these together and independently of the use of past, present, or future tense provides an example of what is meant when we say a substance is "persistent in time."

Every object of discourse is called a substance because before we can say anything about an object we must first judge that object to exist in the context of it having a *Dasein*. We call the notion of the *Dasein* of "body" by the name **soma**⁴. We call the notion of the *Dasein* of "mind" by the name **nous**⁵. However, because *soma* and *nous* have *Existenz* merely as logical objects in the

⁴ From the Greek word for "body."

⁵ From the Greek word for "mind."

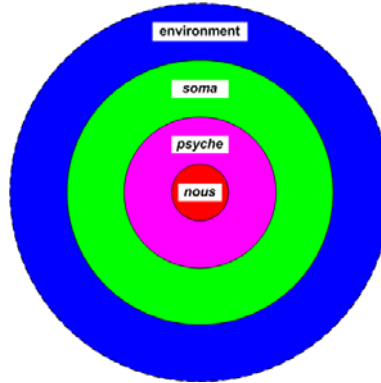


Figure 1.2.3: The Organized Being Model.

merely logical division of a single real object (the Organized Being), they cannot be regarded independently of each other. The concepts of *soma* and *nous* are "coordinates" in two major dimensions of the *Existenz* of an Organized Being (and are for this reason called **coordinate concepts**). As objects, *soma* and *nous* coexist in time because they are logical parts of one and the same Object (the Organized Being). The term **organized being** in general means an Object in which its parts (in terms of *Dasein* and form) are possible only through their interrelation in the whole and must be regarded as reciprocally determining (that is, each part must be regarded as the effect of the other parts and, at the same time, as a cause determining the other parts). Because they coexist in time as parts of one and the same Object, *soma* and *nous* must stand in a relationship of thorough-going reciprocity with each other.

We call the organized structure of animating principles of this *nous-soma* reciprocity by the name ***psyche***. *Psyche* regarded as an object is the idea of a "happening"⁶ and it constitutes the third logical "dimension" in the logical division of an Organized Being. Finally, the Organized Being never exists in isolation. Rather, it is an object among objects in Nature. However, the division between the Organized Being and these other objects which constitute its **environment** is regarded as a *real* division, not merely a logical one. This is what is meant by the distinctions "me" vs. "not-me" or "Self" vs. "not-Self." In all interactions between the Organized Being and its environment, the immediate connection in these Relations is at the boundary of environment and *soma*. We say *soma* is the "physical dimension" of the Organized Being, *nous* the "mental dimension," and *psyche* the "animation dimension." Thus our fundamental qualitative model of an Organized Being is illustrated by the diagram of Figure 1.2.3 shown above.

The relationships among the concepts of mind, body, *nous*, *soma*, and *psyche* is illustrated in Figure 1.2.4 below. In this figure, the circles denote the various concepts. The lines running between these concepts denote determined connections in judgments of the relationships of these

⁶ An object understood in terms of it being a "happening" is called an ***Unsache-thing***.

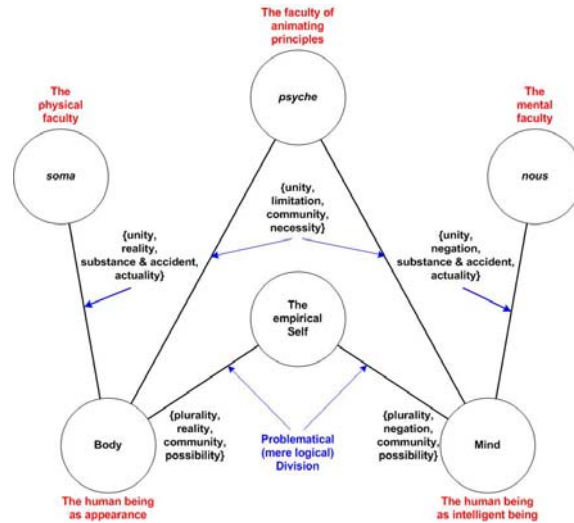


Figure 1.2.4: Fundamental concept structure in the Organized Being Model.

concepts to each other. The labels, e.g. {unity, reality, substance & accident, actuality}, denote specific types of judgments and we will discuss what these terms mean later in this treatise.

§ 3. Phenomena and *Noumena*

Representing the form of the concept structure of the Organized Being as depicted in Figure 1.2.4 rightly suggests that one mathematical tool at our disposal in moving from a qualitative to a quantitative model of the Organized Being in mental physics is graph theory. Mathematics is truly protean in its ability to serve as a language for saying very precise things in science. But at the same time we must also bear in mind that mathematics makes abstraction from the meanings to be assigned to its variables and constructs. Mathematical equations do not come with an owner's manual that says "use me here and here but not there." The meaning to be understood from its variables and constructs is extra-mathematical and must be *placed* in the theory by the theorist. Our objective in this book is not mathematics but, rather, the theory of mental physics.

Recognizing this, it is appropriate at this point to discuss some of the meaning implications inherent in graphs such as Figure 1.2.4 as such graphs are used in our theory. Viewed as an object and from the perspective of mathematical logic, a **meaning implication** is a connective in the logic of meanings. A predication of the form $\langle p \text{ implies } q \rangle$ is a meaning implication if one meaning m of q is embedded in p and if this meaning m is transitive [PIAG1]. As we will later discuss, root meanings in human understanding are intimately connected with actions, e.g. the meanings of an object are what we can do with that object. Equally important in regard to root meanings is what we cannot do with that object. Meaning implications are crucial in our Critical ontology of the Organized Being and therefore we need to understand some of the more basic meaning implications contained in diagrams such as Figure 1.2.4.

You will note that some pairs of connected concepts in Figure 1.2.4, e.g. *soma* and body, are depicted at different levels in the drawing of the graph. This is intended to denote that the relationship between these concepts is one of higher concept (*soma*) to lower concept (body). In such a relationship, the higher concept is said to be **contained in** the lower concept and the lower concept is said to be **contained under** the higher concept. The higher concept represents a characteristic or **mark** of the lower concept. Because the higher concept is a mark of the lower, less is said to be contained in the higher concept than is contained in the lower concept. On the other hand, the basis for extracting the higher concept from the lower concept (the reason for recognizing the higher concept *as* a mark of the lower) is that the higher concept also stands as a mark for some *other* lower concept (or concepts) and contains in its concept something that both lower concepts share in common. We say a higher concept is **abstracted from** two or more lower concepts and, therefore, more is contained under a higher mark than any of its lower concepts.

The totality of all concepts contained under a higher concept (which includes all concepts contained under the lower concepts immediately connected with the higher concept) is called the **sphere** of the higher concept. The totality of all objects represented by the concepts in the sphere of a higher concept is called the **scope** of the higher concept. Because a higher concept is produced by a process of abstraction from its lower concepts, more is contained in the lower concept than is contained in the higher concept.

Now, concepts represent our knowledge of objects. Indeed, for an object *to be real* requires we have a concept of that object connected to other concepts that give our understanding of that object a **coherent context** in Nature. It is this context that "places" the object in Nature. Every object is *real in some context* and is *unreal in another context*. In this sense, we say *the higher concept understands its lower concepts* and, at the same time, we say *the lower concepts stand under their higher concepts*. This is our *practical explanation* of what "understanding" means in the context of a formal logic of concept structures. As we proceed in a series to higher and higher levels of concepts in the graph, less and less knowledge is contained *in* each successive higher concept (although it contains more and more knowledge *under* it in its sphere).

Truth is the congruence of an object with its concepts insofar as from the concepts we obtain the cognition of the object. However, this congruence can only be established by means of experience. **Experience** is the totality of one's knowledge of Objects, i.e. the structured system of empirical cognitions as an absolute unity in the manifold of all one's sensual representations. A conscious representation is called a **perception** and, under our epistemology-centered theory, the **objective validity** of every concept must be grounded in actual *sensuous* experience. This grounding can be by means of connection between the concept and a lower concept containing

that actual sensuous matter of experience, and the connection may be remote (e.g. the concept of "society" abstracted from one's manifold concepts of sensuous experiences with individual human beings). But in every case the object of a concept must in some way be the object of some possible experience or else the concept of the object lacks objective validity and therefore can not be said to be either "true" or "false." This is a fundamental axiom of mental physics.

Sensation is the matter of perception and is that in perception that is subjective in its representation. **Representation** is the *primitive act of mind* describable as "something in me that refers to something else." A concept of an object that contains in its representation some matter of sensation is a concept of possible experience, and the Object is called a **phenomenon**. Now, because every higher concept is the product of a process of abstraction from lower concepts, the sensational content in the higher concept is less than the sensational content contained in the lower concepts standing under it. As the regression from lower concepts to successively higher concepts continues, the sensational content in successively higher concepts is made less and less. When we finally arrive at a concept from which all sensational content has been removed by abstraction, its object is called a **noumenon** and it is understood without the testimony of the senses. Phenomenal objects are sensible objects (objects of experience); *noumenal* objects are supersensible objects (objects of Reason) and the concept of such an object is called an **idea**.

The objective validity of every concept depends on the possibility of representing an object of experience. When the structure of concepts first arrives at the level of an idea, the idea no longer contains in it the sensational matter of experience and, consequently, it can attain to objective validity *only through the sensible effects for which the supersensible object of the idea stands as a cause*. Such a type of objective validity is called **practical objective validity** because in this case sensible experience is bound to sensible *actions* that *are* a part of actual experience. A supersensible object cannot be sensed and so an objectively valid judgment of its *Dasein* (and not its *Existenz*) is possible only by positing the *Dasein* of that object as being *necessary for the possibility of experience*. The notion of such a connection between the higher and lower concept is called the notion of **causality & dependency**.

Every science needs and makes use of ideas of supersensible objects. These supersensible objects serve to unify scientific theory. An example of this is the idea of "probability." As an object, probability is a *noumenon*. No one has ever, and no one will ever, have a direct sensible experience of a probability. Probability is the *noumenon* posited to explain the phenomenon of statistical regularity. A statistic is a sensible object; it is something that can be measured. Probability distributions are abstracted from statistical distributions. Another example of a *noumenon* is "mass" in physics. We posit mass to, among other things, explain the phenomenon

of "weight" and to understand the mechanical dynamics of corporeal bodies.

When in the on-going synthesis of higher concepts we first arrive at an idea, we reach what Kant called **the horizon of possible experience**. The horizon of possible experience is the outermost limit of our objectively valid knowledge.⁷ If the process of abstraction is continued into the realm of still higher ideas, objective validity is lost because it is no longer possible to experience the effect of the higher *noumenon* on the lower *noumenon* (all *noumena* are supersensible). Ideas at this level become **transcendent** (this word means beyond the horizon of possible experience; the word **transcendental** means "necessary for the possibility of experience"). A transcendent idea can be neither true nor false because it is no longer possible to judge the congruence of the idea with its object. This is the acroam of **formal undecidability** in mental physics. Figure 1.3.1 illustrates as a summary what has just been discussed.

As an object, it might seem at first thought that *nous* already occupies a spot as a *noumenon* at the horizon of experience. Indeed, regarded as a *thing* in the manner in which Descartes regarded

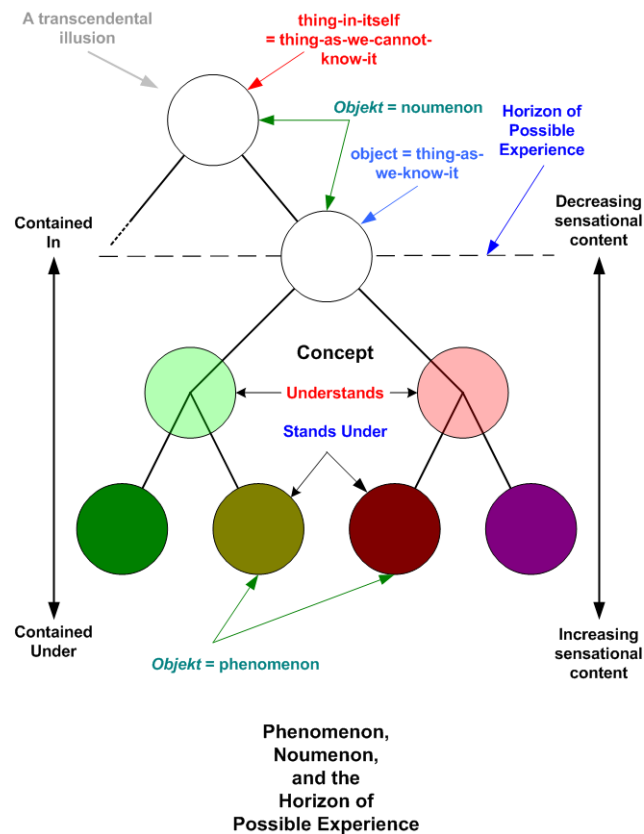


Figure 1.3.1: The horizon of possible experience in the structure of concepts.

⁷ It should be noted that the purpose of scientific measuring instruments is to *extend the range of our senses*. The horizon of possible experience should not be viewed as a static boundary of knowledge. Bacteria were beyond the horizon of possible experience for Hippocrates but they are phenomena to us today.

mind – that is, as a 'thinking substance'⁸ and *res cogitans* – it would be and any scientific inquiry in regard to it would already be at an end. Here is where the fact that the mind-body division is nothing more than a logical division is of fundamental importance. The object of our inquiry in mental physics is not *nous* but, rather, the human being as Organized Being. Each of us, as a human being, is simultaneously both sensible object (an object among objects in Nature) and intelligible object (as a human intellect). The logical mind-body division merely states this formally. As sensible object, the concepts of human Nature are contained in the logical dimension of body; as intelligible object, the concepts of human Nature are contained in the logical dimension of mind. We, each of us, possess both a biological life and a mental life.

For each of us individually, nothing in the world is held-to-be more certain than the knowledge of one's own real *Dasein*. This holding-to-be-true of one's own individual *Dasein* is *absolute* in the sense that there is nothing else in the world we hold to be more certain. I can doubt everything else, including the nature of my own *Existenz*, but of my *Dasein* I have no possible doubt. This absolute positing is the ultimate standard gauge for all one's other ideas concerning reality and existence in Nature. It is in this sense that Protagoras was right: Man is the measure of all things. The *noumenal* Self thus occupies an entirely unique position among all other *noumena* and it is this unique position that grounds the possibility of a science of mental physics. The theory of mental physics is the science of human *Existenz*.

In the disjunction of the empirical Self in terms of the divisions of mind and body, concepts of

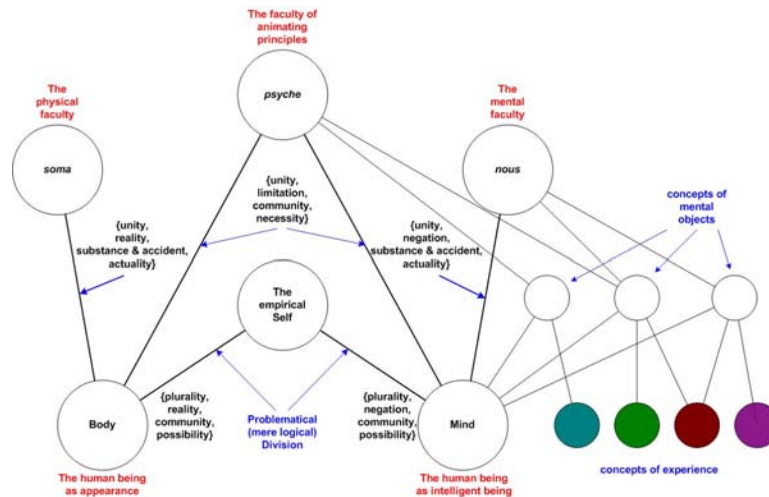


Figure 1.3.2: The structure of concepts of mental objects.

⁸ Descartes held that 'a substance' was "a thing which exists in such a manner that it has need of no other thing for its existence." He held the mind-body division to be a real division and regarded himself as nothing other than mind (*res cogitans*). This was Descartes' error and in making it, he cut 'himself' off from the world so completely his "reasoning soul" could not emerge into it. He could escape this isolation only by invoking the agency of God.

mental objects fall on the side of mind. They are higher concepts relative to the concept of mind but stand as accidents to the higher concepts of *nous* and *psyche*. Figure 1.3.2 illustrates this concept structure. Some concepts of mental objects stand under the concept of *nous*; others stand under *psyche*; still others stand under both as concepts of the relationships between mental life and organic (biological) life. Because these concepts do stand on the mind side of the logical mind-body division, their objects are in every case practical objects and their objective validity is and can only be grounded in practical objective validity. It was the task of the theory presented in *CPPM* to establish the practical objective validity of the mental objects we discuss in this book.

As practical and intelligible objects, mental objects are represented by concepts of processes and abilities under the thorough-guiding restriction that their *Dasein* be necessary for the possibility of human experience. The flavor of all mental objects is the same as the flavor of the objects we employ in mathematics. This at once raises an important issue and the discussion of that issue is the topic of our next section.

§ 4. Mathematics and Nature

The exact sciences use mathematics to make very exacting and precise statements about Nature and their topics. It is fair and correct to say that the less mathematics is used in a science, the less exact is that science. However, mathematics is clearly the product of human intellect and all of its objects are, without exception, intelligible objects. This raises a fundamental and long standing question: How is mathematics, which is so obviously the product of the human mind, able to truthfully tell us anything about the objects of the natural world – which presumably are *not* the creations of human intellect? This would seem to be an impossibility, yet it is not.

As it so happens, we know that occasionally our mathematical theories do lead us astray. When they do, we experience the clash of incongruity between object and concept known as a paradox. The history of science has encountered many paradoxes and these encounters commonly lead to what science historian Thomas Kuhn has dubbed "scientific revolutions." Even within mathematics itself paradoxes occasionally arise. The Russell Paradox was once such an example. Another led to Gödel's famous "incompleteness theorems" in 1930-31, which finally put the stake in the heart once and for all of that philosophical and metaphysical venture known as rationalism.

Kant discussed the metaphysical issues attending this most intriguing of theoretical issues in his *Prolegomena to Any Future Metaphysics*. Unfortunately, this work is difficult and the great majority of its readers found the obscurity of Kant's presentation insurmountable. In consequence, it had no important impact on science or mathematics at that time. Mathematical science continued to encounter paradoxes in the years that followed. Nearly two centuries later, the issue

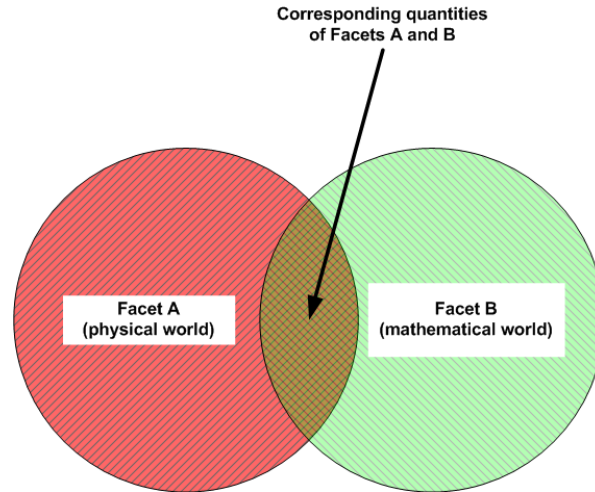


Figure 1.4.1: The Slepian Two-World Model of Facets.

of paradox came back into the spotlight for scientists working in the field of mathematical communication system theory in the form of what was and is known as "the Bandwidth Paradox." In 1975 information theorist David Slepian presented the solution for the Bandwidth Paradox on the occasion of his Shannon Lecture at that year's meeting of the Information Theory Society [SLEP]. As it turns out, Slepian's solution also happens to be the kind of solution Kant had called for in the *Prolegomena* (an interesting occurrence because Slepian is not a philosopher and seems to have not been familiar with Kant's work). The difference was that Slepian was able to explain his idea in a way the rest of us (or, at least, those of us with proper training in that science) could understand.

Slepian's central idea is illustrated in Figure 1.4.1 above. In mathematical science, he tells us, we are in fact dealing with two distinguishable worlds, a physical world and a mathematical world. The physical world is the realm of the sensible objects studied in science. It is the world of experience and experiment. He calls this world "facet A" of science. The mathematical world is the world of mathematical objects proper. He called this "facet B" of science. That mathematics can speak to physical Nature is due to the fact that in our theories we *force* a part of the mathematical world to correspond to measurements and observations of facet A. The mathematical quantities in facet B that can be *placed* in direct *practical* correspondence with observables in facet A are called **principal quantities** of facet B. If a mathematical theory states that a principal quantity corresponding to the reading of a voltmeter is $2/3$ and the voltmeter reading turns out to be 0.6667, this is regarded as a *practical success* for the theory *at a definable level of indistinguishability* $\epsilon > 0$.

Two different mathematical models can produce different numerical results when applied to the same physical situation. Slepian defined a mathematical measure of the difference between

these two models to serve as a criterion of distinguishability.⁹ Two mathematical models are said to be "indistinguishable at level ϵ " if the measure of the difference between the two principal quantities of these models is less than ϵ . If the members of a set of mathematical models all produce principal quantities that are all indistinguishable at level ϵ , these models are said to be equivalent at level ϵ .

Now, in addition to the principal quantities in facet B, there are other quantities as well. These are the mathematical quantities that lie outside the intersect between facets A and B in Figure 1.4.1 above. They are called **secondary quantities**. Secondary quantities are intelligible objects of mathematics that have no direct counterpart in facet A of the physical world. An example of this is the irrational number π . Slepian said,

One can, of course, consider and study any model that one chooses to. It is my contention, however, that a necessary and important condition for a model to be *useful* in science is that the *principal quantities of the model be insensitive to small changes in the secondary quantities*. Most of us would treat with great suspicion a model that predicts stable flight for an airplane if some parameter is irrational but predicts disaster if that parameter is a nearby rational number. Few of us would board a plane designed from such a model. [SLEP]

Hindsight is often a marvelous thing. The crown jewel of physics is the theory of quantum electrodynamics. It was the peculiar nature of this theory that it involves the calculation of two numbers – let's call them n and j – that physicists found to be a puzzle in interpretation. Richard Feynman remarked

Schwinger, Tomonaga, and I independently invented ways to make definite calculations to confirm that it is true (we got prizes for that). People could finally calculate with the theory of quantum electrodynamics!

So it appears that the *only* things that depend on the small distances between coupling points are the values for n and j – *theoretical numbers that are not directly observable anyway*; everything else, which can be observed, seems not to be affected.

The shell game that we play to find n and j is technically called "renormalization." But no matter how clever the word, it is what I would call a dippy process! [FEYN1: 128]

What we can see in hindsight is that the process of renormalization employed by physicists is nothing other than a methodology for meeting Slepian's criterion that the principal quantities placed in correspondence to facets A in the physical world must not be sensitive to changes in secondary quantities in a mathematical model.

We can give Slepian's principle the name **Slepian dimensioning**. Figure 1.4.2 illustrates this. In any theoretical treatment of a real Object in Nature, that Object belongs to facet A and is placed in the physical dimension of Slepian's model. Our mathematical understanding of the Object belongs to facet B and is placed in the intelligible dimension. The meeting point of the two

⁹ In the terminology of mathematics, Slepian's function is known as a metric function.

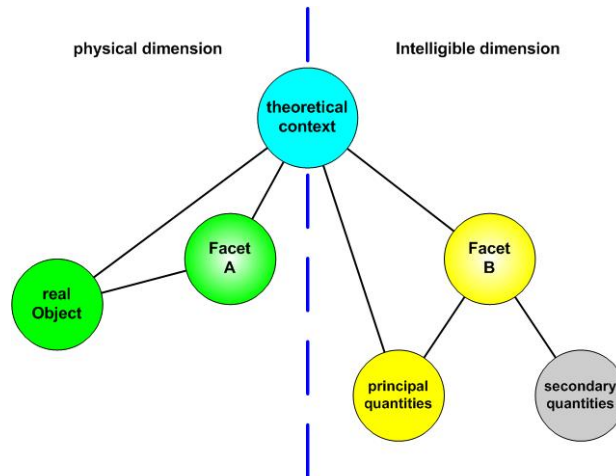


Figure 1.4.2: Slepian dimensioning.

"worlds" where the principal quantities of facet B overlap facet A of the physical (sensible) dimension constitutes the **physico-mathematical context** of the Object. It is the point where the empirical and rational sides of a science come together in a *theoretical context*.

Slepian's Shannon Lecture addressed one particular application of his principle, namely that of the Bandwidth Paradox. It suggested the method for bringing together the physical and mathematical worlds but what he presented at that meeting stopped short of being a fully developed doctrine of method. However, beginning only a few years earlier scientists working in the field of system theory had begun to develop a new paradigm for addressing certain difficult problems encountered in the design and analysis of complex systems. This new method in time came to be called **set membership theory** [COMB]. As it turns out, set membership theory is a generalized mathematical technique for applying Slepian's principle, although no one at the time knew this.

You will have noticed that Slepian's principle calls for doing away with the idea of a single "true" mathematical model for describing a phenomenon. It instead calls for replacing this notion of a "point" solution with an unlimited number of allowable models, all of which share the common characteristic that they are indistinguishable at some level ϵ as determined by some form of Slepian metric function. Not many years earlier, such an idea would have been poorly received by the scientific community because it flies in the face of a centuries-old ontological prejudice that there could be only "one true answer" in scientific explanation. We in fact see this attitude reflected in Feynman's remarks about "the shell game we play" in the theory of quantum electrodynamics. However, as Kant had pointed out nearly two centuries earlier, such an attitude has no real basis and arises from the error of regarding Objects as ontological "things regarded as they are in themselves" (*"Ding an sich selbst"*). Our knowledge of things-in-the-world is and can only

be knowledge of their appearances and then only as Objects. The mathematical Objects of facet B and the physical Objects of facet A are fundamentally different (in Kant's words, they occupy different transcendental places in human understanding). The old ontological prejudice against the Slepian principle is a consequence of an ontology-centered metaphysical view of the world. Only an epistemology-centered system of metaphysics proves to have objective validity for human understanding.

Slepian's principle is a *practical* principle of method. The pragmatic scientists who developed set membership theory did not concern themselves about "philosophical issues." They were only concerned with practical approaches to solving practical problems and set membership theory suited the accomplishment of their objective. Set membership theory (SMT) also abandons the notion of the need for a single "point" modeling solution. Their criterion was that every solution that was consistent with the results of measurements and with whatever *a priori* knowledge of the system model they possessed was an equally valid solution. SMT models usually produce entire *sets* of solutions, all of which are indistinguishable by means of the data of measurement and observation. But this is nothing else than Slepian's principle given a more generalized formal method. It acknowledges that there are limits to what we can know about an Object from observation and measurements – in other words, it recognizes the reality of the horizon of possible experience. This is the *practical* answer to the question of the relationship between mathematics and science. SMT under Slepian's principle is the practical doctrine of method for scientific research in conformity with our epistemology-centered metaphysics of mind.

§ 5. The Logical Organization of *Nous*

The Objects that comprise what we will call the mental anatomy of *nous* are, without exception, intelligible Objects that take their places in the theory of mental physics from the unrelenting ground of their practical objective validity. They stand as theoretical Objects in Slepian's facet B. The deduction and validation of these Objects was the task and the topic of *CPPM* and we will not retrace their long and difficult genesis here in this book. We must, however, introduce, explain and describe these constituents of the organization of mind standing under the concept of *nous*.

As is the usual practice of system theory in the exposition of any complex system, we begin with an illustration (called a block diagram by system theorists) of the overall system of *nous*. Figure 1.5.1 presents this model. The blocks presented in this figure represent various mental processes and functions, each of which we will discuss in turn. The arrows represent pathways by which information, in the form of mental representations, connect from one process to another.

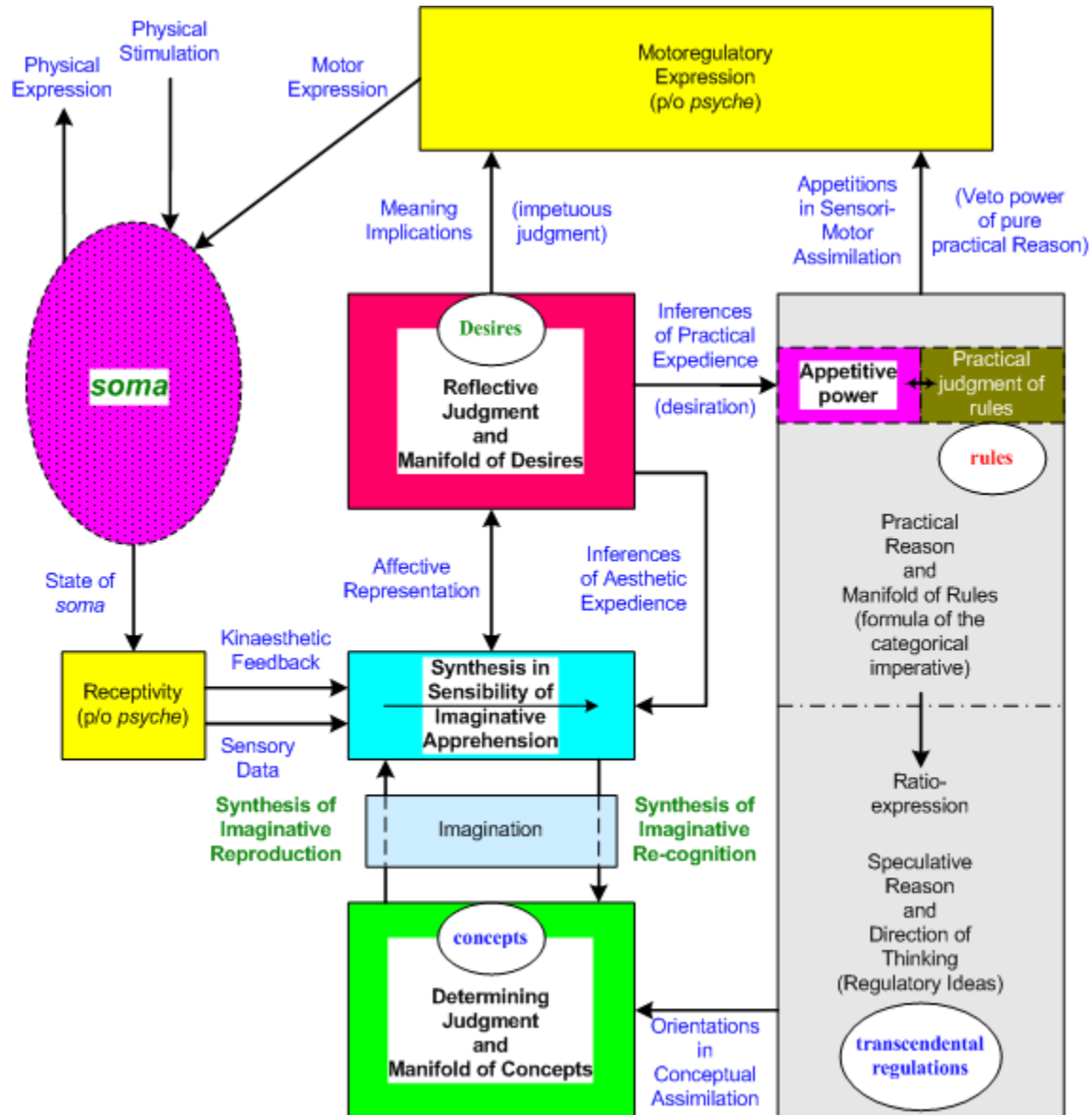


Figure 1.5.1: The Logical Organization of *Nous*.

With the exception of receptivity and motoregulatory expression, which belong to the logical division of *psyche* in the Organized Being model, the processes depicted in the figure stand under the concept of *nous*. They are the processes that, taken collectively, constitute the logical makeup of the outcome in the Critical analysis of the organization of **pure consciousness** [WELL1, chap. 5]. Consciousness viewed as an *act* is, in Kant's words, "the representation that a representation is in me." It is an act of presentation made by the Organized Being to itself. But consciousness viewed as a *system of the organization of representations* is a system described in terms of abilities and processes found to be necessary for the possibility of experience and which, taken together, make up what we may call the logic of pure consciousness.

Again, representation as an act is the primitive act of mind; its outcomes, which are also called

representations, have the practical interpretation of "something in me that refers to something else." The matter of a representation is called its **composition**; the form of a representation is called its **nexus** (connection). The idea of representation is a primitive and is practical because the only way to explain representation is by making a representation; in other words, we can make an exhibition of the act of representation but we cannot explain it in terms of something more elemental [WELL1, chap. 3]. The idea of representation is the idea of a practical object and its objective validity can only be a practical objective validity.

The processes depicted in Figure 1.5.1 are to be understood as functions and capabilities for the production and transformation of representations. Here it is crucial for us to understand that every noetic (mental) representation always has a corresponding somatic representation (a representation in *soma*) that represents *the very same information carried in the noetic representation*. Furthermore, the noetic and somatic representations must always be regarded as coexistent in time (a somatic signal does not cause a *later* noetic representation; a noetic representation does not cause a *later* somatic signal). This **acroam of co-existent representation** is fundamental and it is the consequence of the fact that the mind-body division is only a logical, not a real, division. Somatic representations are called signals. A **signal** is any physical phenomenon exhibiting variations in time that is said to carry information. In the language of information theory, noetic representations and somatic signals are "data representations"; information is that which is common to each¹⁰ (i.e., the notion of information is the notion of a substance for which noetic representations and somatic signals are accidents). In the remainder of this book, we will abbreviate the phrase "noetic representation" as merely "representation" and use "signal" to mean "somatic representation" in the nervous and endocrine systems. The thorough-going reciprocity in the signal $\leftrightarrow$ representation relationship falls under the division of *psyche* in the Organized Being model, the empirical science of which is called psychophysics.

Soma is an object of facet A and we have two ways in which to understand somatic effects. The first is when some change in *soma* is regarded as the effect of the environment on *soma*. In this case, we say *soma* stands as the agent for a reciprocal determination in *nous* (and we say *nous* stands as patient to the agency of *soma*). In diagram form we represent this as *soma* $\Rightarrow$ *nous*. The capacity for *soma* to stand as the agent is called the **receptivity** of the Organized Being. The representation of the manner in which *nous* is co-determined is called **sensibility**. Representation of sensibility in Figure 1.5.1 falls within the block labeled the synthesis in sensibility. The act of receptivity in producing the sensory co-determination is called **sensory impression**.

The second case is when some change in *soma* is regarded as a co-determination of an act of

¹⁰ Information theory draws a fundamental distinction between "data" and "information" [WELL2: pp. 2-3].

nous. In this case, we say *soma* stands as the patient for the act of *nous* and denote this as $nous \Rightarrow soma$. The capacity for *nous* to stand as the agent is called the **spontaneity** of the Organized Being. The transformation from an act of *nous* to an action in *soma* is called **motoregulatory expression**, and this belongs to the division of *psyche*. Receptivity and motoregulatory expression taken together jointly is called the **sensorimotor system** of the Organized Being. Kant called this logical distinction between $soma \Rightarrow nous$ and $nous \Rightarrow soma$ the **transcendental place** in the origin of representations. Nonetheless, we must always understand that the distinction of transcendental place is a logical distinction and $soma \Leftrightarrow nous$ reciprocity is a fundamental real law for the Organized Being.

§ 5.1 The Synthesis in Sensibility

The secondary quantity labeled sensory data in Figure 1.5.1 (including that depicted by the pathway labeled kinaesthetic feedback) is regarded as unformed matter of information arising from the receptivity of the Organized Being. We must regard this quantity as an **obscure** (unconscious) representation, i.e. a representation for which there is no "representation that this representation is in me" for the Organized Being. Logically, it is regarded as the source of possible matter in conscious representation (perception) and for that reason is called **materia ex qua** (matter out of which) or "determinable matter" of representation. In the strict sense, sensory data is not a *datum* ("given") but rather is to be seen as *dabile* ("givable"). It is a Slepian secondary quantity because this representation is that of something in facet B that lies outside the intersect of facets A and B in Figure 1.4.1. Its place in the theory of mental physics is owed to the nature of mathematics, which requires operands upon which mathematical operations operate. As a secondary quantity, the manner in which we employ this mathematical idea falls under the strict requirements of Slepian's criterion. The same is true for *materia ex qua* entering the synthesis in sensibility via the pathway labeled synthesis of imaginative reproduction in Figure 1.5.1; the distinction between these two secondary quantities is that the former is placed with receptivity, the latter with spontaneity.

The task of the process of the synthesis in sensibility is to transform these secondary quantities into conscious representations (perceptions). We distinguish between two types of perceptions resulting from the synthesis in sensibility. Perceptions in sensibility that refer to objects are called **intuitions**. Perceptions that do not refer to objects but, instead, refer only to the subjective state of the Organized Being are called **affective perceptions**. Intuitions are principal quantities in the phenomenon of cognition. Affective perceptions are secondary quantities relating to subjective phenomena such as emotions and motivations.

The name we give to the theory of sensibility is **aesthetics**. Within the theory of aesthetics we will deal with four interacting synthetic processes: (1) the synthesis of imaginative apprehension; (2) the synthesis of the *Verstandes-Actus* ("acts of understanding"); (3) the synthesis of pure intuition; and (4) the synthesis of empirical apperception. **Apprehension** is the representation of perceptions. The *Verstandes-Actus* are comprised of a three-stage process of logical comparison ("*Comparison*"), construction of congruence ("reflexion"), and abstraction. The synthesis of pure intuition is a process of representation formation (**Gestaltung**) carrying out the synthesis of topological structures (**outer sense**, also called **subjective space**) and the synthesis of ordering structures (**inner sense**, also called **subjective time**). **Empirical apperception** is the representation of Self-consciousness (an Organized Being's awareness of itself and cognition of its own *Existenz*).

§ 5.2 The Processes of Determining Judgment and Imagination

A **judgment** in general is the act of subsuming a particular representation under a general rule. A **rule** is an assertion made under a general condition. The process of determining judgment is the process of constructing and structuring concepts by means of primitive rules of cognition. Concepts are representations belonging to the phenomenon of cognition and originate from intuitions. Specifically, a **concept** is a rule for the reproduction of an intuition. Concepts are combined with one another by the process of determining judgment to form a structure called the **manifold of concepts** and it is by means of this process that phenomena are represented. The construction of the manifold of concepts can be viewed as a process of structuring what in mathematics is called an algebraic structure.¹¹ The rules governing the structuring of concepts are called the pure notions of understanding and are also called the **categories of understanding**. An act of determining judgment is called a determinant judgment. The acts of determining judgment fall under the Critical acroam of *the principle of conformity to law*.

Concepts are presented to the process of determining judgment through a function called the synthesis of re-cognition in imagination. This function transforms an intuition into a determinable concept, which is then made into a determined concept by the act of making a determinant judgment. Concepts are reintroduced to sensibility through a function called the synthesis of reproduction in imagination. This function transforms the conceptual representation back into a representation in sensibility. Concepts are Slepian secondary quantities and are implicated in the phenomena of memory, comprehension, and understanding. A **cognition** is an objective

¹¹ Algebraic structure, topological structure, and order structure taken together comprise what the Bourbaki mathematicians dubbed "the three Mother Structures," from which all of mathematics can be constructed. We will be explaining each of these in more depth later in this book.

perception involving the representation of an intuition that contains contributions from one or more concepts.

The direct object of an intuition is called an **appearance** (*Erscheinung*, literally an "appearance"). An intuition in which its sensational *materia in qua* ("matter in which") contains no contribution from any concept has for its object only an undetermined appearance. What concepts, as rules for the reproduction of intuitions, add in cognition is the representation of combinations of appearances that determine the object *as* a phenomenon. Whereas an intuition always has an immediate relationship to an appearance, concepts have only a mediate relationship because consciousness of a concept requires its re-presentation in sensibility (as an intuition).

Such a re-presentation is an act of spontaneity. The Organized Being's **power of imagination** is the ability to spontaneously present an object by means of representation in intuition. However, we must not interpret this in too narrow a sense because the possibility for the Organized Being to accomplish this calls upon all three functions of imagination – the synthesis in imaginative apprehension, the synthesis of imaginative re-cognition, and the synthesis of imaginative reproduction. Imagination is a schematizing function belonging to sensibility (inasmuch as it deals with intuitions but plays no role in judgment) but also serves as a kind of bridge between sensibility and the process of determining judgment.

Determining judgment is the capability most often associated with the rather vague ideas of cognitive intelligence, cognitive learning, memory, objective understanding, and discursive thinking. However, it would be an error to presume these phenomena are explained by determining judgment alone. As we will see, all the processes depicted in Figure 1.5.1 are actively involved in these in one way or another. We can, however, present at this point another fundamental definition: **thinking is cognition through concepts**. Thinking, therefore, involves the interplay of determining judgment, imagination, sensibility, and, as we will see, reflective judgment and Reason.

§ 5.3 The Process of Reflective Judgment

The process of determining judgment is tasked with finding particular concepts to be combined (subsumed) under a *given* general concept. The given general concept serves as the rule for understanding particular concepts. These particulars, once combined in a determinant judgment, then stand under the general concept. However, determining judgment does not have the power to produce the general concept. General concepts are a judicial outcome of the process of reflective judgment.

Reflective judgment has the peculiarity that it does not deal in objective perceptions even

though the production of general concepts for determining judgment originates from it as a by-product of its operation. The matter in reflective judgments consists exclusively of affective perceptions. As we recall from earlier, an affective perception is a conscious representation that can never be part of the representation of an object. Judgments of objects belong exclusively to determining judgment. Reflective judgment deals in affectivity and that which is wholly subjective in empirical consciousness. Its governing acroamatic principle is called ***the principle of formal expedience***.

Sensibility and imagination do not judge (and, therefore, it is said that they do not err). Even so, it should not be difficult to see that something must determine which representations of sensibility are to become intuitions, which are to become affective perceptions, and which will remain obscure (unconscious) representations. Such a determination is a judgment because particular representations in sensibility are given (through receptivity and spontaneity) and for them the conscious general representations (perceptions) must be found. This is what is meant by the term "a reflective judgment."

Acts of reflective judgment are most closely related to such ill-defined phenomena as emotion and motivation. To the extent one wishes to speak of "emotional intelligence," the process of reflective judgment is the process most closely linked to that idea. Representations produced by reflective judgment bear such names as desires, values, and interests. The act of reflective judgment produces what noted neurologist Antonio Damasio calls "the pulse of consciousness" [DAMA1, pp. 176-177]. An act of reflective judgment *marks* the state of representation in sensibility with what we will call **a moment in time**.

However, the acts of reflective judgment are not confined solely to the marking of representations as perceptions. In addition, reflective judgment is tasked with the transformation of representations in sensibility into motor acts. Reflective judgment has a Janus-like quality in the sense that on one side it "faces toward" sensibility and perception while on the other side it "faces toward" motoregulatory expression and the process of Reason (see Figure 1.5.1). The "face" turned toward sensibility is called **aesthetical reflective judgment**; the "face" turned toward motoregulatory expression and Reason is called **teleological reflective judgment**. Roughly speaking, aesthetical reflective judgment can be said to deal with desires, teleological reflective judgment with motivation. As we will see, the character of reflective judgment is impetuous; in this sense, it is functionally reminiscent of the Freudian notion of the id.

The manifold of concepts constructed by determining judgment constitutes a structure. We can also speak of a manifold of Desires presented by reflective judgment, but in this case this manifold does not constitute a structure. We will see that the actions of an Organized Being are

such as to extinguish desires (satisfying the desire) and so the manifold of Desires lacks the self-conserving and stable properties required of a system. A structure is a system. The manifold of Desires presented by reflective judgment is better seen as a presentation of energetics as well as an expression of values and interests. An **energetic** we define as *that which is characterized as being efficacious in arousing actions*. We will give more explicit technical explanations later for the terms value and interest. The acts of reflective judgment produce what we will call *the motivational dynamic*. Again, we will provide technical explanations later for this term and for the term "motivation."

§ 5.4 Reason

Reason is defined as *the power to Self-regulate all non-autonomic actions of the Organized Being*. The process of Reason is the master regulator of the noetic system. We again distinguish two parts in this process, practical Reason and speculative Reason. **Practical Reason** is the master control function. Its acts pertain solely to the acts and actions of the Organized Being and to the construction of a manifold of practical rules aimed at perfecting a structure of *practically universal laws of experience*. Within practical Reason, the construction of this manifold of rules is carried out by the process of **practical judgment** under the conditioning formula of a single supreme regulation called the **categorical imperative**.

Like reflective judgment, practical Reason "faces" in two directions. On the one side, practical Reason is tasked with the making of *choices*. We will see that this capacity of Reason has a kind of negative character to it. Acts of reflective judgment are impetuous and not necessarily in conformity with the system of practically universal laws constructed by the process of practical judgment. At the same time, Reason is entirely unconcerned with either objects or feelings of affectivity. It is, metaphorically speaking, a cognitively dark and affectively cold process. In this character, Reason is in some ways reminiscent of Freud's idea of the superego and in other ways reminiscent of Freud's idea of the ego, although these Freudian distinctions do not match up cleanly with the function of practical Reason. On its side facing motoregulatory expression, practical Reason exercises a veto power over the impetuous acts of reflective judgment, preventing the expression of any action judged to be incongruent with the system of practical laws constructed by the process of Reason. One might say that practical Reason exhibits the character of a "free won't" rather than a "free will."

On its other side, practical Reason faces the process of **speculative Reason**. On this side, the acts of practical Reason have a positive character in the sense that it conditions the acts of speculative Reason. We call this the **ratio-expression** of practical Reason and it is the counterpart

in practical Reason to the conditioning of motoregulatory expression by reflective judgment. Again, however, Reason is wholly unconcerned with objects and the function of speculative Reason is to regulate the acts of determining judgment. Determining judgment contains its own rules of operation (the categories of understanding), but these rules are of a local rather than of a systematic character. Put another way, determining judgment does not determine itself and it is in the employ and under the control of speculative Reason. Speculative Reason provides a system of regulative principles that orient the acts of determining judgment in accordance with conditions set by practical Reason. Speculative Reason regulates with the aim of logically perfecting the overall structure of the manifold of concepts.

The acroamatic principle of Reason is called the **principle of final purpose**. However, one must not let the teleological-sounding flavor of this name get in the way. The general character of Reason is regulative and can be likened to what is called the "set-point" or "reference" signal in a control system. To illustrate this concept by example, consider the simple control system depicted in Figure 1.5.2. Let y denote the response of the system and let the system being controlled be described by the simple first-order differential equation

$$y' = \frac{dy}{dt} = -\frac{1}{\tau}y(t) + \frac{A}{\tau}u(t)$$

where t denotes the time parameter and τ and A are constants and parameters of the system. x denotes the control ("set-point") input to the system and is analogous to the regulations expressed by the process of Reason. $u = x - y$ is called the control law. Analysis then shows that the overall response of the system, y , as a function of control input x , is governed by the differential equation

$$\frac{dy(t)}{dt} = -\frac{1+A}{\tau}y(t) + \frac{A}{\tau}x(t).$$

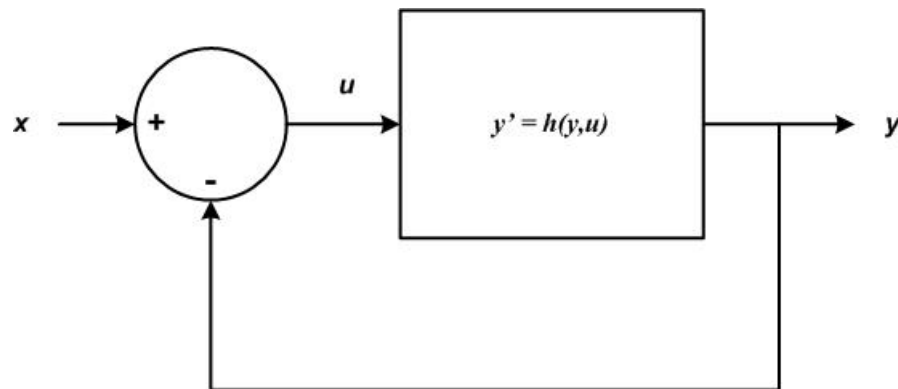


Figure 1.5.2: Simple control system example.

For the case where x is held constant for $t \geq 0$, the solution of this equation is

$$y(t) = \frac{A}{1+A}x + \left(y(0) - \frac{A}{1+A}x\right) \cdot e^{-(1+A)t/\tau}$$

where $y(0)$ is the initial condition of the system. In the limit as t goes to infinity, the response y goes to $Ax/(1+A)$ and if A is large relative to 1, the response y approaches the desired "goal" x . There is nothing in the least that is teleological in this system. One thing we should note about the differential equation describing this system is that the time parameter, t , does not appear in it as a coefficient. Equations such as this yield solutions that are causal in the classic "if A then B" connotation of that term.

However, one can (and should) object at this point that the example just given begs the question. Given x , yes, the system behaves non-teleologically; but does this not simply push the teleology back a step and hide it within the determination of the signal x ? The process of Reason was described above as a process that aims at attaining "logical perfection" for the manifold of concepts and at "perfection of a system of practically universal laws." The idea of perfecting something is goal-seeking (determined by a final purpose) and is this not overt teleology?

It is here where our understanding of the causality of Reason can be helped by referring to another example, this one drawn from the science of physics. One of the fundamental laws of physics is Hamilton's principle, which states that events in nature are such that they always minimize a particular function (called the "action") of the form

$$\int_{t_1}^{t_2} L dt = \text{minimum}.$$

L is an energy function (called the Lagrangian) and nature is said to "want to conserve its precious L ." Hamilton's principle is expressed as an integral (rather than as a differential) equation and, indeed, can be regarded as a "modern carrier of Aristotelian final cause, now called a purpose" [MARG: 422]. Hamilton's principle is but one of several scientific laws that are expressed in integral equation form, and all these laws have this "teleological" flavor. However, by means of a mathematical manipulation (using the calculus of variations), it is possible to re-express these laws in the form of differential equations and *these equations are of the mathematical form that yield temporally causal solutions*. As Margenau put it, the mathematician "has transformed a purpose into a cause" [MARG: 422-425].

We can find other actual examples of this. One sub-branch of system theory is the theory of optimal control systems. These systems are based on optimizing an equation known as the Hamilton-Jacobi-Bellman equation [LEWI: 311-313]. In integral form, this is another of those

equations that have a "teleological flavor" and, in this case, the HJB equation produces a result that states an optimal control strategy must be determined by working backward from the desired final state; this is called a "backward in time problem." Nonetheless, optimal control *solutions* can be obtained for real, physical systems by strictly causal methods such as the method of dynamic programming [LEWI]. Werbos' Backpropagation Algorithm in neural network theory is yet another example of HJB-based optimization implemented in actual systems.

The point of all this is simply the following. In modeling the laws governing the operation of the process of Reason, our theory is constrained by the requirement that any "final cause" or "purpose" represented in modeling the process of Reason must obey the constraint that it be possible to find some transformation of its expression such that this law also has expression in a mathematical form that satisfies what we will call "causality in the Margenau sense." This is because *all* acts of the process of Reason result in physical actions observable in the sensible world. This is the criterion at the basis of practical objective validity for the idea of Reason. All such actions are phenomena bound to the notion of efficient causes and *never* appear in the form of Aristotle's final cause. This *requirement* set on the theory of the process of Reason is an acroamatic law of mental physics, the **law of the causality of freedom** or **Margenau's law**.

From a practical as well as a pragmatic point of view, we can regard the spontaneity of an Organized Being in converting its representations into motoregulatory actions as a capacity to be the cause either of making the object of its representations actual (when these actions produce the object) or of preventing or abolishing the actuality of the object (when these actions oppose the actuality of the object). We call this capacity the **appetitive power** of practical Reason. From this practical standpoint, **appetite is a self-determination** (of the power of the Organized Being) **through the representation of something in the future as an effect of this determination**. Here we must understand that although representations of Desires in reflective judgment are impetuous acts that condition possible motoregulatory actions, acting on these desires is conditioned by the practical manifold of rules constructed by practical judgment. A possible act of desire must pass an evaluation, which we can call a determination of the rightness or wrongness of the action, by practical Reason (the master regulator of all non-autonomic actions). This is the practical meaning of "self-determination" in the context of appetite. An act of appetitive power is an act of this self-determination.

This practical capacity to make a representation the object of appetite is called the power of **choice** (because the action so determined can either promote or oppose the actuality of the object). To properly appreciate this, we must take note that although the representations of reflective judgment stand in an immediate relationship to motoregulatory actions (although

subject to veto by practical Reason), these representations themselves take the source of their *materia ex qua* from sensibility and sensibility, in turn, contains contributions from concepts via the synthesis of imaginative reproduction. But, again, determining judgment does not determine its own employment and is subject to regulations of Reason and the ratio-expression of practical Reason. Therefore, although the actions of the Organized Being can be *stimulated* through the senses, these actions are not solely *determined* by the receptivity of the senses. Indeed, the determined action can actually oppose the raw inclinations of sensuous desire because actions are subject to conditions set in the Organized Being's self-constructed manifold of practical rules. This *freedom* from having its actions necessarily *bound* to determination by sensuous representations is **practical autonomy** and so the power of choice in an Organized Being is said to be **free choice** (*arbitrium liberum*). The Organized Being is the arbitrator of its own actions.

§ 6. *Psyche*

Nous and *soma* co-exist in a relationship of thorough-going reciprocity, each determining and being determined by the other. This is an acronym of mental physics. This principle that all parts in the logical division of the Organized Being are co-determining at the same moment in time is called the **principle of emergent properties**. The power of the Organized Being to be animate through reciprocal co-determination of *nous* and *soma* is called the **power of locomotion**. Both of these belong to the logical division of *psyche*, the organized structure of animating principles in *nous-soma* reciprocity.

The classical and so-called "mind-body problem" is a fictitious problem brought about by the ontological error of supposing that the division between mind and body is a real division. The scientific fact is that the object of our science is the Organized Being as a whole. When we study the human being as a phenomenon in nature we do not find "mind" existing independently of "body" nor "body" existing independently of "mind" in any healthy subject.¹² The classical puzzle arising from Descartes' error was given a tongue once by Ms. Bernita Rabinowitz, a student of psychologist E. Bruce Goldstein:

A human perceives a stimulus (a sound, a taste, etc.). This is explained by the electrical impulses sent to the brain. This is so incomprehensible, so amazing. How can one

¹² Medical cases involving such conditions as coma, persistent vegetative state, or absence seizures followed by an absence automatism (two manifestations of epilepsy) are situations in which there is a neurological abnormality in the *Existenz* of the subject. The principle of emergent properties tells us that where such a somatic abnormality exists, there too a noetic abnormality necessarily exists. Phenomena like this do not provide objectively valid grounds for establishing mind-body as a real division because we cannot say, with objective validity, that "a brain event occurred *and then* a mental consequence *followed*." The phenomenon with which we are presented is that somatic and noetic abnormality *co-arise* with each other. This is not a cause-and-effect relationship but, rather, a reciprocity relationship.

electrical impulse be perceived as the taste of a sour lemon, another impulse as a jumble of brilliant blues and greens and reds, and still another as bitter, cold wind? Can our whole complex range of sensations be explained by just the electrical impulses stimulating the brain? How can all these varied and very concrete sensations – the ranges of perceptions of heat and cold, colors, sounds, fragrances and odors, tastes – be merely and so abstractly explained by differing electrical impulses? [GOLD: 13-14]

Physicists are fond of telling the rest of us that physics is the queen of the sciences and that ultimately everything is explained by atoms. This is the simple romantic boasting of childish innocence. The objects of psychology – feelings, sensation, perception, thinking, affectivity, consciousness, etc. – are utterly foreign to the topic of physics and utterly beyond the reach of physics' paradigm. They are, one and all, supersensible objects and there is no objective validity to be found in the practice of explaining them by simple fiat (as "epiphenomena") or simply subordinating them to the appearances and manifestations studied by physiology and anatomy. One might just as well explain the attraction between the sun and the planets as "love." A poet may do this; a scientist must not. There are no happy electrons, no somber molecules, no pontifical cells, and no mind dust in physics' closet. It is as William James wryly observed,

Every one admits the entire incommensurability of feeling as such with material motion as such. "A motion became a feeling!" – no phrase that our lips can frame is so devoid of apprehensible meaning. [JAME1a: 146]

Nature presents us with two fundamental aspects of *Existenz* in the Organized Being, one physical and one mental, and these aspects are inseparable by any real division. This leaves for our understanding no other objectively valid option but to regard the mind-body division as merely logical – a mere tactic of scientific categorizing, thinking, and theorizing. But this division also presents us with the necessity of understanding the consequent reciprocity in mind-body relationships and so makes necessary a third logical division, which we call *psyche*.

Placed as it is in Figure 1.2.3 between *soma* (a sensible object) and *nous* (a supersensible object), *psyche* presents us with a set of particularly unique theoretical challenges. Each of us, as an individual, has experiences we say are of a mental nature as well as experiences of our own bodies. Indeed, the actuality of these experiences grounds the idea of the logical divisions of *nous* and *soma*. However, the apparent capacity of *nous* to affect *soma* and of *soma* to affect *nous* is not directly presented to us in experience. This capacity is inferred rather than experienced, and it is this inferential nature of mind-body reciprocity that opens the door for the many and divers opinions of the "nature of the mind-body relationship." This inferential nature is implicit when we describe *psyche* as a structure of animating *principles*.

The psychophysical method in present day psychology and neuroscience is an empirical approach for attempting to find laws connecting psychological or mental states with physical states. Lacking a commonly agreed-to paradigm and succumbing to the pseudo-metaphysical

prejudice that ultimate explanations of psychological objects must reduce these objects to an interpretation of physics, the psychophysical method tends to yield an aggregate of competing "mini-theories" rather than a unified science. Reber's *Dictionary of Psychology* tells us "psyche" is most commonly "used" by psychologists to denote "mind"; he also tells us the term "mind" is "the battered offspring of the union of philosophy and psychology" and lists eight different (and sometimes conflicting) "usages" of that term – which tells us psychology has *no* agreed-to definition for either word.

As the "bridge" between *soma* and *nous*, *psyche* both belongs and does-not-belong to Slepian's physical world (facet A); equally, it both belongs and does-not-belong to his mathematical world (facet B) as well. It is little wonder that "*psyche*-logical" questions have historically been perhaps the most contentious questions in all of science. Opinions about these questions span the intellectual spectrum all the way from romantic spiritualism to the hard-line positivism of strict scientific materialism.

The epistemological deduction and *Realerklärung* ("real explanation")¹³ of *psyche* occupies two full chapters (chapters 6 and 15) as well as a significant fraction of a third (chapter 16) in *The Critical Philosophy and the Phenomenon of Mind*. The doctrine of *psyche* in mental physics is comprised of three interrelated parts: (1) the sensorimotor idea; (2) *Lust per se* (pronounced "loost"); and (3) the synthesis in continuity.

The sensorimotor idea is the *applied* metaphysic – that is, it is the *basic paradigm* – for our *science* of the Organized Being *as a psycho-organic whole*. Many scientists feel very uncomfortable or even repulsed when the word "metaphysic" appears explicitly in a science book. We who have been trained as scientists – especially those of us trained in one of the physical sciences – have been carefully taught to regard "metaphysics" with deep skepticism. Indeed, it was the sorry track record of metaphysics in philosophy that led to the rise of "positive science" (positivism) in the nineteenth century. But in a very important sense of the word, paradigms are really nothing else than, in Kuhn's words, "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners" [KUHN: viii]. This, put into other words and the language of the philosophers, is what an applied metaphysic must *be* if it is to merit the title of *scientific* metaphysic. Of course, when it is first proposed a paradigm is not yet "universally accepted"; indeed, the precise moment when the proposition first *becomes* a "universally recognized scientific achievement" is quite foggy at best and strictly

¹³ A *Realerklärung* is an explanation in terms of those powers and processes of *nous* and *psyche* by which Nature (one's "world model") is constructed, structured, and understood, and which makes the objective reality of a concept distinct.

speaking a paradigm is recognized *to be* a paradigm only *ex post facto*. At the time of this writing, mental physics has not yet reached or earned that title within the community of science. But if one wishes to adopt such a strict interpretation of the word "paradigm" then psychology – which lacks a universally accepted paradigm at present – could not claim to be a *science* but only to be an enterprise seeking *to become* a science. Kuhn wrote,

Effective research scarcely begins before a scientific community thinks it has acquired firm answers to questions like the following: What are the fundamental entities of which the universe is composed? How do these interact with each other and with the senses? What questions may legitimately be asked about such entities and what techniques employed in seeking solutions? At least in the mature sciences, answers (or full substitutes for answers) to questions like these are embedded in the educational initiation that prepares and licenses the student for professional practice. Because that education is both rigorous and rigid, these answers come to exert a deep hold on the scientific mind. . . . Normal science, the activity in which most scientists inevitably spend almost all their time, is predicated on the assumption that the scientific community knows what the world is like. Much of the success of the enterprise derives from the community's willingness to defend that assumption, if necessary at considerable cost. [KUHN: 4-5]

No natural history can be interpreted in the absence of at least some implicit body of intertwined theoretical and methodological belief that permits selection, evaluation, and criticism. If that body of belief is not already implicit in the collection of facts – in which case more than "mere facts" are at hand – it must be externally supplied, perhaps by a current metaphysic, by another science, or by personal and historical accident. [KUHN: 17]

Darwin's *The Origin of Species* was not the "last word" on the theory of evolution; it was, rather, the "first word" on that topic. Similarly, this book and *CPPM* provide "first words" on the theory of mental physics. What separates mental physics from the Critical Philosophy proper is its *application* to the phenomenon of "being a human being." That is why the paradigm of the sensorimotor idea is an applied metaphysic and not a pure metaphysic. It must be a bridge.

The sensorimotor idea is the synthetic union of three interlocking ideas: (1) the transcendental sensorimotor idea; (2) the empirical sensorimotor idea; and (3) the data of the senses. The first addresses the requirements of the formal epistemological acroams our paradigm must meet in order for any representation of the Organized Being to be regarded as *real*. The word "transcendental" in the Critical Philosophy *means* "necessary for the possibility of experience" and it is this requirement that must be met for a metaphysical idea to have real objective validity.

The second (the empirical sensorimotor idea) addresses the *Realerklärung* for how we are to understand and use the idea of that which we call **sense** and with the relationships connecting *changes* in the appearances of somatic and noetic accidents with one another. The third (data of the senses) is concerned with understanding the possibility of the representation of empirical appearances by the Organized Being, and thus speaks directly to the Organized Being's capacity for receptivity and to the crucial idea of emergent properties that is central to biology.

Lust per se is the fundamental property of *psyche* for determining **adaptation** in the Organized Being, and it is in this context that we characterize the animating principles of *nous-soma* reciprocity as principles of the **adaptive psyche**. Jean Piaget wrote,

Every response, whether it be an act directed towards the outside world or an act internalized as thought, takes the form of an adaptation or, better, a re-adaptation. The individual acts only if he experiences a need, i.e. if the equilibrium between the environment and the organism is momentarily upset, and action tends to re-establish the equilibrium[.] A response is thus a particular case of interaction between the external world and the subject, but unlike physiological interactions, which are of a material nature and involve an internal change in the bodies which are present, the responses studied by psychology are of a functional nature [PIAG2: 4].

The phenomenon of adaptation, both somatic and noetic, is central to the phenomenon of the Organized Being and the idea of *Lust per se* deals with adaptation in the Organized Being. Like *Gestalt*, the German word *Lust* does not travel well into English. Its connotation is that of a kind of motivated wanting and its flavor is captured in English by the colloquialism, "I'm up for that!" *Lust* does *not* mean "pleasure," which is how many translators erroneously render it in English, nor does it mean the same thing as the English word "lust." The opposite of *Lust* is *Unlust*, which has the flavor of the American colloquialism, "I'm not up for that." As opposites, *Lust* and *Unlust* stand as members of a disjunction under a general Object and this Object for which they are members of the divided concept is called *Lust per se*.

The primary meaning of the word "lust" in modern English is "overmastering desire." However, desire – whether overmastering or not – is an affective perception and neither *Lust* nor *Unlust* is a perception at all. Affective perceptions in reflective judgment are called *feelings* of *Lust* or *Unlust*, but this is not the same thing as *Lust* or *Unlust per se*. We can regard *Unlust* as "negative *Lust*" from a mathematical perspective in that *Unlust* opposes *Lust* in a manner analogous to that when two co-linear but oppositely directed forces cancel one another in physics.

One can be tempted to regard *Lust per se* as some kind of "psychic force," but this is not a useful metaphor for mental physics. As an Object, *Lust per se* is a transcendental and super-sensible Object; our objectively valid understanding of this Object is entirely practical and must be represented only in terms of effects attributed to this Object. **Causality is the notion of the determination of a change by which the change is established according to general rules.** We understand *Lust per se* in terms of the manner in which the animating principles of *psyche* determine changes in the Organized Being. Here we have three interrelated functional ideas of causality through motoregulatory expression in *nous-soma* reciprocity: (1) *Lust-Kraft*; (2) *Lust-Organization*; and (3) the adaptive *psyche*. *Lust-Kraft* describes the functioning of adaptation in the Organized Being. *Lust-Organization* describes how adaptation is specifically determined. The adaptive *psyche* describes the manner in which adaptation activity targets changes in *nous* and

soma. In addition to these three ideas of motoregulatory expression, we also have an acroamatic principle governing this expression. This is called the **Lust principle** and it is the acroam governing how the Organized Being acts *in the particular*. The *Lust* principle is not the same as Freud's famous *Lustprinzip* (commonly but erroneously translated into English as "the pleasure principle"). The *Lust* principle is the acroam defining the condition that marks a state of equilibrium in the *Existenz* of the Organized Being.

Finally, we come to the synthesis in continuity. Because *nous*, *soma*, and *psyche* are merely logical divisions in our representation of one object (the Organized Being), we require *real* relationships among these divisions. In Figure 1.5.1 the only connections running from *nous* to motoregulatory expression run from reflective judgment and practical Reason. However, *nous* and *psyche* differ in their *logical* essence, and this means it is incorrect to think in terms of representations of *nous* as somehow "flowing" from *nous* into motoregulatory expression as we say for a physical system that *signals* flow from a signal source into a signal sink.

Instead of this simple but invalid image, we must rather look upon the connection between noetic representations of reflective judgment and practical Reason with motoregulatory expression in terms of self-regulating transformations from noetic representation to psychic representation. Noetic representations and psychic representations are quite inhomogeneous when considered in their proper contexts. To establish real relationships, something must supply homogeneity *in* representation and this is what is accomplished by the synthesis in continuity. Here we find four fundamental types of transformations: (1) continuity of objectivity; (2) continuity of perception (called the aesthetic Idea); (3) continuity of judgmentation (called the judicial Idea); and (4) continuity of coherence in the context of the life of the Organized Being (called Meaning). Objectivity, the aesthetic Idea, the judicial Idea, and Meaning taken together comprise the synthesis in continuity.

§ 7. Summary

The topic and Object of the theory of mental physics is the human being regarded as an organized being. An organized being in general is an Object in which its parts, in terms of their *Dasein* and form, are possibly only through their interrelation in the whole, and in which each part must be regarded as being combined in the unity of the Object and in reciprocal co-determination, in which each part must simultaneously be regarded as being a cause in the determination of the other parts *and* as an effect of their determinations of it. These notions of cause and effect are in this context notions pertaining to the overall *Existenz* of the Organized Being.

This chapter has presented a general overview of the Organized Being model and introduced some of our technical terminology. The chapters that follow will fill in more of the detail. The theory and everything in it is grounded in and takes its origins from the metaphysics of Critical epistemology, which establishes the objective validity of all the constructs in mental physics. Critical epistemology is the theory of how human knowledge is possible, of the sources of human knowledge, and of the limits to what we can know with objective validity. This more fundamental theory is covered in full detail in the author's prior work, *The Critical Philosophy and the Phenomenon of Mind* and the myriad details and deductions worked out there will not be presented in this book except in summary form. It is an objective of this book to present the reader with a more encapsulated and digestible form of this epistemology as it pertains to the phenomenon of mind. The author hopes that this will be useful to you, the reader, if you should choose to explore this metaphysical substrate in greater depth in the *CPPM*.

No science is ever practiced without its practitioner – the scientist – basing his practices, either explicitly or implicitly, on some metaphysic or – as is more often the case in modern times – some system of unscientific pseudo-metaphysics produced as an accident of a person's life experiences in childhood and early adulthood. We all, each and every one of us, construct some such system for ourselves in the long apprenticeship from infancy to adulthood. In the most basic sense of the word, metaphysics is "the way a person looks at the world." It was shown in *CPPM* that the construction of a "personal metaphysics" is an inevitable consequence of how mind works in human beings.

When empirical circumstances gainsay that system of personal metaphysics, we call those circumstances by such descriptors as paradoxical, strange, defying common sense, and other such descriptors of awe and wonder. Probably the best example of this in modern times is the quantum theory of modern physics. The mathematical first principles of quantum mechanics are actually quite simple and elegant¹⁴, but the phenomena they describe and predict are so contrary to everyday experience that the main difficulty the student has when first learning the quantum theory stems from the outright assault this theory makes upon the student's metaphysical prejudices. The quantum theory tells us that an electron is somehow and at the same time both a "particle" and "wave" (which, of course, means that it is neither yet exhibits particular particle-like and wave-like characteristics). It tells us the same thing about light. It tells us that something that changes the polarization of a photon (a "light particle") at one point in space can immediately

¹⁴ This does not mean that the calculation of the consequences in applying the quantum theory are simple or easy. Indeed, computing the consequences of the quantum principles can be extraordinarily difficult and requires a high degree of in-depth training in physics.

determine the polarization of another photon at a distance so far away that there is not enough time for information about the first photon's state of polarization to be communicated to the location of the second photon if that information is conveyed at the speed of light.^{15,16} Upon first encounter, the pronouncements of the quantum theory stagger the imagination and sound as ridiculous as any pronouncement can be. Yet, when we go into the laboratory and put these pronouncements to the test, the experiments confirm these ridiculous-sounding pronouncements. The ridiculous turns out to be true; the pronouncements of "common sense" turn out to be false.

These paradoxes vanish under Critical metaphysics. Almost all theories of metaphysics that have ever been put forth – and, it would seem, *all* naturally-occurring metaphysical prejudices (pseudo-metaphysics) people develop for themselves in the course of growing up – place ontology (the theory of entities) at the center. This is then used as the foundation and basis for trying to understand, among other things, a theory of knowledge (epistemology). We use "things" as the primitive basis for "what we know." Critical metaphysics reverses this priority by placing epistemology in the center and basing ontology on what Kant called "the thinking nature" of human beings.¹⁷ Critical metaphysics tells us *what we can know with objective validity*, and it tells us the manner in which this objective validity is procured and the limits to this validity. At the rock-bottom foundations, all objective validity is grounded in *practical* objective validity and must answer to the unrelenting requirement that all primitive notions and ideas of objects meet the standard of being necessary for the possibility of experience as human beings come to *know* experience. Kant called this his "Copernican revolution" in metaphysics.

The single most difficult thing in understanding the Critical system is breaking a lifetime of habit in placing ontology at the heart of how one views the world. Even professional philosophers often find it difficult to break this habit of thinking and some people appear to find it impossible to do this. Yet this is what is required of us if we are to have a solid foundation for science. It is absolutely mandatory for us to do this if we are to have a science of mental physics at all.

One of the most crucial and immediate consequences of this epistemology-centered theory is that the mind-body division is and can only be a *logical* division and that it is a fundamental and unrecoverable error to regard it as a *real* division.¹⁸ To make a real division is to make a concept

¹⁵ Fritz Rohrlich, "Facing quantum mechanical reality," *Science*, vol. 221, no. 4617, pp. 1251-1255, 1983.

¹⁶ This quantum phenomenon provides an explicit example of a Relation of community, the notion of which is the notion that underlies the thorough-going reciprocity of *nous*, *soma*, and *psyche*.

¹⁷ A scholar familiar with Kant's work will take notice of the fact the word "epistemology" appears nowhere in Kant's writings. The reason is simple. The word "epistemology" had not yet been coined during Kant's lifetime. It did not become a word until some half century after Kant's death. Kant's word was "critique" and his "critique" is synonymous with "epistemology."

¹⁸ The formal definitions for a logical division and a real division are provided in the glossary.

of disjunction on the basis of a real experience (and in Modality it carries the notion of actuality in the making of this determinant judgment). A logical division is a merely possible disjunction; it is the product of imaginative thinking (speculation) and not a judgment of any real experience. Real divisions organize Nature; logical divisions organize understanding.

Regarded as Objects, the ideas of mind and body are coordinate ideas – two sides of the same coin – and neither can be made subordinate to the other without introducing an irretrievably false premise at the very roots of psychology and neuroscience. We must take mind as a part of the phenomenon of "being a human being" and treat it on equal footing with the phenomenon of body. Mind is *not* an epiphenomenon, not the outer crust of some consequence of body. At the root of this Critical requirement for the logical divisions of mind and body is the primitive notion of a Relation of **community**, a notion that will be explained later in this book. (This same notion of community also, among other things, clears up the pseudo-metaphysical paradoxes of the quantum theory). Under our epistemology-centered system, the so-called mind-body problem vanishes, and does so from our recognition that what it really was in its very origin was nothing more than the transcendent illusion of an ontology-centered prejudice.

After banishing this illusion we can get on with the scientific treatment of the phenomenon of mind. We place this treatment firmly in the context of the Organized Being model and in this context treat it on equal footing with the science of body. We will encounter no occult quantities, no unscientific fiats, and no fog-shrouded mysticism in understanding mind-brain relationships.