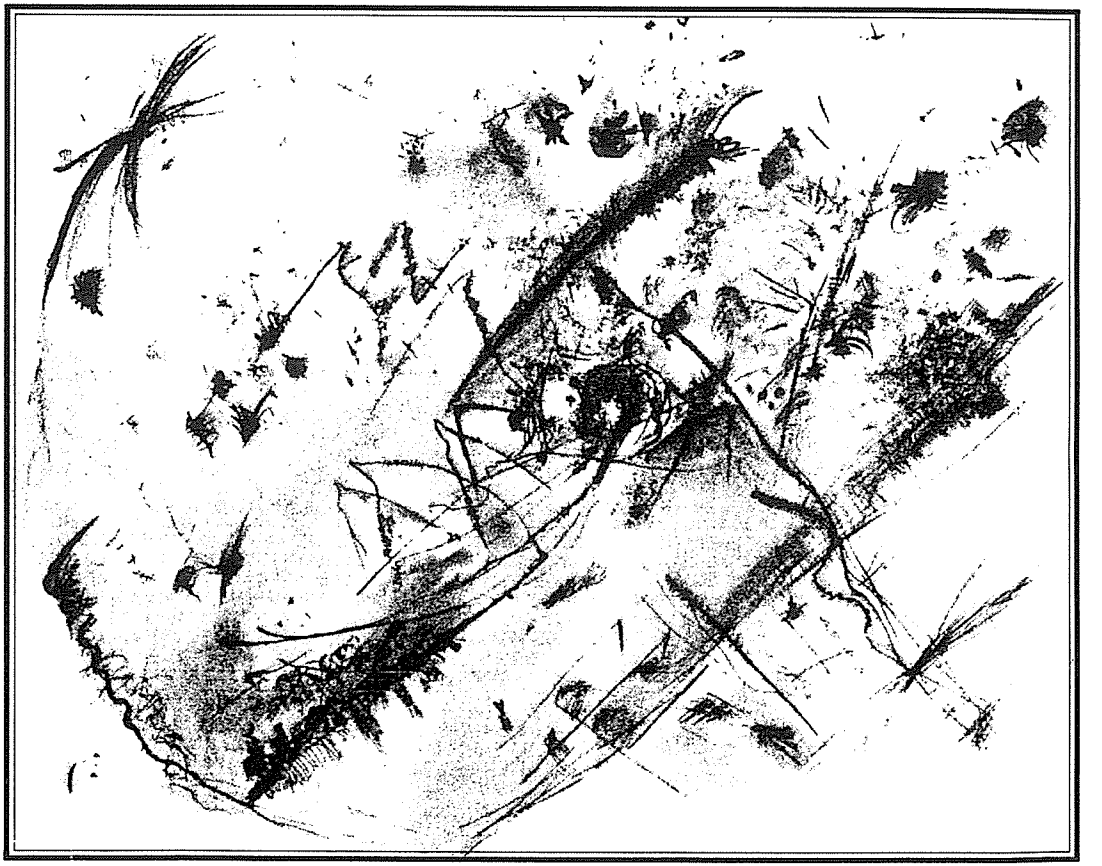
ANPA WEST

Journal of the Western Regional Chapter of the Alternative Natural Philosophy Association



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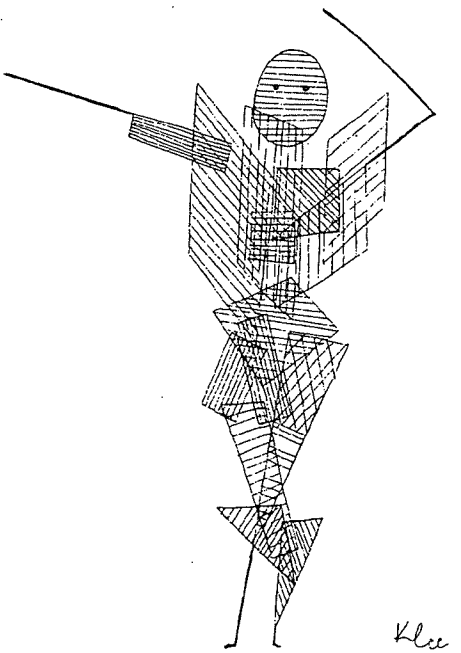
IN THIS ISSUE



correspond to a different simple notation for numbers, and the old question "What is a number?" is raised in a new form.

Multi-set theory looks like it will be a useful tool in the new approaches to quantum theory, and we plan to publish more articles exploring its connections with probability theory, amplitudes etc.

Page 13. Abolish Infrared Slavery by Pierre Noyes.

Next we have a progress report on Noyes-McGoveran bit string physics. McGoveran's approach to calculating the binding energy of the hydrogen atom has been extended by Noyes to the strong interactions. Unlike perturbation theory, this approach does not require that the coupling constants be small for the calculations to yield sensible results, which may be a step towards ending the so-called "color confinement" of quarks.

Page 17. Don't Worry, Be Happy by Niklas Damiris.

There is a story about Metternich and Talleyrand, those great arch-rivals of devious diplomacy, that when one of then, I think it was Talleyrand, heard the other had died, his first reaction was "Now, I wonder why he did that?". Primitive religion, like Talleyrand in his moment of absent-mindedness, naively fills the course of natural events with human purposes. Primitive science, which is what the next generation (if there is one) will call what we practice today, commits the opposite folly, naively stripping the world of purpose altogether. This strange folly, one might almost say this dementia, leads us to treat the world, including even ourselves, as if it were an instrument of our purposes and nothing else.

We've heard a good deal lately about the deadly threat that such an attitude poses to our environment. This article addresses the more insidious and perhaps even more deadly threat that it poses to our humanity. Damiris shows that the mechanistic folly is much harder to escape than most "new-age" people imagine. Those of us who like to think we are creating a non-mechanistic science had better pay close attention.

Page 30. Boolean Fact Sheets by Tom Etter.

Comfort's article raises several questions about logic: does it apply to the world itself?, is there an "old" logic that must be replaced by a better "new" logic? and so forth. Logic has been and will probably continue to be a recurrent theme here, so we have included next some elementary mathematical background old-fashioned Boolean logic.

Many people don't realize how intimately and rigidly the Boolean operators AND, OR, NOT etc. are bound together. You can't make a small change in logic; changing anything changes everything. The main facts of how the logical operators define each other are here briefly summarized, along with the relationship of Boolean algebra to the bit string space of the combinatorial hierarchy.

The Hamlet Problem - Is Definiteness Real?

Alex Comfort

When the monk Malunkyaputta asked the Buddha (among other things) whether "the saint exists, or does not exist, or neither exists nor does not exist after death" he got not and answer but a wigging. Buddha was not in the business of encouraging academic speculation. ANPA, however, and modern physics in general, are in the business of asking not this, perhaps, but equally tiresome questions. We find Wayne Blizard, Etter, and many others asking them about the entities (particles, polarization, probabilities) in which quantum theory deals.

I have a reason for lumping the latter together. Although particles can be conveniently treated for many purposes as "things" and the other two p's cannot, most informed physical discussion subsumes the assumptions that there is no real ontological difference. "Things" are entities which our evolved brains reify in the interests of sensory convergence: it pays for an organism to deal in something other than probabilities and state functions if objects which it sees can also be touched, eaten, or avoided. That cuts down on the amount of computing power it requires to do business. Whether it be particles, cats or bathtubs, we do not observe things, we observe only phenomena, "appearings." For most of the spectrum of observation this works fine and creates no confusion of categories, but in physics we are now beyond that spectrum.

Most of the mathematical and counter-intuitive properties of quantum physics spring, in fact, from our problems in controlling the horse we are riding. We have to use a brain highly canalized by evolution to handle middle-order phenomena, and make it think against itself - where it got the uncovenanted ability to do this and to perform mathematics is another question, but it can and does, even if to make it perform we have to run it in unusual modes such as REM sleep (Pstruzina) or nonstandard algebras. Much of Einstein's problem in formulating relativity lay in getting round common sense. With quantum phenomena it is even harder.

The Old Adam refers events to a dimensional frame, including experiential (flowing) time, and classifies them as local (an electron) nonlocal (a field) or conceptual (elsewhere: the Nonconformist Conscience, the algebra of complex numbers.) The sequential time arrow introduces causality. This is an a-priori frame with its own logic, and that logic unfortunately does not consistently satisfy observation. If we extend it, as in Bell's theorem, we start to get interface problems.

Another part of the a-priori programming is factual definiteness, not as the opposite of CFD in Everitt-Wheeler-Graham terms but simply as the requirement of organisms (from crabs and dinosaurs to physicists) for a yes-no answer. Even when quantum analysis reduces this to probabilistic terms, *we* see a yes-no observation, flash or no flash, and we design instruments and computational systems on an on-off or (0,1) basis. I would question Etter's conclusion that ~X=(X¤0). The two states, X and ~X, may well in some physical contexts be potentially superposed, like Spencer-Brown cells drawn on a

transparent globe, and the superposition will then be distinguishable both from X and from ~X. I would go further and suggest that maybe exclusivity applies *only* to concepts, not to the phenomena on which they are based. Our horse, for good evolutionary reasons, wears blinkers. [1]

We have some clear examples of problems with the Old Adam's ideational system, of the type A ä A ä A, "This statement is a lie," denotable in logic terms as **R**, recursion. Before we had computers and dealt with no-exit loops, philosophers used to bother about this type of statement. The problem with it may be indeed fundamental at the level where observation is a recursive process, the universe viewing itself and thereby dividing itself: mind is recursion. [2]

The problems of the Old Adam (obvious, reasonable, Hellenistic logic) provide a strong argument for Pstruzina's race of self-conscious or model-forming robots. They need not necessarily pre-model and try for fit provided that their thought mode is free of a-prioris, what I have called elsewhere the demonic computer, which selects its display frame from the mathematical relations fed to it. Whether its output would be comprehensible to us is another matter, but we could at least try. The problem of interfacing with it would be the same as the problem we are finding in interfacing with the real substrate, whatever that is, but it would be more easily manipulable. •

1. Editor's note: The expression ~X=(X ≡0) is a theorem of Boolean logic that or remains true in quantum logic, so it is not threatened by quantum superposition, though it might have to be abandoned at a more fundamental level. It's important that we be aware of the difference between negation and contradiction - see Boolean Fact Sheet #1 in this issue.

2. For a proper mathematical treatment both of recursives and of "Hamlet" states (both X and ~X) see the papers of Louis Kauffman, who has greatly extended Spencer Brown's discovery of imaginary numbers in symbolic logic. Some of the contrafactual superpositions which arise in physics come very close to his concept of multiplication by the square root of negation.

Member Theory

By Tom Etter

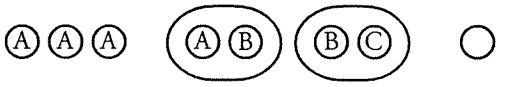
PART 1. Sets, Multi-sets and Anti-members

Set theory is about the relation of membership. Why, then, do we call it *set* theory and not *member* theory? We seem to regard sets as more important than those things which, as we say, *belong* to them. Certainly the owner is more important than his possessions. But a strong case can be made that it's not the sets that own the members but the members that own the sets - after all, members are free to belong to other sets, while a set is uniquely bound to its particular membership.

The present paper will show that this more democratic view of ownership reveals a surprising unity among sets, multi-sets and natural numbers.

We can think of member theory as set theory with a new notation. In the usual notation, a set is enclosed in curly brackets, with its members separated by commas. Thus {A,B,C} is the set with members A, B and C, {{A,B},{B,C}} is the set whose two members are the set of A and B and the set of B and C, {} is the set with no members (the so-called null set), and {{}} is the set whose sole member is the null set. This notation becomes easier to read if we replace the curly bracket pairs by boxes:

Brackets or circles draw attention to what's important, and since it's now the members that are important, we'll circle them instead of their sets. In this new notation a set has no special symbol - it's just the region of the paper where its members are. Here, in *member notation,* are the four sets above:



But I only see three sets, you say. True enough. The fourth is still there, though; it's the null set, whose symbol is blank paper. To make the null set noticeable, you have to confer on it the status of memberhood, which you do by drawing an empty circle.

From now on we shall only be concerned with sets generated out of nothing, so-to-speak, by starting with the null set and progressively conferring membership on the subsets of what has already been generated. It's generally thought that these are the only sets needed for pure mathematics, so we'll call them *pure.* Here are some early members of the progression of pure sets:

Every finite subset of this sequence eventually turns up later in the sequence as a member. By conferring membership on infinite subsets, one can also go on to "super-sequences", but we won't do so here - we'll only be concerned with finite sets.

What's the general rule for drawing a pure set? It's easier to start with the general rule for drawing a pure *multi-set,* which is simply to draw circles in any way at all so long as they don't touch. Note that when you do this, you may get the same member two or more times in the same "set" area.

For an area to be a set rather than a multi-set, members are only allowed to occur once. For a set to qualify as pure, this requirement must be applied also to the members of its members, the members of their members etc. A picture here is worth a thousand words:

multi-set **impure set** **pure set**

Now for a surprise! Consider the number 13, which in binary notation is 1101. Binary notation is based on the fact that every natural number is a unique sum of powers of 2. The 1's in 1101 show that 13 is the sum of the 3rd, the 2nd and the 0'th powers of 2, i.e.:

$$13 = 23 + 22 + 20$$

Let's change our notation a little bit. First, we'll write the n'th power of 2 as n enclosed in a circle:

> **Circle Rule:** *n* is defined as *2*. Next, we'll omit the '+' sign in sums, i.e.: mn is defined as *m+n*.

Finally, we'll write *0* as nothing, i.e. as blank paper:

is defined as 0

With these conventions, we have:

$13 = 23 + 22 + 20 =$ ③ ② ○

Clearly this new notation, which we'll call *binary circle notation,* works for any number. This means we can write the numbers inside the circles in binary circle form too, and then do this again for the numbers inside the new circles etc. until there is nothing left but circles:

$13 =$ ③ ② ○ $=$ 

Lo and behold, we end up with a set! This isn't because of anything special about 13. It's easy to see that any number in this expanded binary circle notation is a set in member notation, and conversely, any pure finite set in member notation is a number in expanded binary circle notation. The "members" of a number are the powers of two represented by the 1-bits in its bit string; to find where such a bit is in the bit string, evaluate the number which it encircles.

> **Membership Rule For Numbers:** *m* is a member of *n* means that the *m'th* power of *2* belongs to n, i.e., it means that the *m'th* bit of *n* is *1*, where bit numbering starts with 0.

Member notation shows that finite pure set theory and number theory are in a certain sense the same theory. If we sent off a plaque into outer space with some proposition written on it in our circle notation for membership, the alien who read it would have no way of knowing whether we were trying to tell him something about sets or about numbers.

Let's now turn to multi-set theory. If we draw set S next to set S' the two drawings combined will be called their *sum,* written S+S'. Only if S and S' have no members in common will this sum be a set - otherwise some of its members will occur twice, so that the sum will be a multi-set. Of course a sum of multi-sets is always itself a multi-set, and this closure property, along with their simpler definition (remember, any drawing of non-touching circles is a multi-set), make multi-sets an attractive alternative to sets. As in the case of sets, we'll only be concerned with *pure* multi-sets, i.e. those generated out of nothing by progressively conferring membership.

How are multi-sets related to numbers? Let's take a look at a new number notation. First, we'll restore juxtaposition to its usual meaning of multiplication rather than addition:

mn means *m* times *n*.

Next, we'll let a blank area of the page represent 1 rather than 0.

is defined as *1*

Finally, we'll change the circle rule: instead of a circled n being the *n'th* power of *2*, we'll define it as the n'th *prime*, where we start numbering the primes with *0*, i.e., *1* is the *0'th* prime, *2* the first prime etc.:

= *1*, *O* = *2*, *2* = *3*, *3* = *5*, *4* = *7*, *5* = *11*, etc.

Circle Rule #2: *n* is the n'th prime, where *1* is regarded as the *0'th* prime.

Since every number is a unique product of primes, these rules give us another circle notation for numbers, for instance:

84 = 7.3.2.2 =  =

Note that we end up with multi-sets. Clearly every positive number can thus be turned into a multi-set, and every multi-set represents a different number. To say that m is a "member" which occurs i times in n means that the m'th prime occurs i times as a factor of *n*. Note that unlike our previous notation this one has no symbol for *0*, so what it demonstrates is the equivalence of multi-set theory and the theory of positive integers.

Wayne Blizard has developed multi-set theory in a way that allows for something to belong to a multi-set a negative number of times (see Blizard ref.'s 1, 2 and 3 for a more rigorous and comprehensive treatment.) To put it another way, *x* can be either a member or an anti-member of *S*. It can't be both, however, since these two roles cancel each other, i.e. if we add *x* as an anti-member to a set in which it is already a member the result is a set in which it does not occur at all (see Blizard 1).

We can easily modify our notation to accommodate anti- members; let's represent them by squares instead of circles. The general rule for drawing a multi-set now becomes this: draw circles and squares in any way so that they don't touch, with the added restriction that the same multi-set can't occur as both a member and an anti-member. When two such multi-sets are combined into a sum, the anti-members of one cancel their positive twins in the other, producing a multi-set satisfying this second restriction. Blizard has given the name MSTZ to the theory of multi-sets formed in this way; for now, let's just call it *circle/square* theory

When we looked at multi-sets as numbers, we saw that adding member m to the membership of n means multiplying n by the m'th prime. Since m as an anti-member cancels m as a member, adding the anti-member m to the membership of n must mean *dividing* n by the m'th prime. But, unless n already has m as a member, this takes us out of the realm of whole numbers and into that of the rationals (numbers represented by ratios). Our circle-square drawings actually become a notation for the positive rationals if we replace the multi-set circle rule by:

Circle/Square Rule: ◯ means the *r'th* prime, while □ means *1* divided by the *r'th* prime, where *r* is any rational number.

Wait a minute, you say, the expression "the *r'th* prime" is nonsense. True, but there is, a simple way to make sense of it, which is to arrange the positive rationals in a list - if r is the n'th item in

this list, we'll interpret the r'th prime to mean the n'th prime. Note that we can use the same list to transfer circle/square membership from the rationals back to integers. For more details, see the appendix.

To summarize where we have come so far: Set theory, which we have renamed member theory, is about the relation of membership. We adopted a notation that encloses members rather than sets and found that this same notation is an expanded binary notation for numbers. We then applied our new notation to two other theories of membership, multi-set theory and Blizard's MSTZ, and found that their rules produced two other notations for numbers. The dual role of our notation shows that each of these three concepts of membership has its simple counterpart as a membership relation among numbers:

Set membership: To say that the number *m* is a member of the number *n* means that the *m'th* power of *2* belongs to *n*, i.e., the *m'th* bit of *n* is *1* (bit numbering starts at *0*).

Multi-membership: To say that *m* is *i* times a member of *n* means that the *m'th* prime is *i* times a factor of *n*.

Circle/square multi-membership. To say that *r* is *i* times a member of *s* means that the *r'th* prime is *i* times a factor of the numerator of *r*, while to say that *r* is *i* times an anti-member means that the *r'th* prime is *i* times a factor of the denominator.

PART 2. Numbers

In his *Introduction to Mathematical Philosophy,* Bertrand Russell writes:

> *The question "What is a number?" is one which has been often asked, but has only been correctly answered in our time. ... Many philosophers, when attempting to define number, are really setting to work to define plurality, which is quite a different thing. ... A plurality is not an instance of number, but of some particular number. A trio of men, for instance, is an instance of the number 3, and the number 3 is an instance of number; but the trio is not an instance of number.*

He then goes on to define number in what has become the familiar way. First you define two classes as having the *same number* if they can be put in 1-1 correspondence. Then you define the *number* of a class to be the class of all classes having the same number; the number three, for instance, is the class of all trios.

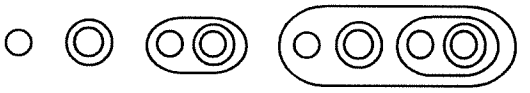
This definition is not without its problems. Consider *The Three Gentlemen from Verona.* Since these three gentlemen are make believe, so is the trio consisting of them, and thus so is any class to which this trio may belong. *Three,* according to Russell's definition, is therefore a make-believe number. As any child will tell you, this violates one of the cardinal rules of good story-telling: don't multiply make-believe entities unnecessarily. "*Three*" should mean 3, not something imaginary that vaguely resembles 3, just as "*Verona*" should mean Verona.

There is a way to define number that pretty much avoids both Russell's complaint against the philosophers and this one against Russell, as well as others against him of a more technical nature. It requires going back to the philosophers' idea that 3 is a particular trio; we'll call 3 the *standard* trio, leaving aside for the moment the question of what are its 3 members. Other trios may not be instances of 3, but why should they be? They are instances, rather, of the property of *3-ness,* defined as being in

1-1 correspondence with the standard trio called 3. "3" as an adjective needn't mean the same thing as "3" the noun, any more than "earthy" means "earth".

Our new definition of number restores reality to the three-ness of the three gentlemen from Verona - now the only make-believe concerning three is the fiction that these three gentlemen *have* the property of three-ness. But note that our definition also supports Russell's contention, which came from Cantor, that the root idea of number is the relation of being equally numerous.

Von Neumann in the 1920's found what is probably the simplest way to construct *standard sets* such as our standard trio, thereby giving us definite and clear things we can point to and say "That's a number." Start with nothing, i.e. the null set, and then generate a progressively expanding set by repeatedly making the set at hand into a new member, i.e.:



. . . and so forth.

That is, each member is the set of all previous members in the sequence, so they have successively 0, 1, 2, 3 etc. members. Von Neumann called these successive sets the *counters.*

Each of the three kinds of set theory we considered in the first section also describes a progressive expansion starting with the null set. The idea here is that at each stage one makes all subsets of the set at hand into the members of the next enlargement. We can think of the differences among standard set theory and the two kinds of multi-set theory as resulting from different definitions of subset. If we define the subsets of S to be just S itself and the null set, then we get von Neumann's counters as a fourth kind of set theory, a minimalist set theory, so-to-speak.

By the time von Neumann invented his counters, Russell's main interests had shifted away from logic, and I don't know that he ever expressed an opinion about them. However, I imagine he might have said something like this: "As I pointed out long ago, an instance of a particular cardinality is not that cardinality itself. Why, in this supposedly more enlightened age, do knowledgeable people still pretend that it is?"

I'll answer with another question: "Why, Mr. Russell, do you identify number with cardinality?" Even in set theory one looks not just at a number's cardinality, i.e. its size, but also at its *ordinality,* its place in the numerical order. For a number theorist, a number is far more than either of these two things; each number has not only a size and a numerical rank, it has its own unique character, perhaps its own color and even its own personality. There are occasions when the most important thing to know about a man is his size and rank, and so it is with numbers. But there are also other occasions.

In Part 1 we found, through a certain notational trick, that three kinds of (finite) set theory can also be regarded as three viewpoints on the natural numbers. In the present section we set out to discover just what it is that these viewpoints are viewpoints on. Instead we have only found two more viewpoints, one of which is another kind of set theory. Just what is a number, then? Any *technical* answer to this question must in part be an artifact to hold and direct our attention to certain kinds of intellectual work. Numbers themselves aren't bound to our tasks, so why should we expect a technical definition to capture their essence?

This may seem a rather negative conclusion, but we have to see it in the context of something important which is happening today: the rescuing

of important concepts from what have become their stultifying roles. Among those still to be rescued are mind, stuck in a bit part as impotent observer and disembodied will, and body, exiled among the impersonal wheels of the world-machine. Perhaps we also need to rescue number from its dead-end job as the servant of measurement and comparison. Seen in this light, member theory joins fractals, chaos theory, and the combinatorial hierarchy as part of the rescue crew.

APPENDIX: The MSTZ list of rationals

There are many ways to enumerate the rationals, but the way that works best here is to create the *place number* of *r* out of its prime factors as follows: Write *r* as *i/j*, where *i* and *j* are relatively prime. Then the number of the place in the list where *r* is to be found is $(ij)^2/k$, where *k* is defined as the product of each of the prime factors of *i* taken only once. For instance, *7/12* is in the *7.3.3.2.2.2.2* place.

I'll leave it as an exercise to show that this way of interpreting the *r'th* prime does indeed make circle/square drawings into a notation for the positive rationals. If a drawing contains no squares it of course represents an integer, and the new membership relation between such integers closely resembles that of our previous notation, becoming identical to it in the case of pure sets.

The list rule $n = (ij)^2/k$ can of course be used to map the rationals denoted by circle\square drawings back onto the integers, so we can think of these drawings as yet a third notation for integers. Here, in more direct terms, is how circle/square membership works for integers:

Given an integer *n*, define the "numerator" *i* and the "denominator" *j* of *n* as follows: First write *n* as n_1n_2, where n_1 consists of the primes in *n* that occur an odd number times, n_2 those that occur an even number of times. To get *j*, take the square root of n_2; to get *i*, multiply n_2 once more by all the primes in it and take the square root. Membership now has the same formal definition that it had before for rationals. That is, *m* is a member *i* times of *n* means that the *m'th* prime is a factor *i* times of the numerator of *n*, while *m* is an anti-member *i* times of *n* means it is a factor *i* times of the denominator of *n*.

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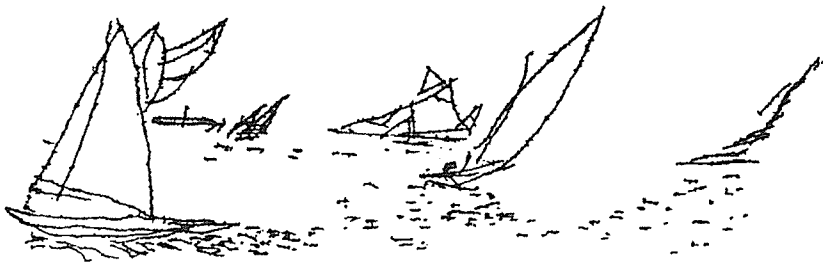


Abolish Infrared Slavery

Pierre Noyes

The current paradigm on which conventional particle physics and cosmology rests—second quantized relativistic field theory—has an Achilles heel. Despite its manifold quantitative successes, and the enormously creative role it has played in guiding high energy particle research, all its quantitative techniques rest, ultimately, on manipulating the theory into a form in which the interaction energy is small compared to some solved problem with a well defined "vacuum state". Then the interactions are seen as "perturbing" the calm of the vacuum by a small amount (eg. one part in 137). Two such interactions should then give an effect proportional to one part in the square of 137, i.e. one part in 18,769, and so on. Although this sequence of terms can rarely be added up to give a finite algebraic formula for the result, it seems reasonable to drop corrections that are smaller than current experimental error in the measurement of the quantity which is being calculated. This is called "perturbation theory".

These clever manipulations take their most sophisticated form in the theory of strong interactions—quantum chromodynamics or QCD. When strongly interacting particles are close together, the uncertainty principle forces them to have high momenta,—high enough to create virtual particle-antiparticle pairs, or new particles allowed by the discrete conservation laws. Wick understood this clearly enough in 1938 when he presented a simple but profound analysis of the physics behind Yukawa's 1935 meson theory; I have often called this the "Wick-Yukawa mechanism" for producing short-range interactions. Quantum chromodynamics is peculiar in that the coupling "constant" between quarks (the particles) and gluons (the quanta, or mesons)—and also for the self-coupling between gluons which distinguishes QCD from quantum electrodynamics (QED)—decreases as the energy increases. Consequently at high energy and short distance the effective coupling constant becomes small enough so that perturbation theory works. This is called "asymptotic freedom". But at low energy or long distance the colored quarks become so strongly interacting that they can never get away from each other. This is called color confinement. Since high energy corresponds to high ("ultraviolet") frequencies, this low energy corresponds to "infrared" frequencies, and color confinement is sometimes called "infrared slavery".

Since QCD (in the "standard model" form which so far has no experimental counter-indications) is supposed to be a well defined mathematical theory, one should be able to solve the equations directly without resorting to perturbation theory. However, the non-linear mathematics involved is not well enough understood to allow formal solutions that can be evaluated numerically. Instead, the continuum space-time of the theory is replaced by a finite mesh of discrete points and the differential operators in the field equations by finite difference equations. The resulting equations are so complicated that, although suggestive results have been obtained, they are nowhere good enough to calculate, for instance, the binding of a proton (two up quarks and a down quark) to a neutron (two down quarks and an up quark) to form a deuteron—the

simplest complex nucleus, that of heavy hydrogen. By ganging several super-computers together, some people hope to get there in a decade or so, while others are studying how to construct specialized supercomputers just for the task of solving "QCD on a lattice", which is the jargon for this class of problems.

Thanks to McGoveran's successful calculation of the binding energy of the hydrogen atom — the Sommerfeld formula, and the correction to the leading value of 1/137 for the dimensionless electromagnetic interaction strength — I have realized that the same approach can be extended to strong interactions. This could be the first step toward abolishing infrared slavery!

Any system of two masses m_1, m_2 which binds to form a less massive system has three mass-energies associated with it. Since we wish our description to be Lorentz invariant, we use the square of the invariant four-momentum $s = E^2 - p^2$, where E is the energy and p the momentum, rather than the masses in formulating the connection. One of the three terms is obviously $(m_1 + m_2)^2$, and the second the square of the mass of the bound system, which we call s_0. The third is the interaction energy, which will be some fraction, which we call f^2, of some reference mass m. This interaction energy must be supplied in order to separate the system into its constituents m_1 and m_2, so the relativistically invariant expression connecting these three Quantities is

$$(f^2 m)^2 = (m_1 + m_2)^2 - s_0.$$

This expression is more general than the equation I presented at ANPA 11, and consequently more useful, as we will see shortly. I call it the HANDY-DANDY FORMULA.

If we rewrite the formula as

$$(f^2 m)^2 + s_0 = (m_1 + m_2)^2,$$

we have a "metric formula" similar to that of Pythagoras in which the interaction energy and the rest energy of the bound system are added in quadrature to produce the free-particle measure. But in a discrete theory, we cannot always extract the implied "square root" to obtain a rational answer. Then the product of the two "roots", i.e.

$$(m_1+m_2+s_0)(m_1+m_2-s_0)$$

may prove to be more useful for physical interpretation. For a more careful treatment see McGoveran's contribution to *Proceedings of ANPA 11*, available from Faruq Abdullah at City University, London early next year.

If we take a dynamical rather than a static point of view, the measured quantity is the energy needed to separate the bound system into its two constituent masses m_1 and m_2 both at rest, and is called the "binding energy" ö; the relativistic definition connecting it to the notation given above is

$$s_0 = (m_1 + m_2 - \epsilon)^2.$$

In the application to the hydrogen atom, the mass of the proton m_p and the electron m_e are assumed known, and unconnected to the binding energy. To take account of 3-momentum conservation we refer the calculation to the "reduced mass" of the system

$$m_{ep} \equiv m_e m_p/(m_p + m_e) \simeq m_e$$

and obtain the result first achieved by Bohr in 1915

$$(m_{ep} - \epsilon)^2[1 + \alpha^2] = m_{ep}^2.$$

Here the coupling constant

$$f^2 = \alpha = e^2/\hbar c \simeq 1/137$$

is called the "fine structure constant". But this is

still only a relativistic correction to a basically non-relativistic treatment. The strong interaction case is a better test of our basic ideas.

Back in 1949 Fermi and Yang found the work going on in elementary particle physics to be too hidebound and conservative. To shake things up a bit they noted that the recently discovered Yukawa particle (the pion) could be modeled as a bound state of a nucleon and an antinucleon with spin zero; all the (discrete) charge, spin, parity and isospin quantum numbers work out right. Their model makes it easy to understand how a proton can emit a positive plan and change into a neutron, or a proton and an anti-neutron can fuse to produce a positive pion. Then we could drop the complicated apparatus of second quantized relativistic field theory for strong interactions. They challenged theorists to produce such a model; they didn't have a clue as to how to do it themselves.

I now believe that the "handy-dandy formula" can be the starting point for meeting their challenge. Let the two nucleons have a mass $2m_N \simeq 2m_p$; and the pion a mass

$$m_\pi \simeq 274 m_e \simeq (274/1836.15..)m_p \simeq (1/7)m_p,$$

values we have already calculated in our program [1]. As our reference energy, m, we take the smallest mass in the system, which is m_π— the mass of the pion. Then most of the energy needed to liberate the nucleon and the anti-nucleon from this bound state will go into making the mass of the nucleon-antinucleon pair, and the coupling constant, conventionally symbolized by G^2, will have to be greater than unity. Invoking the handy-dandy formula

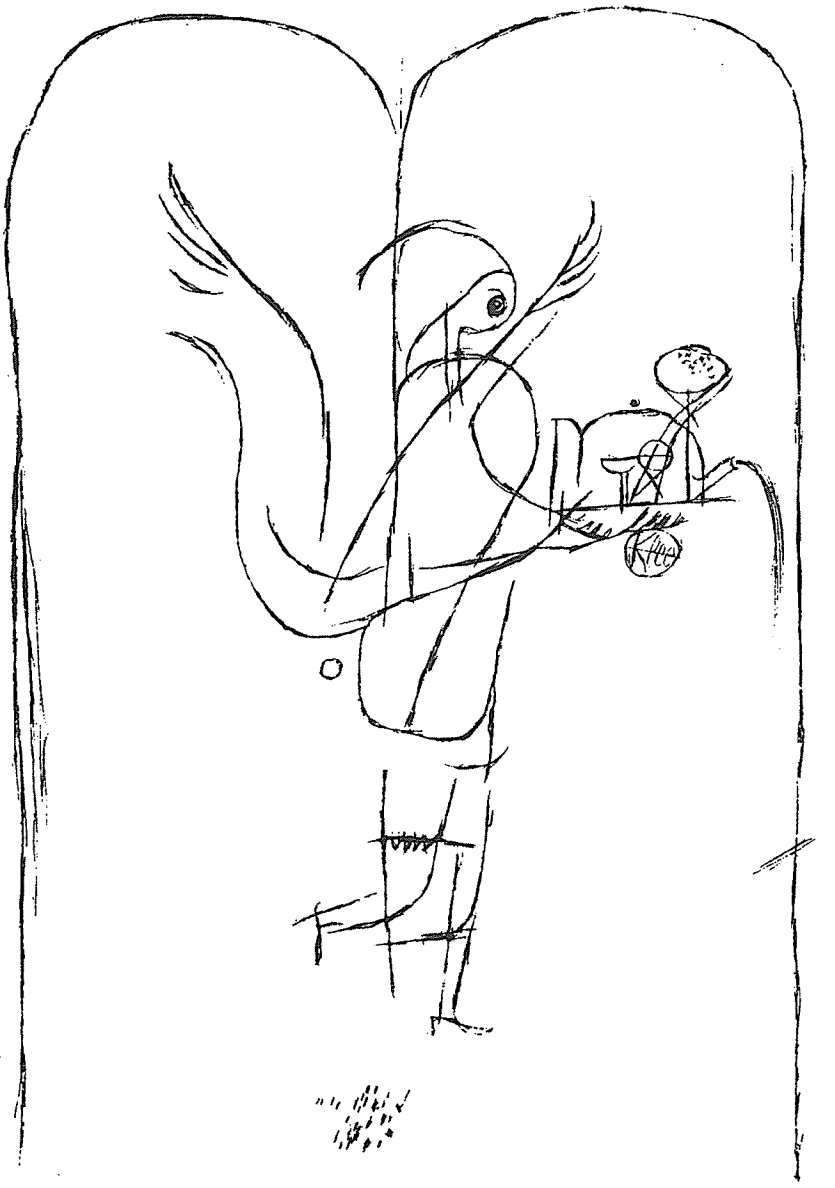
$$(G^2 m_\pi)^2 = 2m_N^2 - m_\pi^2 = (2m_N)^2[1 - \frac{m_\pi}{2m_N}^2] \simeq (14m_\pi)^2.$$

In this way we claim to have calculated $G^2 = 14$, which is close enough to the accepted value for this first attempt.

We now have three ways of deriving the "handy-dandy formula", due respectively to Bohr [2] and Sommerfeld [3], Direct and McGoveran [4]. Biedenharn [5] has shown that the first two derivations rest on the same symmetry principles; we suspect that this is also true for our derivation. Using my relativistic finite particle number scattering theory, I recently found yet another way of getting the handy-dandy formula. The connection between the masses of the constituents, the mass of the resulting bound system, and the "coupling constant" f^2 turns out to be simply the constraint which says that there are precisely two particles in the system, in the approximation in which the amount of time they spend "outside the range of forces" is large compared to the time inside. This may sound a little peculiar for coulomb forces, which are usually described as having "infinite range", but from a modern point of view, this is the region of "asymptotic freedom". The short-range region is where one starts to encounter particle-antiparticle pairs at a distance of half a Compton wavelength or less. Indeed this is just the point where relativistic effects come in and where McGoveran and I have shown that the value of 1/137 for the fine structure constant has to be modified because of these additional degrees of freedom.

The important point in all this is that nothing in either McGoveran's or my derivation of the handy-dandy formula requires the coupling constant f^2 to be small. As we showed here in the theory of pions and nucleons, the coupling constant $G^2 = 14$. Perturbation theory would then require one to neglect 196 compared to 14 even in the next ap-

Continued on page 32



Don't Worry, Be Happy

by Niklas S. Damiris — an ETG-production

"Man has gradually become less dependent upon absolute standards of conduct, universally binding ideas. He is held to be so completely free that he needs no standards except his own. ...As the end result of the process, we have on the one hand the self, the abstract ego emptied of all substance except its attempt to transform everything in heaven and on earth into means of its preservation, and on the other hand, an empty nature degraded to mere material, mere stuff to be dominated, without other purpose than that of his very domination."

M. Horkheimer, "The Eclipse of Reason." 1947

From Bacon's "New Atlantis" to Huxley's "Brave New World", technology has appeared alternately as ally or saboteur of the attempts to found a just and free social order. There is a reason for this. Our society has made the Faustian bargain. In exchange for power over nature, we are allowing technology to usurp our very selves, to replace what I am calling here "the Body." Both Bacon's and Huxley's visions rest on the same wager: that our social ideals will finally be realized through technology. They will fail because they contain the same fundamental contradiction.

Technology and Humanism

Recently the violent social and ecological "side effects" of technological advance have led to a thoughtful reappraisal of technology itself. Describing technology is "merely a means" "occurring within a social context" a humanist revival is attempting to reestablish the autonomy of ethical ideals. The problem is that humanism assumes that ethical discourse is separate from and uncontaminated by any technological extension of power.

That the modern explosion of technology has caused a great deal of concern, is obvious, but rarely

are fundamental questions raised. The threats to privacy, natural habitat, employment, and so forth, are legitimate concerns in the face of the massive social organizations and concentrations of power and knowledge which result from technical achievements. But is this all that is being threatened? The right to make a living, to vote, to participate in political decision making — all of these are important. But fundamentally, what is at stake is the humanist conception of subjectivity itself, the idea that we have a free and creative will, an idea most of us operate under without ever reflecting on its origins — or on its viability.

Thus, to solve problems posed by technology, we imagine that we need empirical studies of the impact of technology on our aspirations, i.e. on this creative will. But such studies are gravely flawed in that they imply that technology itself poses no threat to our received ethical tradition. To suppose that such accounts can be self-sufficient is to presume that the prevailing ethical and political categories are adequate for the assessment of technology — that the values of growth, efficiency, etc. are themselves not presupposed by technology.

Against this I suggest here that humanism contains ideas about technology that co-opt and vitiate its own ethical categories. Of course, to criticize humanism is a difficult and dangerous enterprise; one must be careful not to give aid thereby to technocratic tendencies of a far more vicious and manipulative bent. However, if it is indeed the case that a humanist ethic is intertwined with technological imperatives, then humanism alone cannot provide an adequate critique of contemporary technology. And it cannot provide us with guidelines for an alternative either.

Knowledge and Power

The rationality that led to contemporary technology originated in the Renaissance with the connection of human knowledge with human power. In his discourse on method Descartes predicted that the new "utilitarian" knowledge would eliminate labor, conserve health, and perhaps even prevent the ravages of old age. Bacon in *Novum Organum* articulated the connection between the scientific method and the domination of nature:

> *"For the chain of causes cannot by any force be loosed or broken, nor can nature be commanded except by being obeyed. And so those twin objects, human knowledge and human power, do really meet in one; and it is from ignorance of causes that operation fails."*

But if, for the humanist, power and knowledge are one, then technology and humanism are not opposed. Thus, in both its rationality and in its application, the science of the Renaissance will be committed to the control and domination of nature.

The conceptual basis of this new science of the Renaissance is clear from its love of instruments like the telescope where mathematics is interwoven with the practical. Scientific theory moves away from any conception of nature as an intrinsically value-laden order. Eventually, technology, liberated from cosmological restraint, will be made to serve solely human ends.

Since the Renaissance, technology has come to be seen as an evolving process where the self, as creative will, rules an objective, physical, external and indifferent world. This idea of nature as "indifferent stuff" expelled ethical order from nature and lodged it solely in the human subject. The essential characteristic of subjectivity then becomes this arbitrary "positing of values" without need for foundation or justification.

Many of our problems today seem intractable, but perhaps it would help to distinguish between tensions which stem from unclear thinking and those which are the "stuff of life". After all, conflict and contradiction are not always mere appearances to be dispelled by the unifying power of thought.

There is a suspicion today in many quarters that ultimate foundations cannot be unearthed, that what we are looking for is not to be found in eternal mother nature but only in human history. Indeed the search for an ultimate principle with which to judge social order presupposes that the diversity of social life veils a basic unity accessible to thought. Radical questioning cannot be so certain of its own ground.

Foundations

From Aristotle to Hegel, a base in the household or family was a prerequisite for political life. In order to go out to the "agora" (the realm of the commons) in which one must argue and defend one's thoughts and actions before others, one needed to start from the hearth (the realm of shelter, comfort, and intimacy.) People came to the public arena from an "**embodied**" place.

The turn of technology towards mass production, on the other hand, now begins to hold us to universal standards. Submitting has gradually devalued embodied human existence. This abdication is a more fundamental degradation than submitting to political tyranny. Technology is subverting the very foundation of communal political life. By forcing "the body" into the productive and administrative requirements of an "information society", the formation of individual character has been entirely subordinated to the imperatives of the technological conquest of nature, including "human nature".

Humanist ideology leads us to underestimate and misunderstand the conquest of nature through technology, for it is this upon which humanism itself depends. Humanism tells us that only by overcoming scarcity and inequality can the ideals of freedom and equality be realized. But the technology used in this quest has its own perverse consequences. Humanism's superficial acceptance

of technology blinds it to the root cause of the violence it spawns. Such violence is generally regarded as due to peripheral and removable causes but it really begins with what has become the central purpose of technology: to uproot and displace the body.

Universality and Homogeneity

The term "universal and homogeneous state" was introduced by Alexandre Kojeve during his debate with Leo Strauss in order to illustrate his Hegelian account of the realization of philosophy in history. Alexandre Kojeve claims that Alexander's empire was the first universal state in the sense that it included everyone based on their common human "essence" rather than on geographic or ethnic particularity like the Greek polis. However, this notion of human essence was based on the Greek conception of reason and therefore on the differences in reasoning abilities that justified the division into masters and slaves (and, ultimately between the few philosophers and the "hoi polloi" (the masses)).

Only with Christianity does the concept of equality become equality in the eyes of God. Conversion thus becomes the human act which nullifies the Greek master\slave distinction. Originally universality and equality were reserved for heaven, but the egalitarian tendency of the reformation was secularized by the French and American revolutions. Thus a civilization with Greco-Roman and Christian roots is a universal and homogeneous state exemplifying reason and negating differences.

Subjectivity and Ideology

Two things characterize today's western culture: the scientific-technical manipulation of nature and the predominance of ideology. We have focused on the first now let's turn to the second. Specifically ideological practices such as advertising, broadcasting and propaganda refer to people primarily as grammatical subjects. These references, like "You'll just love our new improved taste" invite us to see ourselves as the addressees of these discourses. Interpolation, as L. Althusser calls it, is this "hailing" which incites human beings to identify their self-experience with the image of that experience that comes for them in the discourses emanating from the technical appliances and the ideological apparatuses.

This is not an issue of intellectual manipulation. The identification with an image of one's self is considered to be instituting that self and such an institution becomes the structural precondition for any manipulation at the level of ideals like beauty, wealth, success. Furthermore the search for a moral philosophy adequate to this new situation meets another obstacle: rationality itself has come to be viewed as another rhetorical device. Consequently, it reinforces the bent of contemporary society and cannot correct it — which is what is required of an ethics.

The "subject" is generally construed epistemologically as the counterpart to the phenomenal object and is described as the intentionality by which and against which the external world is posited. The "subject" is the complex but nonetheless unified locus of the constitution of the phenomenal world. In different philosophical accounts the "subject" enters a dialectic with that world as either its product or its source, or both.

However, literary critics have recently begun to question the role of the epistemological "subject", both as the intending manipulator of structures and as the coherent originator of meaningful actions. Consideration of the subject's complicity in and reliance upon the structures of language and information has become paramount. The attempt has been to formulate a theory of the "signifying subject" in such a way as to allow an understanding of the "subject's" position within all information related practices, and to stress the import and effect of representation in the construction of subjectivity. We are moreover rapidly coming to the point where, as R. Barthes says:

> *"What characterizes so-called advanced societies is that they currently consume images rather than beliefs . . . It is as if the image produced a world without differences (an indifferent world), from which nothing can spring except here and there the cries of anarchisms, marginalities, individualisms."*

It seems like we have come full circle: from a natural world order that is indifferent to us to a socio-cultural order that is indifferent as well.

Technology and Will

Technology requires splitting embodied experience into inner and outer dimensions. This presupposes a subject/object dichotomy which further sustains the division of content from form. Technology becomes the perfect manifestation of the Western philosophical conception of the "will" which comes to fruition in Nietzsche's work. It is an act of the will which allows the Ego to represent the world to itself. But Nietzsche's thought is deliciously ambiguous so that it can be read as both the end of a way of thinking as well as the start of a new one. His book "On the genealogy of morals" traces philosophy to its originating impulse in the rejection of sensibility by the ascetic priest. The idea of truth depends upon the assertion that the sensible

world is "false" and the postulation of a "true" realm, essence behind appearances.

Since the sensible world often involves pain and suffering without apparent reason, the ascetic priest gives a meaning to suffering by becoming a bridge to a true non-sensible world governed by reason alone. Philosophy then is viewed as the product of a decadent will, a will turned against the body and against itself. The whole realm of episteme, scientific method, et cetera, stems from this. But it is not Nietzsche's point to throw out the "rationality" that distinguishes the West. Rather it is to uncover and revalue its hatred of the body's sensuousness from which it stems. Thus arises the possibility that technology is distorted by its origin — the denial of a sensibility that cannot be but embodied.

Having suggested this possibility in Nietzsche's thought we can turn to Heidegger for a provocative assessment of modern technology. He begins by saying that technology is the fusion of the crafts and natural philosophy in the modern era that was not present in antiquity. All modern knowing is a making. Technology is regarded as "the endeavor which summons forth everything (both human and nonhuman) to give its reasons, and through the summoning forth of those reasons, turns the world into potential raw material at the disposal of our "creative wills". This "summoning forth" is the basic attitude which treats the given world as a resource for goals posited by the subject.

The development of technology proceeds thus through an intertwining of knowing and making that has removed the traditional boundaries by which these were kept apart. Creative will with disposable resources marches unstoppable, rendering the conception of justice (which requires a restraint of human actions by an intuition of "the order that is") increasingly anachronistic. We face a growing tension between the driving force of modern technology and the Biblical-Platonic conception of justice as "what we are fitted for".

Technology is "summoning forth". It necessarily produces a distinction between the summoning and what is summoned, between creative willing and its resources. "Technological man" must be continually self-transcending in order not to be reduced to a resource. If we are not all capable of self-transcendence (or to the same degree), the split within the subject (i.e. the will and what is moved by it) becomes a division within society into masters and human resources. Thus ironically technology undermines the moderns' value of equality; it suggests that each "subject" may not ultimately have its "due", namely its body.

Body and Subject

The question of our time is often posed as: How can we bring technology under control? However "bringing under control" is an attitude inherent in technology. Similarly if we say technology must "serve human purposes" we fail to see that "serving human purposes" is characteristic of technology.

We always feel the need to justify our beliefs. At the heart of this, the epistemological project, there is a fundamental instability: how to institute an appropriate "subject" for every discursive practice. This instability arises because the "subject" is both the dupe of discursive practice and its embodied knower. We want to stress that embodied existence, far from being knowledgeable submission to discursive or epistemological formation, is a state of being totally unlike any such formation.

From the physicists who try to generate the cosmos out of bit-strings (P. Noyes et. al.) to the computational linguists preoccupied with their texts and grammar, we find everywhere in the intellec-

tual world that the body is written off. Derrida claims that the "metaphysics of substance and presence" has come to an end. I retort that this does not spell the end of the issue of origins and locality; this issue has nothing to do with physics or metaphysics, but with the body. The danger of technology is that it conceals both its origin (the body) and its "essence" — the world revealing itself as resource.

The epoch of technology brings forth this representational subject\object relation but the epoch is inaugurated by a new revelation of the world.

The metaphysics that projects modern scientific technology co-projects humanist ethics. Thus "human" refers to a subjectivity that speaks the "scientia". A science of the human is construed as the meeting of subject and system. Knowledge comes to seem more and more disembodied, separated and detachable from the human agent who is exhorted to pay attention. Knowledge is no longer OF the embodied agent, but is an abstract and formalizable aspect of the subjected "subject". In such a situation, the body and the self disappear and are replaced by the concept of the subject.

Plato's Quantitative and Qualitative Measures

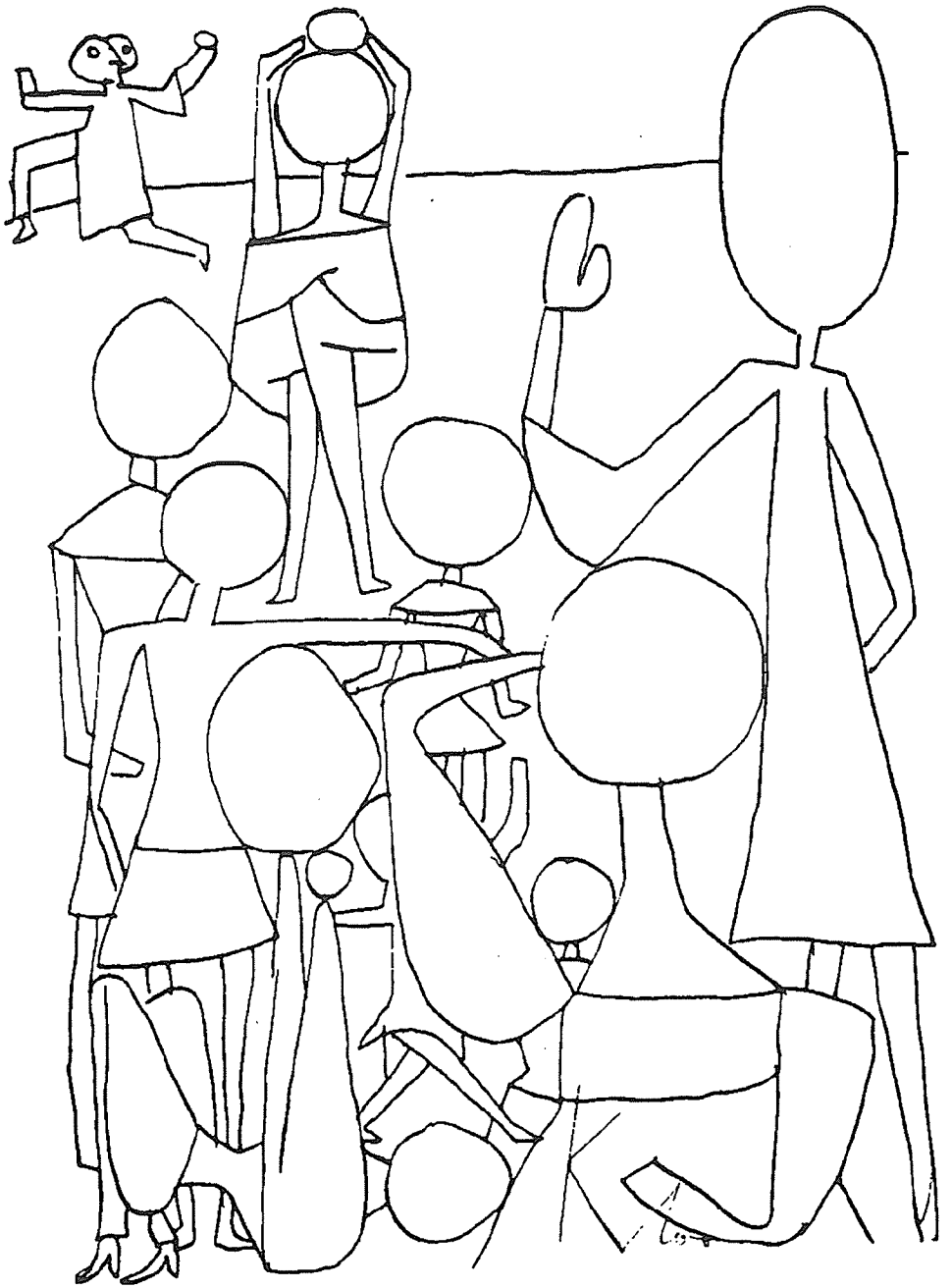
At the beginning of Western philosophy, Plato posed the question of how to measure, or evaluate an entire social order. He introduced the contrasting notions of what he called *quantitative measure,* which measures the excellence of a craft in serving its particular end, and *qualitative measure,* which applies to the overall human good. For example, we measure the excellence of the art of medicine by a quantitative measure, namely the extent to which it promotes health. To health itself, however, we apply qualitative measure: is health conducive to the human good?

Indeed, is there a conception of good which makes a claim on us as humans rather than as doctors, programmers, managers, etc., i.e. as subjects? In order to measure (i.e. judge) a social order it is crucial to confront this question of a context-transcending human good, the good which Plato, in the Republic, calls justice.

There have of course been many conceptions of human good, and today our awareness of the untapped wealth of human potentiality makes us reluctant to speak of *the* good. Yet, without the possibility of measuring an entire social order, the attempt to judge contemporary technology is doomed from the start by cultural relativism. The present revival of humanism takes its sustenance from its defense of qualitative measure. In our critique of humanism, this will have to be maintained, though rethought.

While the machine is certainly the paradigm of technological development, modern technology encompasses all means to any end. When humanism first came on the scene, both means and ends had their places within a mythic world-order. But scientific reason swept this world-order away, thereby legitimating technology in its modern unrestricted sense, and putting us in a situation where the traditional humanistic measure is no longer adequate. Quantitative measure involves a standard of comparison by which objects are graded, and also a viewing "subject" to do the grading (such a "seer" need not be human; much product testing these days is done automatically). Now in the case of qualitative measure, the breakdown of mythic world-order means that the self which judges the overall human good must double as the measure of that good. The "seer" not only performs the act of discrimination but becomes the standard of comparison.

The cornerstone of the humanist defense of sub-



jectivity is that the self can judge the whole social order and thus deserves to participate in shaping it. Thus we see that it is on the distinction between a quantitative, limited measure and a qualitative, overarching one that the humanist position stands — and falls.

Aristotle's Techne and Praxis

The humanist defense of the subject draws on two traditional distinctions in political philosophy: Aristotle's techne versus praxis and Kant's hypothetical imperative versus categorical imperative. Understanding these two distinctions will help us to better understand how the ethico-political categories we inherited from the Enlightenment are vitiated by the assumptions underlying our current technology.

The categories of humanism presume that technology is ethically neutral, which stops us from even imagining how technology might undermine the basis of ethical conduct. Humanist criticism of technology is limited to the "ends" which it serves. Such criticism cannot penetrate the intertwining of means and ends — the moral connection between nuclear power and the atom bomb, scientific medicine and biological warfare, consumer goods and pollution. In short, the humanist subject is defined from the start as uncontaminated by technology and therefore cannot adequately criticize it.

Let's now turn to Aristotle's account of phronesis, or practical wisdom, which refines Plato's notion of qualitative measure by distinguishing techne from praxis or art. The distinction here is between a technique in itself and the practical activity in which it is applied — between, for instance, knowing how to plow and farming.

As any good farmer will tell you, farming is more than technique — it's not just an art, it's a whole way of life. Phronesis is the wisdom that lies within praxis as "a way of life". Many activities aim at particular ends. Often they are subordinated as means to ends of a more comprehensive scope. Unless this end\means\end chain is to be never ending, there must be some other kind of action which is an end in itself. Praxis, practical action in Aristotle's sense, is its own end and thus determines how the limited ends of art are utilized. In Aristotle's view, limited technical ends can only be evaluated on an ethical basis in which human interaction is its own end. In other words, face to face encounters which are the foundation for ethics, are in no way accomplished or affected by technical action. Isol

ated limited ends are presupposed to have no effect in specifying intersubjective action. The good has a determinate content for Aristotle. It consists in using limited ends (such as wealth, horsemanship, skill in crafts) for the practice of virtue in noble and good deeds which are complete in themselves and consequently are even more durable than "scientia" (Nichomachean ethics).

While one may not be able to be happy if one does not have the means (e.g. wealth) to do good deeds, there is no suspicion here that the deeds one can do are constructed in type and in style, by the available means. Thus it would be for instance of little use to donate stocks to the starving poor in Ethiopia who have no access to an exchange market, or to give donkeys to a US inner city charity where the gift has little pertinence. More generally the goodness of a deed for Aristotle consists in its character as situated action, on the fact that it is perceived and remembered as relevant by others. Technical means are excluded from ethical action because goodness for Aristotle resides solely in the interaction between human agents.

We can distinguish between action and behav-

ior and both apply to humans. For Aristotle action is always directed toward the good which is manifest in an Other (human being). Therefore machines can behave but do not act.

Happiness

Kant proceeds very differently. He begins by distinguishing between the technical, pragmatic and moral imperatives of action.

With technical imperatives the goodness of the end is not an issue, only the goodness of the means. Such imperatives of skill are *conditional;* they prescribe rules that must be followed IF we are to realize a certain end, but say nothing about whether or not we should pursue that end.

Pragmatic imperatives are defined as councils of prudence, guides to happiness. They too are conditional, since the actions that they recommend are not good in themselves but only with respect to the end of happiness. Prudence subdivides further into worldly and personal wisdom. The first consists of skill in influencing others to one's own ends, the second in combining one's own ends to lasting advantage. Kant notes that, without personal wisdom worldly wisdom can better be called cleverness but not prudence. This indicates that prudence consists in combining ends in pursuit of happiness and that an unordered collection of ends, however astutely pursued, does not tend to produce happiness.

In contrast to Aristotle, Kant argues that the attempt to harmonize ends within the self to achieve happiness suffers from our ignorance: *"If it were only as easy to find a determinate concept of happiness, the imperatives of prudence would agree entirely with those of skill and would be equally analytic. For here as there it could alike be said, who wills the end, wills also (necessarily, if he accords with reason), the sole means which are in his power."*

Our ignorance often puts our ideas of happiness in conflict with themselves. If we were certain about what makes us happy, it would make sense to describe all means towards happiness as technical. But such certainty could only rest on a-priori grounds, which in this case do not exist. According to Kant, we must turn to "empirical councils"; rational judgment alone is deemed incapable of unifying our diverse ends, and this job must be left to the senses.

The distinction between technical and pragmatic imperatives appropriates Aristotle's dichotomy of techne and praxis, with an important qualification. Like Aristotle's account of techne, Kant's discussion of hypothetical imperatives attempts to show that an adequate moral law cannot be a means to an end but only an end in itself. However Kant replaces the good with the notion of happiness and moreover rejects the Platonic-Aristotelian view of the good as in and of the world. Kant's recognition of the active constructive nature of knowledge keeps him from deriving moral law from an intuition of the good. Happiness becomes indeterminate when knowledge becomes entangled with power.

The last imperative of action, the moral imperative, is termed "categorical" since it does not depend on a prior "if" that can be outside rational discourse. Consequently, the categorical imperative is universal since it applies in every case, whatever one chooses to adopt as ends. Kant states it this way: *"Act only on that maxim through which you can at the same time will that it should become a universal law".* Kant attempted to forestall the universalization of technical ends by finding in the sphere of human interaction a moral law which elevates human subjectivity to an end in itself. The moral will is determined only by the condition of universality and not by any worldly content. Those following in the wake of Kant today are trying to

make this condition of universality into the determinant of human subjectivity itself. Despite the diversity of various humanistic ethical systems, the cases of Aristotle and Kant illustrate how humanistic ethics begins from a distinction between a) technical, limited ends and b) ethical action which is an end in itself and resides solely in the interaction amongst human embodied agents. Such distinction is equivalent to the claim that technical action is ethically neutral. Modern technology is both universal and rational due to the connection of material implementation and mathematical construction. It is unlimited in scope and liberated from any overarching conception of good. The human subject can no longer be extricated by being defined as universal and necessary in contrast to the contingent and limited status of technique. Thus the attempt to evaluate technology encounters a radical dilemma: If the self is altered by technology, how can technology itself be evaluated?

The Renaissance connection of power and good has doubled back on the self. Formal-technical rationality was to serve human ends; but when it comes to determine the content of human ends human good is reduced to the will to power. Technology is an expression of humanism, but technology has now severed itself from the embodied human agent.

The epoch of technology reveals all Being as a resource for making. Even the most esoteric theoretical knowledge occurs within the horizon of action, as we found out in the case of nuclear physics. Meanwhile, human values remain di/sconnected from any locus in the world. Our only escape from this dilemma will be a new mode of engagement. Only then will human beings find a place within what is irreducibly different, though not indifferent. Only then will rationality cease its futile attempt to swallow up the world.

Relativism

In order to clear the way for a renewal of ethics in the era of the twilight of humanism, we must trace the outline of a new "configuration" of 'particular' and 'universal'. The detachment induced by our habits of intellectual abstraction has become a principle of social existence — we live as strangers to ourselves. In this sense, science and technology are profoundly ideological: unrestricted extension of techniques legitimated by scientific methodology, conceals the embodied localized agent that it nevertheless presupposes. (Remember Ma Bell's exhortation: "Reach out and touch someone.")

In rethinking technology we are forced to reconsider the premises of the humanist concept of subjectivity and its fateful interweaving with the technological requirements of modern natural science. It's important to remember that without *texts*, there is no object of study and no subject either. This is the essence of Bohr's insistence that quantum theory requires a classical world. But we must resist the *textualization* of all experience that eliminates the embodied participation of agents. The way in which sound, touch, smell present an Other to us (considering how crucial they are in sexual encounters), must become as relevant to and for thought as the visual-spatial manner of presentation is.

The return to sensuous consciousness embedded in a practical situation, and shaped by the direct impact of technology on our experience, will undo the standardization produced by instrumental rationality. From this new perspective formal-technical science appears as one possibility (one that suppresses its own presuppositions), rather than the only possible mode of knowledge and activity.

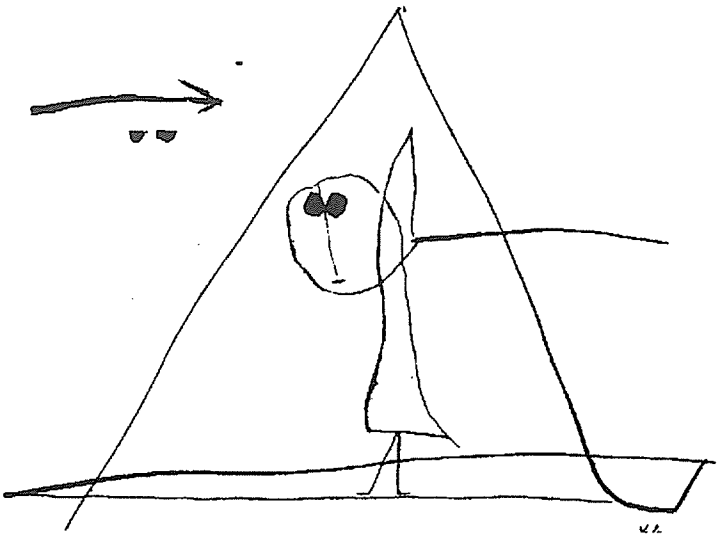
However this return to sensuous consciousness

which is inherently particular cannot avoid the specter of relativism. With the emphasis on situatedness, how is it possible to avoid a thoroughgoing situational boundedness of knowledge and action? And if it is not possible, the attempt to take the measure of technological culture falters. This is the source of the pervasive relativism in which western societies presently founder. In recoil from the stiff universality of technology many go for the warm, fuzzy universality of religious sects or embrace a slack, context-bound thinking. This is the problem: Formal-technical science has been losing its grip on the universal ever since the Renaissance separation of theological from lay-scientific discourse and this cannot be recovered in an all pervasive relativism.

The "merely particular" is the other side of the coin of "formal universal". All content is regarded as irretrievably particular, with only relative significance beyond itself. In other words, the predominant relativism is simply a recoil from technology, its shady side. Our retreat from technology into this relativism is a self-deception, an attempt to flee from text which only lands us in context! What is needed is a rethinking of the particular and the universal that leads us not to context but to situation.

Trying to live in a relativistic world which is still shaped by technological imperatives is an impossible task. For one thing, if much more shaping is done by the imperatives of nuclear technology, this world, relativistic or not, may literally vanish. In a less apocalyptic vein, think of what technology does to our experience of the world. A telescope magnifies the surface of the moon only at the price of a loss of awareness of one's distance from it and its place in the night sky. A telephone transmits the voice over great distances by severing its connection to the gestures of the speaking body.

These various technological transformations of experience lead to various "subject-positions" which together make up the "individual" who exhibits or inhabits them. Yet they will never cohere to form a complete and non-contradictory "individual". In this light it might be useful to point out the lure offered by the very term "individual", which evokes the fantasy of a fully self-conscious power wielded by an indivisible self in which all of one's "subject-positions" are united. Such indivisibility, and its resulting power, is of course a fiction. It could even be said that the urge to become an "individual" and the commonplace consciousness of either being one or having the obligation to become one, is itself



only a "subject-position".

Ethics

My earlier claim that ethics is altered by technology can now be clarified. Humanist tradition recognizes that ethical goals are limited by technical means, for example, the just distribution of wealth requires a sufficient amount of wealth and an adequate distribution system. While technology is important for the realization of an ethical goal, it does not define that goal. Furthermore, technology can and must be evaluated ethically.

What is really at issue here is how subjects are instituted. If technique consists in abstracting an end from the practical context of human existence, then this context is tacitly retained in the framing of the technical end. Consequently, the contingent, limited choices which are made in pursuing actions based on technical abstractions select only certain aspects of the practical context for attention at the expense of others.

The universality of technology, which distinguishes modern from ancient societies, requires the suppression of two things: intentionality and the "here and now". As a first step in thinking beyond the universalizing (i.e. situation-transcending) tendencies of technology, we must recognize that the human body is an irreducible "remainder." Therefore universality must suppress the "here and now". Having seen this, we must also disagree with particularity as the conceptual opposite of universality.

Today technology raises the extreme threat of rendering the body obsolete, the thoughtful, acting body which is the ground for self-interest and for responsibility for others. With the understanding that the worst prospect for technology is the severing of the human basis of knowledge and action, the relationship of power and good mentioned earlier can be restated: human potential finds its voice in embodied consciousness.

Consonant with the body, such a voice begins and ends with responsibility for an Other and an understanding that self-interest which is to a certain extent one of conscious calculation cannot consist only in reflexive observation of one's actions. Rather it must be regarded as being continually crossed by unconscious components, repressed memories, anxiety, and so on. A subject's self-interest is in part what has to be articulated in order for someone to be able to act thoughtfully. Qua embodied self, subjectivity is always caught in the process of engaging the world and itself at the same time.

Nietzsche pointed out that the idea of science with which the West operates consists in reducing the strange to the familiar: "Is it not the instinct of fear that bids us to know? And is the jubilation of those who attain knowledge not the jubilation over the restoration of a sense of security?" Scientific technology renders the experienced world conventionally familiar because its premise as a mode of thinking is to assert a mode of givenness that is designed to eliminate strangeness.

The splitting of experience into inner and outer that leads to metaphysics comes from the Old World's (Europe) primal memories of autochthony. Metaphysics is a dislodging from one's being at home in the world. The memory of belonging gives rise to the metaphysical yearning to establish closure of inner and outer.

In the New World there is no such memory — we are born in the eye of the storm. The European desire to belong is out of place in the wilderness. With the death of God, the European attempt to hold together Primal (origin) and Ultimate (goal) falters. Nostalgia is replaced by homelessness. The

experience of the New World moves to the heart of civilization and revitalizes it. Our Primal is the wilderness. Wilderness does not need us; it does not need to be formulated as a project. The Goal, the Ultimate, the Highest — all of these are civilized, but, caught between wilderness and civilization, we cannot identify the Primal with the Ultimate.

While life in the wilderness has generated an ethic of libertarian individualism, it should not be forgotten that many risked the wilderness to escape the concentrated powers of civilization. The civilized imposition of the division of labor means that a person with many skills and talents will waste most of them. On the other hand, in a community where such skills and talents are used to address the wilderness rather than help the community evade it, they will all be used, and used to make the individual more humane rather than as exchange for a subjectivity that provides an illusion of stability and security.

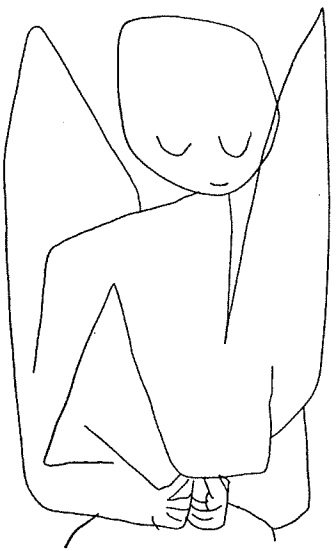
The Western concept of free individuality has been based on metaphysical ground as has, for instance, the idea of progress. In the wild any doing is universal since there cannot be a particular in the absence of an all encompassing principle. Co-operative community can be based not on the "re-collection" of individual subjects dispersed by the division of labor and united by law, but on the various abilities of the body wrestling with pain without the guarantees provided by civilization.

Civilization and thought are forged from pain by memory. Our memory in the New world need not be of an anterior belonging that has been sundered and requires restoration by metaphysical insight. Rather it is of the wild: purposeless seething that annihilates the self among the countless tall pines of the pacific Northwest; a heightening of the self when facing the wind that goes through them. The mirror image of this precarious but not fragile individuality is ambivalence toward nature, the will to control and the wish to let go. Socio-cultural reality is constructed from fear of wilderness. It forms the "origin" from which "ontotheology" and the call for technological supremacy proceed.

Listen: another possibility lurks behind the wind blowing the tall pine trees: The wild is our own; we are in and of the wild. Loss of belonging and goals, floundering where all conventions and institutions are without force, one uncovers the "great in-between" of life on earth, human bodies speaking which welcome the wild. Remember:

"*Wild is transitory. It does not write itself.*"
Michel de Certeau.

This paper is dedicated to the memory of Uhlan von Slagle, from Chattanooga, Tennessee, and Sara Etter.



Boolean Fact Sheet I

The Boolean Connectives Classified

By tom Etter

We can think of a Boolean algebra as a set of elements together with the 16 *truth functional connectives* shown below. These, of course, are not independent of each other; it is well known that they can all be defined in terms of NOT and AND ("-" and "&"). Less well known is that they can all be defined in terms of any single one of the 8 so-called *complete* connectives; the proof is on Fact Sheet II.
Here are the complete connectives:

	Name		Truth Table			
			TT	Tf	fT	ff
#1	OR	-(-x & -y)	T	T	T	f
#2	⊂	-(-x & y)	T	T	f	T
#3	⊃	-(x & -y)	T	f	T	T
#4	NAND	-(x & y)	f	T	T	T
#5	AND	x & y	T	f	f	f
#6	x-y	x & -y	f	T	f	f
#7	y-x	-x & y	f	f	T	f
#8	NOR	-x & -y	f	f	f	T

Here are the *incomplete* connectives, which constitute the part of Boolean algebra called *pre-logic*. They can all be written in terms of NOT and XOR ("-" and "+"), but they cannot be defined in terms of any single incomplete connective.

#9	XOR	x + y	f	T	T	f
#10		x	T	T	f	f
#11		y	T	f	T	f
#12	0	x + x	f	f	f	f
#13	IFF	-(x + y)	T	f	f	T
#14	NOT	-x	f	f	T	T
#15	NOT	-y	f	T	f	T
#16	1	-(x + x)	T	T	T	T

Boolean Fact Sheet II

Interdefinability and Pre-Logic

It will now be proved that the each of the complete operators determines the entire structure of Boolean algebra.

First we must define two relations on the elements of a Boolean algebra, implication and contradiction:

"x implies y", written $x \hat{U} y$, means $(x ä y)=1$.

"x contradicts y", written $x \mid y$, means $x \hat{U} -y$.

Next, we see that implication, contradiction and can all be inter-defined:

$x \hat{U} y$ means that $(x + y) = x$.

$x \mid y$ means *for all z*, $(x + y + z) = (x + y)$.

$x + y$ is the element z such that $x \hat{U} z$ and $y \hat{U} z$ and *for all w, if* $x \hat{U} w$ and $y \hat{U} w$, then $z \hat{U} w$.

x + y is the element z such that for all w, w | z if and only if either w | x or w | y.

Next we see that NOT can be defined in terms of AND:

-x *is the element* y *such that* x | y *and*, for all z, if x | z, *then* z → y.

Since NOT and AND together define all the connectives, so does AND alone, and hence so does Û alone and | alone.

It will now be proved that any one of the other 7 *complete* connectives (see fact sheet I) can be used to define AND and hence all the connectives. This is well known for #4 and #8. We'll now show that it is also true of #2, #5 and #6 by showing how to define ®in terms of them:

#2. $x \hat{U} y$ means that $(x-y) = (x-x)$
#5. $x \hat{U} y$ means that $(x \text{ OR } y) = y$
#6. $x \hat{U} y$ means that $(x ä y) = (x ä x)$

To complete the list, note that #3 and #7 are just #2 and #6 with x and y reversed.

Pre-Logic

Any finite Boolean algebra can be represented as the set of all bit strings of a given length; the connectives are applied bit by bit. We can think of these bit strings as *vectors* with components 0 and 1, with vector addition interpreted as XOR, and scalar multiplication defined by $1 \times x = x$ and $0 \times x = 0$. Thus we can regard Boolean algebra as a vector space over the binary field on which we have chosen a particular basis; let's call this vector space *bit string space.*

Connectives #9 ¾ #12 characterize the structure of bit string space; all the other Boolean connectives come from the choice of a basis. *Pre-logic,* i.e. the structure of the incomplete operators, is bit string space without a particular basis, but with the class of linear transformations restricted to those which preserve NOT. Since $-x = x+1$, preserving NOT is equivalent to keeping the vector 1 fixed.

Continued from page 15

proximation. This obvious nonsense is why conventional methods have yet to produce an adequate *fundamental* theory for nuclear physics. But for us this large coupling constant simply means that in such a system the two particles interact 14 times as often as they fail to interact. The formula still holds. This indeed is a start on abolishing infrared slavery!

Applications to quarks and gluons on the one hand and to gravitation and the composition of "dark matter" are in the offing. We will discuss these problems in Volume 2, #2 of the *ANPA WEST Journal.*

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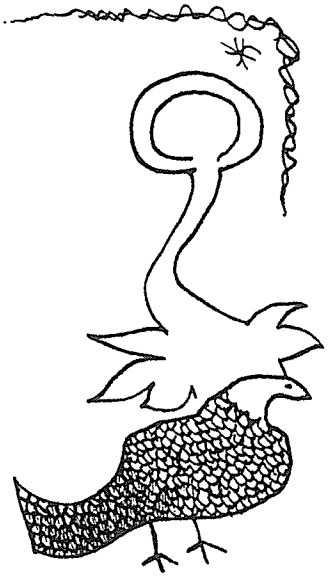
Next Issue: Consciousness

Articles are invited.

Editor's note: unsolicited manuscripts are welcome, but time limitations may prevent our replying to all authors whose work we can't use. If you want your manuscript returned, enclose a stamped, self-addressed envelope.



Illustrations

Cover: Wassily Kandinsky,
"Bright Picture," 1915
Pp. 5 & 33: Georges Braque,
Sketchbook
P. 11: Paul Klee,
"Sailboats"
P. 12: Goya,
"Can't Anyone Untie Us?" 1799
P. 16: Paul Klee,
"Fulfillment Angel"
(Engel bringt das Gewuenschte) 1920
P. 23: Paul Klee,
"Group with the Fleeing Scold," 1940
P. 27: Paul Klee,
"Shame," 1935
P. 29: Paul Klee,
"Forgetful Angel," 1939

Alternative Natural Philosophy Association

Statement of Purpose

1. The primary purpose of the Association is to consider coherent models based on a minimal number of assumptions to bring together areas of thought and experience within a natural philosophy that is alternative to the prevailing scientific attitude. The combinatorial hierarchy, as such a model, will form an initial focus of our discussion.
2. This purpose will be pursued by research, conferences, publications, and any other appropriate means including the foundation of subsidiary organizations and the support of individuals and groups with the some objective.
3. The association will remain open to new ideas and modes of action - however suggested - which might serve the primary purpose.
4. The Association will seek ways to use its knowledge and facilities for the benefit of humanity and will try to prevent such knowledge and facilities being used to the detriment of humanity.