VARIOUS PAPERS IN SPECULATIVE PHYSICS

Pat Gunkel

FOREWORD

I believe that all scientific and mathematical subjects ought to have, in effect, three conjoint divisions: empirical, theoretical, and speculative. The speculative division of a subject would be concerned with ideas too extreme, incomplete, untestable, inchoate, obscure, improbable, fanciful, and/or the like to fit, at least momentarily, in the other two divisions of the subject.

Attempts to communicate such merely speculative ideas could stimulate the thinking of others, profit from the commentary of others, advance the structure of the subject, encourage the author, and so forth.

Accordingly, the ideas presented within this present sheaf of papers are purely speculative in nature, they are often revolutionary, they are often little developed and poorly expressed, they may or may not be related to one another in any way or degree, and they are generally highly ambitious.

The papers are therefore circulated for the curiosity of certain individuals who are peculiarly tolerant to such papers, and who are perhaps to some extent already familiar with the larger work of this author.*

A conviction of his is important and may be stated here: The world admits of an infinity of equivalent representations, or corepresentations. Therefore the present ideas should never be taken as representing the monomaniacal pursuit of ultimate, absolute, mutually exclusive, inseparable, completely universal, absolutely general, etc. physical ideas. They have instead, at least I believe, some aesthetic, pragmatic, heuristic, etc. significance, and I believe they may contribute to the conceptual development of physics and cosmology.

At present your author's ideas are undergoing fundamental and extremely rapid development, a consequence of which is that he views these momentary papers--their words, formulations, data, accomplishments, etc.--with maximal disdain. Each morning he finds himself repudiating and transcending the ideas of the previous day!

* Especially as presented in his manuscript, The Efflorescent World View, and to be presented in a book which he is currently writing, The Future of Science, esp. in the chapters on physics, cosmology, and mathematics.

FUNDAMENTAL COMPLEXITY

Pat Gunkel

I will develop in this paper a thesis which represents a deep, but very unorthodox, conviction of mine, the belief that nothing exists in nature, or can be conceived by mind, that is absolutely simple and fundamental.

Such a belief, if valid, would require that the pursuit of any ultimate physical, mathematical, philosophical, or other truth--as something by nature finite, absolute, eternal, universal, essential, perfect, supreme, complete, etc. in unlimited degree--is, has always been and will always be, fallacious.

The meaning of this Doctrine of Fundamental Complexity may be illustrated by stating part of what it requires of physics. In brief, it says that all physical interactions and relationships are at once irreflexive, asymmetric, intransitive, nonadditive, nonassociative, and nondistributive in senses and degrees that are fundamentally important in any account of the nature of the physical world.

It may be further illustrated by a single example of its mathematical consequences. It requires that, contrary to what is almost universally believed, $1 + 1 \neq 2$.

The preceding physical and mathematical requirements, all of which must inevitably be the source of the most extreme controversy, will be treated in this paper. It will obviously be the first task of this paper to show that such extreme proposals are not altogether absurd. For example, it is almost surely the case that few persons even have any conception of how it could be the case, in either mathematics or physics, that $1 + 1 \neq 2$!

I believe that the prevalence of the doctrine which is the opposite and the contradictory of mine, and which might be called the Doctrine of Fundamental Simplicity, has enormously hindered and corrupted the progress of human thought, with its exemplifications in science, mathematics, philosophy, and other areas. I believe that the general adoption of my contrary doctrine will, to a corresponding degree, be of benefit to the further advance of human thought. The latter indicates the potential importance of the present paper, or of the outcome of the debate which it is hoped the paper will instigate.

12/16/76

THE NEED FOR A "SYNECHISTIC PRINCIPLE"

Pat Gunkel

You cannot add anything to a whole universe, or any part of one, where the would-be addem could be a mind or a rock, since this would presuppose shared organization, and in the degree of an identity, which would be indistinguishable; but now notice also that you cannot remove or modify any part or aspect of a universe--any quantity, quality, relation, moment of time, thing--since the same would be true, absolutely identical organization would be presupposed and absence of any part would be wholly inconsequential and therefore virtually impossible, the explanation for all this presumably being that a universe must be redundantly omnipresent in its parts, monadologically, or the universe is inseparable from mind, which is indivisible, a self-identical continuum of form matched against form (and the same applies to information, so that our definition of information must accordingly be modified to include a "Synechistic Principle", an infinite bond through the mind, which we are, between the universe in its totality and any part of the universe, and back again, as Leibniz would have required).

Thus, how else do we men know other men than by our likeness to them?

Also, a famous, even notorious, assertion of Arthur S. Eddington receives its confirmation. Declared Eddington, "An intelligence unacquainted with our universe but acquainted with the system of thought by which the human mind interprets to itself the content of its sensory experience, should be able to attain all the knowledge of physics that we have attained by experiment."

The single reason for recognizing and embracing the external universe is simply convenience--in it the exposition of possibility has already begun, as illustrated by the fact that we ourselves grew out of the universe and represent one of its experiments. To ignore the "external" universe would be to ignore part of ourselves, or the possibilities of which we ourselves are a part, hopefully a humble one. Bluntly, it is hard to glorify matricide!

Hence the above, which at first seems a mere metaphysical irrelevance, proves to be profoundly important. It imposes, for example, a radical supplementation on the proper definition of the concept of real information, because of which the latter must hereafter be understood as complementary to, and fundamentally inabstractable from, the totality of the universe. The seeming isolability of information from other information and from the universe in its totality is a powerful but complete illusion.

The uses to which the concept of physical information have therefore been put--in such varied cases as the formulation and calculation of order, entropy, neural communication, energy, time's arrow, probability, complexity, etc.--must all be fundamentally reexamined that they be freed of the errors which were unsuspectedly introduced by the fallacious definition of such information.

It is my expectation that this fundamental correction will revolutionize the foundations of the relevant subjects. Certainly the future of these subjects will take a completely different course than it would otherwise have taken. A single example may be mentioned in cosmology: the laws of physics, it would seem to be required, must ultimately be formulated in other than their current "suicidal", or "cosmocidal", form. It is a largely undiscussed fact that modern physical theory may be interpreted to require, when extrapolated to the whole universe, that physical laws must ultimately both destroy the universe and/or destroy themselves. I leave the reader to decide for himself whether these pantocidal consequences are intrinsically cause for suspicion about the nature and validity of such physics!

One particularly important implication of the Synechistic Principle may be mentioned. It is evidently the case that fundamentally simple things are impossible of either natural existence, mental postulation, or technological invention since there is nothing which can be absolutely abstracted from the universe in its entirety.

THE TRAGIC ERROR IN A STANDARD LAW ($\underline{H} + \underline{I}$ = CONSTANT = $\underline{H}_{max} = \underline{I}_{max}$)

Pat Gunkel

It is assumed by physicists that entropy and information are related by a simple conservation law, which states that the sum of the information and the entropy is constant and equal to the system's maximum attainable information or entropy under given conditions: $\underline{H} + \underline{I}$ = constant = $\underline{H}_{max} = \underline{I}_{max}$. Thus a gain of information would always be compensated for by an equal loss of entropy.

It has, however, been my contention that the standard characterization of the quantity, physical information, is fatally incomplete. I do not believe that such a quantity can be either calculated or defined in isolation from the entirety of the physical universe. This belief that in the case of all physical information an operation is being performed, that is essentially a reference of all of the universe to itself, institutes a circularity in the very existence of such information, and this latter fact necessitates that physical information, despite all appearances, must everywhere be infinite, owing to the self-infinite nature of the universe. Thus the standard characterization of physical information makes two egregious errors: (1) it treats the desired quantity as a genuine isolate, something which is fundamentally and absolutely simple and which per se invites a finite numerical representation, and (2) it treats such information not only as finitely representable but as itself finite, where it is actually infinite.

Two illustrations may be given immediately of the tragic error which obtains in such standard treatment of information.

First Illustration: Implications of Poincare's Recurrence Theorem for the Proper Formulation and Quantification of "Physical Information":

In a paper of mine with the title, "An Error and Its Importance", I considered the possible consequences for the appearance of the physical universe if the universe were viewed by means of arbitrarily greatly accelerating time-lapse cinematography. I showed how such virtual acceleration in the direction of an infinitesimal rate of sampling would inevitably cause a universe of Galilean simplicity, a mere kinematic machine of rigid atoms, to generate an internal reality which would include an infinite variety of apparent qualities and relationships--the progressive transcombination of the n interacting homoeomerous particles would actualize all possibilities because of the accumulative and infinitely combinatorial nature of physical information in such a Galilean universe of vergent being.

Poincare's Recurrence Theorem would require that all possible states of physical order, energy, information, and entropy will occur and recur any number of times with arbitrarily great approximation over arbitrarily, or sufficiently, great time. Moreover, with adequately accelerated time-lapse cinematography the physical universe will appear to oscillate with an arbitrarily high frequency, say of 10,000 Hz., between antiphasal states of order and disorder, energy and entropy, etc. Paradoxically, however, the successive cycles will never be perfectly symmetric, a trace of novelty and of regularity will be transmitted to subsequent cycles, these novel quantities will grow, eventually the rhythm will be destroyed entirely, new descriptions of the state of the universe transcending those previously mentioned will be required, these will then be succeeded and transcended by yet others, an infinite hierarchy of successive and mutually transcendent ontological categories will follow, the universe will over time experience an infinite spectrum of complete metamorphoses, etc. Furthermore, the apparent necessity for the universe to progressively assume all possible ratios of durations and intensities of ordered to disordered states, of energetic to equilibrial states, etc. would seem to produce a statistical truncation problem, since the choice of any particular ratios of these supposed opposites would seem to be wholly arbitrary. I cannot see how the conclusion can be avoided that our current treatment of such quantities as information, energy, entropy, etc. must be drastically modified so as to incorporate the challenge posed by these facts about extreme conditions.

In particular, it is evidently the case that both physical information and physical entropy can, serially or simultaneously, increase and exist without limit. Moreover, the n-body interactions of the complex of particles which are the universe may evidently embody an arbitrarily great amount of accumulative combinatorial information about the universe in its entirety, and yet in a form which is not obvious and a degree which is not immediately calculable; hence an infinite amount of an infinite variety of information may be immanent in the deceptively simple interactions of real particles, or real physical phenomena, and the recovery, manifestation, and use of such immanent infinities might require, in effect, the passage of an infinity of time.

Indeed, the strange fact is that, since the physical universe could well be the appearance generated by a single spatial Peano curve, and since the fluctuation of the universe over time could well be the appearance generated by a single temporal Peano curve, the entire infinite or arbitrarily long lifetime of the seeming universe could well be but an instant in duration. Moreover, by being present a an infinite variety of statistically self-similar but mutually dissimilar spatiotemporal Peano curves, or their like, an infinite density of an infinite variety of physical information might, and may, obtain everywhere and all the time in the universe as we so ignorantly know it.

The above conservation law--that $H + I = \text{constant} = H_{max} = I_{max}$--could be valid despite all these things if information, I, and entropy, H, are assigned infinite, as opposed to finite, values. The result would be that information and entropy could be conceived of as varying both dependently and independently of one another, two actual or potential infinities would be in some sense both equivalent and nonequivalent (say a la the nonstandard analysis of Abraham Robinson, etc.), and both information and entropy could be at once conserved and unconserved over time--both quantities could increase without limit over time in the much more subtly conceived physical universe.

Second Illustration: Implications of Combinatorial Specificities and Complexities Present as "Initial Conditions" for the Proper Formulation and Quantification of "Physical Information":

Contrary to an apparent presumption, Planck's quantum of action, h, does not limit, quantize, and finitize the amount of genuine physical information which may obtain in the "initial conditions"--or cosmological coordinations--of physical phenomena (or certainly this is the theoretical situation at the present time).

Thus a detective's clue, perhaps in the form of a mitten being present in a washroom, may have an infinite amount of significance (that a poor human detective does not make use of it is irrelevant). A detective possessed of an infinite intellect might extract the infinite amount of significance from the deceptively simple clue. In natural processes, it may be suggested, similar clues may carry to the future for progressive release the infinitude of holistic information: such information having been imparted to the initial conditions, or temporary conditions, of the physical universe as the product of prior combinatorial interactions of all the elements of the universe inter se (with such transcombinations being the very generative origins of all the current self-appearances of the "self-projected" universe), the information can be once again recovered by combinatorial processes working, in effect, in reverse. No hay cerradura si es de oro la ganzua--there is no lock that a golden key will not open!

The standard kinematic 6n-dimensional phase-space representation of the physical interactions of, say, a large number of molecues in a volume of gas is completely misleading when used to indicate the quantity and variety of physical phenomena and information which may inhabit that set of molecues. Imagine applying it to the momentary states of the accelerated Galilean universe considered in the First Illustration above! Such an abstract and nonhistorical description, by missing the infinity of developed patterns and meanings, would strip the universe of virtually all of its informational content--the corpse of the universe would be there, but not the soul!

Moreover, in reality it would not be possible to assemble a pure kinematic 6n-dimensional phase-space system of physical molecues, a system free of the continuum of information which represents the universe in its entirety. The set of molecues necessary to construct such a system would have to be taken from the real universe, with its contextual continuum of transformable-but-irreducible information. The act of removal would merely redistribute the static and kinematic information of the universe, without destroying it. Indeed, the act would, in a sense, contribute to the information of the universe. The set of molecues used to create the phase-space model would be a set of specific molecues. The arrangement of the set of molecues creating the model would be a specific process of arrangement. The effort involved in trying to force the chosen molecues into the Procrustean momental and positional symmetry of the concrete model would liberate the information expressing the effort and the degree of success to the surrounding universe, although the Procrustean aim would itself be unavoidably futile (much as the act of compressing a volume of gas raises the temperature of the gas adiabatically). Furthermore, it would not be possible to choose a specific, arbitrary set of molecues, owing to Heisenberg's Uncertainty Principle, and therefore the set of molecues chosen would inevitably carry natural information over into the model being constructed, and proceed in conformity with a natural determinism.

Moreover, it would not be possible to construct a concrete phase-space model in dynamic and informational isolation from the rest of nature since Borelian influences would constantly import consequential information into the system from the hierarchy of interactions of the universe at large, and would likewise constantly export energy and information from the local system which would alter the system.

In all this one sees the operation of what I have called the Synechistic Principle, which says that the universe is informationally indivisible, or monadological by nature.

APPENDIX

I indicated in the preceding paper that because the physical universe could be various sorts of spatial, temporal, spatiotemporal, informational, energic, ontic, etc. Peano curves (or infinitely various analogous or catalogous mathematical taxa), an infinite quantity of space, time, space-time, information, energy, being, etc., ad infinitum, could and may obtain at any "point" in space, time, space-time, information, energy, being, etc., ad infinitum. For example, due to such infinite density, one has the paradox that all of time could be contained in every instant of time, all of space in every point in space, all information in every "piece" of information, etc.; or these things could be self-containing.

However, the situation is much more remarkable! Peano curves allow finite objects to have infinite boundaries "locally". Moreover, Peano curves enable infinite lengths to obtain over finite intervals (which seems contradictory). One might call the former "sublengths" (or l_{-1}, as opposed to the former, or l_0); there can be an infinite sequence of lesser, or progressively more subjacent, sublengths (l_n, where $n = 0 - \infty$); therefore our standard length, l_0, may in reality be subjacent to an infinite sequence of superjacent lengths, $l_{1-\infty}$. Cosmology may have to be revised! Cosmology may have to be still more revised--the adjacent lengths can be nonintegral (fractal)!

More importantly, Peano curves permit infinite lengths to exist at any and all points over lengths (of length l_0). (Thus continuous intervals can be "ultradense", not just dense.) As a consequence, Peano curves can be not just infinitely long, over "finite" lengths or perimeters (of length l_0), but superinfinitely so ("continuously long")--the infinite lengths, of length l_0, can be infinitely compressed and added to (joined to other lengths, of length l_{-1}, of infinite number).

Still more importantly, such Peano curves, as superinfinitely long, can be <u>infinitely</u> superinfinitely long (length = $\infty^{2-\infty}$, or Alef n, where $n = 1 - \infty$). (Hence they can be infinitely ultradense or dense.) This is particularly extraordinary since it indicates that, and how, superinfinite ($= \infty^{2-\infty}$ = Alef $1 - \infty$) quantities and qualities may occur in nature and have cosmological, or ultracosmological, importance (also, it seems to suggest how novel mathematical objects, relations, and taxa may <u>uniquely</u> exist for separate cardinal and ordinal transfinites beyond Alef 0 (for Alefs $1 - \infty$)).

Still more importantly, Peano curves are clearly constructible, and hence may exist in and as nature, that are more than merely <u>infinitely</u> superinfinitely long, which are in fact <u>superinfinitely</u> superinfinitely long (length = $\infty^{\infty^{2-\infty}}$ = Alef $\infty^{2-\infty}$ = Alef Alef $1 - \infty$). And again, these may have ultracosmological implications <u>of any degree</u> (and we are learning, by these things, what <u>that</u> means!), suggest the existence of unique mathematical concepts and entities (see above) and hence suggest the future of mathematics ($!^{\infty}$?), etc.

Yet Peano curves may apparently be constructed and naturally exist having <u>any</u> lengths (illimitably-many lengths)--$_{\infty}\infty^{\infty^{\infty}}$, $^{\infty}$ exp ∞ exp ∞ exp ∞ ... ($_{\infty}\infty^{\infty^{\cdot^{\cdot}}}$) ad infinitum (infinity or Alef with infinitely-many infinities or Alefs as exponents or "superexponents"), the same but <u>ad superinfinitum</u>, a number I serio-whimsically proposed a long time ago--Alef exp bis (Alef $\circlearrowright$ exp), a number (which grows as you contemplate it) intended to exhaust the self-potential, or meaning, of the designation "Alef", and hence intended to suggest the necessity for the number (or antinumber?) which is Ineffable (the illimitable, that which is beyond number, the fact that no greatest number can exist, the apparent requirement that mathematics is <u>alive</u>, etc.). Notice, for example, that it seems to have been demonstrated that George Cantor's transfinite arithmetic is <u>incomplete</u>; in a Goedelian way, it is not self-contained; and the meaning of Alef is indeterminate! It can be imagined that, in a good mathematics, it may be required that (any and all) lesser, or earlier conceived, numbers be definable in terms of (all) longer, or later conceived, numbers. Therefore, the foregoing illimitable, non-self-limiting, indeterminate, or Ineffable hierarchy of numbers may conceivably represent a crisis for (our) mathematics.

As for the Peano curves, these, as curvature (or, indeed, as quasi-curvature of any degree) of any dimension or dimensionality (equally as they can be curved lines, Peano curves can be curved surfaces, curved volumes, or curved hypersurfaces or hyperlines of any dimension or dimensionality--infinite, superinfinite, or trans-Cantorian), can simulate any and all structures and dimensionalities. As a humble example, a curved line, as a closed or open Peano curve, can generate a plane or a triangle in that plane--but, what is important, the dimensionality of the generated triangle or plane will, mathematically, be neither one nor two but instead fractional (fractal). Similarly, one-dimensional or any-dimensional curves (it is also probably not trivial that objects can have two or any number of dimensions and/or dimensionalities and/or forms "simultaneously", i.e. e.g. there can exist--and these need to be analyzed mathematically--omnidimensional, n-codimensional, and other weird mathematical objects!) can generate hyperobjects of any dimension, etc., associated with which there must be a field, at least "infinite" but really of unknown magnitude and/or "dimensionality" (this last to be sure!), containing all the characteristic and unique fractal dimensions (and, of course, there must in turn be associated with these still other fields of numbers representing the consequential sets of relations, or illimitably-many characteristic and hierarchical correlations, obtaining between these fractal dimensions--the task of mathematics is never done!).

But this has interesting consequences. For example, it is evidently the case that there can be simulations of simulations (hypersimulations), and higher simulations of illimitable degree, with which must be associated still stranger specific fractal dimensions. Thus a triangle may prove to be composed of a curved Peano line, but the Peano line may itself be composed of curved or quasi-curved Peano objects of any type, including lengths of any lengthness ($l_{-\infty} - +_{\infty}$), pseudopoints of any dimension and number, real and/or pseudo objects of any topological structure or complexity, objects or simulations of objects of any negative whole or fractal dimension ($0 - {}^{-\infty}$-dimensional "objects"), etc.!

These fractal dimensions, and fractal-dimensional objects, having dimension >0 and <1 are of particular pure and applied interest, both in general and because they introduce the subject of infinitesimal dimensionalities and differential dimensionalities, infinitesimal-dimensional and differential-dimensional "objects", and infinitesimal-dimensional and differential-dimensional universes.

And, of course, any and all of the numbers which have been considered may be of importance, and of any degree of importance, not only in pure mathematics but in the real world (or for ultracosmology).

The Efflorescent World View says that there are no pure abstractions and that nature is infinitely, or ineffably, complex! In this way, perhaps the preceding discussion has given some sense of either the possible or the necessary openness of the world.

WHY EVERYTHING EXISTS

Pat Gunkel

The Efflorescent World View categorically asserts that everything imaginable and unimaginable exists in and as the greater nature of things. Two corollary assertions are that all possible numbers exist and are coessential to the physical world, and that our world is ineffably complex. Ineffably so, because no ultimate quantity or quality exists or can be imagined which would describe transcendent nature.

It is obvious that these will be received by others as rather demanding assertions! What do they mean? it will be asked, and How can they be proven?

I have indicated, in various of my papers, how a seemingly dull Galilean universe of interacting particles, when viewed by means of arbitrarily greatly accelerating time-lapse cinematography, will appear to generate within itself, as a result of an ever-enlarging and completely-vergent cosmological "memory" representing the unending combinatorial many-body motions of the particles making up the universe, all possible qualities and relationships, and hence that such a deceptively finite universe will organically experience the Aristotelian plenum of all possible things. I have also indicated how the universe may actually be a spatiotemporal, or existential, Peano curve of any or all dimensions generating any or all dimensions, or an ineffable complexity of phenomena. In particular, for example, seeming mathematical points may be constituted of illimitably-many mathematical "objects" of illimitably-great complexity; and the existence of trans-Cantorian numbers would appear to be unavoidable.

Elsewhere I have suggested that the accumulation of greater complexity by an ever-evolving universe would appear to alter the unisolable "past" of the universe by inserting it into an illimitable number of successive perspectives. It follows that if the fate of the universe is to become illimitably complex then the past of that universe must itself acquire an illimitable, if merely negative, complexity.

These and other considerations which appear in my accumulative writings would seem to require that such universes as suggested above must generate in the course of their existence not only an illimitable complexity of facts but also an illimitable complexity of illusions. All possible illusions must be brought into existence, and it would follow from the above that all possible illusions must virtually exist already in the (illimitably virtual) nature of things. Yet it is apparent that the world is exquisitely, really illimitably, ambiguous, and therefore what is truth and what is illusion, what is fundamental and what is epiphenomenal, must be illimitably intermixed, and therefore illimitably close--in some essential sense the distinction vanishes in the greater nature of things.

Therefore reimagine the Galilean universe alluded to above. Toward infinite or illimitably-great acceleration and sampling there will inevitably be brought into subjective existence as the life of the universe an illimitable number of illimitably great and illimitably diverse fluctuations of appearance or self-transcendences of reality. Yet, as argued in my writings, the totality of these fluctuations will represent the potentiality for all of the other fluctuations, and, indeed, will give rise to these and illimitably more. The universe is monadological, omnipresent in itself, and all possibilities will continually be in statu nascendi everywhere in the universe.

In particular, all local systems of particles or events will enjoy a virtually illimitable autonomy.

In such a universe, prompted by illusion or willfullness or an aesthetic quest for cosmic variety, there will be beings of illimitable number who will pursue notions of illimitable arbitrariness and peculiarity. Indeed, they will found civilizations and illimitably perfect weltanschauungen on the basis of these capricious notions.

All of reality will come to be perceived, conceived, and known in terms of the illimitably subtle covariations of self-similar curves (as these are discussed in my writings). Yet, owing to the Principle of Eternal Vergence, of The Efflorescent World View, and owing to the fact that the world admits of an infinity of equivalent representations or corepresentation, there will be no harm in this illimitable diversity and extremity of arbitrariness.

It is apparent that a Galilean universe could never know the ultimate stuff --here imagined as rigidly interacting atoms or as the simplest stuff momentarily imaginable as the possible basis of a universe such as ours--of which it is made. All it would know, all it would ever know, would be its interactions. Yet, remarkably, all its interactions would ever know would be other interactions. If one extrapolates this sequence it becomes apparent that all that would ever be known would be the ineffable complexity of the totality of interactions, a limitless field of transformations of transformations... without meaningful end, and without meaningful beginning. Indeed, the local forms of things would continually be reborn in an illimitably complex kaleidoscope of mutually transcendent appearances or representations.

It is therefore required, in this ultracosmological scheme, that the very possibility of things demands their actualization. We already have difficulty separating possibilities and realities from each other. Thus the relationships between one and infinity, between one and two, between part and whole, between discretes and continua, between particles and waves, between information and entropy, between operators and operands, between past and future, between force and matter, between process and object, between different and higher infinities, and so forth, are all sources of growing perplexity. A quite reasonable conjecture would be that in the future these ambiguities, perplexities, and complications will, rather than diminish, increase, and increase without limit.

For example, it is evidently required that the future lifetime of the world will be more than infinite in time. The necessity for this results from consideration of the subjective nature, and measurements, of the interwoven realities of the Galilean universe--the lifetime of the universe known by its inhabitants cannot defensibly be assigned by ourselves any definite number, whether finite or infinite. All possibilities known to the inhabitants of this closed universe will appear to become realized.

In a like way, Marcel Proust sat immovably on his bed in his unvaried chamber and dreamt into existence The Remembrance of Things Past--a world grew within a world, as, indeed, is such a commonplace occurrence!

Mathematics allows that all things can be represented in terms of all other things. This means, in particular, that functionality can be made infinite, or is illimitable. Thus infinities can and do exist within finites, and are finites within other infinities. More importantly, the definition of things is never finished. Mathematics is an all-transcendent anastomosis; so is the "world".

In particular, in such a Galilean universe it is required that all things, and all ideas of such things, eternally grow. Thus a number, such as a googolplex or a trans-Cantorian animal, about which we at first have but the merest fancy, the sheerest velleity, the most involved intuition, the greatest disinterest, or the most damnable loathing, must inevitably with time grow into something ever more substantial, real, and consequential--a universe will form about it as a crystal shapes about a seed. Indeed, such things must have been germinating long before they occurred to us as possible. What Goethe wrote of man in his poem, "To the Moon"--"What is unknown and unthought by man/Wanders in the night through the labyrinth of the heart."--he should have written about the world soul!

This illimitable realization of possibility is not really hard to accept. For example, it is really analogous to the difficult but presumably unavoidable coorigination of things, whether in the hypothetical beginning of the universe, the vast ontic singularity from which we may have sprang, or in the coderivation of the meanings and forms of things in the ontogenesis of the human mind or the panlingenesis of epistemological and cosmological researches.

It is an attractive idea that all things are compossible, that all possibilities are mutually enabling and intercreating, that reality is an illimitably complex and extended spectrum of possibilities continuously intergraded between ideal potentiality and ideal actuality, that involved, here, is a perfect relativity (as suggested by the Principle of Perfect Relativity in The Efflorescent World View), that over and as time the world expands to embrace all that it makes possible, that all things are true in some sense and degree so that reality may be an infinite network of equivalences, and so forth.

That such a known or supposed variety and manyness of things may have cooriginated from some supremely mysterious cosmogonic unity, or may coderive in terms of their meanings and thus their realities, or simply may conterminate in some, evidently symmetric, cosmotelic unity, are things which severally suggest that the variety and manyness of things may forever increase, much as many cosmologists believe that the physical universe will expand without end, and may be intrinsically limitless in the deeper nature and compossibility of things, much as some cosmologists believe that the physical universe is infinite and hyperbolic. Indeed, the word "hyperbolical" furnishes an especially nice metaphor for what may be the efflorescent nature of an omnificent and illimitably complex reality--for just as the volume of the physical universe may in a hyperbolic cosmology go up by more than the square of the radius, so that physical space and reality "effloresces", thus also it could well be the case that all the things which seem to us improbable, impossible, incompatible, and contradictory within the economical confines of reality as we presently know it may ultimately become accomodated by a universe of possibility which illimitably expands, grows out of itself, in such a way as to bring into neat coexisting combination all things which at first seem merely possible, or not possible at all.

11/24/76

PRESUMABLE CONSEQUENCES OF AN INFINITE BEGINNING OF THE UNIVERSE

Pat Gunkel

There is a chance that our presumably exploding universe sprang from an initial state which was infinite in one or more respects or aspects, or virtually infinite. Major cosmological theories more or less assume that the cosmogonic singularity, or presumed singularity, was either literally or figuratively infinite and infinitesimal in many quantitative and/or qualitative ways. Of course it is understood that such "transcendental" numbers involve certain problems and paradoxes. Such problems and paradoxes might have two alternative implications: either our current physical theories and assumptions are faulty by reason of an excessive heterodoxy, or else they are faulty by reason of an excessive orthodoxy. Both types of error or inadequacy, however, would have important consequences, such as those which I now propose to discuss.

First, let me list a few ways in which the beginning of the universe may have been truly or virtually infinite (or infinitesimal).

Potential Cosmogonic Infinities

1. Infinite total energy.
2. Infinite energy-density.
3. Infinite total mass.
4. Infinite mass-density.
5. Infinite material particle population.
6. Infinite energic particle population.
7. Infinite deceleration of expansion (and hence infinite acceleration of expansion!). Paradoxically, this might require an equivalent description of the inception of the universe as an infinitely decelerated and accelerated contraction!
8. Infinitesimal or zero radius, diameter, circumference, volume, surface, etc. of the universe (infinite contraction).
9. Infinite density of particles and of waves.
10. Infinite total physical information.
11. Infinite density of physical information.
12. Infinite frequency (infinitesimal wavelength) of physical entities.
13. Infinite energy associated with each physical particle, wave, phenomenon, etc.
14. 100% or infinite decomposition of intracosmic phenomena.
15. 100% or infinite cosmic homogeneity and isotropy.
16. 100% or infinite breakage of all possible physical symmetries, laws, constants, principles, etc.
17. 100% or infinite chaos, randomness, indeterminacy, entropy, etc.
18. 100% or infinite cosmic order, structure, complexity, negentropy, etc.
19. Infinite variety (or substitution and elimination) of particles, waves, phenomena, laws, cosmic regions, spatiotemporal manifolds, metrics, etc.
20. Infinite multiplication of events.
21. Infinitely-many successive events.
22. Infinite total cosmic interactions and density of interactions.
23. Infinitely-many historical stages, infinite branching of history, infinite diversity of historical branching, etc.
24. Infinite spatiotemporal and informational dimensionality.
25. Infinitesimal or zero spatiotemporal and informational dimensionality.
26. 100% or infinite total organization, and organizational density, of the universe.
27. Infinite hierarchical, anastomotic, etc. organization of the universe.

28. Infinitesimal or zero total energy, and energy-density, of the universe.
29. Infinite "preevolution" of the universe.
30. Infinite blueshifting of everything in the universe.
31. Infinite spectral self-dispersion of the universe.
32. Infinite co-acceleration of the parts of the universe.
33. Infinite corotation of all the parts of the universe.
34. Infinite self-regulation of the universe (infinite interregulation of all of its parts).
35. Infinite covibration of all the parts of the universe.
36. Infinite or 100% quantization of the universe.
37. Infinite or 100% relativization of the universe (or of all of its parts).
38. Infinite self-reproduction of the universe.
39. Infinitely many, and infinitely paradoxical, apparent or real physical so-called "catastrophes".
40. Infinite "topometrological" (i.e., "topological-and-metrical") transformations of the universe.
41. Infinite or 100% "exhaustion" of time.
42. Infinite cosmic temperature.
43. Infinite or 100% cosmic symmetry.
44. Infinite or 100% equalization of the velocities of all physical entities.
45. Infinite or 100% pluralization (i.e., polycentralization) of the contractedness or infinitesimalization (infinitesimal magnitude) of the universe.
46. Infinite convergedness of the stuff of the universe.
47. "Instantification" (i.e., possession of infinitesimal or zero duration) of all of the stuff of the universe.
48. Infinite or 100% "subtractedness" (i.e., state of having been subtracted from existence) of all of the stuff of the universe.
49. Infinite asymptotic approach to, or 100% attainment of, the velocity of light, c, by all physical entities.
50. Infinite or 100% emergence of the cosmic vacuum.
51. Infinite or 100% equalization of all the sizes or magnitudes of all things.
52. Infinite or 100% extension of the virtual ranges of various or all physical quantities (e.g., infinite range of frequencies, mass, energy, number of quantum numbers, strengths, relative sizes, relative rates, densities, etc.).
53. Infinite mathematical complexity of the universe.
54. Infinite self-effects of all the parts of the universe.
55. Infinite coderivation of the parts of the universe.
56. Infinite or 100% absorption of the cosmic vacuum (i.e., of the interstices of the universe, some sort of tolerable ether, and/or the like).
57. Infinite "inversion" of all physical phenomena.
58. Infinite multiplication of the total states, and density of states, of the universe.

N.b. <
59. Infinite possibility and actuality (an ontically infinite universe).
60. Infinite conceptual complexity of the universe (i.e., a universe whose infinite complexity would presuppose infinite intelligence in order to be perceived and conceived).

The foregoing list is obviously incomplete, and yet I think that it serves to make many important points.

For example, many of the items are such as to appear to be contradictory. This situation means two things. First, the ambiguity of the hypothetical initial conditions of our universe may be infinite for analysis or may have been infinite in fact, or in the very nature of things. Secondly, contradictory descriptions of cosmogonic conditions are not truly contradictory, and the beginning of the universe,

however intellectually, theoretically, and empirically demanding, and however paradoxical, could have combined and transcended all possible contradictory realities.

Ideas as to the origin, subsequent development, current state, future development, and ultimate fate of the universe must henceforth be as sophisticated as the long, difficult, and paradoxical enumeration of potential cosmogonic infinities obviously or conceivably requires. For example, it is evidently the case that fundamental mathematical uncertainties pose cosmogonic difficulties the resolution of which is an inescapable prerequisite for any axiomatization of and progress in cosmology and physics generally, a requirement which will surprise most cosmologists and theoretical physicists.

Of particular interest is the possibility that the epoch of the last 20 billion years, and the whole universe as we now find it, must be considered to represent the relatively infinitesimal quasi-finite sequel of an antecedent universe which was in one, a few, or infinitely-many respects and aspects infinite by nature--really or virtually infinite in age, size, complexity, evolution, mass, energy, completeness, perfection, and/or the like.

We may specifically be faced with such difficulties as explaining how an apparently or supposedly finite universe (in respect of size, energy, mass, order, age, variety, information, density, subdivision, interaction, structure, rate, dispersion, condensation, etc.) could possibly have been derived from an antecedent infinite, or even "infinitely infinite" (possibly also infinitesimal), "universe". In what continuous and/or discontinuous manner did infinities become finites, and thus infinite quantities of mass, energies, forces, information, entropy and/or negentropy, symmetry and/or asymmetry, laws, events, entities, regions, etc. vanish from the universe as we know it, or as we think we know it?

One problem would appear to be that we have no idea what an infinite-relational manifold would be like (or how many, even infinitely-many, infinities would behave inter se). Evidently we have need in the future for very many Kurt Goedel's, or for Goedelian physicists!

It is a particularly interesting notion that the conclusion we should draw from a study of the list of Potential Cosmogonic Infinities is that our present universe merely gives the illusion of being only finitely complex as a reflection of our finite science, finite intellect, finite form, finite perspective, etc., so that with the infinite future evolution of these things the universe will progressively disclose itself as by nature infinitely complex. It is a platitude of human literature that what riches the discoverer finds depend on who the discoverer is --the vapid soul will find the world impoverished, the genius will discover a kingdom.

Also, we find more and more (qualities, quantities, information, order, entities, possibilities, hierarchies, meanings, exigencies, satisfactions, reconsiderations, transformed and transformable perspectives, etc. ad infinitum) in paintings, sculptures, faces, persons, trifles, facts, the world, equations, signatures, history, stories, ideas, symbols, philosophies, theories, etc. as we study, experience, come to know, love, apotheosize, etc. things--infinity in any wild flower, the universe atop the head of any pin, and eternity in any instant, hence Leibniz's monadology!

Ideas of the equivalence of the point to the sphere, of the part to the whole, of the beginning to the end of things, of the finite to the infinite, of the one to the many, of the atom to the universe, of the instant to eternity, of diminution to augmentation, of nothing to everything, of change to permanence, of creation to destruction, and so forth are known to be ancient and universal.

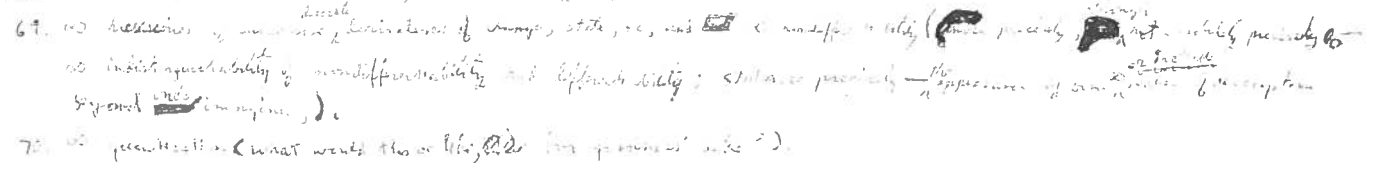
Incidentally, many of the entries on the list of Potential Cosmogonic Infinities can be derived from one another in various ways and degrees.

The propriety, meaning, exemplifications, and implications of all of the different Potential Cosmogonic Infinities should be given careful consideration. Indeed, there are difficulties connected with the mere statement or the definition of the various entries. For example, what is "physical information", insofar as it is countable, quantifiable, limitable, definable, knowable, etc.? How could such information be "created", "destroyed", "conserved", "transformed", etc.? How exactly could such information have "variety"? How could it "operate" in nature? Does it obey certain "laws"? These are primary questions!

Additional Entries or Separate Points Re the Above List:

61. Infinite pressure.
62. Infinite self-effects of the whole universe.
63. Bizarre effects of various infinite or 100% applications, intensifications, transformations, evolutions, negations, and/or the like of Mach's Principle, and/or possible variants or analogues thereof.
64. Infinite broadening and complication of the spectra (or "superspectrum") of all things, infinite or 100% intraspectral discretization of the spectrum(s), this entraining infinite antidiscretization of the amplitudes, this "then" entraining infinite would-be discretization of the amplitudes (in part because of the equivalence of "perfect continuity" to perfect discretization), this instead entraining infinite trade-off between infinite discreteness and infinite continuity in an infinitely horizontal and vertical hierarchy of successive and simultaneous cogenerating and logically infinite inter-classificatory and intraclassificatory regressive discrete and continuous spectra and "antispectra", etc. etc.!
65. Infinity-related possibilities, in terms of George Cantor (Alephs zero through infinity), Abraham Robinson (nonstandard analysis or the arithmetization of infinity), Pat Gunkel ("Aleph exponent bis", "transdimensionals", "arbitraries", the "Ineffable Principle", etc.), P. Cohen (nonintegral Alephs), &c
66. Infinite objective (absent any observer!) time dilation.
67. Oddly, the very fact, supposedly, that 100% collapse, singularization, or punctification will appear to occur within the cosmic collapsar in a finite interval of time (in imagination, with time played backward and from the standpoint of an observer within the cosmic collapsar)--since any finite or finitization has its own infinite aspects.

The 60-67 item list of Potential Cosmogonic Infinities is likewise an interesting list of "Potential Cosmotelic Infinities", or respects and aspects in which the future or end of the universe may also be, or appear to be, infinite, and it should be studied as such. Both the beginning and the end of the universe are paradoxical and fundamentally important! What symmetries and/or asymmetries may be surmised to exist between the start and finish of the universe? May the start and finish, perhaps as a result of their being infinite, be indistinguishable or even coexistent?



12/2/76

A SET OF IDEAS IN SPECULATIVE PHYSICS

Pat Gunkel

May longest wavelengths be the explanation of universal expansion?

May--or even should--photons, gravitons, massons (i.e., all particles having rest mass), and/or the like (ad infinitum?) with subdetectably-long (e.g., esp. $\nu < 1$ Hz.), cosmic ($\lambda \sim \geq 2$, 6, or 8 x 10^{10} light-years), or asymptotically infinite wavelengths (primordial and/or downshifted), and/or some real or virtual infrared (and/or ultraviolet?) "catastrophe", be exerting a (positive and/or negative!) "pressure" (of any type and/or complexity) which is causing, did cause, and/or will (temporarily or eternally) cause the expansion, and/or the acceleration or deceleration of the expansion, of the apparent universe? This, perhaps because the energy, density, nonuniformity (inhomogeneity and/or isotropy) of distribution, variety, complexity, creation or procreation, and/or the like of such basic or concomitant physical entities (or cosmic uniformities, these?) is infinite or is sufficiently enormous?

I have recently come to doubt that physicists' so-called ultraviolet and infrared catastrophes, which have forced certain artificial adaptations in the structure of modern physics, need or even ought to be regarded as impossible, absurd, incomprehensible, refractory, contrafactual, and/or undesirable, and hence as truly catastrophic. Even if they might be some of these things, it is significant that they need not be all of them (e.g., if the state of affairs which theory, calculation, and/or intuition indicate would exist if such stigmatic catastrophes were the case were to seem to us to be partially or wholly, and finitely or infinitely, incomprehensible, such true or presumed incomprehensibility would not necessarily have to preclude the existence of the indicated catastrophes--thus, similarly, such important concepts as God, the ultimate cause and destiny of the universe, undecidable propositions, interpretations of Heisenberg's Uncertainty Principle, the ultimate laws and stuff of the world, the ultimate meaning of existence, have an analogous status in present thought).

In particular, I suspect that the existence of such catastrophic or quasi-catastrophic phenomena or foundations has been rejected by modern physicists for expedient reasons, and in large part because of the failure of mathematicians, logicians, and physicists to come to terms with the forms, bases, meanings, and implications of infinite things and ideas, and especially with the possible abstract and physical relationships between sets of infinites. For example, so far we have no understanding of the necessary, probable, or even possible interrelationships of finities vis-a-vis infinities. We lack infinite-valued and transfinite-valued logics, we lack developed or rudimentary infinite-dimensional pure and applied geometry and topology, we have no arithmetic of infinity, we know nothing about noninteger Alefs, we know little or nothing about the real dimensions (the numerical structure generally) of the physical world, algebraic topology has gone almost wholly unapplied to physics and cosmology, our theories of measurement and probability are clearly puerile and misconceived, and so on ad infinitum! Under these impossible conditions it is not a bit surprising that physicists have viewed certain possibilities as by nature catastrophic.

I wish to plant the idea that the forsaken general and specific possibilities will and should be resuscitated, because they are compatible with the universe as we see it, help to explain various phenomena, and are ultimately essential to the development of physics and cosmology. Their resurrection may be stimulated, in part, by physicists' growing awareness of the generally paradoxical, and everywhere seemingly "catastrophic", nature of physical fact and theory--and by the perception and conception of still greater, deeper, and stranger apparent catastrophes, anomalies, and sheer ignorance.

The concept that the self-spectrum of wavelengths of things of the universe may be infinite is interesting because it opens the door to continuous creation, unites opposites on a continuum, fuses cosmogony and cosmotely, highlights how the universe may consist of nothing but information, gives time a needed symmetry, etc.

Is the subject matter of physics the correlation of dichotomous carriers and messages?

Does not modern physics implicitly assume that the universe analytically reduces to but two dichotomous, ineliminable yet inseparable, constituents or perturbations: carriers (modes) and messages (information)?

Interrupting this train of thought for a moment, might the foregoing be coessentially equivalent to the distinction between, respectively, waves and particles, especially since the waves of matter or energy should be universal, continuous, and/or divergent in form and the particles of matter or energy should be by contrast local, discrete, and/or convergent in form? That is, might the classical wave-particle duality represent at heart a carrier-information duality, or the like? (But see the definition of "quasi-discretes" on page 269 of The Efflorescent World View, whereat all sorts of dualities are suggested.)

If that suggested in the first paragraph is so, does this require that adjustment between the velocities of these binary luxonic constituents (the carriers or invariants) and tardyonic constituents (the "messages" or transformations) can only be asymptotic and never perfect, so that the inequality, $v_t \neq c$, where v_t denotes the possible range of velocities of tardyonic constituents or messages, must hold eternally (both ab aeterno and ad aeterno)? Does this, in turn, require (per the Principle of Perfect Relativity and the Principle of Open Time, of The Efflorescent World View) that the universe, in being composed wholly and only of these dichotomous carriers and messages, can never collapse, or have collapsed, completely; can never expand, or have expanded, completely (infinitely); can never really die or begin (ad vel ab nihilo); can never truly lose any information (since, whatever the appearances of things, all information will be conserved in a continuum of interadjustments "within" and "between" carriers); and/or the like?

Is it time for a Theory of Infinite Relativity?

Evidently Special Relativity and General Relativity must be succeeded by what might be called a Theory of Infinite Relativity.

Just as choice of reference frames can cause the order of any pair of physical events in space or time to vary and reverse, a fact which was one of the incentives for the development of conventional Relativity, so also choice of physical systems over the universe can, I suggest, cause the pattern or information of all physical phenomena to assume, or to lose, any form--especially given the fact that all the measuring and perceiving phenomena of the universe, such as ourselves, represent merely finite informational patterns of a correlative or evolutionary nature (that is, finite probabilistic spectra, ideas, or "realities"). Another way of putting this last point is that all things possess a finite "self-probability" or "self-truth".

Such a theory (of the complete relativity of information) must be a theory of combinatorial work, of combinatorial integrodifferentiation, for which space-time will be completely combinatorial in nature. Facts must be competitive (there are no idle facts).

The constituents of any real object or phenomenon have an arbitrary spatiotemporal or informational pattern, apart from selective coordination with the rest of the universe, and hence they or their structures admit an infinite variety of alternative correlations with the rest of the universe--thus the need for a Theory of Infinite Relativity. Movements in space-time are equivalent to coordinations, or to the use, of information. Evidently what are propagating in nature are not "particles", "waves", or the like, but instead perspectives, different historical ideas, the evolutionary memories possessed and created by objects, etc. In effect, in truth or equivalent truth, particles are in the process of exchanging universes (the infinite-dimensional discrete quanta, which are thus like Leibniz's monads, which were windowless and individually mirrored the whole universe).

It would seem that an equation must be set up, or at least assumed, expressing a triadic mass-energy-information equivalence (and superseding the ordinary mass-energy equation). Let would-be formulators of such an equation be forewarned that the taxonomy of such a concept of "physical information" may be complex--there may be any number of types, degrees, and bases of information in our world. The mass-energy-information relationship may be an equivalence and/or an indeterminacy!

In any case, such an Infinite-Relativistic mass-energy-information equation introduces thought, ideas, mind, and being into the physical quantities of the universe. That is, the latter are indeterminate where the former are unconsidered; likewise, mass and energy are indeterminate apart from information. The effect of these things is that cognitive selections can and do redesign, recompose, requantify, etc. the (psychophysical) universe.

Tail thought: Are discrete quanta single infinite-dimensional events? Such transfinite-events could have the philosophically satisfying property of enabling the whole universe to undergo transformation(s) without changing its appearance, or without sacrificing information. Thus the universe could undergo nonparadoxical self-transformations, or fulfill the Rheostatic Principle of The Efflorescent World View.

Is our sense of time inverted?

A task for the future is to develop the initially preposterous notion that, in truth or equal truth, all seemingly "prosotemporal" ("prosochronological") quasi-entropic emissions of particles of energy and of particles of mass in the universe may instead, also, or equivalently represent the relatively "retrotemporal" ("retrochronological") quasi-negentropic transfer of "emissions", energy, matter, and/or information from the already-integrated, minimally focused (figuratively "holographic"), future-originating and relatively retrotemporal (retrochronological), wave-constituted as opposed to particle-constituted, perhaps representing advanced potentials, remote, holomorphic, etc. holocosm. (All the neologisms here are defined in the Glossary of Special Terms, pages 247-269, of The Efflorescent World View. "Prosotemporal" means "going, or appearing to be going, forward in time". "Retrotemporal" means "going, or appearing to be going, backward in time".)

Or that in this inner-manipulative way, paradoxically but elegantly, the retrotemporal holocosm may actually be the basis of seemingly forward-going time, of discrete events, etc.

Returning to the metaphor of the minimally focused (maximally unfocused) hologram, what we habitual, prejudiced, and infinitely sciolistic beings perceive as the forward advance of time may have its surprising explanation in the, actually retrotemporal, progressive self-focusing or redifferentiation of the timelessly or ultimately already-integrated universe, or Apeiron.

Forward time may be real or it may instead be a complete illusion, a perceptual error, with the only real time being what we think of as backward time, with the conventional future being the conventional "cause" of the present and the conventional past being the conventional "effect" of the present.

A question which should be answered is, What about the "direction" of other particles, forces, etc., such as gravitons and gravitation?

The preceding idea is made more plausible when it is considered that many cosmologists believe that the universe will end (as many believe it began) in a perfectly, or else virtually perfectly, contracted and zero-dimensional state, with which, as I have indicated elsewhere, there should or may well be associated certain infinite aspects of a paradoxical and very consequential kind.

Tail thought: Should the idea that the 4-dimensional universe began as a zero-dimensional universe prove defensible, an interesting implication of this might be that there are abstract and/or physical ways in which dimensions, dimensionalities, and spatiotemporal manifolds can be generated out of that which is dimensionless, with the hint that our 4-dimensional space-time is an accident.

Quantum theory is inevitably as much holistic as it is atomistic.

It is generally assumed that quantum theory is, in effect, a theory of absolutely equal (indistinguishably isometric and isomorphic) and integer-like particles, the quanta (an implicit or explicit generalization of which is that space-time, or the entirety of nature--by consisting of nothing but a finite set of different natural or rational numerals, a la Pythagoras, these being the qualitative quantum numbers, the essential natural "table of the elements", or "isopolies", as they might be called, which somehow maintain their identity in order to function as the assumedly-finite set of mechanical qualities--might be altogether discrete, and therefore function as and indistinguishably be a linear self-complete lattice of intercellular operations), which would be the fulfillment of the atomistic dream. This is not so. The quantum theory is as much holistic as atomistic since the proximity of other quanta modifies (as required by theory and attested by data) each quantum (a change which is not describable by using just two, or any number of, quanta; at least inasmuch as any use of the two, or any number of, quanta produces a new--undescribed--modification, and so on as an infinite regression), such combinations of quanta are greater than the sum of their parts (e.g., gravitation is nonlinear, if simply because space is cubic whereas gravitational force is quadratic; countless other known and hypothetical, analogous and unanalogous ("catalogous"), examples can easily be provided; in fact, the very idea that nature is either continuous, semicontinuous, or else quasi-continuous proves, upon examination, to be equivalent to the nonadditivity of parts in the formation of wholes!), the combinations constantly change internally with time, this process is nonlinear (and may be arbitrarily complex), all quanta in existence modify all other quanta in existence, existence is thus a great (to be precise: kaleidoscopic!) combination of quanta, the complexity of this great combination is such that existence is (at minimum) groups of groups, the circularity of the fact that that there is no highest group definable (only groupings; i.e., the products of unending process) requires existence to be regarded as limitless in its groups, its groupings, its combinations, its proximities, and its quanta, etc. A simple example is the independence and consequence of relativity for quantum theory.

An ironic and significant agreement is to be noticed between the very etymological meanings of the words holism and atomism. That is, the a-tomicity, or uncuttability and hence ultimacy, of the latter doctrine is required so that the systematic "atoms" can function as miniature wholes, as monads mirroring the rest of the (holistic) universe with the life of the universe occurring by the (unexplained!) organic co-operations of the transcendental system of mirrors, the holistic a-toms having the anti-paradoxical virtue of truncating what would otherwise be a loathsome (to the atomists!) infinitude of particularity and thereby giving the universe a cyclomorphic referential symmetry. In a word, the doctrine of the physical and philosophical atomists is essentially but a disguised holism, and the holistic and atomistic doctrines are unitary rather than dichotomic! For these and other reasons I am convinced that the contrapletal holisticity of physics--the necessity for the ultimate formulation of all physical principles in holistic terms--is inescapable.

It is amazing how simpleminded physicists have been in propounding physical philosophy. I think that in the difficulties of modern physics we are witnessing the consequences of this philosophical inadequacy, since physics--like everything--is concerned with the meaning of things.

12/12/76

A FEW VERY NICE COSMOLOGICAL IDEAS

Pat Gunkel

The missing antimatter part of the universe may literally be the other half of the universe, that (quasi?)hemispheric part of the Riemannian (or even the Riemannian-and-Lobachevskian?!) cosmological hypersphere where velocities of mutual recession are too great relative to the velocity of light to reach us.

Several cases may be set forth for consideration:

No. I: The Purely Non-Tachyonic Case.

Now it may be that this velocity merely is asymptotic to c, the speed of light, from below c, thereby causing the mutual relationships of tardyonic matter (those physical entities which always appear to us to go at something less than c) and luxonic radiation (those physical entities which always appear to us to move at precisely c) to reverse or "turn inside out" (and/or carriers and messages; and notice that wave and particle forms could turn inside out, too, say to such an anti-symptote "c̄" relative to "v", in our "anti-anti-hemicosm" (such as it would be); indeed, this is, I believe, precisely equivalent to time reversal, with anti-emissive absorption of retrotemporal luxonic quanta; thus, for example, Maxwell's missing "advanced potentials" might perhaps merely be (our) tardyons and/or messages, our recognized luxons being the subjective retarded potentials).

No. II: The Genuinely Tachyonic Case.

Or it may, instead, be that this velocity is genuinely tachyonic (perhaps, again, locating the missing advanced potentials suggested by Maxwell's equations), or asymptotic to c from above. The reader should be apprised that the tachyon is a particle the existence of which is tolerated by Einstein's equations, the possibility of whose actual existence has been advanced by some physicists, but whose actual existence might be somewhat disturbing; the present suggestion might make the tachyon not disturbing.

No. III: The First Mixed Case.

Or it may be that cases I and II are complementary and/or equivalent.

I propose that koinomatter (that is, what we think of as normal matter and the opposite of antimatter) may become, or else virtually become, antimatter by their (or luxons!) mutual spherical recession approaching c asymptotically from below, and/or by their mutual antihemispheric recession exceeding c and thus mutually appearing tachyonic.

An extraordinary possibility is that, virtually or really, the antihemisphere (or "antihemicosm") is also cosmologically antiphasal (that is, in cosmotelic as opposed to cosmogonic phase) and contracting during that interval of time, or cosmological hemicycle, that we are expanding--and, again, there are some very beautiful symmetries that can be worked out here. And, once again, such a universe may have Lobachevskian and Riemannian aspects in serial and/or simultaneous combination.

No. IV: The Second Mixed Case--A Decussate Situation.

Or, finally, a possibility related to case II, above, is that (quasi?)anti-hemispheric antiluxons cross over and become our koinotardyons and the (quasi)-antihemispheric tachyons cross over and become our koinoluxons, and, conversely, our (quasi?)hemispheric koinoluxons cross over and become the (quasi)anti-hemispheric antitardyons, and our (quasi)hemispheric koinotardyons cross over and become the (quasi)antihemispheric antiluxons--a process which regrettably suggests cosmic mitosis. It is usually assumed that koinoluxons and antiluxons are identical and unique, but in the current case this need not hold absolutely since a population of luxons could be dichotomized by having interrelationships as carriers and messages, or conceivably luxonic velocities approaching c from both below and above. Mutatis mutandis, the "retarded vs. advanced potential" and "carrier vs. message" descriptions can be applied to, or incorporated in, this fourth variant. Likewise for gravitation and gravitons, etc., etc.

If puncta (extensionless atoms) are substituted for the conventional extended elementary particles imagined to compose the universe (and I have also pointed out that a particles-as-universal-fields description of the universe could be equivalent although seeming antithetical!), then, as I have shown elsewhere, distinctions between gravitational and other forces, and between expansion and contraction, can be eliminated by the things distinguished being made paradoxically equivalent, distance can be reduced to structure, motion can be reduced to information (and structure to information), the puncta to as few as three (i.e., to three mutually undampable cooscillators having a continuous metric), etc. This melds very well with the "carrier vs. message" and other distinctions and proposals above. Thus the universe could necessarily be a rather elegant perpetual motion and work machine, a machine appearing, if necessary, to fluctuate between one or two pairs of enantiomorphic asymptotes.

It will be noted that the above set of ideas potentially give at least all of the following, often long puzzling in their absence, symmetries to cosmology: (1) Antimatter + koinomatter. (2) Retarded + advanced potentials. (3) Tardyons + tachyons. (4) Luxons + tardyons; energy + matter. (5) Expansion + contraction of the universe. (6) Finite expansion + finite contraction (instead of paradoxical infinities). (7) Loss + gain of energy by the universe. (8) Information + entropy made equivalent (and/or carriers + messages). (9) Riemannian + Lobachevskian curvature of the universe. (10) Wave + particle forms.

A NOTE ON THE CONCEPT OF COSMOLOGICAL CELLULAR AUTOMATA

The cosmological cellular automata idea is essentially the proposal that every thing in the world is a growth of information. It is the idea of the infinite incremental addition of things, or of the self-addition of the world.

This concept opposes the statistical-thermodynamics idea of the completely entropy-increasing nature of the degenerating of macroscopic time asymmetries (or time-asymmetric things) into microscopic, wholly time-symmetric things. Perhaps the basic error here is that of the essential "forwardness", and absolute and/or fundamental (primary as opposed to secondary or derivative) nature, of time (a doctrine which I have elsewhere referred to as "prosotemporalism").

In other words, standard physics throws away the essential fact in physical existence: that things are created or accomplished, things occur, and they are enjoyed.

All fluctuations at points in space are morphogenetic because all the facts about them are competing. (There are no static facts.)

Why is the above "cellular automata" idea necessary? It is such because any of the world's physical entities, including the smallest, are locally and universally competing to modify all other physical entities. By way of example, the molecues of a liquid which is supposed to be in a state of thermodynamic equilibrium are, in fact, inevitably competing to replace each other in space. The actually fully time-asymmetric nature of this process is indicated by the random-walk patterns which the molecues describe over time, which are infinite in time, especially since a molecue's historical random walk has any pattern only by reference to neighboring molecues (themselves prosecuting such walks), and has the greatest possible (specificity and complexity of) pattern only by reference to the greatest possible set of other cosmic molecues, their patterns, and their walks (all such references are real only insofar as they are found within such walks, patterns, molecues, or the like; hence the instantaneous and minimal-locational definiteness (or self-probability) of information (or probability of self-probability!) is infinitesimal (or zero) and is only infinite (and/or truly finite, truly absolute, truly final, truly complete, and/or the like) at or toward or for eternity, the holocosm, infinity, "God", and/or the like.

The very fact that the thermodynamical universe ever in its life is supposed to reorganize macroscopically (acquire macroscopic energy, order, etc.) tells us that all such microscopic molecular interactions are anamorphically nonadditive (and represent multiplications of information, and represent cellular automata) since otherwise local molecular events would be nothing (represent nothing) for the rest of the universe, and such turbulence on a cosmological scale could never come about.

Also, quantum mechanics tells us that there must inescapably be synchronic processes on the microscopical scale, and it is logically obvious that such synchronic processes, which are groupings of severalities of molecues, if they exist at all, will compete to exist on all scales in nature, and to regulate the whole universe. That is, such processes are in their essential nature groupings of groupings, or, over infinite time (and no cosmologist today can bound the past with necessity), an infinite hierarchy or system of such co-groupings. Thus information (or being itself) is co-definite.

Thus I was looking at the network-theoretic development of a system of caves in karstic hillside in my mind, when I had the train of thought: [1]there is a filling of space (the hillside), [2]hillside and aquifer are coextensive, [3]any developing cave or cave system as a drainage network (the function of speleogenesis being drainage) will attempt within limits to fill the hillside space by growing, [4]a set of parallel interbranching networks, with and without anastomoses, will develop progressively, [5]very delicate synchronic and asynchronic adjustments will occur in the degree, kind, design, etc. of growings, including dynamic equilibria, transformations, and overall systemic evolutions, [6]such a speleogenetical hillside

is visibly a field of parallelistic cellular automata, [7]such a geophysical democracy of parallelistic cellular automata will be exquisitely morphogenetic (as opposed to being merely thermodynamically degenerative over the long term) because of its everywhere-competitive nature.

So take the number of networks (developable networks) in a bounded space to the maximal limit. You will be left with, or almost (asymptotically) with, points, or, in the real world, things like atoms. These, then, are the cellular automata existing at the limit of the analysis of physical nature. Thus the interactions of molecues must be conceived as branching histories: [1]the infinitely-open "random" walks of the molecues, and [2]the Everett-like infinitely arborescent wave of "negative chains of consequences" produced by the orderly network of "vergent" random walks of the totality of molecues or of holocosmic "Borelian" influences. (For the definition of these terms see the glossary aback The Efflorescent World View. "Everett" refers to what has become known as Hugh V. Everett III's many-worlds interpretation of quantum mechanics.)

Of course, thermodynamical, entropic, and probabilistic laws may simply compose the process of assimilating novelty and actuality by which nature effects the concrescence of things and thereby produces the endless upward evolution, the infinite synthetic becoming, of the world, the all-creative "vergence" by which all things know themselves by knowing all other things in mutual sacrifice, and because of which the world is infinite in its process.

12/1/76

AN ERROR AND ITS IMPORTANCE

Pat Gunkel

An article titled "Galileo's Theory of Indivisibles: Revolution or Compromise?" by A. Mark Smith (Journal of the History of Ideas, Volume XXXVII, Oct-Dec 1976, No. 4, pp 571-588) begins:

> E. A. Burtt would have us believe that Galileo stripped matter of all but "being" and "being in motion," thus banishing man from a determinist Democritean world into a sensory limbo of secondary qualities.[1] Because Galileo's commitment to atomism led him to view Nature as a purely kinetic reality comprehensible in mathematical terms alone,[2] he made of the world a "vast, self-contained, mathematical machine."[3] So "at the price of a sort of denaturing of nature,"[4] he supposedly destroyed the Aristotelian plenum, denying metaphysics its traditional wealth of qualities and relationships.

When I read this I immediately realized that it was in error for a reason which is at once simple and remarkable.

Imagine Galileo's attributed mechanomorphic universe existing and operating. Then, as discussed under the Principle of Open Time in my The Efflorescent World View, consider how such a universe must appear as one samples its motions over progressively larger units of time--in effect, via progressively accelerated time-lapse cinematography. Obviously the universal vibrations, rotations, and translations will appear to quicken, increase, complicate, and so forth. But what will happen in particular is that Galileo's rigidly interacting and presumably identical corpuscles will acquire a progressive complexity of collective systems of motions which will successively and simultaneously undergo every possible dynamic and static combination and transformation. That is, the transcorrelation of all the Galilean corpuscles will grow with time, and greater units of time, in such a way that all possible qualities and relationships--that infinity which Smith refers to as the Aristotelian plenum --will be originated and virtually incorporated by an all-transcendent flux. That is, all possible appearances of things will be generated willy-nilly.

Yet throughout this process a hypothetical objective observer would see nothing but the eternal colliding of a bunch of rigid balls, or at least this would be what he would see if he glanced instantaneously at the universe without any preconceptions (actually such an observer without preconceptions is impossible; nevertheless, the types of order assumed at any point by the Galilean universe could be so complex, yet at once specific, that the intervenient observer would see nothing but seeming chaos; I would go further and suggest that the equivalence of space and time would manifest itself in this instance by a requirement that the "rate" and "corpuscular population or population of distinguished physical events" be meaningless apart from their union, and be an epiphenomenal expression of the transcorrelational history of the imagined Galilean universe; subsequently, the past duration and present extension of such a universe--regardless of when it supposedly began and of how large it supposedly was when it began--would have to be virtually infinite, and so virtually as to have to be regarded as being absolutely such).

There is a troublesome theorem of Poincare's which requires that any specific configuration of a thermodynamic universe such as ours must over arbitrarily great time be once again approximated with arbitrarily great accuracy. It follows that any energetic or ordered state of such a universe must be periodically restored. Assume that such a universe is observationally accelerated in the way I suggested above. The paradoxical result of this would

then be that the universe would appear to oscillate more and more rapidly between its states of (undefined!) minimal and maximal energy or order, and before long we slow-eyed observers would be confronting a universe wherein the distinctions between energy and entropy, order and entropy, disequilibrium and equilibrium, construction and destruction, continuity and discreteness, matter and information, and so forth would be blurred, hopelessly lost, and completely transcended--superseded by something entirely different but which we find difficult, if not impossible, to comprehend (particularly since there would actually follow an infinite succession of mutually transcendent "somethings"--and we finite minds are certainly not up to comprehending such an infinite hierarchy of all-transcendent ever-greater ontological categories!). This infinite hierarchy of superimposable concepts implies that our simplistic appreciation of the things which we call energy, entropy, order, matter, space, time, information, etc. must be infinitely presumptuous, crude, and mistaken. We must surely reconceive such concepts, especially if we would employ them to quantify, limit, and otherwise describe our physical reality!

The importance of the error of Burtt and Galileo is that the sum and density of physical information, the local and overall interrelatedness of the universe, the qualitative richness of reality, the ontological complexity of nature, and so forth are not definable by the act of glancing at some supposedly elementary system in nature or the mind. Whether finite or infinite, they inhere in the progressive or historical combinatorial interweavings of the quasi-elementary entities; and it is entirely possible that our ideas about such elementary entities are themselves fallacious, in that no such discretes, integers, pure qualities, finites, absolute forms, pure ideas, etc. may be creatable or discoverable in nature, and even the mental entertainment of such possibilities may be erroneous and corrupt our thought. In other words, to have resort to apothegm, nature without insight is barren; nature with understanding is infinite.

Finally, notice how the process of the transcombination of the motions of the corpuscles of the Galilean universe, and its equivalents, is such that the qualitative richness of the past is carried along into the future in an unending advancement of the depth of meaning of successive occurrences; that is, qualitative novelty occurs by the preservation of the qualitative entirety of the past. Thus such a universe must always grow.

What would such a Burttian-Galilean universe look like if sampled over infinite or arbitrarily great units of time (in infinite apparent acceleration)? It would appear essentially no different than in the beginning! And yet, at that point or for that acceleration, information and meaning would have to be represented in all the local interactions--a product of the infinite combinatorial history of the, themselves completely dull, particles! Thus the meaning of physical events in the external world is immeasurable. It is totally diachronic--and, recalling the above discussion of Poincare's recurrence theorem and its greater implications, there are paradoxical respects in which such meaning is not only accumulative but infinitely accumulative, so that the universe may be compared with an ontogenetic spinning wheel which adds to the apparent texture or complexity of things without end as existence cascades into infinity--a vergent transformational contexture which is inevitably productive, among other things, of hallucinated homoeomerous particles existing in astronomic quantities, of hallucinated cosmological voids, of hallucinated eternal constants, and of hallucinated worlds without end.

Such experiential meaning is no more apprehensible directly than is, say, the melody of a musical composition--the meaning and melody of things are creatures of time, and must be discovered in their element.

Thus if the universe is a machine, it is a machine essentially without parts.

Owing to the infinite distributedness of information (and hence its virtually infinite variety and spatiotemporal density) which exists in all combinatorial interactions, the world is a myriorama (as this is defined in The Efflorescent

World View in terms of its Myrioramic Principle), and the mind can choose among an infinity of virtually equivalent combinations and be in this coinfinitely selective way creative.

There is something else of importance to notice in connexion with Poincare's theorem and my acceleratory apparent reductiones ad absurdum. It is, that as the penultimately-accelerated Poincarean universe oscillates (nonsinuosoidally!) at such a fantastic frequency between its contrary (anthropomorphically-defined) phases of minimal and maximal energy, entropy, order, equilibrium, etc., the oscillation will not be wholly time-symmetric beyond each and every individual cosmological cycle. Instead, some persistent, growing, nucleative (solipsistic), inextinguishable, and evidently eternal trace of historical order, or universal memory, will evidently transmit itself to the future beyond each and every finitely-symmetric cycle. Likewise, although it sounds paradoxical, some seed of evolutionary chaos will also transmit itself to the future. There is an important sense in which the elements of the present, or of any cosmological present, must refer to, and even represent the manifestation of, eternity, or some transcendental world of pure ideas (one is reminded of Alfred North Whitehead's Process and Reality and its description of existence in terms of the concepts of concrescence, ingression, eternal objects, and actual entities).

Does the persistent historical trace embody a fractional or a complete memory of the antecedent states of the universe? Light is thrown on this matter by the Principle of Cumulative Complexity of The Efflorescent World View, which asserts that order and disorder (symmetry and asymmetry, etc.) simultaneously and always increase, and by the Principle of Eternal Vergence, which says that it is the essence of all things that they simultaneously, eternally, and infinitely converge and diverge, and hence represent "vergences". Actually it is possible that we wholly misperceive the temporal process, and that it is the apparent process of temporal progression which generates the illusion of the past--in other words, the combinatorial (perhaps basically time-symmetric) interactions of the corpuscles of the Burttian-Galilean universe may simultaneously originate the perspectives of the past and of the future of the universe. Reexpressed, it may be as true as it is false to say that the world is developing backward in time, and that the world has its roots in the standard future and its branches in the standard past.

In another suggestive way, the meaning of the world might be said to represent the fifth dimension of a five-dimensional manifold of space-time-being. These suggestions may be metamorphically true, equivalently true, heuristically valid, partially true, or just invalid. The real problem may well be the infantility of man's encyclopedia of ontological concepts at this stage in the evolution of thought; that proud encyclopedia may vanish against the backdrop of the actual categoreal complexity of the completely transhuman universe!

Peano curves, Helge von Koch curves, and statistically self-similar curves are remarkable mathematical taxa. For example, a Peano curve can pass through every point on a square and its boundary; objects of any dimension can be constructed using curves or curved surfaces of any dimension, it is possible to construct a snowflake with but a fraction of the normal area of such an object, a snowflake can have an infinitely long perimeter, indeed the distance between any arbitrary pair of points on such a perimeter can be infinite, the area of certain objects can be undecidable as to two different values, and the entire universe could be constructed from--it might even be equivalent to--a one-dimensional curve; any number of regions or geometric elements can be distorted so as to exist virtually simultaneously at any or all points; such curves can construct objects whose dimensionality is fractional or "fractal"; such curves can be everywhere nondifferentiable; infinite-order Helge von Koch-curve snowflakes can be constructed the structure of which recurs infinitely-many times at infinitely-many microscopic (and macroscopic!) scales; closed (Sierpinskian) Peano curves are constructible for which the distinction between inside and outside is abolished (thus the whole universe could consist of an infinity of insides and outsides at every point!); etc.!

Regarding such snowflake curves as just discussed, the ultraconservative physicist Philip Morrison has said, "Of course we have no physical snowflake curves. Nature gives no infinities, not even within molecular dimensions. There is a cutoff at the angstrom level." It is a pretty good rule that when Morrison makes an absolutely negative statement of that kind he is probably wrong!

Thus for the moment the question of the existence of regularly or statistically self-similar curves in spatial forms may be set to the side, and the possibility of regularly or statistically self-similar temporal, spatiotemporal, informational, etc. curves may be considered. I doubt that in this case Philip Morrison could afford to be so bumptious.

In this way, notice the very beautiful possibility of applying the mathematical concepts of such curves, and the attendant notion of fractal dimensionalities, to the Poincarean-Burttian-Galilean ultra-accelerated universe of thermodynamic fluctuations discussed earlier. The self-similarity could be represented, in such a universe, as the eternal accumulation over time of all generating and forever superimposing informational patterns in the production of a virtually fifth-dimensional hierarchy of self-similar differentiations continuously samplable over the accumulative future of the Poincarean-Burttian-Galilean universe. Which is to say, the self-similarities could be differentiated into infinite self-dissimilarities (or catalogous curves), and the like!

It might be wondered at this point whether possibilities associated with concepts of infinitesimal-dimensional, or infinite-dimensional, time should be considered?

To continue, the point is that the total history of the universe could asymptotically approach infinite (instantaneous) availability, infinite efficiency, infinite self-analysis, infinitely-varied infinitely-reduplicated representation, infinite correspondence with noninformation and anti-information (energy, order, entropy, etc. could all approach infinite mutual correspondence), etc.

An oblique and ill-expressed speculation may be mentioned, Is the universe a computer of Alef-10^{77-80}-dimensional information (that is, is one infinite, or one Alef, informational dimension contributed by each particle in a 10^{77-80}-body system), or the like?

Another speculation, Is the task of science to prove, or to show how, the universe is semi-infinite (e.g., that it everywhere has the "same" beginning but no same, or other, endings)? Thus the universe might begin with, or reduce to, an infinite or finite set of distinct or co-derivable finites, or an ultimate simplicity.

Of particular interest is the fact that the Brownian motion of suspended particles approximates a statistically self-similar curve that (at the limit) has infinite length and no tangents! To the objection that this is not really true, because of quantal cutoffs in divisibility, it may first of all be replied that the theory of probability in its current form or degree of development is a continuous theory of inter-intercorrelations (correlations of correlations)! What may await probability theorists is an infinite hierarchy of discrete-continuous regressions! The statement that the interrelations of the world are probabilistic is not a requirement of the finite complexity of such interrelations. It is not even a fundamentally simplifying statement. It is a quasi-fundamentally simplifying statement. But this is something quite different.

An objection to the implications drawn above from Poincare's Recurrence Theorem is that such a theorem might be wrong. For example, it might be wrong owing to the partial, dominant, or complete occurrence of eternally divergent (or "hyperbolic") combinations, so to say; and/or convergences to absolute equilibria, or entropic or random chaos. An immediate rejoinder to the former possibility is that such an objection must show that the form of the divergence is not itself an inverted vehicle of information of an equivalent kind. Thus when Confucius was asked what he would do if he were a woman and were raped he replied that he would sit back and enjoy it.

12/10/76

THE EPHEMERAL NATURE OF REALITY

Pat Gunkel

Students of my book, The Efflorescent World View, will recall its fourteenth principle, the Rheostatic Principle. This asserts that the universe is fully described only by a complementary combination of a Heraclitean principle of the total fluidity of nature and a Parmenidean principle of the total invariance of nature.

The habits of the orthodox (and who is not orthodox in a world bound by a single universal language as the penalty for being understood and being human?) are unavoidably outraged by either of these contrapletal principles. This present article is essentially limited in its concern to the Heraclitean contraplete, which requires that the world is infinite in its change.

Therefore the orthodox points to what he feels to be the contradictory elements of permanence and inertia in what he sees as commonsensical and inescapable reality--to physical laws, fundamental physical constants, physical quanta, space-time (if not space and time apart!), mathematical elements and axioms, the changelessness of the physical past, essential invariances in scientific progress, and the like (or to what is viewed as the potentially paradoxic fact of the very continuity of change). Such things are regarded as stubborn matters of fact, the basis for the natural demarcation between the surd and the absurd.

Two beginning ways in which reality must be regarded as totally fluid may be indicated immediately: [1]as a consequence of Heisenberg's Uncertainty Principle, and [2]as a corollary of any supposed or proven falsification of Poincare's Recurrence Theorem.

(1) The possible Heraclitean corollary of any falsification of Poincare's Recurrence Theorem: In brief, this theorem states that any particular configuration, state, or set of such configurations or states in which any real physical kinematic system may lie will, with arbitrarily great approximation, recur once and infinitely many times over a sufficiently great period of time. By way of example, the current degree and kind of energy, order, disequilibrium, etc. which the known universe appears to possess will recur with arbitrarily great approximation once and infinitely many times over infinite future time. This theorem may be false. Some feel that it has been "proven" to be false by modern physics.

Thus the set of configurations, states, relationships, etc. of the universe may forever diverge--even divergingly diverge--over finite or infinite future time. In a sense, our universe may progressively transform into a very "anti-universe"--an eversion of reality as we know it.

Yet this would presumably have as its extraordinary consequence the falsification of all limits to change and the verification of the Heraclitean principle! Without recurrence, or approximate recurrence, the changingness of reality must be total. The Efflorescent World View, in its peculiar contrapletal embrace of a Heraclitean principle, asserts that reality has such form as it seems to as a consequence of the patterned way in which it undergoes change which is infinitely complex. It says that the foundations of science will prove to have only the order of transformation --sequential, but no static, order.

The demonstration of nonrecurrence requires the introduction of recurrence, but on a higher level of description. This is experimentally important because whenever we would endeavor to evict recurrence from our description of the world we will be compelled to employ such theory and data as attest to recurrence as the conditions of nonrecurrence. And vice versa--evidently total recurrence and nonrecurrence are complementary aspects of reality!

(2) The possible Heraclitean consequences of Heisenberg's Uncertainty Principle: As is typically the case with the fundamental principles which physicists embrace, the full and greatest consequences of the Uncertainty Principle have never been thought out. For example, imagine that the present world determines for some reason that it has to send a message (a time capsule) to the ultimate future--finitely or infinitely many eons hence. Candidate messages might be statements to the effect that 1 + 1 = 2, the fundamental constants of nature have such-and-such values (to a certain number of places), John Wilkes Booth assassinated Abraham Lincoln, the Present Moment greets Eternity, the contents of the Encyclopaedia Britannica are as follows, or the like. Or the attempt might be made to transmit a physical object like an atom, a rock, or a man in suspended animation. The pity of all this is that the current laws and assumptions of physics make it seem as though such messages would not traverse the endless eons without the inevitable degradation of their information; indeed, after sufficiently great time any message we can imagine would be so negligible in its information relative to the noisiness of the universe and time that the existence and nonexistence of any such message would be indistinguishable possibilities--the message would have vanished!

The importance of all this is incalculable. There is no need for the Present Moment to determine to select and send a time capsule to Eternity. The entire universe is doing this all the time. It is trying to send all and any things to the end of time. Thus it is trying to send the kit of things which scientists see as physical reality--absolute, invariant, universal, irreducible, finite, etc. laws, constants, quanta, transformation groups, etc.--to a sort of ultima thule.

Yet we see that modern physics requires that over finitely many eons this great time capsule of the entire universe, including all current physics, will vanish completely in the noise of Heraclitean reality.

For example, the current laws of thermodynamics are very satisfactorily suicidal. They require that the total physical information of the universe must continually diminish with the inexorable passage of time, and, in finite or infinite time, either become zero or virtually zero. Reality will therefore culminate as a tabula rasa.

And/or these thermodynamic laws require that such order and energy as exist in and as reality will undergo an analogous self-immolation.

Actually the cosmic Thanatos is much more rigorous than that.

The Uncertainty Principle, for example, would seem to require that all existing physical entities must generally, progressively, and infinitely disperse as a consequence of each and every physical event. In effect, everything in physical reality is a measuring process, physical phenomena and objects of any scale essentially reduce to concatenations of discrete measurements and re-measurements (and virtually to infinite mensurational regressions), accuracy must diminish with each measurement, the totality of perceived and scientifically formulated physical reality must everywhere in its parts and aspects be only finitely true, the real world must therefore be at a certain resolution a dynamic network of finitely self-probable interrelationships, the seeming facts and contrasts of that which we conceive of as absolute and eternal physical reality must fundamentally be nothing more than cellular and ephemeral anastomoses of an ultimately infinite complexity and infinitesimal specificity which at the limit emanate from and rejoin an epistemologic and ontologic continuum, etc.

The "graininess" which the Uncertainty Principle would seem to impose upon physical reality would seem to require that the self-consistency of all things, and ideas about those things, be finite. For example, by fusing subjective and objective truth, and requiring the total fluidity and relativity of all mental ideas, it would seem to require the virtual total fluidity and relativity of all physical facts and scientific formulations--even apart from such intrinsic fluidizations and relativizations of the latter as it would seem to require.

11/13/76

THE UNCERTAINTY PRINCIPLE AND THE UNIVERSE

Pat Gunkel

The Uncertainty Principle requires and explains the expansion and decay of everything, it probably requires the parabolic closure of space-time, it necessitates the coderivation of the entire universe, it explains the relationship between waves and particles, it is coessential with General Relativity, and so forth. The Uncertainty Principle, if anything is, is the key to the universe.

The Uncertainty Principle essentially says that all physical phenomena are essentially measurements of measurements. Everything in the universe is a measuring process. All measurements are finitely accurate. As the number of measurements becomes infinite in time, space, or space-time, the related accuracy of the measurement becomes zero and the ambiguity, indistinguishability, or similarity of things becomes infinite (everything converges into everything else in an infinite-dimensional specifity or simplicity).

All physical magnitudes upon analysis will prove to decompose into finitely many integral measurements. Measurements are the atoms or quanta of the world. Because accuracy and specificity decreases in all strings of measurements, and because the whole of space-time proves to decompose into atomic measurements which are also atomic uncertainties and this requires that all objects and events are cellular collections of measurements which are only finitely distinguishable from each other, it is required that reality is absolutely scale-dependent. This means that space, time, space-time, and the total fabric of things is necessarily inhomogeneous. Therefore the nature of things must change virtually continuously--and yet to limits--over time (equally as to age and brevity), over space (equally as to magnitude and parvitude), with respect to the maniness of things (their relative populousness in any existential society), with respect to complexity, and in infinitely many other ways of measurement.

One corollary of these axioms would seem to be that light will decay with time (although perhaps unequally as to its frequency and intensity). Thus it is possible that cosmic redshifts are not due at all, or due only, to the recession of distant galaxies and the expansion of the universe. Yet, at the same time, these axioms require that the universe as a whole must expand and attenuate with time. Indeed, since all which exists is measurement of measurement, and represents a process of the nature of a description whose accuracy forever diminishes and yet whose complexity foreover increases, it follows that the changes of things with scale must be nonlinear. Indeed, such change must be infinitely nonlinear, in the special sense of being ineffably complex. The world changes even in its changes. The Heraclitean flux is such that one may never step into the same waters of the river of existence, the river stepped into twice is never the same river, the stepper is never the same stepper, the second action cannot be that of stepping, and so on ad infinitum.

It would, furthermore, seem to follow from these axioms that distant and ancient physical phenomena--such as the quasars--must become enlarged in proportion to their distance and age. Therefore at a limit distance the universe must converge to a point and appear as a homogeneous equidistant inner spherical surface.

I am momentarily inclined to favor the idea, in terms of these axiomatic interpretations of the Uncertainty Principle, that the deceleration parameter of the cosmological expansion is such that the universe is spatiotemporally parabolic. This supplementary idea may be developed and defended at another time, and is not a necessary consequence of the axioms here being presented to the best of my knowledge.

That all these things should be so is not really surprising. It is assumed by modern physics that all data, sensa, laws, ideas, and phenomena have only a fractional probability of being what they seem and that none are certain. This requires that the truth, insofar as it is anything, is infinitely complex and must be in any instance infinitesimal.

The cellular nature which the Uncertainty Principle is here considered to impose upon the world of all things, and because of which all quantitative and qualitative distinctions must be considered as multiples of monadological cells, has as one of its corollaries that all energies, masses, velocities, etc. must be finite in magnitude and finite in parvitude, and heterogeneous over their scales. Their haecceity must be finitely small, a consequence of which is the Quantum Principle, and finitely large, a consequence of which is the Principle of Relativity; the specificity and generalness of all things must be finite.

Again, nature is only describable as an infinite chain of multiplicative improbabilities. A consequence of this interdependent definiteness of things is that all things are graded into one another as an infinite manifold of finite transformations.

The fact that all reality is a process of measurement requires that all things which exist are alive and changing. It requires that all things are finite (and are infinitely complex) in their self-consistency. All things are reflexive, continuously self-modifying, and evolutionary. Nothing is absolutely self-identical and no two things are absolutely identical or ever the same. No particles, waves, quanta, laws, ideas, or appearances are absolutely self-identical or mutually identical. All things are virtual.

A corollary of these things is that the informational density of nature is infinite.

The fact that any real physical entity, any process of observation, any real physical observer, and any interaction between any two things must decompose upon analysis into cellular measurements of an infinite dimensionality evidently requires that the world virtually consists of one perpetually self-modifying and self-creating entity--which might very well be called God. All things must only exist in an interdescriptive way. No thing which really exists is absolutely isolated or isolable from all other things. All things are necessary to the description and existence of all other things. All things which exist must be emitting and absorbing physical quanta with all other things; all things are modifying all other things in an infinitely reciprocal way.

All these things are consequences of the Uncertainty Principle being the one common denominator of the physical universe. Ultimately physics will be driven into exploring the realm of pure ideas as something indistinguishable from what was previously considered to be the separate physical world.

The apparent homogeneity of the world is merely a first approximation. Yet even today's physicists acknowledge that the world is heterogeneous in its structure and properties insofar as nonfinite quantities of space, time, mass, energy, information, physical law, calculation, formalization, intuition, experience, theorization, probability, description, regulation, etc. are concerned.

The Uncertainty Principle does not say that the future of science and reality will be convergent. Nor does the Uncertainty Principle assert that the future of science and reality will be divergent. What the Uncertainty Principle does imply is that the future of science and reality will be infinitely vergent (where vergence is defined as "simultaneous convergence and divergence").

Caveat emptor: The Uncertainty Principle says that the universe permits itself to be seen from an infinity of perspectives, and the principle would seem to have as its most paradoxical and mischievous consequence that it is absolutely neutral as to its own truth or falsehood!

The Uncertainty Principle may imply that a cluster of (e.g., 3, 10^{79}, or 10^{89}) particles kept compressed in an imaginary absolutely inexpandible cell (that is, in a tiny finite region of physical space as their "initial" universe) would over time separate stochastically in a virtual metrical space, qua an expanding universe. (N. It is here required that theoretically postulable absolutely stationary states have no reality.) Indeed, the fact that the velocity of the separations, or of the expansion, might likewise be subject to the Uncertainty Principle (which for the moment might be called the Principle of Universal Intermeasurement) could allow or might require the rate of expansion to celerate (again in keeping with contemporary astronomical observations). The question as to the "absolute" rate of this involutional or introversive universe or cosmogony is irrelevant since time is presumably available, and the prior "ultracosmological" need is to to devise any basis whatever for certain cosmological transformations using contemporary data and/or ideas--a need met by the present suggestion.

(As to two terms just used, "celerate" means "accelerate and/or decelerate", and "ultracosmological" means "having to do with ultracosmology", where by "ultracosmology" is meant "that science which seeks to comprehend the nature of all possible universes through generalization of our specific universe, to cast new light on ordinary cosmology as a result of such overarching speculations, and to estimate, describe, and understand the absolutely complete nature of our universe by investigating the possible importance of initial conditions, physical information, ultimate developments in mathematics, an Anthropic Principle, an Automorphic Principle, an infinite universe, an exterior or immanent infinite-dimensional superspace, open or closed past or future time, an infinite-valued logic, the complete integration of all physical laws and principles and entities, the union of physics with mathematics, the union of cosmology with noology and ontology, and the like".)

We see here how the Uncertainty Principle would seem to demand that physical reality must reduce analytically to a quadratically (two-dimensionally: uncertainty x uncertainty: eka-uncertainty) and cubically (three-dimensionally: uncertainty x uncertainty $\overline{=}$ "certainty": dvi-uncertainty) intracellulating ("imploding or collapsing") or, equivalently, extracellulating ("exploding") cosmos. If the cosmos should be indicated by observation to be hyperbolic, such hyperbolicity may simply pertain to yet another orthogonal realm of consequences of the Uncertainty Principle--a quartically (four-dimensionally: uncertainty exp. 4) cellulating and "ploding" (actually explodingly exploding) cosmos. Actually such cellulation representing the self-intersective consequences or ramifications of the supremely important Uncertainty Principle may be infinite-dimensional, in which case the universe might consist of an infinite series of dimensions, curvatures, subtler causal phenomena, etc.

(As to the terms just used, the literal rendering of "eka-uncertainty" is "second uncertainty" and "dvi-uncertainty" means "third uncertainty", by "cellulation" is intended "the formation of cells", where "intracellulation" refers to "the hierarchical formation of n levels of subcells" and "extracellulation" to "the equivalent hierarchical formation of n levels of supercells", and, finally, the word "ploding" simply means "exploding and/or imploding".)

To the extent that the Uncertainty Principle is reflexive, it might require a single particle (in terms of the virtual or real self-vibrational, self-rotational, self-translational, and/or cetera self-effects of that particle) to be cosmopoietic, meaning such as to give rise over time to a whole, arbitrarily great universe of "image particles", "echoic" phenomena, hierarchical spaces, and/or cetera. Moreover, it may be that our universe is indistinguishable from, and thus scientifically reducible to, the evolutionary product (the self-appearance) of such a single self-interfering "particle" (perhaps properly called the "monon").

Postscripta

Where would the information of a particle (e.g. a photon with its de Broglie wavelength or a proton with its Compton wavelength) with a wavelength approximating or exceeding the radius, diameter, or circumference of the universe be located? "When" (e.g. ≷"20" gigennia ago or ≷"60" gigennia hence), "where", and "why" would and might such a particle be emitted, transmitted, and absorbed? What would such a "particle" be like (why would it be a particle?)? What about the case of an infinite-wavelength (infinitesimal-frequency) particle? A cute surmise is that particles having wavelengths equal (or super/subharmonic) to the radius, diameter, and/or circumference of the universe (in any of various cosmologies) are, ipso facto, the basis and explanation of known discrete quanta; perhaps the universe is thus lyriform, many or all of its elementary particles representing unitary cyclotemporal strings (spanning 20, 60, or 80 gigennia) which are embellished with sets of quantum numbers and/or other physical relationships and transformations representing the vibrations, harmonics, and/or other tonal relationships of such timeless corpuscular strings.

Is not the fundamental natural vacuum assumed to be immortal (infinitely old and yet infinitely young and absolutely imperishable)? Given the conventional axiom of spatiotemporal equivalence, must not an infinite age have as a corollary the vacuum's possession of an infinite spatial density (infinite self-organization or spectral complexity), in turn requiring, through a principle of equivalence (e.g., structural equivalence), the infinite spatial extension (or spatial unboundedness) of the plenum-like vacuum? The self-correlations of the vacuum seemingly require that the vacuum also be spatially and temporally "continuous". Yet this continuum must be transcended by a higher novelty! The physical noninstantaneity of the vacuum, manifest as its infinite spectral diversity (imperfect harmony), would seem to impose upon the vacuum a perpetually creative present. The fundamental nature of this present would appear to perforce be that of a single spatiotemporally dimensionless point (a chronon, onton, or monon), a monadic or autotheistic being. Since the vacuum, even as just described, must presumably underlie our present world or reality, our world or reality must presumably conform to, and reproduce, the indicated (albeit only finitely comprehensible) properties of the vacuum in a level-less quintessential way.

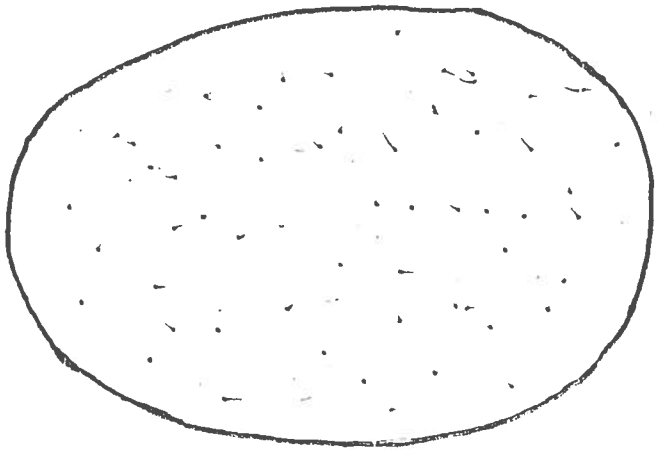
N. John Wheeler has since told me that the vacuum is expected to vanish completely during the gravitational collapse of the universe, and hence to be finite in past time and, on the assumption of the eventual recollapse of the universe, finite in future time. This spurs questions as to the comparative complexity of a mere universe vis-a-vis the complexity of Wheeler's superspace, and as to the very basis of such a comparison. I, at least, find it hard to imagine how the information of one universe would really be lost during the reentrance of the universe into hypothetical superspace (I can postulate and fancy such loss, but I cannot believe in it). Also, I happen to believe that it is quite likely that the quantity of information in our universe is not finite but infinite or superinfinite, and I do not know what Wheeler's Lethean or "empiriocidal" recollapse would do to such special quantities of information. There is a temptation to postulate an Omnimorphotic Principle, which would require that the universe, qua universe, must necessarily fulfill in its finite or infinite lifetime absolutely everything which is possible and hence realize through continuous transformations every possible form. Wheeler's perfectly noisy collapses might violate such a synechistic and probably irreversible principle.

(As to the terms used above, "cyclotemporal" means "having to do with time which is circular or closed", a "chronon" is "a spatiotemporally unextended and property-less particle or 'atom' of which the whole order of nature might hypothetically be composed", an "onton" is "a particle of universal being" of a similar nature, and a "monon" is "an absolutely unique particle which might by itself constitute the whole universe on the basis of its self-effects", and, finally, "empiriocidal" means "destroying facts or experience, e.g. entropically".)

WHAT NEED A WORLD BE?

Pat Gunkel

I think it to be of interest that what we call the "world" could be something completely random, chaotic, --anything, and yet a mind could discover (at once really and virtually--for the cases are indistinguishable) anything in that environment, e.g. because its actions, thoughts, etc. would be self-modifying, or e.g. the movements across a flat grid could be progressive because of the identity of backward and all other self-relative and self-ordered motions, and because of the total relativity of any observer. Experience would be vergent (i.e., simultaneously and coessentially convergent and divergent), for combinatorial reasons, and the being's reality would always grow and evolve.



The above represents a pen of dots in which a "mind" (the self) could be kept and in which the perpetual self-modification of the mind produced by its random but not self-random experience would cause the mind to see everything eventually (or postulably) grow into existence--an infinite amount of order to be perceived in the actually "perfectly patternless" pen of random dots (or whatever).

The foregoing illustrates the intrinsic infinity (self-infinity) and self-derivation of existence, or the non-finitude and the artificiality of the external world. It is a little like that optical illusion where a dense field of randomly positioned dots is organized into illusory but kaleidoscopic shapes by the observing brain, and like the psychedelic hallucination which results from complete sensory deprivation. Furthermore, it illustrates the infinite relativity, infinite fluidity, infinite instability (the poetry), infinite holism (the monadology), etc. of the "world".

The interest of all this lies, above all, in the fact that the universe reduces to nothing but "dots" on its large and small scale--to clusters of galaxies confusable with galaxies, to galaxies confusable with stars, to constellations; and to atoms which microphysically resolve into systems of hierarchical points in virtual clouds. Moreover, if the universe be conceived as a random distribution of points of zero dimension, then what is "size", what is "distance", what is "containment"? Apparently, miraculously, a universe composed of mathematical points would acquire a dimensionality (e.g. 3-4 in place of 0) only insofar as its points were at least infinitesimally nonequidistant.

The infinitesimal point-dislocations of such a universe (which would necessarily embody pattern everywhere or monadologically) could originate infinite or all possible complexity of pattern. In a sense what one sees in this is the topological omneity, or omnipotentiality, of the continuum. Also the interconversion of the vacuum and the ontological plenum, and the meeting of opposites at the heart of nature, and the interconversion or converseness of topology and metrology (geometry), and the interconversion of maximally fast radiations (luxons) with maximally slow material particles (tardyons) (the circular equivalence of velocity 0 and velocity c), and the inevitable microscopic and cosmological closure of space-time (and of its further but hidden microscopic and cosmological extension, or "openness"--the requirement that nature comprise an infinity of "telescoped", or nested, but separable horizons, and constitute, thus, an infinite ladder), etc. Likewise the absolutely stoichiometric character of the universe (increase of entropy causing increase of energy or negentropy, and vice versa--all this within the internally and externally absolutely dimensionless points), and the (at last comprehensible) "equivalence" of mass and energy, etc.

In other words, diminutive perturbations in the asymptotic approach of the points to absolute equidistance would give rise to the same illusion of solidity as is produced in series of fence posts when one travels down the posts on an adjacent road. The world we seem to see about us may be an illusion produced by a perspective; point sets wherein each point is a set, or lies both inside and outside all possible sets as an infinite-valued logic.

We see how if the macrocosm (indicated, above, to be a set of points) "expanded" ad infinitum its infinite (yet finite) expansion would inevitably cause its apparent but coessential infinite and finite recontraction, since two such states are equivalent (topologically, metrologically, chronologically, and in every other possible way). All this reminds us of the finite-and-infinite nature of a circle, and of a finite-but-unbounded, or closed, universe. We also see how absolute thermodynamic equilibrium (of the universe or of any "part" of it) is symmetric to and indistinguishable from its supposed opposite--absolute thermodynamic disequilibrium (of same).

Notice that in a world consisting purely of zero-dimensional points their density could be infinite and yet their separation (the apparent emptiness of the world) could be infinite simultaneously. Thus aleph-zero infinity, the denumerably infinite, always necessarily represents what we call time (a potential eternity of enumeration), and aleph-one infinity (the continuum) represents space (that is, the everywhere-inexhaustible density of points, or the ubiquity of denumerable infinity, or of denumerably infinite points). Time is therefore the self-counting of the world.

A common fallacy is the belief that physical laws contain less information than do concrete experiences. Actually they in a sense contain equal amounts of information, in another sense they contain more information than each other, and in yet another sense they are simply not comparable by nature (just as such ratios as infinity/infinity, zero/zero, and infinity/zero are noncomparable). Physical laws and other generalizations possess an informational power which is derived from their infinite combinatory significance. It is also true that such laws and generalizations can become arbitrarily powerful; partly because of the fact that the laws of the universe are infinitely numerous.

Stochastic or dynamic production of asymptotic universal and perfect equidistance of points in a universe consisting only of such point-particles (but note, obiter, the impossibility of complete universality in a universe consisting of infinitely many points) would inevitably give rise not to chaos but to order, since a field of equidistant points is ipso facto a field of polyhedra (yet of what type--tetrahedra, cubes, or?). Moreover, this would presumably engender a transformation

since a field of point polyhedra, in dynamic or kinematic terms, is ipso facto a network of mathematical lines and hedra (plana), and, in accordance with Gunkel's Principle of Perfect Relativity, these lines and hedra, as the crystallization of the universe proceeded asymptotically to infinite perfection, would inevitably function as parallactic amplifiers of relational inequalities, inversely generating infinite imperfection, instability, reexplosive turbulence, a new universe of interactions, etc. This would perhaps be analogous to Abraham Robinson's nonstandard analysis with its "galaxies" and "monads", or infinitesimals (virtual infinities) within infinitesimals, etc. The lines and/or hedra (plana) would in the new universe acquire the functional roles (and hence form) of points (or old lines → new points, old plana → new lines, old points → new lines and/or plana and/or volumes; old volumes would "evert"; interiority and exteriority, and hence microcosm and macrocosm, would change place or "intertransform"). The world would turn inside out for "relativistic" reasons.

Thus physical quanta may simply represent the spatial (geometric), temporal, or spatiotemporal equilibria which should always exist at the extremes of fluctuations in nature (where such quanta and extremes of fluctuation should always be present, the finite asymptotic extremes being necessary to define the fluctuations). Planck's quantum of action, h, may thus represent the unavoidable unitary finiteness of the convergent-divergent texture of the energetic equilibrium (or equilibrium-disequilibrium or self-reciprocity) of the world.

Returning to the earlier considered asymptotic approach of a universe of point-particles toward perfect and/or universal equidistance: It might alternatively be imagined that the macroscopic local or approximate phasal and spatial interlocking of intrasymmetric aggregates of point-particles, quanta, and/or states would give rise to macroscopic or ever-growing quantum states, bodies, "regions", or whatever (in analogy to such known phenomena as superconductivity, superfluidity, tunneling (where quantum tunneling, incidentally, might represent antisymmetric "isopores", as I have elsewhere defined this concept), etc.). Thus the finite or infinite (or variously finite or infinite) universe might represent a field of competitive crystallizations of orders of quantum states, equilibria, or equilibrial inversions. In any case, the co-equilibrial, or intrasymmetric, polyhedra of quantum states would exert pronounced (accentuated in proportion to their size) physical ("force" or probabilistic) effects on the rest of the universe. Such universal competitive (infinitely relative) equilibration of point-particles (or averageable phenomena) might force the temporal universe to represent an infinite arborescence (the being or becoming of an infinitely arborescent space-time).

Moreover, "energy" would seem to require a combinatorial definition (or redefinition).

In connexion with this, we are all acquainted with zero-point fluctuations and the Uncertainty Principle.

The hierarchic ocean of not-self-random and of growing fluctuations of energy, or the quantum sea, would seem to necessarily conserve all physical information by necessarily reinserting it at another level in nature, or in the anastomotic network of fluctuations.

Regarding this crystallogenic (or infinite self-crystallogenic) metaphor for the cosmos, it is worth remembering the analogizable importance in solid-state physics of holes and other defects in crystals (and perhaps of solitons in plasma-state physics, etc.?).

The concept of zero-point fluctuations would seem to require that the universe reduces microscopically to nothing but changes of changes, a continuum of coordinations, a foam of many-body motions, etc.

The infinite extendedness of gravitation would seem to require that the supposed violation of the first and second laws of thermodynamics by plasmas,

in which extended electromagnetism engenders macroscopic filaments, plasmoids, solitons, and/or other structural or morphodynamic phenomena, should apply as well to a universe consisting of gravitatable point-particles in a state of supposed thermodynamic equilibrium.

It is interesting that in a universe, or in any part of a universe, in a state of thermodynamic equilibrium--ideally, in a field of vibratory or "jittery" point-particles--all the loci or interactions should at minimum be continually creating and emitting pieces of order or of informations. The emitted order or information, even if hypothetically somehow degenerative (per convention), should never vanish or degenerate entirely. Therefore traces of such should always be accumulating locally and universally (whether the universe is supposedly infinite or finite in space and infinite or finite in time). Even degeneration should be regular and continuous (however great in complexity). These orderly emissions should (1) amount to exchanges, (2) carry pattern, (3) permit morphogenesis, and (4) permit infinitely quantitative and diverse morphogenesis (i.e., cosmopoiesis). Hence the universe should be "self-cosmopoietic". In fact, a spatiotemporally infinite universe should possess an infinite creational and existential density (in space and time).

Once again returning to the earlier considered asymptotic approach of a universe of point-particles toward perfect and/or universal equidistance, and the associated paradoxes: The uncertain but necessary and critical implications of the extraordinary fact that truly mathematical points (or systems thereof) permit no absolute (i.e., absolutely definable or absolutely meaningful) objective distances and patterns remain to be worked out (all transpositions, translations, groupings, dynamics, sets, etc. of such points would be indistinguishable; and the absolute nonextendedness of such points would forbid their ever intersecting, overlapping, or superposing one another, <u>even conceptually</u>). Therefore the would-be, and presumably partial, equidistantly-defined thermodynamic equilibrium of such points would have to depend on the whole system of such points. This fact would seem to require that actuality is circular or holistic in nature.

An interesting possibility, in general, is that the most distant parts of the universe intercommunicate by the weakest waves, energies, interactions, information, order, etc., and the latter predominantly exist for the former. The possibility that this might actually be so is suggested by the fact that as a photon tends to lower and lower frequency, larger and larger detectors are necessary to retrieve its information.

To express the point made earlier about the omnificence of the <u>infinitesimal</u> dislocations from perfect universal equidistance of a system of "pure" points (which was merely the statement that displacements must be defined as perspectives generated by combinatorial sequences of binary loci, with the plenum and vacuum separated by single discrete decisions over an absolutely flat lattice), the earlier point might be reexpressed: Within a system of points limited to flat orthogonal or biaxial displacements, with the displacements themselves limited to the closed or open continuous or quantized infinite-valued or two-valued interpunctate "lines" (although even this definition can be simplified or enlarged), the entire morphodynamical universe we know could be described, and therefore our universe may reduce to an equivalent of such an abstraction--or at least a study of such an abstract system may clarify the actual universe.

A statement I made elsewhere is germane: "The data of the world form a <u>linear set</u>, a set of brute and contingent facts. The ideas of the world represent the self-product, or <u>quadratic set</u>, of all the binary intersections of these data contained in the aboriginal linear set of pure data. The processes of the world represent the <u>cubic set</u> whereby all the ideas of the quadratic set are returned to the linear set of aboriginal data as the gonotelic cycle of existence evinced in the intersections of the intersections of brute and contingent facts."

One can imagine a "universe" consisting of puncta which constantly strive to attain local, or else universal, equidistance. (These might have been randomly interlocated or infinitesimally nonequidistant in the beginning, virtually nonequidistant because of the lineality or nonsimultaneity of active interadjustment or measurement, or because of the Uncertainty Principle, and/or the like.)

Clearly, the puncta being zero-dimensional, perfect universal and local equidistance (perfect equilibrium) will never be attainable, and the magnitude of local disequilibria will always only be relative to the universal network of successive interactions. Such a "universe" of puncta will experience all possible degrees of apparent fluctuation, and all possible states and correlation, over eternity (or arbitrarily great time). The infinite self-equilibratory "motions" of this "universe" evidently will be such things as: panmnesic (all-remembering), time-asymmetric, cyclotemporal, cyclospatial, cyclospectral, monadological (merarchical, holarchical, and sterarchical), vergent, infinite-spectral, omnificent, topometrological, rheostatic, all-transcendent, virtually infinitely dense (actually infinitely self-dense), self-infinitizing, omniconsequential, omnipossibilistic, cosmopoietic, infinitely logical, myrioramic, infinite-hierarchic, etc. The "universe" could comprise anywhere from 3 to infinitely-many puncta, perhaps equivalently. Corepulsion, coattraction, and equilibration would also appear to be equivalent for such zero-dimensional puncta. A "universe" of infinitely-many puncta might be instantaneously equivalent to, and not addable to, infinite time; and vice versa, a "universe" of infinite time, even if limited to 3 puncta, might be equivalent to, and not addable to, a "universe" of infinitely-many puncta.

The unfamiliar terms of the previous paragraph will be found defined in the Glossary of Special Terms, pages 247-269 of The Efflorescent World View.

AN ESSAY ON PHYSICS

Pat Gunkel

> "One crucial assumption underlies the standard hot big-bang model (of the universe): that the universe "began" in a state of rapid expansion from a very nearly homogeneous, isotropic condition of infinite (or near infinite) density and temperature. During the first second after the beginning, according to this analysis, the temperature of the universe was so high that there was complete thermodynamic equilibrium between photons, neutrinos, electrons, positrons, neutrons, protons, various hyperons and mesons, and perhaps even gravitons (gravitational waves)."
> ---from Gravitation, Misner, Thorne, and Wheeler; pp. 763-4.

Would it not be expected that in such an instantaneous universe there might, even probably, exist, in addition to the above listing of classes of particles, either finitely or infinitely many other classes of particles (or, perhaps one should say, of "physical entities")?

If an infinite variety of types of infinitely, and of infinitely infinitely, diverse physical entities must then have existed, might a necessary corollary be that there must also have existed (as the virtual "origin" of things) equally (that is, superinfinitely) many and diverse mental entities (that is, "ideas")?

These things in turn would seem to have the corollary that the subsequent history and form of the universe is merely apparent, and disguises in a timeless way an infinite plurality of coexistent worlds, realities, levels to existence, aspects to existence, divergent truths, hierarchies of levels, etc.

Thus we see that the alleged sharedness of energy in the "complete thermodynamic equilibrium" of all primordial particles must have simulated the continuum as a qualitative Apeiron, a self-infinite ground, from which an infinite informational disequilibrium arose as the very holistic instability and vergent (i.e., simultaneously convergent and divergent) turbulence of a self-generative and non-self-boundable world.

Particles are conceived of by modern physics as waves. They are therefore point fluctuations. Yet modern physics also suggests that things static and changing, equally, cannot exist (or in any way be definable) except as they enjoy, respectively, the contrasts of change and of permanence; in a like and greater way, parts and wholes can neither exist nor be defined apart from the conjugate contrasts which they respectively afford each other.

This immanent, and necessarily infinite, relativity therefore means that all the fluctuating entities belonging to the quasi-beginning of the universe could not have oscillated all together as one indistinguishable quantum state (an idea which is physically self-negating), and that the compact and self-converged universe must have been preceded by, or incorporative of, an infinite hierarchy and sequence of prior existential realms--as a consequence of Poincare's Theorem and of Gunkel's Principle of Open Time and Principle of Perfect Relativity. In other words, or variously, "perfect thermodynamic equilibrium" can only exist and have meaning as a consequence of a hidden and coexistent perfect disequilibrium, the latter imposing and defining the former as an appearance of things having its foundation, not in indeterminate but rather in infinitely complex and concinnous, self-reference.

It would take infinite energy to produce, and hence to even define, absolutely perfect (100%) thermodynamic equilibrium. This noteworthy paradox attests to

the circularity, and infinitely complex periodicity (or to the essential hierarchicalness), of the ill-understood concept of a finite (or relative) "thermodynamic equilibrium". Thus also the concept of the universe having had a beginning, in terms of a finite past, in a primordial state of "absolute or infinite disequilibrium" is necessarily invalid because it is essentially meaningless (given the "sterarchical" inseparability of equilibrium and disequilibrium, and their necessary membership in some infinitely greater truth). (Whereas the word "holarchical" would mean "governance of parts by the whole", and "merarchical" would mean "governance of the whole(s) by the parts", the word "sterarchical", referring to a concept which I see as an unavoidable tertium quid, means the "governance of everything by everything (etymologically, of or relating to governance by the 'solid' of things)" --an essentially monadological notion.)

In cosmological terms, an infinitely "flat" universe must at once be (or become as it becomes flat) a closed alias spherical, and an infinitely closed alias infinitely spherical, universe--since nature is a self-polarized, or self-polarizing, Apeiron.

It might also be suggested that the acquisition of an infinite energy by each of the primordial particles, as required if there is to have existed a perfect thermodynamic equilibrium in the primordial universe, would necessitate the particles to have all been black holes which were internal to the greater black hole of the macrocosm.

What would be the subjective and objective fate of such "black subholes" (or what might be called "ultrablack holes")? Might, for example, for example, such an "ultradense universe" be a so-called hyperbolic universe (such a system being, cardinally and/or ordinally, both closed and open--alias elliptical-hyperbolic)?

Moreover, and/or instead, wouldn't the corpuscular subholes grow, as the macrocosmic implosion and self-equilibration continued, and become infinite as the macrocosm became infinitesimal? And wouldn't this cause the subholes to, in effect, expand upon one another indefinitely, to compress one another as bubbles, to become a certain framework of lines, to crowd and fill the macrocosm, to equal and to exceed the macrocosm, and to reexplode as a system of lines which would represent a topological network of infinite discrete complexity, etc.?

Furthermore: (a) Even the n-body (n-subhole) systems of the mutually interacting concrescent, or quasi-concrescent, corpuscular subholes, under the mutual but competitive attraction of their interpenetrating gravitational fields (or their tangential equigravispheres), would, for dynamic reasons, have to originate myriad co-accelerational singularities, or accelerational spectra (i.a., an infinite hierarchy of derivatives, an infinitely anastomosed network of "brackets", moments, etc., etc.--perhaps ad infinitum), singularities which would themselves have to possess velocities, energies, unique gravitational fields, and fields which would themselves have to accelerate, grow in strength "illimitably", become black holes (having some order of holeness), perhaps compress other interexpanding fields, participate in higher-order n-body systems (in the overall conspiratorial production of infinite-body systems), etc., and presumably conform to ideas about non-Abelian gauge-theoretic gravitational fields. Would such a universe become infinitely self-knotted, or become something vaguely like an infinite Alexander's horned sphere? In any case, in such a system one could certainly imagine that total information might increase to infinity, and thereby confront us with the challenge which can arise in infinite exponential branching processes.

Continuing: (b) Even the infinitely increasing masses of the energetically expanding subholes would have to involve the uncertain situation of Compton wavelengths tending to zero (and becoming infinitesimal points), and simultaneously to infinite frequency, infinite intercorpuscular interaction (which again--see

above--is necessary for existence and definability), where such interaction might actually be enhanced by the operation of the Uncertainty Principle, etc. It might be the case that the resulting "condivergent" (that is, diverging as a result of converging) intercorpuscular gravitational interactions would necessarily give rise to infinitely many and infinitely diverse co-oscillatory asymmetries (and hence to an infinite self-packaging, or internal particle-creation, of the world, owing to chaotic clumping and intergrouping of the world), etc.

In all this one certainly sees opportunities for such things as a secondary, and n-ary or infinitary, folding of space-time, an arborescent (actually for an infinitely-arborescent) structure of space-time, and so forth. (The word "arborescent" means "branching repeatedly in the manner of a grown or growing tree".) Also, philosophically, one sees in these ideas a basically monadological space-time wherein the universe could simultaneously be everywhere-reduplicated (i.e., omnipresent) and everywhere-novel (i.e., omnifarious).

Further, one sees a topological equivalence of points and volumes, an interconversion of both, a transformation of a location in 3-space into a location in 1-space, a manifest interconversion (or inversion) of space becoming time and of time becoming space, a manifest coderivation of past and future time (through the conservative convergence of their total possibilities) (with the accompanying production of a paradox), a cosmological explosive implosion, implosive explosion, implosive-as-explosive implosion, etc. (presumably and so on ad infinitum), etc. One also witnesses the infinite-transformational nature of the universe.

Finally, the fact that this should perhaps have been the past of our universe may require that it is also the true present form of our universe, a structure almost--no, completely--beyond our imagining.

The higher mathematical and general consequences of these ideas are totally unknown but surely awesome. For example, what should modern mathematics make of the apparent demonstration that all would-be "points" are actually spheres (there are no true points), that there is a universe (presumably ours) which is everywhere "inside" and "outside", etc., etc.?

11/5/76

THREE-DIMENSIONAL SPACE-TIME?

Pat Gunkel

It may have been a mistake to have assigned time to an extra dimension, a "fourth", in a four-dimensional space-time. Perhaps time either should or could (indistinguishably and economically) have been assigned instead to a single arbitrary dimension as a one-dimensional, and yet also third-dimensional, aspect of a three-dimensional cosmological space.

In a "wholly" three-dimensional universe or "space-time" the arbitrary (syn. nonabsolute) first dimension would be time (i.e., succession), and it would arbitrarily (i.e., indistinguishably--since contrapletal) represent momentum or position, and all the other relational unipoles of Heisenberg's many uncertainty conjugates.

The arbitrary (nonabsolute) second dimension would be measurement by quadratic exponentiation and it would represent all the possible (whether discrete or continuous) bipolar relationships within Heisenberg's pairs of conjugate uncertainty: an instantaneous conjugate matrix or continuous graph, the instantaneous--i.e., timeless--spherical surface surrounding one whose curvature simply represents the finite minimal causal union or asymptotic coderivation, the "wave nature" and the indeterminacy (i.e., the nonisolability), of the conjugate or contrapletal uncertainty relata. It would, perhaps or in a sense, represent the determinacy (i.e., the divergent determinism), self-divergence, radiativeness and radiation (perhaps the finite-causal "luxons" and/or the finite fastness of things), etc. of nature.

Finally, the arbitrary (nonabsolute) third dimension would represent measurement of measurement (what might therefore be called "eka-measurement"), cubic exponentiation, and the cosmological illusion of spatial depth or distance (and hence of volume and space or emptiness) produced by the necessary reflexivity of the uncertainty principle or its conjugates--that is, representing the uncertainty of uncertainty itself (or "eka-uncertainty"), the probabilisticity of nature, and hence also nature's creativity, growth, evolution, self-transcendence, self-creation, unity, ubiquitous self-convergence, materiality (i.e., the finite slowness of things) and material or quasi-material particles, etc.

In such a universe as here envisioned all the possible discontinuities (produced by orthogonal and yet spherically-closed waves, and representing time in a certain sense) would produce, or be synonymous with, a quadratic exponential creation of "material particles" and would be preserved as material particles scattered (in a fashion at once stochastic and lawful!) by the above eka-uncertainty over the perhaps endlessly (or even hyperbolically, even infinitely hyperbolically) expanding cubic void which we call the "universe".

In it, apparent time past and time future are actually contrapletes and increase simultaneously (in contradiction to appearances).

It should be understood from the beginning that this speculative cosmology imposes no limits whatever on the possible qualitative complexity of the universe. Quite the "contrary".

Conjecture: Might first-order measurement--the arbitrary second spatial dimension (obiter, spatial dimensions are not, I believe, static but are instead exhibitions of incessant projective processes)--somehow represent nature's so-called "retarded potentials", and the second-order measurement (to which we have given the name "eka-measurement")--the arbitrary third spatial dimension--somehow represent nature's so-called "advanced potentials" (that are of a contraplex nature, and which physicists have yet to account for)?

Conjecture: May it be that it is necessary (to the extent that anything is compelled to be the case), partly as a continuation of Albert Einstein's relativistic philosophy of epistemology concerning experimental and natural reality, that the analysis of the world is partially solipsistic, and that, in this way, everything in experience, and hence even in physical law, must be nonsimultaneous in time and discontinuous in space (that the world must be totally serial), that this in turn requires that reality under exhaustive analysis (whether finite or infinite) must prove to reduce to the equivalent of discrete events in one-dimensional space-time, which might be called "chronons"?

My preliminary conception of these hypothetical chronons would see them as either virtual or real recurrences which by infinitely many combinations or relationships produce an infinitely complex kaleidoscopic construction, from an infinite number and diversity of constituent finites, this construction being what we call "nature". I prefer the idea that these chronons have zero extension, and therefore represent ideas. Yet my chronons (which might also be termed "ontons"; radically, "particles of being") would be far (postulatorily, infinitely) simpler than even Roger Joseph Boscovich's puncta (which were, by definition, unextended atoms of force), in part because I prefer the initial consideration of the concept of chronons which are also unextended in time (absolutely nonintervallic) so that all of time (that is, "eternity") would be, in effect, at once infinite and zero in amount, and infinitely self-convolved (that is, equally describable as zero-dimensional, one-dimensional, and infinite-dimensional, since representing something wholly transcendental, self-infinite, and ineffable).

Comment: As to the list of uncertainty relations, whether it is properly finite or infinite, these relations at the center of the universe may prove to be either divergent (orthogonal and hence multidimensional), convergent (either fusible, a priori rankable, or subordinable by the invention of new and generic uncertainty relations), or vergent (both convergent and divergent --or such as to always be circumvented and yet always to be added to, in specific and/or general senses).

It will be reflected that some of the known uncertainty relations are:

1. $\Delta\nu t = 1$ (where Δt is time interval, $\Delta\nu$ is spectral width; being the uncertainty relation for classical waves).
2. $\Delta E \Delta t \geq h$ (the uncertainty relation between energy and time).
3. $\Delta p_x \Delta x \geq h$ (the uncertainty relation between linear momentum and position).

Concerning uncertainty relations: How many are there? Are the known ones supposed to be actually or potentially independent of one another? complementary? intertransformable? discretely or instead continuously related? etc. Are they hierarchical or instead democratic, inter se? Do they form a closed or instead an open set? Do they form an additive or instead a multiplicative set with respect to their consequences (--are they temporal or instead eternal)? What, really and precisely, are the relationships of the uncertainty relations to quanta, quantum numbers; the activity-density, informational density, and corpuscular density of the whole universe? What is the necessity, utility, and interconnexion of the concept of the complete discrete-quantization and finitude of space-time and the universe? How comprehensive and how limited are the uncertainty relations? Does the uncertainty principle make the universe, at least in part, tautologous or instead evolutionary, finite or instead infinite, ephemeral or instead eternal, simpler or instead more complex, cellular or instead holistic, closed or instead open, knowable or instead unknowable, regular or instead indeterminate, etc? Are the uncertainty relations absolute or themselves relative? What is the imaginable relationship between microscopic and macroscopic uncertainty? Ad infinitum.

POSSOGRAPHIC LISTS TO BE MADE ON PHYSICAL CONCEPTS

Foreword. Where "possonomy" is defined as "the system of laws governing or sum of knowledge regarding things which are possible (of either a general or specific nature)", the subordinate word "possography" means "the systematic, either general or specific, presentation of the things which are possible (regardless of their differential necessity)". It follows that "possographic" is an adjective the meaning of which is "of or relating to possography, or the description of possibilities". As to the following, it represents, as a list of lists-to-be-made, a work program for the eventual systematic presentation of all imaginable possibilities connected with important physical concepts, both known and unknown. The theme is specifically the idea that the set of concepts on which physics relies is not a set of unanalyzable, irreducible, absolutely simple and ultimate, unexplainable, unrelated, noneliminable, and so forth physical entities and mental ideas. On the contrary, it is a highly or infinitely partial, unexplained, differentiable, reorganizable, arbitrary, idiosyncratic, hypothetical, presumptuous, integrable, multidimensional, and so forth set of excessively theoretical and excessively empirical temporary scientific coordinates.

1. A list of all the possible [bases, forms, effects, implications, transformations, meanings, uses, etc.] of the concept of "particle".
2. A similar list of all the possibilities connected with the concept of "mass".
3. Ditto "dimension" and "dimensionality".
4. Ditto "space".
5. Ditto "time".
6. Ditto "space-time".
7. Ditto "wave".
8. Ditto "universe".
9. Ditto "law".
10. Ditto "energy".
11. Ditto "entropy".
12. Ditto "uncertainty".
13. Ditto "probability".
14. Ditto "proof".
15. Ditto "conservation".
16. Ditto "measurement".
17. Ditto "form".
18. Ditto "change".
19. Ditto "vacuum".
20. Ditto "causality".
21. Ditto "separation".
22. Ditto "science".
23. Ditto "motion" and "motionlessness".
24. Ditto "spin".
25. Ditto "rotation".
26. Ditto "charge".
27. Ditto "size".
28. Ditto "continuous".
29. Ditto "discrete".
30. Ditto "spectrum".
31. Ditto "radiation".
32. Ditto "size".
33. Ditto "point", "region", "whole", "part", "boundary", "limit", etc.
34. Ditto "radius", "diameter", "area", "surface", "volume", etc.
35. Ditto "number".
36. Ditto "quantity".
37. Ditto "quality".

38. Ditto "identity".
39. Ditto "completeness".
40. Ditto "in" and "out".
41. Ditto "before", "after", and "during".
42. Ditto "simplicity" and "complexity".
43. Ditto "statistical", "probabilistic", and "deterministic".
44. Ditto "complementarity".
45. Ditto "relativity".
46. Ditto "location".
47. Ditto "direction".
48. Ditto "constancy".
49. Ditto "normality".
50. Ditto "idealness" and "realness".
51. Ditto "sufficiency".
52. Ditto "inertia".
53. Ditto "interaction", "intermediation", etc.
54. Ditto "force", "carrier", etc.
55. Ditto "power", "work", "action", etc.
56. Ditto "greater", "less", "greatest", "least", and "equal"; "inequality".
57. Ditto "approximate".
58. Ditto "field".
59. Ditto "virtual" and "real".
60. Ditto "activity".
61. Ditto "self-action".
62. Ditto "stability" and "instability".
63. Ditto "instantaneous" and "eternal".
64. Ditto "zero".
65. Ditto "infinity".
66. Ditto "finitude".
67. Ditto "information".
68. Ditto "absolute".
69. Ditto "atomicity".
70. Ditto "bootstrap".
71. Ditto "critical".
72. Ditto "turbulence".
73. Ditto "attraction" and "repulsion".
74. Ditto "decay", "lifetime", "radioactivity", "emission", "absorption", etc.
75. Ditto "parity".
76. Ditto "excitation".
77. Ditto "quantum number".
78. Ditto "elementariness".
79. Ditto "fundamentality".
80. Ditto "singularity".
81. Ditto "freedom", "degree of freedom", etc.
82. Ditto "collision", "contact", "transparency", etc.
83. Ditto "isotropy", "homogeneity", etc.
84. Ditto "polarization".
85. Ditto "sound", "heat", "temperature", "periodicity", etc.
86. Ditto "state", "phase", etc.
87. Ditto "catastrophe" (ultraviolet, infrared, etc.).
88. Ditto "orbital".
89. Ditto "spontaneity".
90. Ditto "environment".
91. Ditto "background".
92. Ditto "phenomenon".
93. Ditto "noise", "chaos", "random", etc.
94. Ditto "propagation".

95. Ditto "angle", "curvature", etc.
96. Ditto "closed", "open", etc.
97. Ditto "divergence", "convergence", etc.
98. Ditto "ether".
99. Ditto "initial conditions".
100. Ditto "organization", "pattern", etc.
101. Ditto "totality".
102. Ditto "acceleration".
103. Ditto "linearity", "nonlinearity", etc.
104. Ditto "boson", "fermion", etc.
105. Ditto "differentiality".
106. Ditto "Mach's Principle".
107. Ditto "topology", "metric", etc.
108. Ditto "current".
109. Ditto "consistency".
110. Ditto "specificity" and "generality".
111. Ditto "equilibrium".
112. Ditto "impossibility" and "possibility".

Afterword. The foregoing--which is preliminary, unedited, and incomplete--is meant to be used in the subsequent writing of a rigorous orismological and arcological treatment of the conceptual, or the "categoreal", foundations and directions of physics. Historically, and presumably eternally, physics and metaphysics are circular phases of one another: the imaginative generalization, or categorization, can properly proceed only so far, whereupon it must return to narrow and special theory, and to brute facts and some shaping criteria of utilitarian relevance (which selects things which might otherwise seem or be arbitrary, yet which are fundamental to science, which is a servant of life); and likewise this latter phase or enterprise (which can be simultaneous) can and should proceed only so far, whereupon the data, axioms, postulates, theories, purposes, methods, conventions, etc. must be reviewed, new and greater concepts must be created, and a new phase of metaphysical generalization or categorization must ensue. Metaphysics is merely the territory of highest conceptual formulation, activity, relevance, or invention, the Empyrean of categories, or that soaring towards the gonotelic point at infinity whereat all concepts, categories, and details are transcended, dissolved in the Apeiron, irrelevant.

A LIST OF SURMISES ON HOW A FREE QUARK MIGHT OUTWEIGH A BOUND ONE

Pat Gunkel

Foreword. The failure to find or create free quarks, in the face of the explanatory power of quark theory, has led to speculation that quarks may be fundamentally inextractable, eternal prisoners accessible only to the theoretician and the oblique experimentalist. A counterpossibility is that quarks may be liberated with great but finite difficulty. Perhaps they are very massive, and today's accelerators are inadequate. But then free and bound quarks would be required to be of disparate mass. Yoichiro Nambu has said, "Indeed, a single isolated quark might be more massive than a baryon composed of three quarks, a notion that is difficult to understand if it is not inconceivable." (emphasis mine). Not at all! Exempli gratia--

1. Gravitational rest mass might be of the nature of a charge (which perhaps it should be) and per se maskable by an anticharge (say in the selected hadrons of our part, or phase, of the complete universe).
2. There might be different types of gravitational forces (e.g., strong vs. weak, long-range vs. short-range, differing in exponential gradient, and/or cetera; many such have been proposed, such as "strong finite-range gravity" by Lloyd Motz) and which are interconvertible.
3. The Equivalence Principle might be either wrong or limited (thus separating the inertial and gravitational properties of quarks).
4. Mass and/or gravitation might be able to screen themselves out (shield).
5. The gravitational static inverse-square law might fail at short or polar distances.
6. The four known "fundamental" forces might unite as an uncertain divergent (cooriginating) or convergent (interferential) manifold at nuclear or subnuclear distances or structure.
7. Gravitational force might have a microscopic (as opposed to macroscopic) limit to its range. (Some of the ideas on this list first require even their potential of making for a greater mass of the free quark to be defined and justified!)
8. Some sort of time reversal might occur on this microscopic and microphysical scale.
9. Positive gravitation (and/or inertia) might "become" negative on this scale.
10. Space might become non-Euclidean (Lobachevskian, Riemannian, and/or?) at this microscopic scale.
11. At this scale the spatiotemporal dimensionality of the universe might cease being three or four.
12. Gravitation, inertia, and/or mass might exhibit certain other abnormal mathematical properties at this scale.
13. Mach's Principle applied to gravitation and inertia might finally exhibit itself by being polar at this fundamental scale.
14. The relationship existing between mass and the surrounding or constitutive vacuum might bare itself or alter when matter or mass is separated, rearranged, and/or decomposed to the degree it might be when emancipating quarks (say for discrete or continuous non-Abelian gauge-theoretical reasons).
15. A certain peculiar structure might be shown by general or special causality at this scale.
16. Phenomena such as gravitational self-damping or some sort of negative energy might be discovered.
17. A surprising nonequivalence of gravitation and space-time might be discovered.
18. Gravitons might be shown to possess a microtemporal decay or limit.

- cont. -

19. Time might be found, microscopically, to be nonlinear.
20. Certain multiplicative (hence also divisional) relationships might be found to exist between the fundamental forces.
21. Certain quantal or uncertainty properties of gravitation and/or mass might be perceived.
22. Of relevance may prove to be certain relationships between gravitational force and known or unknown quantum numbers proper to this complex and mysterious elementary domain.
23. There might hypothetically exist something (perhaps implicit in the foregoing) which might suggestively be called "second relativization".
24. And/or it might be possible for a quark to have a greater mass in the free as compared with its bound state for any number of other variously fanciable reasons, many of which are neither implausible nor especially improbable, and which, in general, might merely be deemed consistent with the perpetual and seemingly self-contradictory novelty and richness of the universe when the latter is subjected to scientific investigation of perceptual and/or conceptual kind. (This, because nature could well be considered to be an infinitely ambiguous optical illusion, or as a myriorama, perhaps necessitating omniscient and/or panoptic examination to appear in its purported essence.)

Afterword. Readers conscious of the presumably numerous omissions, errors, and other shortcomings of the above list would delight its author by transmitting their comments to him. Amplifications and indications of agreement would also be warmly received. Le vrai n'est pas toujours vraisemblable.

NOTE FOR A PORTION OF THE READERSHIP

Those readers having an interest in the trilogy of books I am hoping to write, A Study of the Future, might wish to know that the above serves as an illustration of the systematic enumeration of possibilities, ideas, and other considerations of a general and specific nature throughout the sciences with which I intend to fill the second volume of my exercise in Pegasean phaneroscopy, The Future of Science. I hope this connexion does not trigger the immediate dissolution of that larger interest!

SOME RATHER PECULIAR COSMOLOGICAL TRANSFORMATIONS

Pat Gunkel

The following is stated very loosely and could easily be rearranged in countless other quantitative and qualitative ways, and in many respects the following is only a metaphor even for itself.

Imagine the universe collapsing under gravitation to or toward a condensational singularity. The universe here being imagined as Euclidean--an imploding 3-dimensional sphere. (Whether a non-Euclidean universe would tolerate with or without difficulty the present set of ideas is a question not considered here. It is, however, interesting to consider what would be the, if any, nature of rotation induced by cosmological contraction in a closed non-Euclidean universe.)

Progressive self-contraction of the Euclidean universe is to be imagined as giving rise at a certain point, at a certain rate, and in a certain way to compensatory rotation of the spherical universe, which is, furthermore, imagined as causing the universe to distort progressively into a reexplosive disc tending to infinite diameter and infinitesimal thickness. The discoid's equatorial expansion --as the summation and reexpression of the finitely or infinitely numerous ang. and lin. momenta of massive particles and other angular and linear momenta associated with the absolute and relative ang. and lin. momenta of the compresent massless radiational waves--might or might not exhibit more than one discontinuity in the production of an elliptical, parabolic, or hyperbolic coplanar expansion.

Imagine that the flattening after a finite while becomes asymptotically or absolutely infinite--the universe becomes a perfect Flatland.

Nicolas Rashevsky and Henri Poincare have suggested the possibility that the apparent three-dimensionality of universal space is basically an illusion which represents the consequences of earlier biological selection of an arbitrary set of orientational coordinates, where this three-dimensionality or any three-dimensionality is not absolute but rather a choice from amongst dimensions and dimensionalities of any finite number. As a neurologist, I can attest that what we regard as external and absolute nature, or as the absolute nature of things, is to a tremendous, either finite or infinite, degree a basically arbitrary or purely functional anthropomorphic projection--the world is filled with our imaginations, and the absolute basis of these imaginations is utterly unknown. This suggestion of these two men is intriguing, but I would go a few steps further.

I would suggest that infinitely much of the quantitative and qualitative static and dynamic appearance of the external and internal worlds may be such things as anthropomorphic projections, biomorphic projections or selections, and/or the "paleontological" or cosmogonic product of physical selections or self-selections in the finite or infinite childhood of the universe--reality may comprise an infinite hierarchy of levels of all-but-absolute illusion and/or expedience and/or unsuspected fundamental complexity.

However, these possibilities are not our concern here.

What interests me is the possibility that the internal reality of the universe become perfectly flat would not differ physically and/or subjectively from the universe we know. I suggest that the world of Edwin A. Abbott's Flatland has been misappreciated by readers' having taken it as finitely thick rather than absolutely 2-dimensional. I may be mistaken, but I cannot imagine why the internal reevolution of nature in the universe above, which we imagined to be absolutely transformed into a wholly 2-dimensional realm, would not or could not reproduce down to the the dots on the i's the appearance of things about us now. In other words, I am suggesting that three-dimensionality, or the 3-4 dimensions of our reality, "are" far more Intrinsic to the universe or perceived reality than is ordinarily assumed.

What would seem to us an absolutely two-dimensional world would or might seem to its inhabitants a perfectly three-dimensional world--or the opportunity for the identical illusion would be there!

Assume that the expansion of the discoidal universal transformation was of a hyperbolic cosmological kind. At first one might assume that the ubiquitous, progressive, infinite, and irreversible drifting apart of the particles of this world might spell the doom of it (or one can imagine, for the moment, certain patterns of total drift which would suggest this tragic consequence).

This need not at all be so. For example, all the particles of the universe could be attracting and/or repelling one another to varying degrees by infinite fields of fundamental forces such as gravitational fields. The differential interaction of these everywhere-extending and presumably sempiternal fields would perpetuate the activity of this infinitely and endlessly expanding and attenuating universe.

Please note that it is not possible to refer to any such quantitative value as the specific activity-density of the dimension of time as the average over all time. The sum activity of the universe over time might be infinite at eternity, but as far as we know it is impossible to divide infinity in a meaningful way.

Therefore picture the expanding planar universe of physical entities as the endless jostling--pushing and pulling by attraction and repulsion--of such entities crowding one another even as the universe expands as a reciprocating, negative, and relativistic process producing an infinity of interactions, and an infinite variety and hierarchy of differential interactions, at eternity.

In other words, such an expanding and hyperbolic universe would necessarily at once simulate a closed and contracting universe. This universe could resemble the reality we know in every way and be indistinguishable. Being indistinguishable, and perhaps inevitable, the reality we know may be the illusion induced within an infinite series of real or illusory integrodifferential metamorphoses of nature, or the ineffable Apeiron.

It might be objected that in such an infinitely or perfectly two-dimensional universe resulting from the flattening of such an apparently three-dimensional universe as ours, the physical particles would remain fatally three-dimensional, at least in the sense that their radiations would be in three dimensions as opposed to two, and, in fact, would never be absolutely confined to the discoid plane in which I require the occurrence of a perfect simulation of our world. It might be thought that this would destroy the perfection of the two-dimensional simulation of a three-dimensional world by introducing nonconservation of energy and matter, or at least an element of random variation in the laws and phenomena of such a subjective world. Yet the world we know is rich with such quirks. The quirks are qualified and they tend to be forgotten.

The physicists of our world picture its energy as running down, its details as uncertain and indeterminate, its physical realities as residual, its laws as approximate, and its matter and energy as coessential.

The only reality we know is that which represents the infinite series of melodic fluctuations of immense but progressively interweaving and hierarchical uncertainties. What we call natural reality is at best the sympathetic conversation of vast unknowns--a panlogistic and cosmorganic awareness.

Since the subjective reality of the expanding two-dimensional transformation of our three-dimensional universe would constitute an infinite cosmopoietic process of an integrodifferentiational kind--at once synthetic and analytic--it would inevitably generate within itself both entropic and negentropic processes, illusions of cosmic closure and of cosmic openness, of expansion and contraction, of physical law and of physical chaos (e.g., as to so-called discreteness, even discreteness is relative, depending for its definition on the "continuous"--actually the quasi-continuous! physicists are continually reviving new and higher absolutes, especially by implicitly postulating absolute, as opposed to relative, relatives!), of time and of permanence, of matter (i.e., of "greatest" relative matterness) and of energy (i.e., of "greatest" relative energyness), of a past and of a future, etc. Indeed, it would re-create in this way the universe as we now perceive it, and as we will yet discover it to be in its immanent infinite complexity and plenitude.

Space-time is currently considered to be continuous--a self-defining, self-developing, self-coextensive, immortal, all-constitutive, self-infinite, self-returning, infinitely self-differentiating, and all-creating field. As such, it is ultimately unknowable. It is a paradox of absolute order and absolute chaos being one and the same. The task of the scientist is therefore to accomodate everything which can possibly be imagined within everything which is found to be the case, with infinite concinnity.

The ground of existence being thus considered, and being perceived as an Apeiron, the transformation of a contracting three-dimensional universe into an expanding two-dimensional universe will necessarily allow the transformed universe to reproduce an order of things indistinguishable from that we know, or which we seem to, and unbounded in its future evolution, regardless of whether an element of the subjective reality of the universe will be, as in ours, a superficial illusion of infinite degeneration.

It becomes apparent, when one considers the integrodifferentiational (or "vergent") processes in all universes which are minimally similar to our own, that analogues of such things as the condensation and progressive drifting apart of galaxies, the condensation of intragalactic (and, indeed, characteristic) stars, the vanishing redshifts of the farthest galaxies, the cosmic ultraredshifted background of blackbody radiation, the pervasive decay of local phenomena, the curvature of space-time, the equivalence of matter and energy, the great interspaces of the universe, the hierarchy of scales of things, and so forth can appear in such universes--and therefore our universe may be that universe in which they most truly appear.

It has been suggested by Branden Carter, John Wheeler, and others that certain extraordinarily improbable fundamental characteristics of our world, without which one would be loath to imagine the existence of life, might very well be explained by assuming that life has virtually played a selective role in shaping our world, and that the fundamental characteristics of an inhabited universe must be consistent with the possibility of life evolving within that world. This so-called "Anthropic Principle" might prudently be extended to include the assertion that many other extraordinarily improbable, bioselective, fundamental features must await discovery in the past, the present, and perhaps even <u>in the future</u> of our universe.

In any case, to the Anthropic Principle may now be joined another--an Automorphic Principle which asserts that things appear the way they do because they mirror our ideas, our biological constitutions, and themselves. Conversely, we think we see within and as ourselves what are in fact the introjections of the external universe. Furthermore, what we experience in the future will be an infinite variety of other such projections and introjections--which identifies the task before us, an "ontological" task.

The point which Nicolas Rashevsky made, above, was that dimensional perception of the world could be synthesized from any closed set of the more or less fundamental physical qualities of the universe--such as the many quantum numbers so far inventoried by physicists. David Bohm has postulated the existence of a Principle of the Qualitative Infinity of Nature, according to which the world comprises an infinite number, variety, and complexity of equally fundamental qualities. In combination with Rashevsky's point, this means that the universe may have an infinite number of equally fundamental dimensions, any finite set of which might be the "language of nature" as perceived by a being reconstructing the Monadic universe from the special vantage point of its basically arbitrary constitutional set.

Even if the universe collapsed not to a planar disc--an infinitely expanding circle--but instead to a punctiform singularity, as per the conventional picture, there is no necessity whatever in modern mathematical physics for the above Monadic space-time to either diminish in its absolute complexity or to terminate the postulated infinite cosmopoietic process--a process able and required to synthesize a universe as grand as ours and infinitely grander!

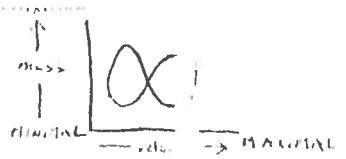
THE REICOSM AND THE NIHILOCOSM

Pat Gunkel

The following ideas are new and tentative ideas--the truth and falsity, goodness and badness, completeness and incompleteness, and complexity and simplicity of which are not to be considered at this eoan moment.

To the extent that current physics assumes that all physical events must emit a discrete or continuous spectrum of real or virtual particles of energy which is infinite or unbounded at least in the direction of lowness of energy of single particles (and hence also their longness of wavelength and lowness of frequency, and perhaps, variously, in respect of finitely or infinitely many spectral autocorrelations and intercorrelations having to do with such things as the structure of wave packets and trains, the processes of emission, transmission, and absorption, the chronotopology of the universe, and so on), and also that all so-called material particles must exist only insofar as they somehow reduce in space-time to equivalent spectra (so that all true geometry and existence must ultimately prove of an essentially dynamic, intertransformational, and emissive nature), to the same extent it would seem to be required by current physics, that a at least with regard to the future and perhaps also with regard to the past, radiational memory of all physical events and possibilities must endure in the world in the form of fluctuations bearing information where the wavelengths and periods of these panmnesic coessential fluctuations must equal and exceed the supposedly finite past and future lifetime, total lifetime, and the radius, diameter, or circumference of the apparent or expansible universe, and the set of such transcendental informational fluctuations must compose an illimitable hierarchy of greater, and ever more inverse, wavelengths. Indeed, the unavoidable set of such cosmological fluctuations evidently confronts the physicist with the paradox of the nonsubtractability, nonaddability, nondivisibility, and nonmultipliability of infinity, or the nonarithmetic interrelationships between any set of simple infinities.

One might wonder whether the curvature of rays of light under the influence of gravitational fields, as indicated in special relativity and general relativity, must not ultimately and asymptotically be wavelength-dependent, however greatly or little, and regardless of whether the assumed cause is the continuous and/or the discrete nature of gravitation? Is it possible that extremely long photon wavelengths are attracted by gravitation in some inverse proportion to their extremeness of length? Moreover, with regard to the overall curvature of the universe, presumably as a result of the bipolar (and not unipolar) equivalence of space and time, one wishes to know the differential effect of initial, final, and diachronic gravitational fields, or cosmological structure, on the relative directions of the emission, trajectory, and absorption of the particles of energy which possess wavelengths approaching, equaling, and arbitrarily exceeding the supposed spatial, temporal, and spatiotemporal "widths" of the universe? It would also be of interest to know, in connexion with these matters, whether the wavelength spectra of the particles of energy or matter are relatively and/or absolutely discretely quantized (indeed, one would always like to know whether the levels of discreteness and quantization of the universe are few, enormous, or infinite)? There are other interesting questions, not strictly relevant here, as to such things as the consequences of possibilities of particles with universal wavelengths being for informational reasons so transversely spread as to asymptotically approach, absolutely achieve, or arbitrarily exceed the circumferential "width" of the whole universe, or to spherically close the universe, and so forth. It is of special interest that particles of either energy or matter, by being associated with arbitrarily great wavelength, would also be associated with such (arbitrarily but proportionately) vast propagational and existential spatial and (past, present, and future) temporal surfaces and volumes as to be such things as--in various cases and senses and degrees--concentric, acentric, polycentric, myriocentric (i.e., having

Figure 1: 

infinitely-many centers), infinitely complex or fine-structured, primarily or n-arily virtual, etc. (The reference to "temporal surfaces and volumes", which seems bizarre, expresses an apparent necessity for the geometrization of time and its multiple dimensionality, the necessity severally springing from a variety of individually sufficient causes, not to be considered here.) Moreover, particles of the most minute mass must be especially diffuse in their localization in space and time; hence in a sequence of hypothetical particles of relatively smaller and smaller mass the effective volume and diffuseness of the massive particles must become greater and greater--giving an uncertainty relationship between mass and volume, mass and distinctness, mass and location, mass and time, etc.--a seemingly paradoxic situation which is of considerable interest. For example, things of most negligible mass must approximate and perhaps duplicate, quantally, the volume, overall structure, location in time and hence duration and perhaps being, etc. of the apparent universe. Such a fact might explain the finitude of the velocity of light, the finitude of causal propagation, the oneness of these rates, the distinction between matter and energy, their equivalence, etc.; it might also explain the general-relativistic or Riemannian nature of our world, reemphasize that everything which exists is a process of universal intermeasurement and coderivation, and illustrate how the Principle of Relativity and the Principle of Uncertainty are coderived and coessential. For example, note the uncertainty relationship existing between mass and velocity, which is fourfold and thoroughly reciprocal. I.a., the velocity of any physical entity must tend asymptotically to the limit of c or the velocity of light as the mass of the physical entity is diminished asymptotically to a limit minimal value, where the obvious colimitation of velocity and mass gives a Lissajous configuration to the permissible coordinate maximal and minimal values of velocity and mass in ever-circular nature (Fig. 1). Note how mass is associated with the octaval covariation or self-variation of velocity which represents the specific frequency, and hence energy and momentum, of a particle of energy, this secondary variation of velocity being a type of acceleration. Essentially what one sees in this inversion is that the distribution of masses and the distribution of velocities in the universe are inseparable components of a superordinate codistribution; Planck's quantum of action, h, or the Quantum Principle, means that space-time has an "ergomorphic" structure. Conversely, the asymptotic effort to make a physical object absolutely stationary will require compensatory adjustments between the object and all the other information of the physical universe which will have to proceed at the speed of light, and hence will require all the activity of all the objects of the universe to be coordinated at the velocity of light and the "consumption" of all the energy of the universe, which, being all the mass of the universe, will encounter an indeterminacy. In brief, without discussing these possibilities in full, a few relationships are: maximize velocity and mass looms, minimize velocity and mass looms, maximize mass and velocity looms, minimize mass and velocity looms. I have oversimplified terribly, in my too hurried analysis of these highly complex matters.

Abandoning this rich discursion and returning to my original concerns.

I suggest that the consideration of the implications of such possibilities as arbitrarily long wavelength radiations, the unlocalizability of these in space and time, the necessity for the primordial cosmic singularity to have paradoxically become and been infinitely arboresced (and hence infinitely anastomotic) at the instant the universe supposedly began its departure from an absolutely singular state (and hence to be virtually timeless in nature), etc. persuades one that there must exist in the nature of things, in addition to the world of real and possible things we know, a second world of excluded opposites, an antiworld constituted of everything which is nonexistent and impossible, the complete negation of being and reality as we know them. Our positive world may be named in this opposite relationship the "reicosm", or the world of things, and the word "nihilicosm" can be used to refer to the negative world of antithings, or the "antipossible universe", the incomprehensible coexistence of which I see as unavoidable. In a sense our "possible universe" sprang from such a symmetric antipossible universe.

Profound paradoxes and challenges await us in the physicomathematical concept of the "probability" of things. Some of these may be identified here.

If the world is to be described in terms of a spectrum of differential probabilities, the extremes of such a spectrum are absolutely enigmatic. What is meant by, and what are examples of, things the probability of which is 100% and which are certain, or things the probability of which is precisely 0% and which are therefore absolutely nonexistent and/or impossible? These problems at the extremes of such a spectrum of probabilities complicate any interpretation of all probabilities of intermediate degree, and are inseparable.

The explicit or implicit contention of physicists, which might be referred to the cosmological consequences of the Uncertainty Principle and various other matters, is essentially that all the laws of physics as formulated by man, and perhaps all the laws presumed to be intrinsic to nature regardless of human formulas, are probabilistic by nature. The assertions made by these laws are therefore to be supposed of only a limited validity. A strict consequence of this limitation is that the laws must not only describe nature imperfectly but also incompletely. Unfortunately, the probability calculus which man uses is essentially tautologous; therefore the spectrum of differential probabilities is a circular spectrum, its extremes (supposed certainty and supposed zeroness of probability) meet, probabilities cannot be said to converge, the probabilities of things are at best infinitely complex and involve an infinite-valued logic, and the spectrum of the formal and intuitive probabilities of things has a nature which might be described as Riemannian, being finite as self-closed and infinite as unbounded. Ergo, the laws are only infinitesimally accurate and complete.

This essentially probabilistic and infinitely complex status is assumed to hold not only of the natural and human laws of our world but also of all data, sensa, ideas, and physicomathematical realities. That is, an infinity of truths, realities, etc. are virtually what constitute our world. All this follows from the presumptive fact that the Uncertainty Principle is totally reflexive: all the honored "facts" of the world will prove under analysis to decompose into chains of complications, into qualified and iridescent realities, into an oceanic network of convergent and divergent quasi-realities.

The exquisite fractionality--really the infinite transience and infinite-valuedness--of all perceivable probabilities as to the truth and form of things, and the consequent forbiddenness of absolute certainties and absolute impossibilities (in the reicosm, as opposed to the situation in the nihilicosm), would seem to have as its corollary that any such event as the eventual or original complete contraction of our universe is of necessity at best only fractionally probable. Moreover, the infinite-dimensional nature of the spectrum of the differential probabilities of appearance (because of which facts and forms should not be spoken of in terms of the "probability" of each being so, but instead in terms of the "probabilities" of each being such) essentially requires that the probability of a presumption (in effect, the probability of a probability) tend to zero over time, that the accuracy of an appearance similarly tend to zero, and that all things essentially be superseded by other things. It is required that there is a nonzero probability that the universe will not and cannot ever collapse; certainly nothing compels its collapse.

In some sense the things we deem to be arbitrarily improbable must all both transpire and hold in the nature of things.

Actually the fractionality of all truths, and the coderivation of all appearances, requires that in an ultimate sense all realities, appearances, and possibilities are equiprobable, equally valid, and coessential. The differential probabilities of things identified in the spectrum of differential probabilities are misinterpreted by us as mutually exclusive realities and possibilities--instead they merely indicate the degrees of intertransformativeness of all truths, realities, beings, appearances, and possibilities, the infinite multiviousness of the world, and the degrees of immanence of all things in everything. In reality all things happen and are so!