Noesis 47

The observer creates the computative observer-aspect of reality; reality computes the reality-aspect of the observer. You observe $\Gamma$ and he observes you. The two sides of observation are dependent, and the logico-mathematical formulation of codependency is symmetry. The relationship of an observer to objective reality, as perceived by a second observer witnessing their interaction, is thus a symmetrical relationship. The observer can create reality, and the sum of all other observers, only insofar as they create him. His limitations stratify $\Gamma$ and projects its stratification as that of his mind and experience. This ontological feedback is the stuff of consciousness. Consciousness is relativized to the $\Gamma$-sub-automata possessing it, and is quantified according to their parameters. It is a function of unified multiplicity...the unified multiplicity is different from the self-differentiated teleology that is $\Gamma$.

So these are the principles needed to resolve the issue of collapse: syntax-projectivity; the computative tenor of reality; observational symmetry; and the global consistency constraint on sub-symmetric terms. These, in light of the structure of $\Gamma$ as thus far described, suffice to lay the matter to rest. If there is a doubt of these, you need merely try - in your own mind - to refute one of these principles. Given enough time, and the insight of which you are capable, you will recognize the logical necessity (and even the self-evidence) of all of them.

Note that we have been discussing collapse from a physical perspective. Our resolution is thus $\Gamma$-relativized; it applies to the physical collapse of physical quanta. But where collapse is more generally defined on the measurement or determination of arbitrarily-relativized random variables, it can obviously occur in different $\Gamma$-timetypes (i.e., on different $\Gamma$-control-levels). Ultimately, we can speak of the teleological phase of collapse, tentatively identifiable with the hypersonic identity. This is the highest possible "quantum holor", whose relation to its merates is the concern of religion...a concern we are not allowed to neglect. As Kant, Newton, and Einstein knew, it is naturally the ultimate goal of any serious exploration of the nature of reality.

The theory of quantum wave-function collapse marks the crossroads of physics, philosophy, and the foundations of mathematics. If there was ever any doubt that these fields are inseparable, this is where it ends. Such doubts are the delusions of moles who tunnel until they have lost the capacity to sense anything but the minutiae just ahead of their snouts. It is therefore a point of some importance that the members of this society have demonstrated more than their quantum intelligence. A clear verification of this was offered by C. Cole, who - after circling around many of the issues essential to this discussion - expressed his feeling that the problems of nonlocality and collapse are deeply connected. We now know him to be unambiguously correct: both have computation-theoretic solutions within the CTMU formalism.

As, in principle, does everything else.

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The bibliography for the above paper is rather extensive and will therefore be omitted at this printing due to lack of space. It is in no way to be assumed that this reflects an unscientific absence of formality. Such determinations are typically made by those who face different practical constraints than the ones associated with this publication, and therefore do not apply here - Ed.)
encountered in the socioeconomic disciplines, which are almost concerned with larger-scale effects which do obey laws which have the applied sciences. That is, most science and technology is exist without benefit of reason. Cybernetics, the machine science, or use are those which improve upon coin tossing, the existence of physics, in which science appears to have reached certain ultimate difficulty of predicting the outputs of many variably-parametered systems. However, the narrow usage is still current, due mainly to the fact that quantum theory has never been deemed essential to most of the applied sciences. That is, most science and technology is concerned with larger-scale effects which do obey laws which have been deterministically formulated.

Many theories purporting to be "scientific" - including those encountered in economic and social disciplines, which are almost absurdly fallible in their determinations - are explicitly statistical. This is usually written off to the number and complexity of parameters for which such theories must account, as well as to the notorious difficulty of predicting the outputs of many variably-programmed human "transducers". It has seldom been claimed that improvement is impossible, & even ways to acquire and handle larger amounts of data. This situation differs sharply from that of physics, in which science appears to have reached certain ultimate sensorial limitations. Here, the wealth of measurement has been shown to interfere unavoidably with measured quantities: when physics is measured, it is measured as a physical phenomenon, and one must interact with it and disrupt its state. This, of course, bodes ill for the formation and validation of theories linking the states of quanta with the events in which they participate.

Yet, it has always been expected of physical theories that they should not only allow a prediction of phenomena, but account for the mechanisms which so uniformly determine what should be observed. Cybernetics, the machine science, has been consistently formulated such that mechanism and causality can be identified with constraint, which obtains whenever variety is restricted, in an immediate and no less than chance predictions. Since the only theories of any interest or use are those which function upon coin tossing, the existence of such a theory implies mechanism and so causality. This syllogism is a property of the logic in terms of which we comprehend the world; without it, neither statistical nor inductive probability can be justified. The confusion arises when we attempt to place symmetrically with their additive inverses. If this seems hard to fathom, just couple 1/2 and -1/2 by addition, and see what you get. This is how the world works, to whatever extent we can reasonably hope to know it.

We project our inner reality outwardly. Our inner reality is computational, and so too is outward reality for the purposes of human observation and understanding. The attempt to separate these purposes from a higher "objective reality" has fueled the quantum mechanics debate, and it is insufficient to say that science and human purposes impose conditions on reality, what is reality "really" like in the absence of human beings and their designs? Unfortunately, somebody has to be asking this question, and he is probably human. He therefore requires an answer formulated within his acceptance of the quantum syntax. The state syntax he proposes to factor out of the picture. This, of course, is a paradox, and it necessitates a conceptual extension of the formulation. But to be humanly comprehensible, this extension must also be formulated in our native syntax! This regresses intractably, and so the above question is otiose...for our purposes. The closest we can get to a meaningful answer is the CTMU stratification of inference, and the CTMU is thus our highest possible conception of "objective reality". Try sliding out of that, and your circular slide will deliver you hard and unerringly back to your starting point... or, if you prefer, into a puddle of tar in which your intellectual movements, like the struggling of an insect in prefossilized amber, will mire you even more hopelessly.

The universe is computation-theoretic. Notice that we are no longer calling it a "computer": this would draw irrelevant associations out of the reader's own background, and very possibly prejudice his or her understanding. Computation theory is so general, and the concepts so broad, that a given computer may have particular architecture or style of computation, except by consistency with our own computational architectures. But it remains true that extended reality, and every part of it, both computes and is computed by other parts. These computational interactions are limited only by the dynamical or cognitive syntaxes - "programs" of the appropriate subsets of extended reality, and cannot for the most part be "absolutized" except in tacit regard to them.

Time is computation. Space is computative potential. Matter computes, and parametrizes the deterministic or nondeterministic computations of other matter. Relative to position, this is true that extended reality, and every part of it, both computes and is computed by other parts. These computational interactions are limited only by the dynamical or cognitive syntaxes - "programs" of the appropriate subsets of extended reality, and cannot for the most part be "absolutized" except in tacit regard to them.

Observers who intend to exploit dynamical processes "in absentia" require that the "in absentia" Schrödinger's cat be real, and that the attribution argumental to the intrinsic (metabolic) and extrinsic G-dynamical processes involving it are computed by it. When the tree falls out of earshot, it thunders nonetheless.

The true nature of Schrödinger's paradox has now become clear.
or aspire to be a scientist, this is your “relativized” resolution of Schrödinger’s paradox. And because you are the human object of an anthropic relativization, the resolution becomes conjectural.

Suppose, then, that you are so obstinate a solipsist... of reasoning happens to be quite a bit more comfortable than other realities you might have created for yourself. Your further satisfaction compels you to produce a reason for this, thereby to improve the quality of your daydreamt “lifestyle.”

First, you notice that your dream is far too deep and complex to bring entirely under your conscious control, much of it has to be of “subconscious” origin. For one thing, the scientists and technicians who invent and operate all those pleasurable and time-saving gadgets for which you cannot produce blueprints must be tapping into your subconscious mind for their designs. It follows that the design principles, and the designers’ access to them, are the means by which your subconscious has fashioned the means of your gratification. The value to you of this process is clear. It thus behooves you to allow quantum collapse to be scheduled in the way that best enhances its efficiency. But this is the same way that it should be scheduled to maximize the power of objective science—its objective function is with respect to the degree of objectivity of science or to your “degree of solipsism”; the solipsist is compelled to identify the reality of χ with that of his own subconscious mind. So the Copenhagen interpretation is realistically pruned, and Newton defies banishment from the dream.

Of course, there are other versions of quantum reality” than Bohr’s “coordinate” interpretation, which may be regarded as nonlocal parallel distributed computative involution of χ, by way of empyrean temporal operators (call it “organic” if you like, but organisms necessarily compute and must therefore answer to χ). There is Everett’s “many-worlds” interpretation, an unconstrained computative exhaustion of all possible evolutions (and subject to pruning by means of multilevel χ-operators). There is the vague “quantum logical” perspective, which relies on χ-universality for the relativized reification of arbitrary logics... and is thus realized as the logical structure of χ itself. There is “neo-realism” which cannot survive Bell nonlocality without the χ-stratification of reality. And then there is Heisenberg’s conception of quasi-real “potentiae” whose existence is supportable only in terms of the “pro-output phase” of χ-functionality. All are analytic within the CTMU unification of physics and higher logic, and there only. Our results are thus impervious to objections from them.

The quantum-mechanical oxymoron has frequently been portrayed as the Achilles’ heel of Newtonian mechanistic reality. How, it is asked, can reality resemble a deterministic machine, when the laws by which it operates are nondeterministic? Mechanism is challenged by mystical concepts, like “quantum holicity”, which would—despite certain real conceptual assets—have been laughed off the “hard-wired” logic of our inner mechanisms. The precybernetic version of this truth originated publicly with Kant, and was not difficult to reformulate in light of modern insight concerning the structures of computational devices like human brains. The sheer mathematical necessity of this reformulation is so evident, and so obviously crucial to “reality research”, that the delay in its discovery is a bit more comfortable than other realities you might have created for yourself. The question thus overshadows the priorities of individuals who may (or may not) have planned to capitalize on the hole it covers.

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of mechanical systems - is represented by probabilistic state-transition matrices. Parallel to these developments were certain arcane advances in metamathematics, whose bearing on real logical machines was not understood by pre-CTMU theorists.

Matrices of transition probabilities are governed by mathematics generally invariant with respect to interpretation. On one hand, such matrices can be interpreted in terms of quantum states; on the other, in terms of machine states. Where, then, is the crucial distinction? We must find out what is not. One fact is certain: the basis of quantum-formalistic probabilism is thus predetermined to failure. Quantum indeterminacy cannot be validated only as a characteristic of our particular relationship to the reality-machine. That paradox is the root of this entire subject. The question is, which juncture gets the first shot of deterministic r-subautomaton definable, where "determinism" is the CTMU...a kind of "logical general relativity" (as we have remarked before, the need to relativize indeterminacy does not directly imply that the universe is deterministic).

So the "crisis in physics" can be reformulated as a crisis in logic. The basic problem in "reality research" is usually called the quantum measurement problem; it centers on the mensural collapse of the quantum wave-function. Like Newcomb's (or any other) problem, it has an antinomical formulation: the "Shrodinger's Cat" paradox. In Shrodinger's original formulation of wave mechanics, the diffraction-oriented version of quantum mechanics - managed to encapsulate with devilish ingenuity the problem of defining the means and scheduling of quantum collapse. Unfortunately, because his formulation rended the feline incomprehensive, no one knew how to see or constrain it. Had he done so, he would no doubt have been answered by a cat-say (see the final paragraph on page 11, issue 44).

Shrodinger's formulation was clever in that it incorporated a critical range of possible junctures for quantum wave-function collapse. It involves an emitter; a quantum; in its original form, a calcite polarization-splitter; a quantum-detector rigged to a mechanical apparatus; a lower form of life (the cat); and a higher form of life (the observer). The quantum is emitted, filtered, and detected, whereupon its state determines whether or not the device kills the cat. The question is, which juncture gets the first shot - of observing the "nondeterministic" quantum "wave" into definite, deterministically invariant with respect to interpretation. Where, then, will we ignore the filter?

The question is logical, and calls for a logical answer. While most problems in physics demand exact quantitative determinations, this one is so basic - so metaphysical - that quantity is all but irrelevant. The decisive generalities may accordingly be analyzed directly and conveniently of abstract symbology. It should thus be possible to answer Schrodinger's question without sacrificing clarity or concision. As this is done out of consideration for my readers, I do not expect to be counted lax for dereliction of my scholastic duty to obfuscate.

The proper resolution of any paradox requires that we closely examine its formulation to see how the metamathematical syntax has been mapped into its semantical domain. Here, this calls for some background. Matter quanta, depending on observational context, display the characteristics of both particles and waves. The waves in limit of relativistic physics and the "classical limit" of quantum physics. The requisite transformational symmetry is called an empiron; under inductive stratification, it becomes the epyrion, a large-scale algebraic formulation of r.

The computational necessity of logical consistency has direct bearing on the status of Schrodinger's poor cat. For one, your eventual observation of its biological state, with an eye to determining whether it is dead or alive, must jibe with the "subjective", co-dependent "observations" of the apparatus, the quantum, and the cat. The differentiated existence of these realities is ensured by their fusion in the physical stratum r, of r, whose connected reality is equivalent to the consistency function necessarily governing multiple observations. This consistency implies a recurring potential for theoretic incompleteness - an "incomputability" problematic to "observer-created reality". It is hard to create by observation what cannot be computed apart therefrom, particularly when one is required to create it in perfect harmony with other observations.

Where the consistency function is localistic, it can be distributed in r. Where consistency is nonlocal - as for spin conservation - the consistency function must reside in r hyper-space and act projectively. That part which r-distributed is the guarantor that physical reality exists apart from observation; that part which is not is the guarantor that programmatic reality is similarly objective. The consistency function consists of nomological invariants in which observations are meristic; if it did not, it could not constrain observation in any dependable way. Observers are to constrain themselves autonomously in their observations of local or nonlocal physical phenomena (all inevitably contradict each other); that this does not happen in irremediable ways is the empirical evidence we need against it. The quantum-holistic interconnectedness of all observers, to whatever extent it enforces consistency among them, is computational...and meaningfully exists outside the CTMU formalism.
mechanically amplified - or electromechanically translated by the 
human inner ear - into observations: a sudden auditory
the objective, classical point of view is the "subatomic"
these are inherently and absolutely so in the 
as the impact of the tree against the 
earth. But there are other ways to view the situation. As effects
are defined on the pre- and post-sonic positions of gaseous molecules
are written in principle - and absolutely so in the
absence of a conscious attempt to measure them and read the measurement
we can, without fear of contradiction by any physical
measurement, deny the effect in the absence of observation. Forget
the observations of insects, snakes, and squirrels: these too are
dependent for their being on the sacred act of human observation,
living only for, and in, the eyes of human godlings.
This may not sound much like science, but it happens to be the
view tacitly held by those quantum physicists who concur with the
conventional "Copenhagen interpretation" of quantum mechanics due
to the Danish physicist Niels Bohr. The etiology of this view goes
something like this: the induction of causes is enabled only by
determinism. The inference of cause is thus impossible without
deterministic explanatory formalism, which is not available with
respect to quantum or other "indeterminate" phenomena. So these
causes - or, if you like, these mechanisms - have no absolute
determine existence in the absence of a deterministic formalism
by which we live. So existence in general depends on
the mind generating the constructive formalism which implies
not only to indeterminate contexts but to all contexts, and real-
ity - where it can be said to exist at all - is observer-created.
Notice that there is yet farther to go along this chain of
reasoning. Any individual human being can easily adapt it to a
slightly more useful version in which nothing is real
itself observes it! All things, including other so-called human beings,
are nothing but the products of his observations; he "creates"
them by acts of "transcendental imagination". The universe is a
one-man show, a command performance by the individual conscious-
ness for the pleasure and edification of itself. The "godling"
becomes God.
We thus go from a quantum-mechanical vitiation of induction, to
the dependency of reality on intelligent observation, to the suffi-
cency of a single intelligent observer and the superfluity of
all "others". Few would deny that this gives science a whole new
meaning. Fortunately, meaning has now become indistinguishable
from meaninglessness. Because science itself has guaranteed this
reasoning, only a science of science - i.e., a metaphysics - can
save it. Since all possible metaphysical schemata are required to
conform to CTMU principles, the CTMU itself is the core of that
metaphysics. The implications are straightforward enough.
We must assume the relativistic symmetries of G-subautomata. This is no harder to comprehend than the special-
relativistic symmetrization of velocities in G. Both of these rel-
tativizations have the same overall effect: they ensure the logical
consistency of a complex computation, that of physical reality,
in tacit accordance with principles of computational economy (ef-
ciciency, elegance). Both guarantee that the computational nature of
reality, even though Einstein's contributions were made prior to the
"age of computers". This is hardly astonishing, since good
theories typically have places even in the advanced theories which
follow them (e.g., as Newtonian physics is the "nonrelativistic
question are not ocean-style waves of many particles, but waves of
potential states of single particles. They are thus often referred
to as "possibility waves". This model is usually inferred from the
probabilistic formalisms necessary to describe quantum phenomena,
as well as from wave-like effects observed in some kinds of quantum
experiments (e.g., n-slit diffraction experiments). Of course,
the analogy holds only up to a point; there may be aspects of waves
and quantum phenomena which do not readily translate.
Macroscopic bodies like cats and Schrödinger boxes, because
they consist of vast numbers of matter quanta, are supposedly
subject to the same duality as the quanta. That is, they can be
represented by wave functions defined on the wave functions of the
quanta comprising them. Because quantum waves are superpositioned
potentials, so are the complex waveforms of macro-bodies. So the
material objects of classical physics far from being solid and
intrinsically deterministic, are ghostly apparitions in which many
contradictory attributes exist at once.
Yet, when we observe such objects, they never display this
kind of ambiguity: if they are here, they are here, and if they
are over there, then they are there. If a cat is alive, then it is
alive, and if it is dead, then it is dead. If a given input can represent many different
transformations, each to be realized by a different set of transducers. This suggests a question: given a "pre-real" stage of acceptance,
why should different observers collapse interactive quantum waves in a consistent manner? While a single
wave can be collapsed only once, why should correlated sets of
such waves not be inconsistently collapsed by the varied acceptors
that interpret them? Consistency is either built into the system
as a measure of observer dependence (and dependency), or it is
enforced by other means. But it is either the system itself, or
the wider system including it, which enforces it.
It has been shown that the classical view of reality is based
on three assumptions which are generally accepted without proof.
The first premise, that of realism, holds that the patterns we
observe among phenomena exist independently of our observations.
The second, that of locality (Einstein separability), holds that
nothing propagates faster than light. These three "axioms" char-
acterize certain "neoclassical" theories of quantized reality. The
problem with such theories is that the data conforming quantum
mechanics appear inconsistent with the given axioms, seeming to
necessitate the rejection or revision of one or more of them.
Thus, quantum data seem "anomalous" with respect to theories
incorporating the above premises as axioms, and a paradox exists.
Technically, it was resolved by the theoretical advance from clas-
sical to quantum mechanics, which accounts for the data and thus
decides the issue against neoclassicism. But the paradox persists,
largely because quantum mechanics is merely probabilistic, gives
only statistical predictions, and must therefore be classified as "incomplete" in the usual sense of a theory. Quantum mechanics is not giving us all the answers... and among those it is leaving out, some may bear on the relationship of the superseded premises in such a way as to redeem them in spirit if not in absolute truth.

The desirability of such a redemption is obvious. Just imagine having to give up one of these premises unconditionally. If you reject the first, then there is no reality: there is only observation (at which point you will be forced to consider the reality of your observation to make them, including yourself). If you reject unrestricted induction, then you keep your reality, but surrender any possibility you thought you had of understanding it. If you reject locality, you are squaring off against a pantheon of revere scientists and philosophers, including Albert Einstein and several of the fathers of quantum mechanics themselves. And many of those who now call themselves "physicists" will all but laugh you out of whatever club or journal you might have planned to use as a forum for serious consideration of your views.

The question thus arises: is there some model of reality which retains the validity of all three premises within their respective physical ranges of application? Such a model must obviously extend the classical framework within which no classical paradox has been derived. This extension must not create further unresolvable paradoxes; that is, it must be constructed with "headroom" for the resolution of whatever paradoxes might be formulated within it. And it must be able to incorporate physical theories like quantum mechanics and general relativity as subformalisms. Is there, among these criteria, anything to serve as a clue in our search for the required extension?

These criteria are all computational, and computational logic is thus the means of extension. This could not possibly be plainer or more irrefutable. In the CTMU, standard induction has indeed been the stratification of reality in such a way that locality applies on the appropriate stratum. This logic is flawless. The only thing that militates against it is the idea that reality is the output phase of an incredibly huge and complex "computer". This thesis seems designed to stretch the throat of whomever tries to swallow it, and the intellectually timid will be discouraged from even trying the attempt. Of course, the intellectually timid are typically not involved in any major conceptual advance, and their opinions may accordingly be dismissed.

To see why, let us sample the kind thinking that would tend to resist the CTMU extension of physical reality. The model is too complex; such a computer as \( \Gamma \) would be impossible to construct or even entirely described; it is not a computer at all. It will suffice to observe that these same criticisms can be leveled at the classical model. In fact, it can easily be shown that the classical model is equivalent to a parallel distributed "cellular" automaton! If one has an aversion to inhabiting a computer, it may reasonably be asked what he thinks is being done by existing at all. Such a critic must either respond with an hysterical torrent of meaningless objections, or effect a rapid accumulation of mental courage. After all, it is better to exist in a logical construct than in the "vat" of a "mad scientist" - an inductive possibility mentioned in these very pages.

Where it can be shown that all roads lead to Rome, we might as well make ourselves the walk and get on a plane. The plane to catch in this case wears on its fuselage letters which read: "The wave-function collapse can be modeled as the executive phase of an instruction decoded by the meta-automaton \( \Gamma \) as \( \Gamma \), output. This formulation is invariant with respect to the local structure of \( \Gamma \), the "programming language" formulating the superimposed potentia \( r \), and the collapse of superimposed potentia \( r \) as \( r \), output-level reality; an appropriate morphism must exist. The scheduling of this collapse, as von Neumann realized, cannot be experienced beyond the range of effect. In CTMU terms, this effect equates to the first \( \Gamma \)-effective computation after propagation (i.e., the first effect of an associated \( \Gamma \), event-causation). Very tight and tautological... but with the important qualification that the tautology is in this case a property of immediate output-level reality and their underlying causes, and therefore terminal.

Prior to EPR/Bell nonlocality, the only restriction on the classical viewpoint involved Heisenberg uncertainty. But this was usually rejected. people, after all, one could still induce from observables whatever classical, localistic "reality" one might need to explain the observations. In this case, however, it would still have been necessary to extend the observational syntax by adjunction of these variables, and this cannot be done without admitting the existence of a metaphysical syntax. The advantage of such a "localistic" version would be the retention of the \( \Gamma \)-metric, the elevation of the locality premise to the status of metaphysics. Some of those attracted to this advantage, using a variety of increasingly dubious arguments, still question the validity of experiments designed to confirm nonlocality. But reality must still be partitioned into that which we can know directly, and only by adjunction of extra mental, objective reality (we can know directly). Thus, reality is tacitly relativized to syntax.

Notice what this does to the concept of wave-function collapse. By relativizing reality, we relativize the function determining the collapse of superimposed potential into reality. So collapse is relativized to the criteria for reality. This means that where we insist on reality, we realize that classical objects consisting of many quanta, the collapse of a quantum wave must occur upon the interaction of that wave with the classical object. In terms of Mr. Cole's formulation of Schrodinger's paradox, this occurs at \( d/v \) seconds after emission of the quantum wave from its source (where \( d \) is the distance in meters, \( v \) is the speed of the particle in meters per second).

Because the source is not a system of radioactive atoms, but a single atom, it is not quite a classical object. But even if it were, can the loss of mass-energy associated with the radioactive decay of a single atom be considered a classical, "observable" event? If one were to formulate the equation, one would have in a temporary bind. Fortunately, an atom is composite enough to let its decay be rated a classical event, quantitatively different from the localistic propagation of a matter quantum through space. Even if this were not the case, however, the classical nature of the apparatus would force the classical scheduling of its state transitions. The problem that now arises has much to do with a certain elementary philosophical paradigm: if a tree falls in the forest, but no one hears the sound of its falling, then is there a sound? Now, sound is usually considered an objective, classical physical phenomenon. Molecules - in this case, of air - are caused by the mechanical vibrations of a source to form compression waves which have objective attributes like frequency, intensity, and the effects of such waves, while for the most part transient, can be
only statistical predictions, and must therefore be classified as "incomplete" in the usual sense of a theory. Quantum mechanics is not giving us all the answers...and among those it is leaving out, some may bear on the relationship of the superseded premises in such a way as to redeem them in spirit, if not in absolute sense.

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These criteria are all computational, and computational logic is thus the means of extension. This could not possibly be plainer or more irrefutable. In the CTMU, standard induction has indeed been the stratification of reality in such a way that locality applies on the appropriate stratum. The logic is flawless. The only thing that militates against it is the idea that reality is the output phase of an incredibly huge and complex "computer". This thesis seems designed to stretch the throat of many of those who now call themselves "physicists" will all but laugh you out of whatever club or journal you might have planned to use as a forum for serious consideration of your views.

To see why, let us sample the kind thinking that would tend to resist the CTMU extension of physical reality. The model is too complex; such a computer as Γ would be impossible to construct or even imagine. Even if one had a "computer" like Γ, would it be possible to use it as a "computer"? It will suffice to observe that these same criticisms can be leveled at the classical model. In fact, it can easily be shown that the classical model is equivalent to a parallel distributed "cellular" automaton! If one has an aversion to inhabiting a computer, it may reasonably be asked what he thinks is being done by existing at all. Such a critic might even respond with an hysterical torrent of meaningless objections, or effect a rapid accumulation of mental courage. After all, it is better to exist in a logical construct than in the "vat" of a "mad scientist" - an inductive possibility mentioned in these very pages.

Where it can be shown that all roads lead to Rome, we might as well move ourselves the walk and get on a plane. The plane to catch in this case wears on its fuselage letters which read: "The wave-function collapse can be modeled as the executive phase of an instruction decoded by the meta-automaton Γ as Γ, output, or physical reality". This formulation is invariant with respect to the local structure of Γ, the "programming language" formulating the metaprocess, or the event in which it translates as the output-level reality; an appropriate metaphor exists for the scheduling of this collapse, as von Neumann realized, cannot be experienced beyond the range of effect. In CTMU terms, this effect equates to the first Γ-effective computation after propagation (i.e., the first effect of an associated Γ-evolution-causation). Very thought and thought's object are kept in a distinct qualification that the tautology is in this case a property of the sentence's mental structures and their underlying causes, and therefore terminal.

Prior to EPR/Bell nonlocality, the only restriction on the classical viewpoint involved Heisenberg uncertainty. But this was vanquished by those who now call themselves "physicists" will all but laugh you out of whatever club or journal you might have planned to use as a forum for serious consideration of your views.

Notice what this does to the concept of wave-function collapse. By relativizing reality, we relativize the function determining the collapse of superimposed potential into reality. So collapse is relativized to the criteria for reality. This means that where we insist upon the reality of the classical objects consisting of many quanta, the collapse of a quantum wave must occur upon the interaction of that wave with the classical object. In terms of Mr. Cole's formulation of Schrodinger's paradox, this occurs at t/dv seconds after emission of the quantum wave from its source (where d is the distance in meters, c is the speed of light and v is the speed of the particle in meters per second).

Because the source is not a system of radioactive atoms, but a single atom, it is not quite a classical object. But even if it were, can the loss of mass-energy associated with the radioactive decay of a single atom be considered a classical, "observable" event? If not, then the formulation leaves us in a temporary bind. Fortunately, an atom is composite enough to let its decay be rated a classical event, qualitatively different from the localistic propagation of a matter quantum through space. Even if this were not the case, however, the classical nature of the apparatus would force the classical scheduling of its state transitions. The problem that now arises has much to do with a certain elementary philosophical paradigm: if a tree falls in the forest, but no one hears the sound of its falling, then is there a sound? Now, sound is usually considered an objective, classical physical phenomenon. Molecules - in this case, of air - are caused by the mechanical vibrations of a source to form compression waves which have objective attributes like frequency, and intensity. The effects of such waves, while for the most part transient, can be
mechanically amplified - or electromechanically translated by the human inner ear - into observable effects or observations. We thus go from a quantum-mechanical vitiation of induction, to the dependency of reality on intelligent observation, to the sufficiency of a single intelligent observer and the superfluity of all "others". Few would deny that this gives science a whole new meaning. Unfortunately, meaning has now become indistinguishable from meaningfulness. Because science itself has warrantied this meaning, only a science of science - i.e., a metaphysics - can save it. Since all possible metaphysical schemata are required to conform to CTMU principles, the CTMU itself is the core of that metaphysics. The implications are straightforward enough.

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of mechanical systems - is represented by probabilistic state-transition matrices. Parallel to these developments were certain arcane advances in metamathematics, whose bearing on real logical machines was not entirely understood by pre-CTMU theorists.

Matrices of transition probabilities are governed by mathematics generally invariant with respect to interpretation. On one hand, such matrices can be interpreted in terms of quantum states; on the other, in terms of machine states. Where, then, is the crucial distinction in mechanism to be found? One fact is inescapable: the apparatus is non-determinate, and therefore not found in the formalistic inter-section. Any attempt to vitiate the mechanistic view of reality on the basis of quantum-formalistic probabilism is thus preordained to failure. Quantum indeterminacy can be validated only as a characteristic of our particular relationship to the reality-machine. That part of the indeterminacy which is the cut for relativization, which in this case can apply only to the term "indeterminacy". This relativization implies others, and the overall relativization which results is the CTMU...a kind of "logical general relativity" (as we have remarked before, the need to relativize indeterminacy does not directly imply that the universe is deterministic).

So the "crisis in physics" can be reformulated as a crisis in logic. The basic problem in "reality research" is usually called the quantum measurement problem; it centers on the mensural collapse of the quantum wave-function. Like Newcomb's (or any other) problem, it has an antinomical formulation: the "Schrödinger's Cat" paradox. In the Schrödinger cat-mechanism, there is a mechanical apparatus; a lower form of life (the cat); and a higher form of life (the observer). The quantum is emitted, filtered, and observed, whereupon its state determines whether or not the device has detected, whereupon its state determines whether or not the device has observed, whereupon its state determines whether or not the device.

Schrödinger's formulation was clever in that it incorporated a critical range of possible junctures for quantum-wave-function collapse. It involves an emitter; a quantum; and an observer. Where consistency is localistic, it can be scheduled in any dependable way. But necessity of logical consistency has direct bearing on the status of Schrödinger's poor cat. To wit, your determined observation of its biological state, with an eye to determining whether it is dead or alive, must jibe with the "subjective", co-dependent "observations" of the apparatus, the quantum, and the cat. The differentiated existence of these realities is ensured by their fusion in the physical stratum $\Gamma$ of $\Gamma$, whose connected reality is equivalent to the consistency that we want necessarily governing multiplex observations. This consistency implies a recurring potential for theoretic incompleteness...an "incomputability" problematic to "observer-created reality". It is hard to create by observation what cannot be computed apart therefrom, particularly when one is required to create it in perfect harmony with other observations.

Where the consistency function is localistic, it can be distributed in $\Gamma$. Where consistency is nonlocal - as for spin conservation - the consistency function must reside in $\Gamma$ "hyper-space" and act projectively. That part which is $\Gamma$-distributed is the guarantor that physical reality exists apart from observation - that part which is not is the guarantor that programmatic reality is similarly objective. The consistency function consists of nomological invariants in which observations are meristic; if it did not, it could not constrain observation in any dependable way. Observers must constrain themselves autonomously in their observations of local or nonlocal physical phenomena; all indeterminacy is due to the determinacy of the consistency function of our mutual existence. This function, like any enforceable pact, must allow for the finest details of our existence. The quantum events defining them follows that if you and I have mutual reality, then so do quanta, and so do the classical objects composed of them. Because they are automaton, they have "accepting syntaxes". The mutual consistent translation of these syntaxes - the transformations of common data configurations from logical basis to logical basis - then becomes the essence of science.

Science computes theories and devices from experimentatively observed phenomena. For scientific purposes, the syntax of wave-function collapse should therefore be that of the most powerful deterministic $\Gamma$-subautomaton definable, where "determinism" is relativized to each observer - their consistency function (these in turn being apparently limited by Heisenberg uncertainty). This is by definition $\Gamma$, with the finest possible deterministic quantization of space, time, and matter. This takes us directly down to the atomic level, at least with respect to the solid state physics of the Schrödinger apparatus. This implies that we can schedule wave-function collapse by means of an atomic clock...with or without anyone watching it. So if you are not a solipsist, and if you are...
or aspire to be a scientist, this is your "relativized" resolution
of Schrödinger's paradoxa. And because you are the human object
of an anthropic relativization, the resolution becomes absolute.

Suppose, then, that you are so obstinate a solipsist as to yet
insist that this atomic clock can only be created by your own act
of mind. Then rational self-interest compels you to adopt a view-
point tending to maximize your own power over this self-simulated
reality. Delusionality happens to be quite
a bit more comfortable than other realities you might have created
for yourself. Your further satisfaction compels you to produce a reason
for this, thereby to improve the quality of your daydreamed
"lifestyle".

First, you notice that your dream is far too deep and complex
to bring entirely under your conscious control, much of it has to be
of "subconscious" origin. For one thing, the scientists and
technicians who invent and operate all those pleasurable and time-
saving gadgets for which you cannot produce blueprints must be
tapping into your subconscious mind for their designs. It follows
that the design principles, and the designers' access to them, are
the means by which your subconscious has fashioned the means of your
gratification. The value to you of this process is clear. It
thus behooves you to allow quantum collapse to be scheduled in the way
that best enhances its efficiency. But this is the same way
that it should be scheduled to maximize the power of objective
science: it must be scheduled with respect to the degree of objectivity of science or to your "degree of solipsism"; the solipsist is entitled to identify the reality of \( \Gamma \) with that of his own subconscious mind. So the Copenhagen interpretation is
realistically pruned, and Newton defies banishment from the dream.

Of course, there are other versions of quantum reality" than Bohr's. A celebrated one, which consists in the argument that quantum
nonlocal parallel distributed computative involution of \( \Gamma \), by way of
empyrean computational operators (call it "organic") if you like, but
organisms necessarily compute and must therefore answer to \( \Gamma \).
There is Everett's "many-worlds" interpretation, an unconstrained
computative exhaustion of all possible evolutions (and subject to
pruning by means of multilevel \( \Gamma \)-programming). There is the vague
"quantum logical" perspective, which relies on \( \Gamma \)-universality for
the relativized reification of arbitrary logics...and is thus
realized as the logical structure of \( \Gamma \) itself. There is "neo-realism",
which cannot survive Bell nonlocality without the \( \Gamma \)-stratification
of reality. And then there is Heisenberg's conception of
quasi-real "potentia" whose existence is supportable only in terms of the
"pro-output phase" of \( \Gamma \)-functionality. All are analytic
within the CTMU unification of physics and higher logic, and there
only. Our results are thus impervious to objections from them.

The proactivity of our internal logics allows us to derive
the potential for quantum nonlocality - an apparently "objective"
concept - subjectively. This sounds fatally unscientific, but
only because it is a "boundary condition" of science...a limit. By
analogy, the sequence \( \infty \n/1_1, 2/2, 3/3... \) converges on 0,
which is not the same kind of number as those in the series. Does
the "unscientific" nature of projective exhaustion
less valid with respect to the process of scientific induction
than the "unnatural" aspect of 0 makes it with regard to numerical
induction of the given series? Not likely. In fact, because 0 is
the identity of the additive group of such numbers, they can be considered its "projections"; they exist "within it", coupled
unjustifiable restrictions on mechanism...e.g., that it be "material" in the sense defined on our particular accepting syntax.

Obviously, theorists who propose to develop a new concept
of causal mechanism in favor of statistics tacitly propose to use
those statistics inductively - i.e., to make predictions. But this
forces them to define some equivalent concept in its place. Their
crimes would go unpunished by truants at the expense of their
lessons, and cannot be "violated" in the sense of constraint.

Mechanism is reified constraint. Single-argument (logical)
constraints differ generally from statistical constraints only
in the extent to which elementwise distribution is possible...by
inductive limits on the range of quantification. Constraint thus
attends any notion of computation, which we may identify with probabilistic freedom. So mechanism attends alongside it. Theories are
useful only when they substitute predictive veracity for variety.
So the existence of useful theories implies mechanism, and any
such theory necessarily models the "automata" to which it applies.
Objective mechanism is thus seen to be an outward projection of the "hard-wired" logic of our inner mechanisms. The precybernetic
version of this truth originated publicly with Kant, and was not
difficult to reformulate in light of modern insight concerning the
structures of computative devices like human brains. The sheer
mathematical necessity of this reformulation is so evident, and so
obviously crucial to "reality research", that the delay in its
discovery is a major curiosity.

This gap has been spanned by the CTMU, which may accordingly
be considered the last word in "reality research". It may inspire
sorrow to see the lid slammed on an emerging "branch of science",
particularly one which seemed to promise so much to so many in the
future. But the lid can double as a foundation, and this one bears
impressively on this importance, thus overshadowing the priorities of individuals who may (or may
not)
planned to capitalize on the hole it covers

The quantum-mechanical oxymoron has frequently been portrayed
as the Achilles' heel of Newtonian mechanistic reality. How, it is
asked, can reality resemble a deterministic machine, when the laws
by which it operates are nondeterministic? Mechanism is challenged
by mystical concepts, like "quantum holicity", which would - despi
certain real conceptual assets - have been laughed off the
stage of science at any other point in recent history. But the
challenge is not fatal. Werner Heisenberg, the inventor of matrix
mechanics, is of the opinion that it is possible to replace certain elements
of the Newtonian machine - dynamical variables in the classical
equations of motion of a particle - with probabilistic matrices, resulting in a coherent "statistical mechanics". The question thus becomes:
what grounds exist for discarding the notion of mechanism in favor of a new one as a model of physics?

The answer, not fully recognized even by the CTMU, was hidden
in the work of certain extradisciplinary contemporaries of
Heisenberg and and the other founding fathers of quantum physics.
The "extraneous" discipline in question was the newborn science of
computation theory, notable among whose inventors was the British
logician Alan Turing. Turing invented oracles and machines
attempting to compute each other'S structures and behaviors can
generally achieve no more than statistical accuracy in their mutual
determinations. Norbert Wiener and Claude Shannon, whose labors
were eventually joined in the modern theory of communication, then
evolved a formalism wherein mechanical behavior - the "dynamics"
Encountered in the socioeconomic disciplines, which are almost concerned with larger-scale effects which do obey laws which have the applied sciences. That is, most science and technology is justified. The confusion arises when we attempt to place can be identified with constraint, which obtains whenever variety exist without benefit of reason. Cybernetics, the machine science, considered to be statistically predictable at best, whereas the array of perspectives on the meaning of quantum phenomena.

The search for an overall view of reality, including man and his peculiar preoccupations, has traditionally been considered the province of philosophy. Now, apart from its fancy new name, does really recognize itself from plain old philosophy? By particular attention to the modern oxymoron known as "quantum mechanics". The term is oxymoronic in that quanta are generally considered to be statistically predictable at best, whereas the physical usage of "mechanics" derives from the deterministic Newtonian mechanics which reigned over science for the two centuries preceding this one. This usage is still current, due mainly to the fact that quantum theory has never been deemed essential to most of the applied sciences. That is, most science and technology is concerned with larger-scale effects which do obey laws which have been deterministically formulated.

Many theories purporting to be "scientific" - including those encountered in the economic disciplines, which are almost absurdly fallible in their determinations - are explicitly statistical. This is usually written off to the number and complexity of parameters for which such theories must account, as well as to the notorious difficulty of predicting the outputs of many variably programmed human "transducers". But it has seldom been claimed that improvement is impossible, & even ways to acquire and handle larger amounts of data. This situation differs sharply from that of physics, in which science appears to have reached certain ultimate mensural limitations. Here, the means of measurement have been shown to interfere unavoidably with measured quantities: when a physicist measures, the assessed object must interact with it and disrupt its state. This, of course, bodies ill for the formation and validation of theories linking the states of quanta with the events in which they participate.

Yet, it has always been expected of physical theories that they should not only allow prediction of phenomena, but account for the mechanism in so-underlying the event as to explain it. This contention that causality has been prematurely jettisoned by those who assume that logic can exist without benefit of reason. Cybernetics, the machine science, has been consistently formulated such that mechanism and causality can be identified with constraint, which obtains whenever variety is restricted, in an ever more powerful way. This suggests a more than chance predictions. Since the only theories of any interest or use are those which improve upon coin tossing, the existence of such a theory implies mechanism and so causality. This syllogism is a property of the logic in terms of which we comprehend the world; without it, neither statistical nor inductive probability can be justified. The confusion arises when we attempt to place symmetrically with their additive inverses. If this seems hard to fathom, just couple 1/2 and -1/2 by addition, and see what you get. This is how the world works, to whatever extent we can reasonably hope to know it.

We project our inner reality outwardly. Our inner reality is computational, and so too is outward reality for the purposes of human observation and understanding. The attempt to separate these purposes from a higher "objective reality" has fueled the quantum debate. But can we really, ever, if human purposes impose conditions on reality, what is reality really like in the absence of human beings and their designs? Unfortunately, somebody has to be asking this question, and he is probably human. He therefore requires an answer formulated within his own syntax - the same syntax he proposes to factor out of the picture. This, of course, is a paradox, and it necessitates a conceptual extension of the formulation. But to be humanly comprehensible, this extension must also be formulated in our native syntax! This represses intractably, and so the above question is otiose...for our purposes. The closest we can get to a meaningful answer is the CTMU stratification of inference, and the CTMU is thus our highest possible conception of "objective reality". Try sliding out of that, and your circular slide will deliver you hard and unerringly back to your starting point...or, if you prefer, into a puddle of tar in which your intellectual movements, like the spinning of an insect in prefixed amber, will mire you ever more hopelessly.

The universe is computation-theoretic. Notice that we are no longer calling it a "computer"; this would draw irrelevant associations out of the reader's own background, and very possibly prejudice his or her understanding. Computation theory is so general, and need not be channeled into any particular architecture or style of computation, except by consensus with our own computational architectures. But it remains true that extended reality, and every part of it, both computers and is computed by other parts. These computational interactions are limited only by the dynamical or cognitive syntaxes - "programs" of the appropriate subsets of extended reality, and cannot for the most part be "absolutized" except in tacit regard to them.

Time is computation. Space is computational potential. Matter computes, and parametrizes the deterministic or nondeterministic computations of other matter. Relative to position, this is a paradox, the CTMU is the realization that matter has its own sort of "awareness"; to the extent that a conscious observer self-projectively creates reality, reality is conscious. Attributes argumental to the intrinsic (metabolic) and extrinsic r.-dynamical processes involving it are computed symmetrically with their additive inverses. Schrodinger's paradox has now become clear.
The observer creates the computative observer-aspect of reality; reality computes the reality-aspect of the observer. You observe *r* and the observer observes you back. The two sides of observation are dependent, and the logiconmathematical formulation of codependency is *symmetry*. The relationship of an observer to objective reality, as perceived by a second observer witnessing their interaction, is thus a symmetrical relationship. The observer can create reality, and the sum of all other observers, only insofar as they create him. His limitations stratify *r* and projects its stratification as that of his mind and experience. This ontological feedback is the stuff of consciousness. Consciousness is relativized to the *r*-subautomata possessing it, and is quantified according to their parameters. It is a function of unified multiplicity...the unified multiplicity being self-differentially telos that it is.

So these are the principles needed to resolve the issue of collapse: syntax-projectivity; the computative tenor of reality; observational symmetry; and the global consistency constraint on sub-symmetric terms. These, in light of the structure of *r* as thus far described, suffice to lay the matter to rest. If there is any doubt of these, you need merely try - in your own mind - to refute one of these principles. Given enough time, and the insight of which you are capable, you will recognize the logical necessity (and even the self-evidence) of all of them.

Note that we have been discussing collapse from a physical perspective. Our resolution is thus *r*-relativized; it applies to the physical collapse of physical quanta. But where collapse is more generally defined on the measurement or determination of arbitrarily-relativized random variables, it can obviously occur in different *r*-timetypes (i.e., on different *r* control-levels). Ultimately, we can speak of the *telosological phase* of collapse, tentatively identifiable with the prophylactic identity. This is the highest possible "quantum holor", whose relation to its merates is the concern of religion...a concern we are not allowed to neglect. As Kant, Newton, and Einstein knew, it is naturally the ultimate goal of any serious exploration of the nature of reality.

The theory of quantum wave-function collapse marks the crossroads of physics, philosophy, and the foundations of mathematics. If there was ever any doubt that these fields are inseparable, this is where it ends. Such doubts are the delusions of moles who tunnel until they have lost the capacity to sense anything but the minutiae just ahead of their snouts. It is therefore a point of some importance that the members of this society have demonstrated more than sufficient amaranth intelligence. A clear verification of this was offered by C. Cole, who - after circling around many of the issues essential to this discussion - expressed his feeling that the problems of nonlocality and collapse are deeply connected. We now know him to be unambiguously correct: both have computation-theoretic solutions within the CTMU formalism.

As, in principle, does everything else.

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(For the bibliography for the above paper is rather extensive and will therefore be omitted at this printing due to lack of space. It is in no way to be assumed that this reflects an unscientific absence of formality. Such determinations are typically made by those who face different practical constraints than the ones associated with this publication, and therefore do not apply here - Ed.)