

# Immaterial Aspects of Thought

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Chapter 6

Immaterial Aspects of Thought

I. Introduction

Here we reach the book's central argument, the one that unifies the notion of human understanding's having real components in our basic judgments, with the idea to be developed in the next Chapter, that there really are explanatory structures, both forms and natures, in the physical world, which are the content basically abstracted. In fact, the cosmos is a world of "software everywhere," comprehensible by abstraction and judgment alone.

The argument, at the end of this chapter, that the principle of intelligent animal life is subsistent and is explanatory of the being of the human psycho-physical composite, rests upon the premise that a principle of immaterial activity, without a physical organ, has to be on-its-own. That rests on the epistemically prior claim that both the activities of judgment and the contents of judgment have to be immaterial and that immaterial processes and contents have to have an immaterial explanatory principle. This is the issue investigated first in this Chapter.

Further, the idea that the first constant activity of an intelligent animal, qua intelligent, is deparicularization of what is sensibly perceived again supposes that a human can and does carry out such an activity by nature, and that it cannot be a physical process.

Thirdly, the idea that structures (forms) are disclosed in things by our comparisons and our reflective observation of what things do and undergo, rests on the premise that we can and by nature do perform an immaterial separation of real structures from their particular materializations and form our conceptions that way, e.g., "wheel" from a tire. Similarly certain consequences depend on those premises too: specifically that by comprehension we can prescientifically grasp the real "what sort" of many things, from lions to pears, and by science can articulate and interrelate the "what-it-is" and the "how-it-does-it" of many things, under encompassing generalities and with "inner mechanisms," from water to dams, to toilets, and glaciers;

similarly, that the objective of science is stable comprehension of things (technologically displayed and, perhaps sometime leading to comprehension of the whole of nature), and that we can come to know general necessities of nature and natural impossibilities, as well as contrary to fact situations that are explicable from the real natures of actual things (and from the potentialities realized in actual things).

Finally, because conceptions and judgments are immaterial processes and contents, we have a way to explain how what we think, when what we think is true, is what is so: by the fact that the abstraction of a physical situation is the same situation operated on in a way that leaves the particular entirely unchanged, but the agent altered from merely "being able to judge that..." to "actually judging that...", just as, less perfectly, a dog's seeing a person approaching leaves the approaching person unchanged, except for a few reflected photons, but changes the dog, even physically, as well as sensibly. I am not suggesting by that example that canine perception involves any immaterial process or content, but only that even physical exchanges can leave one participant unchanged and the other changed.

So the reasoning in this Chapter is not only foundational to other claims, it organizes the book into a unified explanatory whole and establishes a basis for a further conclusion that the principle of human life, being immaterial, is incorruptible and thus cannot cease to be by undergoing any change. I am not suggesting that a human being is two parts, one immaterial and the other material but made to exist by the immaterial part. Rather, the human person is one being, with bodily/animal states essentially, but also with immaterial states and operations essentially, and the explanatory reality for both kinds of states and operations has to be one immaterial principle of being -- otherwise, there would not be a single entity, a person. Failure of the bodily/animal activities by failure of the material capacity is not sufficient for destruction of the unified person. Part V of this Chapter develops the idea that there is an immaterial principle for the substantial unity of the person for whose personality animality is indispensable.

The following chapters make the notions of form and nature clearer, allowing for man-made forms and sorts, for our conventions of naming, and for the diverse, even conflicting descriptions and classifications that reflect diverse referential and observational vantages and, lastly, articulate some of the varieties of falsity, a perplexing and neglected subject.

The Chapter, then, is in four parts: (1) the main argument from the forms and processes of understanding and the underdetermination of physical processes; (2) the parallel argument from the definite content of judgment and the underdetermination of physical processes as to content; (3) several subsidiary arguments concerning (a) causation, (b) the transcendent determinacy of the physical over judgment (that every true physical object judgment requires a physical state infinitely more determinate than whatever can be thought), (c) the infinite multiplicity of judgment vs. the numerical finitude of the physical, (d) the atemporality of judgment vs. the temporality of all causes and expressions of judgment; and (4) the reasons why there is an immaterial principle of the substantial unity of the person and why animality is essential to personality.

## II: The Main Argument

### I. Introduction.

Animal cognition and desire, from the appetite of a clam to the optical systems of vultures and frigate birds, is supposed to have neuro-biological explanations resultant from, if not reducible to, universal laws of

physics. That is a minimal and modest project for epistemology naturalized, one to be assisted by specialized sciences.

There is a larger and bolder project of epistemology naturalized, to explain human thought in terms available to physical science, particularly the aspects of thought that carry truth-values, and have formal features, like validity or mathematical form. That project seems to have hit a stone wall, a difficulty so grave that philosophers dismiss the underlying argument, or adopt a cavalier certainty that our judgments only simulate certain pure forms and never are real cases of, e.g., conjunction, or modus ponens, or adding, or genuine validity. The difficulty is that in principle such truth-carrying thoughts cannot be wholly physical (though they might have a physical medium), because they have features that no physical thing or process can have at all.

I articulate that difficulty in principle to press home that it cannot be dismissed, evaded, or the underlying arguments or costs disregarded. First, the underlying arguments themselves are among the jewels of analytic philosophy (underdetermination considerations); and, secondly, to deny that our judgments are of definite logical forms and pure functions, conflicts with our own certainty and with what we tell our logic, mathematics and linguistics students about validity, proof and formal syntax, and leaves us unable to explain what we do when we do mathematics, logic or any other formal thinking.

Look at this argument:

Some thinking (judgment) is determinate in a way no physical process can be. Consequently, such thinking cannot be (wholly) a physical process. If all thinking, all judgment, is determinate in that way, no physical process can be (the whole of) any judgment at all. Furthermore, "functions" among physical states cannot be determinate enough to be such judgments, either. Hence some judgments can be neither wholly physical processes nor wholly functions among physical processes.

Certain thinking, in a single case, is of a definite abstract form (e.g.,  $N \times N = N^2$ ), and not indeterminate among impossible forms [see #2, next]. No physical process can be that definite in its form in a single case. Adding cases even to infinity, unless they are all the possible cases, will not exclude impossible forms. But supplying all possible cases of any pure function is impossible. So, no physical process can exclude impossible functions from being equally well (or badly) satisfied [see #3, below]. Thus, no physical process can BE a case of such thinking. The same holds for functions among physical states [see #5, below].

Other applications of the reasoning.

The reasoning is first to be elaborated as to logical forms or processes. Part II develops the same reasoning as to content: (a) the content of a judgment has to be so definite as to eliminate an indefinite or incompatible content and to be repeatably the same, but no physical process or function among them can ever be that definite; (b) all thought lacks the transcendent determinacy of the physical, and thus cannot be physical, although sense perception is transcendently determinate and may indeed be physical (though not as the physical has been conceived since the 17th century); (c) a judgment cannot overflow thought, except logically, whereas any compliant physical reality has to overflow any judgment infinitely.

2. The determinateness of some thought processes.

Can judgments really be of such definite "pure" forms? They have to be; otherwise, they will fail to have the features we attribute to them and upon which the truth of certain judgments about validity, inconsistency and truth depend; for instance, they have to exclude impossible forms or they would lack the very features we take to be definitive of their sorts: e.g., conjunction, disjunction, syllogistic, modus ponens, etc. The single case of thinking has to be of an abstract "form" (a "pure" function) that is not indeterminate among impossible ones. For instance if I square a number -- not just happen in the course of adding, to write down a sum that is the square, but if I actually square the number -- I think in the form " $N \times N = N^2$ ".

The same point again. I can reason in the form, "modus ponens," ("If p then q"; "p"; "therefore, q"). Reasoning by modus ponens requires that no impossible form also be "realized" (in the same sense) by what I have done. Reasoning in that form is thinking in a way that is truth-preserving for all cases which realize the form. What is done cannot, therefore, be indeterminate among structures some of which are not truth-preserving. That is why valid reasoning cannot be only an approximation of the form, but must be of the form. Otherwise, it will as much fail to be truth-preserving for all relevant cases, as it succeeds; and thus, the whole point of validity will be lost. Thus, we already know that the evasion, "We do not really conjoin, add or do modus ponens but only simulate them" cannot be correct. Still, I will consider it fully, below.

"Being truth-preserving for all relevant cases" is a feature of the single case. The form of the reasoning that actually occurs is "truth-preserving," regardless of which case it is. Otherwise, it would not be "impossible by virtue of the form to proceed from truth to falsity" in that reasoning (especially when the premises are not true). Thus, the form of the actual "encompasses" (logically contains) all relevant counterfactual situations. In fact, it encompasses all relevant cases whatever. Without that, there is no genuine difference between valid and invalid reasoning.

Squaring, conjoining, adding.

I propose, now, with some simple cases, to reinforce the perhaps already obvious point that the pure function has to be wholly realized in the single case, and cannot consist in the array of "inputs and outputs" for a certain kind of thinking. Does anyone doubt that we can actually square numbers? "4 times 4 is sixteen"; a definite form ( $N \times N = N^2$ ) is "squaring" for all relevant cases, whether or not we are able to process the digits, or talk long enough to give the answer. To be squaring, I have to be doing something that works for all the cases, something for which any relevant case can be substituted without change in what I am doing, but only in which thing is done.

Size and length of computation, for example, are external to the form of thinking, accidental to what is done. I am squaring just in case my thinking is of the form mentioned. If it is of any impossible form, or is indeterminate among impossible forms, it is not of the form, " $N$  times  $N = N$  squared." It is not, then squaring, however much its products may look like it, and however long a sequences of its outputs do.

The fact that I cannot process every case of modus ponens because most of them have premises too long for me to remember, sentences too long to say, or words I do not understand, is adventitious, like my not being able to do modus ponens in Portuguese. Those are features of the functors, not of the function. The function that has to be realized in every case is the one wholly realized in the single case.

That point is to be taken literally: that the function is wholly present, not by approximation, exemplification, or simulation, but by realization in the single case. To make that distinction clearer, consider an even simpler function, "conjoining." Conjoining is the functional arrangement of an n-tuple of assertions into a single assertion that is determinately true just in case every one of the n-tuple of judgments is, and false otherwise. The truth of the whole block is the truth of all of the units ("p.q=T just in case, p=T and q=T"). I can conjoin every sentence in the 14th Edition of the Encyclopedia Britannica, or yesterday's Times. What I do in the single case is what would conjoin any string of suitable units, even ones too long for me to think of, or beyond my access to refer to. It is impossible to conjoin thoughts, if what I do is indeterminate among impossible forms (at the same level).

Adding -- genuinely adding, not estimating -- is a sum-giving thought-form for any suitable array of numbers. If I add two "evens," I am doing what would have given "forty-four" had I been adding two "twenty-twos" (and not making mistakes), and so on for every other combination of suitable numbers. I cannot be really adding when I do something that gives the "right output" but which cannot, by its form, determine the "right outcome" for any case whatever, even one on which I make a mistake. There is a great difference between adding incorrectly and doing something else, like guessing, estimating, or following a routine or algorithm. The adding I am talking about, like conjoining, is a form of understanding.

This is not a claim about how many states we can be in. This is a claim about the ability exercised in a single case, the ability to think in a form that is sum-giving for every sum, a definite thought-form distinct from every other. When a person has acquired such an ability is not always transparent from successful answers, and it can be exhibited even by mistakes.

Definite forms of thought are dispositive for every relevant case, actual, potential and counterfactual. Yet the "function" does not consist in the array of inputs and outcomes. The function is the form by which inputs yield outputs. The array of inputs and outputs for a function is the logical tail of the comet, not what the function is.

The trait that determines the tail of the comet, the trait that "settles every relevant case, including all counterexamples," marks the contrast with any physical process: a physical process has no feature that can do that. That grounds my main argument: that a necessary consequence of even a single case of such thinking is something that is logically impossible to be a consequence of any physical process, or function among physical processes, whatever. Thus, the activity of such thinking cannot be a physical process, and the ability for such thinking cannot be a physical capacity.

### 3. The indeterminacy of the physical.

Now we need reasons why no physical process or function among physical processes can determine "the outcome" for every relevant case of a "pure" function. Those considerations mark some of the most successful analytic philosophy, from Quine, to Goodman, to Kripke. No physical process is so definite as to determine among impossible abstract functions that one rather than another is realized, and thus, to settle for every relevant case what the "outcome" is to be. That indeterminacy remains no matter how long the physical process is "repeated," even infinitely. In a word, with a machine, it is indeterminate among impossible functions, what it is doing, no matter what it does. Therefore, no matter what it does, what it is doing remains formally indeterminate. Goodman's "grue" considerations [1955, pp. 63-86], and the plus-quus adaptations by Kripke [1982, p. 9 and passim] suggest the form of my argument to show that. The argument is as follows.

Whatever the discriminable features of a physical process may be, there will always be a pair of incompatible predicates, each as empirically adequate as the other, to name a function the exhibited data or process "satisfies." That condition holds for any finite actual "outputs," no matter how many. That is a feature of physical process, of change, itself. There is nothing about a physical process, or any repetitions of it, to block it from being a case of impossible forms ("functions"), if it could be a case of any pure form at all. That is because the differentiating point, the point where the behavioral-outputs diverge to manifest different functions, can lie beyond the actual, even if the actual should be infinite; e.g., it could lie in what the thing would have done, had things been otherwise in certain ways. For instance if the function is  $x(*)y=(x+y, \text{ if } Y < 1040 \text{ years; } =x+y+1, \text{ otherwise})$ , the differentiating output would lie beyond the conjectured life of the universe.

Just as rectangular doors can approximate euclidean rectangularity, so physical change can simulate pure functions but cannot realize them. For instance, there are no physical features by which an adding machine, whether it is an old mechanical gear machine or a hand-calculator or a full-computer, can exclude its satisfying a function incompatible with addition, say, quaddition (Kripke's definition of the function to show the indeterminacy of the single case [1982, P. 9]: quus, symbolized by the plus sign in a circle, "is defined by:  $x \text{ [*edit note: use plus sign in a circle] } y=x+y, \text{ if } x,y < 57, =5 \text{ otherwise}''$ ) modified so that the differentiating outputs (not what constitutes the difference, but what manifests it) lie beyond the lifetime of the machine. The consequence is that a physical process is really indeterminate among incompatible abstract functions.

Extending the list of outputs will not select among incompatible functions whose differentiating point lies beyond the lifetime (or performance time) of the machine. That, of course, is not the basis for the indeterminacy; it is just a grue-like illustration. Adding is not a sequence of outputs; it is summing; whereas, if the process were quadding, all its outputs would be quadditions, whether or not they differed in quantity from additions (before a differentiating point shows up to make the outputs diverge from sums).

For any outputs to be sums, the machine has to add. But the indeterminacy among impossible functions is to be found in each single case, and, therefore, in every case. Thus, the machine never adds.

Extending the outputs, even to infinity, is unavailing. If the machine is not really adding in the single case, no matter how many actual outputs seem "right," say for all even numbers taken pairwise [see the qualifying comments in footnotes 8 and 11, about incoherent totalities], had all relevant cases been included, there would have been non-sums. Kripke drew a skeptical conclusion that it is indeterminate which function the machine satisfies, and, thus, "there is no fact of the matter" as to whether it adds or not. He ought to conclude, instead, that it is not adding. If it is indeterminate (physically and logically, not just epistemically) which function is realized among impossible functions, none of them is. That follows from the logical requirement, for each such function, that any realization of it must be of it and not of an impossible one.

There is no doubt then, as to what the machine is doing. It adds, calculates, recalls, etc. by simulation. What it does gets the name of what we do, because it reliably gets the results we do when we add (perhaps even more reliably than we do), by a distinct process. The machine adds the way puppets walk. The names are analogous. The machine attains enough reliability, stability and economy of output to achieve realism without reality. A flight simulator has enough realism for flight-training; you are really trained, but you were not really flying.

A decisive reason why a physical process cannot be determinate among impossible abstract functions is

"amplified grueness": a physical process, however short or long, however few or many outputs, is compatible with counterfactually opposed predicates; even the entire cosmos is. Since such predicates can name functions from "input to output" for every change, any physical process is indeterminate among opposed functions. This is like the projection of a curve from a finite sample of points: any choice has an incompatible competitor.

We have no doubt that the processes in a mechanical adding machine and in a personal computer are entirely physical. Addition cannot be identical with either of those physical processes because then it could not be done by the other. Suppose then that addition is identical with a function among those processes. Then the processes would have to determine that function to the exclusion of every impossible function. But they cannot do that, as the "quus," "grue" and "points-on-a-curve" examples show. So, the machines cannot really add.

Secondly, opposed functions that are infinite (that is, are a "conversion" of an infinity of inputs into an infinity of outputs) can have finite sequences, as large as you like, of coincident outputs; they can even have sub-sequences that are infinitely long and not different (e.g., functions that operate "the same" on even numbers but differently on odd numbers). So for a machine process to be fully determinate, every output for a function would have to occur. For an infinite function, that is impossible. The machine cannot physically do everything it actually does and also do everything it might have done. That is the heart of the matter. The physical, as process, is formally vague, no matter how far you extend it, or how minutely you describe its innermost mechanisms. The conclusion is that a physical process cannot realize an abstract function. It can at most simulate it.

What happened to nature?

Don't natural processes, say the behavior of a freely falling body, realize pure functions like " $d=1/2gt$ " and, where  $g=32$ , " $d=16t$ "? And is it not true that an object in empty space decreases in length in the direction it is travelling by an amount equal to  $1-v/c$ ? [\*edit note: please put square root sign over formula.] There are two reasons why such processes do not realize pure abstract functions of the sorts mentioned, only the second being relevant to the present discussion. First, these laws apply by idealization. What is "the direction" in which the object is travelling? There are no "point-masses." That is an idealization, as is its rest mass (say for photons or neutrinos, which are always moving at  $C$ ). No object falling to earth is in a vacuum and under no gravitational attraction to other bodies. Physical phenomena often come close to our mathematizations which, of course, are invented to represent them. But those mathematizations are idealizations [see N. Cartwright, 1983, and Ian Hacking, 1983]. That the laws are idealizations does not affect the present point.

The kind of indeterminacy I am talking about is different from that. For the impossible functions are equally idealizations, and may differ only logically because the "manifestation phenomena" lie beyond the actual (it being presupposed that all the actual phenomena accord with each function). So it is not a consequence of this account that there are no general and mathematizable laws of nature. Rather, just because there are general and mathematizable regularities, an object falling to the earth "in a vacuum" satisfies some impossible function just as well as it satisfies " $d=1/2gt$ ." That is a consequence of the underdetermination arguments.

Now, to accept the overall argument, one does not need to deny that there are definite natural structures, like benzene rings, carbon crystals, or the structural (and behavior-explaining) molecular differences

among procaine, novocaine and cocaine. These are real structures realized in many things, but their descriptions include the sort of matter (atoms or molecules) as well as the "dynamic arrangement." They are not pure functions.

A musical score, say The Mahler 2nd Symphony, can be regarded as an analog computer that determines, from any given initial sound, the successive relative sounds and their relative lengths (within conventions of intervals and length), and thus is a function from initial sound onto successor sounds; yet, from the sounds (a performance) there is not a unique score determined among impossible ones, except by convention. So too, when we abstract the formal structure, without matter, the physical thing (cell, molecule, gene, enzyme) or process will satisfy a logically impossible structure just as well.

#### 4. Retreat from people.

So, to avoid the argument, someone will say,

We do not really add, either; we just simulate addition. Pure addition is just as much an idealization as  $E=mc^2$ . Of course we can define such pure functions but cannot realize them; that is just a case of the many functions we can define that cannot be computed by any finite automation, or any other computer, either. In a word, the fact that there is no pure addition and no pure conjunction or modus ponens is no odder than the fact that there are no perfect triangles.

We cannot really add, conjoin, or do modus ponens? Now that is expensive. In fact, the cost of saying we only simulate the pure functions is astronomical. For in order to maintain that the processes are basically material, the philosopher has to deny outright that we do the very things we had claimed all along that we do. Yet, our doing these things is essential to the reliability of our reasoning. Moreover, we certainly can, platonistically, define the ideal functions, otherwise we cannot say definitely what we cannot do. However, that exposes a contradiction in the denial that we can think in pure functions. For to define such a function is to think in a form that is not indeterminate among impossible forms. To become convinced that I can only simulate the recognition that two Euclidean right triangles with equal sides are congruent, I have to judge negatively with all the determinateness that has just been denied. Each platonistic definition of one of the processes, and each description of the content of logical or arithmetical judgment is as definite a form of thought as any of the processes being denied; and each judgment that we do not do such and such a function is as definite in form as is conjunction, additional or any of the judgments that are challenged; otherwise, what is denied would be indeterminate. It is implausible enough to say we do not really add or conjoin. It is beyond credibility to say we cannot definitely deny that we add, conjoin, assert the congruence of triangles, or define particular functions, like conjunction.

The final and greatest cost of insisting that our judgments are not more determinate, as to pure functions, than physical processes can be, is that we can do nothing logical at all, and no pure mathematics either. Now, who believes that?

There is not some parallel evidential indeterminacy between our activities and those of a machine whereby we cannot be sure what either is doing. The machine cannot in principle add. We can be sure of that. And we can, and do add, and conjoin and reason syllogistically. We can be sure of that, too.

Someone rejoins, "So you say. But we might be just simulating." The rejoinder defeats itself. By its presumption, it grants the force of the argument as a whole, that there are pure functions and that if certain

thought processes were physical processes or functions among them, they would not be formally determinate. It merely asserts as a counterpossibility that I may think I am adding, etc., when I am only simulating a pure function. But to think I am adding or conjoining, with a clear idea of what that is, is to perform a pure function in that very thought, whether it is true or not.

Besides, such counterpossibilities require an ontological status for the pure functions simulated. We think of them and even define them. If that is so, then the thoughts and definitions cannot be indeterminate among incompatible functions because no definite function would then be defined by such thinking. So those function-determining thoughts cannot themselves be just simulations but have to realize pure functions, e.g., "defining addition," "conceiving modus ponens." Hence in order to be mistaken in a certain way, I have to think in exactly the way that cannot be entirely physically realized.

To say we may not know whether we are adding, when we are, or squaring, when we are, is actually to grant that we might perform the determinate thought-function that cannot be wholly physical, and thus, to grant the whole argument. Similarly, to say, "We do not know whether we ever perform a formally determinate function" is to say either (a) we are in a cognitive state, "uncertainty as to whether we are really adding, squaring or conjoining," although we do not experience uncertainty, when we produce sums, squares and simple arguments; or (b) we are always mistaken when we are certain we are adding, conjoining, etc., because at most we simulate.

Now the first option also concedes the main argument because it postulates uncertainty when we actually do add, etc. The second postulates mistakes about what we are doing, and thus concedes the main argument, too: that there are such definite functions for which the only locus must be in thought. Any other answer will leave the pure function without any logical space (locus). When we are certain we are adding, we are always wrong. But that reasoning will hold for whatever we do. Thus, we are always wrong about what we think we are doing, when we think we are doing something definite enough to be a pure function. To suppose we can think definitely enough about functions to be wrong about what we are doing, concedes the supposition of the argument again. Now the doubt has spread to include every pure function: asserting, questioning, objecting, stating, reporting, as well as adding and squaring and conjoining. The doubt has even spread to include the very repeating of what I take, mistakenly, to be my argument and to make it indefinite whether you are actually denying or disputing my conclusion. Moreover, the cost extends to particular pure functions, specified by content: "adding three and three," "judging that Greeks are courageous," "doubting whether philosophy is scientific," "reading a paper," "thinking this writer is mad." Such an epidemic of doubt, without any effect on one's own certainty, must involve a mistake.

If we are always only simulating when we think we are doing something formally definite, then it is never determinate what we are doing at all. That requires that we are never doing such definite things at all. That is expensive, because there is no place for logic or mathematics or any other formal thinking at all; we cannot even "castle" in chess, but only "simulate" it, without any explanation for what "it" is or what its status, ontologically, is. Saint Augustine similarly objected to a "verisimilitude" account of truth in *Contra Academicos*. The relation of simulation will not be definable without the prior notion of pure functions.

If we can agree that (1) either we do have such definite thought processes as I described, cases of conjunction, determinate among all incompatible functions, and that they cannot wholly be physical processes (or functions among physical processes only), or (2) we never perform such processes but at most simulate them, I am content. For I will then wait for the counter-attack to support (2), the one that explains the status of all those functions I cannot really perform and only think I can define (for to define one is to perform another one), and, in particular, explains the success of mathematics and pure logic, especially natural deduction systems and the proofs of completeness of propositional calculus, and offers a worked-out contrast between adding (which no one, apparently, can do) and simulating adding.

## 5. Functional states.

Kripke [1982, pp. 36-37, note 24] seemed to realize that functionalism would fail because "any concrete physical object can be viewed as an imperfect realization of many machine programs." But it looks to me as if he was about to draw the wrong conclusion, when he said "taking a human organism as a concrete object, what is to tell us WHICH program he should be regarded as instantiating? In particular, does he compute 'plus' or 'quus'?" He should have concluded that if a human is only a "concrete physical object," then nothing determines, at a certain level of refinement, which program it instantiates because it instantiates none. Whereas, humans do add, define, and so forth, and are thus, not just concrete physical objects.

If a "thought process," say, adding, were a function linking actual physical states to "subsequent" physical states, then whatever the pattern of inputs to outputs, there are impossible functions that link the states equally well. In that case, we could not really add. Nor could we deny that we add, precisely. Since we can add, we know our thought process is not the same as any function among brain states because no such function is determined (the way two points determine a line) by physical states.

The very step toward generality, to escape the inconveniences of identifying an abstract process with a particular physical process, say mechanical addition (with the inconvenience that there could be no electronic addition), creates the situation where impossible general functions equally well "explain" the succession of physico-cognitive states, and thus, discloses that no one function is realized to the exclusion of all the others at the physical level, and, thus, no pure function is realized at all. That guarantees that functions among physical states (in a process) are not the thought states because there are no determinate functions realized among physical states, when the form of thought is determinate. No real process of adding is identical with any process that equally well realizes an impossible function. Consequently, "adding" is not a physical process or function among physical states, either. Besides, the functions in such functions are not physical either. For, of course, it is numbers we add, not numerals.

Similarly, despite the 1996 and 1997 "duels" between Kasparov and Big Blue, strictly only Kasparov was playing chess; Big Blue is just a chess simulator, for the same reasons that a computer is just an addition simulator, explained above. The fact that eventually such a machine may reach winning outcomes faster and more reliably than any human will never show that it ever plays chess, just as the fact that a computer can reach calculation outcomes faster and more reliably than any human cannot show that it ever adds or multiplies or does any pure function at all -- for the reasons given above.

## 6. All thought is abstract.

The main argument is that some thought is determinate, among impossible functions, the way no physical process, series of processes or physically determined function among processes, can be. The result is that such thought is never identical with any physical process or function, though it may, for all we have said, have a material medium, like speech.

The full generalization that all thought is determinate that way, is harder to make cogent, because it rests on one's recognizing that whatever thinking we do, whether simple assertion, or hoping or wanting or intending (over the whole family of things each of those can be, according to its particular content on a particular occasion) is such that, in order to do that, we have to do what is the same for an infinity of other cases (sorted by content) that do not happen. For someone else might have thought, or said, or believed, or

felt the same, in a way definite among impossibles. So, any thinking at all is of general "form," just as is adding, conjoining, reasoning validly and squaring.

By its nature, thinking has "other cases" and is, therefore, always of a definite form (which may not be articulable by us, as are mathematical and logical forms). Asserting (in any one of its senses) cannot be "halfway" between opposed forms; it would not be asserting, then. And so on, for every form of thinking. But no physical process, or sequence of processes, or function among processes, can be definite enough to realize ("pick out") just one, uniquely, among impossible forms. Thus no such process can be such thinking.

The conclusion is that no physical process, or sequence of processes or function among physical processes can be adding, squaring, asserting, or any other thinking at all.

### III: The Parallel Argument as to Content

Judgments and reasonings have content as well as form. Modus ponens can apply to "If you drive me to my office, I will arrive in ten minutes," etc., as well as to any other content of the same form. Now the question arises whether the content can be the same as any physical process or function among physical states.

Take any physical process, any machine state or output and a whole family of like states, and suppose it is to be unified by our attributing a particular content to it, one that maps every point, phase or output of it, contrastively to whatever content does the same for every other machine state or output, with none left over or doubly unified. Still, there is another content incompatible with the first that will (a) preserve all the content assignments of the other states and will (b) equally well fit the physical state at hand. Worse, there are incompatible contents, compatible with a wholesale reassignment of content to all the actual states, that equally well fit all the physical states. That can be displayed by Putnam's Lowenheim-Skolem type reasoning, or, more convincingly to me, by the simple relationships of score to sounds in music: any number of diverse soundings for a simple score and no unique score for any sounding.

If a trained listener transcribes a fairly complex orchestral work from hearing it, alternative scores, equally good within the conventions, can be constructed; that is, the conflicting scores would serve equally well for the production of the same work (again within the conventions), such differences as may be noticed, being attributable to differences of interpretation. It may well be, and very probably is that the sounds are indeterminate between the alternative scorings, though it is to be emphasized that even assuming notation can be refined as we need to, more precision about the sounds will only produce more indeterminacy about the scoring (to be transcribed). If we take a particular score to be analogous to the content of a judgment, we can see that the "content" of the physical process, the sounding, is indeterminate among competing "contents," scores. That is the relationship of a physical process, no matter how complex it is, to the content of a judgment. Basically, the differences among physical states cannot be refined enough to map, much less constitute, the differences, in principle, among thought states. It follows that it is impossible that by carrying out some physical process or arriving at some physical state, whether mechanical or electronic, a device can be judging, "there is smoke in the room," as distinct from that "something is moving about here," although there is no difficulty in making a pair of devices, one of which sounds when enough smoke is present and the other of which sounds when there is enough motion present.

#### 1. As to definiteness.

To put the matter the other way, judgments are typically so definite that no physical state or process can constitute that judgment alone. Thus,  $2+7=9$  is so definite in content that it cannot be realized by any physical state or process, for the same reasons as given in the main argument of Part I. For instance, indistinguishable word-processor states (by type, especially at the binary electronic level) can be used to type "This is not a holiday" by an American who refers to a specific list of legal holidays and by a Spaniard who refers to a different list: thus the judgments expressed are different but the machine states are the same. That is only an analogy; but still, the differences in brain states cannot map the differences in judgments, which are potentially infinite, and, in a way to be discussed below, are qualitatively actually infinite.

## 2. A brief aside.

There is another feature, indefiniteness, that also defeats physical mapping or constitution: "The French revolution was not as profound a social change as the industrial revolution." Such a thought, without a context in which a standard of comparison is implicit, is so inchoate, and so indefinite among competing, even incompatible interpretations that it could not determine one brain state rather than another similar to it. Now one might think that content would be perfect for a physical realization. But the indefiniteness involved in the thought is far more than can coherently be mapped onto a physical state, which in its contrast with other physical states, is inchoate to match the contrast of thoughts. This judgment is too blurry to determine which physical realization is "closest" or even "close enough" to realize it. Of course, there is another problem; the statement quoted may be a pseudo-judgment in either of two ways: first, it may be so vague and loose as to have no truth or falsity at all, a sort of wandering assertion that is no definite judgment (as is common in undisciplined thinking), or it may function as a "truth by mere assertion," that is, a kind of loose postulate to begin some train of thinking. Thus some judgments, or apparent judgments, are so indeterminate in content by themselves that no physical process or function among them can be the same because no physical process can be that indeterminate.

## IV. The Other Arguments

### 1. As to causation.

All of the above arguments apply first to any claim of identity between physical states or functions among them, and judgment content, and secondly to any proposed causation of judgments, both as to form and content, by physical states or processes (or functions among them) because whatever is caused is as indefinite as the cause is. A wavering hand with chalk draws a wavering chalkline. So if the physical state is indeterminate among incompatible judgments, then whatever the physical state causes will have the same, or more, indeterminacy of content and form: that is just an application of "nothing comes from nothing." As a result no physical state or process can be the same or be the (complete) cause of any definite thought content, like " $2 + 2=4$ ," of "if p then q, p, therefore, q," or of any particular instance of the latter form.

The reverse does not hold: determinacy can be lost from cause to effect. Thus whatever physical states thought causes can and do lack the determinacy of the thought states and will be compatible both as to form and content with mutually incompatible thought states. Thus, if in order to think I am going to be late for a certain appointment, my medium-with-which, namely cerebral-cortex/neuro-physical states, have to be caused, the states caused will be such that qualitatively indifferent states can be caused by another thought. The situation is like the reverse of musical transcription: this is a case of musical production: no matter

what the pattern and particularity of the sounds I produce interpreting a score, the sounds produced are compatible with competing and mutually inconsistent scores (as might be transcribed from them); moreover, the score, whatever it is, is compatible with distinct and incompatible series of compliant sounds. Thus, even if there is causation of physical states from thought, as there undoubtedly is (and more normally, even real sameness), the physical effects, or realizations, are indeterminate in ways their causes or constituent thoughts are not.

Whereas, if there is causation of thought from physical states, the causation cannot be productive and sufficient, because the thought states are definite in ways the physical states cannot be. Therefore, we can conclude that not only do the physical states not constitute the thought states, they do not even wholly cause them: there must be an additional immaterial activity going on that wholly or partly constitutes or causes the thought content. And that, in turn, requires that there be an immaterial manner of being to originate such activity, with consequences explored in Part IV, below.

Further aspects of causation concern the absence of any way of typing or classifying thoughts and brain/neural states so as to make anything more than a rough translation manual from one to the other. What we need is a two-way telephone book, item by item. But all we can get is incomplete and torn maps. Some physical defects and disorders and drugs produce certain kinds of thought states, even sometimes specific as to content; others, produce generic sorts: depression, excitement, elevation, paranoia, fear, and the like, where the content is person/specific. Damage to the brain can cause loss of memory, speech, bodily movement, which we can locate cerebrally. But even if we include everything we know from medicine to neurology to chemistry, we have no more than a tattered and gross map of which thought and sensory states are lost with which injuries or drugs, and even less, as to which sorts of thoughts and sensations are caused by drugs and other stimuli.

Looking at the matter in the opposite direction, we notice quite usually we can "cause" physical states from thoughts: especially in normal living, sports, musical activity, etc., where thought is as easily transmitted into action as when I reach for a glass of juice. I put "cause" in quotation marks because the relationship is far more intimate than that: quite typically such actions are not only modes of perception, they are modes of judgment and volition; when you walk up a hill, each step involves volition and judgment as well as perception and proprioception, but where circumstances are familiar, no attention to the actions is required. In fact the action and thought are so close in experience that we regard them as the same, so that walking is a kind of thinking that can go on in parallel with other kinds, like remembering, imagining, reasoning, arguing, or daydreaming. Even sitting up to typewrite is a kind of thinking; that becomes obvious once the ability is lost or damaged and one has to concentrate deliberately on what was automatic otherwise. We also know that judgments combined with sensation can produce feelings, e.g., acute anxiety, which are bodily as well as thought states and also can cause further bodily states (from shaking and blood pressure changes to ulcers).

Although it is convenient for some purposes to talk of causation of thought/perception by bodily events, for instance, the pain from banging one's hand, especially when we can interfere with the process by anaesthesia or severing nerves, and can similarly inhibit the production of activity by perception/judgment/volition, it is better to think that the cause/effect ordering is not the normal and natural relationship of bodily states to judgment/perception/volition, but the ordering that remains when the content/medium relationship is disturbed. That is, the content of the judgment/volition (as distinct from a per-actionary intention) IS the bodily event, and the bodily event (including the pain from banging one's hand) IS the perceptual/judgment content. (Now I know there are all sorts of exceptions: a pain that appears in one place in the back where the stimulus is at another, but, again, the derivative should not be taken as the normal and normative.) It is when the natural sameness of perceptual and volitional conditions is disturbed that they become related by causation. In a word, natural sameness can degenerate into causation. If I waive goodbye to you, what I do and what I judge and will are the same (*ceteris paribus*). But if I am

impaired, what I will and what I do may diverge, as also when one is lying. Then when I succeed in waiving my hand we rightly consider the gesture as the effect of the thought/will.

The upshot of all this is that whether we are talking of sameness of bodily state and thought, with the bodily state originating the thought (one's finger banged in a doorjamb), or with the bodily state expressing the thought (waiving to a friend), and whether we include the entire cerebral-neural-chemical, etc., states in both cases, the bodily state, as physical is too indeterminate to determine or even translate into the content of the thought. The thing philosophers cannot seem to keep straight is that although the action may be really the same as the thought, the thought can be more definite than the action. Another thing philosophers do not keep straight is that although cause and effect have to be logically distinct, it is simply not true in general that the one can occur without the other: and if they do not like the account of necessity and impossibility in Chapters 1 and 2, they will have to produce a new one because the "suitably similar possible worlds" analyses explain nothing and simply repeat the notion that what is naturally necessary is "what happens in any world like this." A lot of help that is. To retreat to the idea that what is conceptually distinct can occur separately is simply to repeat a foundational mistake already disclosed in the first chapters.

No matter how much normal sameness and subsidiary causation we find, both ways, between bodily states and the contents of judgments and volitions, the bodily states are always insufficient to determine the content of judgment, for the same sorts of reasons that they are insufficient to determine the form. A simple way to make that clear is this: with any bodily state multiple bodily states are in input alignment, and any one of those may be what is seen, heard, felt, approved, hated, misjudged or recognized or entirely missed, depending upon the attention, orientation and experience of the thinker. Input alignment would have to be impossible for the physical state to determine the content of the perceptual judgment. But we know that talking on a telephone, I can hear the phone, the quality of your voice, you, or what you are saying, or even what you are leaving out: all from the same bodily/cerebral state: my bodily state cannot constitute the content of judgment.

The shape of a chair, its outermost surface outline as we normally see it, is the same reality as the chair, though an accident of it and not all of it. Similarly, a judgment and volition may be far more determinate than any bodily state that is its medium, while the bodily state, with its own transcendental determinacy [see Chapter 1] is also more definite (e.g., unrepeatable) than any (repeatable) judgment can be. They have contrasting determinacies and so cannot be the same in the sense that the features of the one are explained by the features of the other. This is not a simple repetition of Descartes' argument from the contrasting properties of body (divisibility) and soul (indivisibility) to their real distinction and possible separate existence. For one thing, I am not arguing that judgments possibly exist without their bodily medium, or vice versa. I am simply arguing that each has features (determinate, repeatable, content of judgment, v. transcendental, unrepeatable determinacy of the bodily state) and thus, that the bodily state cannot constitute or cause the judgment-content because the effect cannot be more determinate, in the relevant respects, than its cause or constituents.

## 2. As to multiplicity.

Another line of reasoning, as to multiplicity that cannot be physically realized, applies both to form and to content of judgment. Basically the idea is that there are more judgments distinct as to form, as well as more judgments distinct as to content, than there can be brain/states in an individual, no matter how long it lives, though humans live only a century or less and are capable, say, of no more than  $2 \times 10^{24}$  such brain states. Yet the simple truths of arithmetic exceed that number. So, unless the same brain state is used for multiple thoughts (and thus is neither the same as, nor the sole cause of any), there will be an infinity of simple arithmetic truths which we cannot even understand, much less judge to be true. Why then has no

one ever encountered one? Is it possible that a dedicated accountant, doing sums all day, could use up all the suitable brain states and thus understand no new arithmetic claims, simply go blank some day and retire disabled? And similarly, a talkative human might talk so fast, so continuously and so variously, that at a certain point, he goes dumb, unable to formulate any more English sentences because he used up the store of brain states? Remember, this need never actually happen still to be the inevitable outcome of saying that cortical states constitute or determine the form and content of judgments, because it will be obvious that there are not enough states to "go around" for the abilities we claim, e.g., to be able to produce an infinity of new sentences, or to be able, with a piano, to produce an infinity of new note-sequences.

As mentioned in note 12, above, we are able to be in an infinity of states of understanding qualitatively: that is, ignoring accidents of presentation, etc. for now, we are in principle capable of understanding anything at all, as far as it has being (reality). There is no arithmetic theorem we cannot understand nor anything else, as far as it has reality. Even if, like Big Blue (1996 IBM) you can do 50 billion operations in 3 minutes, you can use up all the states the computer is capable of in a finite time, with the consequence that there are an infinite number of arithmetic operations, some quite simple, that at some point you cannot even understand, much less perform. It is as if, listening to music long enough, you could use up all the states of which a cortical area is capable, and could hear no more music, but only sounds. That sounds far fetched.

What about the NP-problem?

NP Completeness, though interesting and suggestive, does not settle anything about the understanding because, no matter how the understanding is related to sensory states or to their underlying cortical states, we know there are many problems for understanding that cannot be performed computationally [Penrose, 1989]. Still it is suggestive that experienced humans can, with little difficulty, arrive at solutions to questions like "which is the most cost-effective path for a salesman to follow among eight destinations" and for highway trucking experts to do the same for as many as a hundred destinations despite the fact that as the number of destinations rises to a hundred, computational times and memory resources "would exceed the known future life of the universe" [Hopcroft and Ullman, 1974, pp. 98-103]. The reason this is only suggestive is that we know the process humans follow is not computational. But we need also to notice is that in doing rigorous thinking that cannot be done computationally, humans are also doing something that cannot be done physically at all because it is too precise.

Furthermore, modern cryptography, closely connected with NP-completeness, especially by the public key/personal key notions, undercuts any idea that there are no features of the message that cannot be explained by features of the signal (the matter). Now we know, with a vengeance, that that is not so -- as it was obvious to Descartes looking at the ink marks he used to write. But, in the latter case, the additional organization or meaning was supposed to come from an intelligent extrinsic cause, the mind. That hypothesis distracted attention from the obvious fact that a physical signal can contain a message that cannot be explained by the principles that explain the assembly of the signal. In a word, there can be an intrinsic organization (the message) which explains the assembly and transmittal of the physical signal, that cannot itself be explained the other way around. That holds not only between bodily states and animal perception/action and human thought and human neuro-motor states, but probably between the behavior of force-fields and material particles and the behavior of galaxies and larger units.

We tend to think explanation goes upward from basic units operating under universal physical laws, as well as inner mechanisms, to the variety of higher-level units, like clock-work explaining clock behavior, without noticing that it is impossible to use such explanation to explain time-marking. That explanation has to come from outside the system; in this case, from judgment. So it should be no surprise that judgments cannot be explained as to content by the physical states we use to make them, any more than the meanings

of what we write can be explained by the physical shapes we use to write with. These observations will be further unified with the discussion of "software everywhere" in Chapter 7.

"The understanding is in a way all things," Aristotle said. And that, of course, is what no physical thing, process or function among physical processes, can ever be. Even granting that there may be realms of being of which we can form no adequate conceptions by ourselves because all our conceptions come by abstraction on the platform of animal awareness of material things, the fit between conception, judgment and reality is so extensive that because the actual states of reality vastly outnumber the potential cerebral states, the understanding can be using cerebral states only as material-with-which, like graphite marks for writing, and not as states-by-which it understands.

This is no more than a quantitative phrasing of what can otherwise be argued qualitatively. Physical processes and their products are transcendently determinate by overflow conditions. But no understanding has an infinity of content not contained therein logically. So no physical product can ever be the content of the understanding.

### 3. As to time.

The time for physical processes and the time for judgments are incommensurable. A physical process takes time, lasts for a time and is temporally located (even if vaguely). Functions are maintained and then cease. Judgments, however, can occur instantaneously (though expression takes time), can last beyond occurrent brain states, and last after all distinguishable brain states have altered. Comprehension has no connection to time, as do sentences, because it has to happen all at once, whenever it happens, but sentences cannot happen all at once [Peter Geach, 1957]. For now we can conclude that although thoughts succeed one another and are temporally ordered, the ordering is not the same for thoughts and bodily states, because thoughts can occur instantaneously and persist permanently and, unlike bodily states and processes, do not have temporal segments, nor is there a smallest interval in which a thought may occur. Moreover, thoughts may be shared by many people, even when they have opposed assertoric attitudes, and when there is no reason to suppose the concomitant cerebral-bodily states are any more than similar: but if the bodily states are only similar and the thought-content (e.g., the propositional content) is the same, then the bodily state cannot constitute or sufficiently cause the content of the thought.

## V: The Immaterial Principle, the Substantial Unity of the Person and

the Indispensability of Animality to Human Personality.

The overall thesis should be clear enough from the section title. To account for the substantial unity of the human being there has to be an "explanatory principle," like a form or software, that makes it into a single thing existing on its own. But that principle has to be the origin of all the essential activities of the person, of which understanding and rational volition are the most obvious and distinguishing. Yet for each kind of operation, like understanding and willing, the ability has to have a basis in reality that is fitting for such operations. Now those operations cannot be performed by any physical process or function among such processes for the reasons given at length above. They must be performed from a principle with an immaterial mode of being. Hence we can say that the principle of understanding and willing in a human is subsistent and immaterial.

How then do we account for the unity of the whole human that is essentially an animal and, thus embodied? There may be more than one way to do this. I will sketch one. Animal powers are contained eminently in the immaterial organizing principle that is the direct source of human understanding and willing. Thus there is a single explanatory principle of the being of the human, though the human is essentially both immaterial in its operations and powers and material. Nor can a human exist in a non-animal condition, because a human is essentially an animal. But, in principle, although the destruction of bodily organs can make the psyche unable to exercise its animal powers, it cannot deprive the psyche of such powers, which become non-active for lack of suitable materialization; but that only reduces animality, and thus individual personality, to potentiality, not to non-existence because the active principle with such abilities still exists. Destruction of the entire body cannot destroy the psyche, the principle of the intellectual powers, because the being required for those powers is immaterial and cannot be physically destroyed. Thus, in principle, a human could continue to exist, but incapable of any bodily activity, and therefore, of any intellectual activity based upon the body (just as Aristotle described the soul in *De Anima*) unless it is bodily reconstituted.

Now, for the main purposes of this book, no one needs to take a position on these issues. I simply draw out some consequences of my main arguments that lead to the outcome that the explanatory principle of human being has to be one, that it cannot be merely physical because essential human operations are not physical, in fact, it has to be immaterial in its activities, but capable of all the animal activities of a rational animal, and must, therefore, have an appropriate mode of being, not dependent on the physical, but, rather, explaining the unity and being of the destructible individual personality (which depends upon the animality and particular bodily features). Further details on these reflections are not germane to the overall project of showing that the hidden necessities of things require an abstractive, judgmental ability for us to know what things are, and require real structures in things both to explain their roles in nature and their intelligibility. So, now I turn to the explanatory structures of things.