

# ANPA WEST

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

### EDITORIAL

I'd like to extend a welcome to those of you who have joined us since our last issue.

Who are we at ANPA and what is the function of this journal? Most of us work in technical fields like physics, mathematics and computer science. We all need to communicate our ideas, and so we tend to broadcast our latest technical papers to each other through the mails. I'm afraid that in all too many cases these papers end up in the "To read" file. The label "To read" is something of a misnomer - usually, it means "To study", and when one is deeply absorbed in creative work, the time and energy left for study may be limited. One of the functions I see for this journal is to meet the needs for "broadcast" communication among a community of people with strong overlapping interests who are very busy with their own projects.

This means short non-technical papers in plain English, a frustrating restriction when one's ideas involve mathematical reasoning. It's a useful restriction, though, for us who want to become more 'conscious of what we are doing. Speaking for myself, I find that a rather large part of my mind lies somnolent when the technician in me is furiously juggling abstractions, but wakes up when there is a call for thinking in ordinary words.

For us in ANPA there is another reason to think and write in plain English. What brings most of us together is the sense that present-day science is in need of radical change. Now technical thinking is by its very nature conservative, a kind of business- as-usual. Technical jargon is designed to block out most of the conceptual spectrum in order to confine us to those ideas that pertain to the job at hand. But it is in the nature of radical change to call the job at hand into question.

Suppose we are sailing, the paradigm of a technical activity, with its own very necessary jargon (you'd better not say "right" when you mean "starboard!"). Suddenly we see gigantic blue peaks ahead, capped with white. Are they waves or mountains? Should we prepare for a terrible storm or an unplanned landfall? This, the urgent question of the moment, is 'not a

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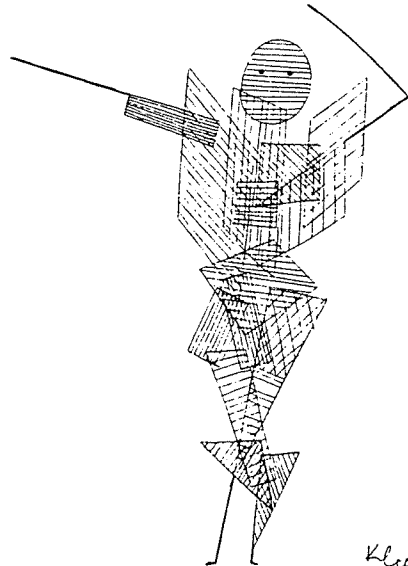
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Continued from Page 1

technical question about how to sail. If the blue peaks turn out to be mountains, those who cannot wake up from their technical mindset will have dream-like thoughts about sailing over mountains. In my own opinion, these are close kin to the dream-like thoughts of people who imagine that quantum mechanics is a continuation of physics as usual. I must admit I'm prejudiced about this, and contrary opinions are certainly welcome in this journal, as long as they are stated in English. ●

### COMING IN THE NEXT ISSUE

It looks like our theme next time will be non-locality and "negative probability". We'll have articles by Dave McGoveran on Bell's theorem and by Wayne Blizard, the father of axiomatic multiset theory, on negative set membership, as well as something on the relationship between non-locality and "abberant logic". If you have something to say about such matters and would like it to be included, send us a proposal or an abstract.



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## IN THIS ISSUE

Our articles this time have mostly to do with language and writing.

4. RADIO SHACK MEETS STAR TREK - A New Electronic Awareness Module.  
by Nick Herbert.

Those of you who have read Nick Herbert's book "Quantum Realities", an admirably lucid introduction to the problem of interpreting quantum mechanics, will recognize his inimitable light touch in our lead article, which is about the kind of "writing" that might come from beyond the quantum veil.

6. WHAT IS LANGUAGE THAT EGOS MAY SHARE IT?  
by Helga Wild and Niklas Damiris

The second article, a collaboration between brain scientist Wild and physicist-philosopher Damiris, is a brief headlong plunge into the dense philosophical thicket surrounding language, knowledge, world and self. Despite all of the difficulties they touch upon this is a very readable article.

9. ON ETTER'S FLYING BANANAS, by Herman Mueller.

The graceful prose of our third article quickly reveals its author to be a professional wordsmith. Ironically, his point of departure is to take your editor to task for making too much out of words. He goes on to share with us his own explorations of what lies behind words, touching on philosophical issues that are of great importance for the kind of science that some of us in ANPA are trying to create.

13. ON GROUNDING THE BANANAS, by Tom Etter.

This article is your editor's response to Mr. Mueller's criticism. It tries to fill in some of the background that was presupposed by the essay he was criticising, and in keeping with our theme, sketches some connections between writing and quantum measurement.

16. ON TO QED, by H. Pierre Noyes.

Our last article is in a rather different vein, being a progress report on some promising new turns in Noyes-McGovern bit-string physics. Some of us non-physicists have a big stake in all this, since if it works out, it may prove to be the royal highway connecting our areas of interest to mainline experimental physics.

# RADIO SHACK MEETS STAR TREK

A New Electronic Artificial Awareness Module

Nick Herbert

In the mid '60's British neurophysiologist Sir John Eccles persuaded the Pope to host an international conference on the mind-body problem. The book that resulted from this congress of brain scientists and philosophers - "Brain and Conscious Experience" - still remains a high-water mark of informed speculation on the vexing question of how consciousness manages to inhabit the fistful of quivering meat inside the skull. In the twenty-odd years following the Vatican conclave, our knowledge of the brain has increased immensely, but the mystery of human consciousness has hardly been touched.

Eccles received the 1963 Nobel Prize in Medicine and Physiology for his part in elucidating how nerve cells communicate with each other: they do it with drugs. Each nerve cell is a separate entity. Nerve cells never meet and fuse together but always maintain a definite gap called the synapse. Although a few nerve cells can communicate electrically, in most synapses the gap is too large to be bridged by electrical signals alone. Instead, when a nerve cell is excited, its extremities are motivated to emit tiny packets of chemicals, called neurotransmitters, which diffuse across the synaptic gap to excite or inhibit the firing of adjacent nerve cells. Since Eccles' pioneering discovery of chemically mediated synaptic transmission, more than a dozen chemical neuro-transmitters have been discovered. To handle the details of its vast informational traffic, the human brain employs a veritable pharmacy of exotic substances.

In a recent article (1) published by the Royal Society of London, Eccles suggested a model for human consciousness based on the way in which these chemicals seem to be released into the synaptic gap. He proposed that human awareness is a quantum effect, that an immaterial mind incarnates into matter right here by willful manipulation of certain special "quantum-unstable" synapses, artfully master-minding the concerted release of thousands of neurotransmitters packets much as a skilled musician - Eccles' metaphor, not mine - manipulates the keys of a piano. Mind is a kind of spirit-generated music.

The speculation that matter and mind intersect at the fundamental quantum level is as old as quantum theory itself. What Eccles has added is the specification of a particular neural mechanism whereby quantum processes can be directly implicated in the brain's otherwise totally Newtonian operation.

In the early 70's, the author and his colleagues, notably physicist Saul-Paul Sirag and computer scientist Dick Shoup, designed and built an electronic device whose purpose was to link processes on the quantum level to information flow on the human scale. Our so-called "metaphase typewriter" churned out reams of pseudo-random English-like text whose ultimate source was

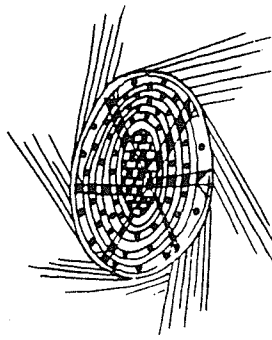
not a computer algorithm but the quantum-random decay of radioactive thallium atoms.

The metaphase typewriter and "quantum metaphone", a quantum-random speech generator driven by the same isotopic source, were conceived as open channels to the void, "empty heads", as it were, craving to be occupied by any passing discarnate entity. In our quest for a suitable occupant we exposed the metaphase typewriter to seance chambers, to world-class psychics, to amateur PK groups, and to the spirits of recently deceased colleagues. Although many curious and unusual incidents occurred during the few years of metaphase research, never was the typewriter seen to be occupied for any length of time by a self-evidently discarnate correspondent. As originally conceived - an electronic clear channel for discarnate spirits - the metaphase typewriter must be judged a failure.

However, the metaphase project may not have failed because the quantum consciousness hypothesis was wrong but because a radioactive source is not a suitable quantum transducer for wandering minds. For one thing, a radioactive atom, unlike a synapse, is not reusable. Once it decays, that's it. For a second-generation metaphase typewriter project, I propose to use quantum-random sources that are more like neurons than neutrons.

That is, I propose to embed quantum randomness in devices similar to what computer scientists call neural nets. The "neurons" in such a net will fire with a probability dependent on a "learning" mechanism that establishes their thresholds of excitability and a quantum process that, so-to-speak, delivers the excitement. What would this quantum process be? We've excluded decaying atoms. Other people have tried to snare wandering minds with noise diodes, but with no better success than we had with our radioactive thallium. Now the problem with noise diodes is that, in a word, they are noisy; that is, they flood the channel between the quantum level and the information-processing level with a great deal of classical "static" which may well form an impenetrable barrier to communication. How can we quiet this deafening thermal hiss enough to let the quantum level "talk" and "listen" to the Newtonian machine? If the solid state wizards of the world can meet this challenge, they will give us the first artificial Eccles gate.

And then what will we have? Assuming we can embed Eccles gates in classical electronic circuitry, they could become the essential components for a new race of self-conscious robots, for PK-operated household appliances, for electronic spirit mediums, quantitative augmentations of human awareness, perhaps even extraterrestrial radio receivers (why send your body, when soul travel is so cheap?). More than just another piece of software, more than a mere mechanical device, the artificial Eccles' gate may well act as humanity's stargate to another dimension, to the presently uncharted realms of transhuman inner space. ●



## WHAT IS LANGUAGE THAT EGOS MAY SHARE IT?

by Helga Wild and Niklas Damiris

Philosophers before the 18th century held that reason was bestowed by God on man and nature alike. But with the Enlightenment, reason became that which distinguishes man from nature. It became that which sets him above nature as an autonomous agent, and the means by which he can carry out the Biblical injunction to subjugate nature and put it to his uses.

Rationality, the province of reason, was the ground on which the scientific method arose. According to Descartes, the origin of rationality is the cogito. But by the time of the Enlightenment, the cogito had become more than an origin, it had become the *center*. It was Descartes who introduced the Ego into philosophy, but it was the Enlightenment that put the Ego onto its throne, establishing it as the very source of the cogito. Cogito (alias cognition) becomes the means by which the Ego gains access to the world (cogitatum). In short, Ego -- cogito -- cogitatum.

With the Ego at the center, rationality and mind become synonymous. Cognition turns into a faculty in the mind of the subject.

Before the Enlightenment, the nature of language was not an issue; God spoke the Word and the Word was light. The scientific view tends to relegate language to the status of just another mental faculty like memory or perception, all at the service of rationality. As true heirs of the Enlightenment, computational linguists see language as a system of signs with which rationality expresses itself. Thus the divine gift of speech is reduced to a set of arbitrary signs standing for things in the world and concepts in the mind.

This modern conception of language raises the problem of how rational agents manage to exchange their reasonable thoughts. Supposedly, they *communicate* them. What does this mean? That they exchange tokens of the arbitrary signs they agree to share. How do they arrive at such agreement? No problem at all - they will it!

With language placed securely inside the minds of individual agents, public contact turns into a matter of communication. Supposedly communication is made possible by a shared context. But just what is this context? What role does it play? And just what does communication communicate?

There is a well-known story about the joke writer's convention where everyone knows the universal joke book by heart, and people just call out numbers: "Number 12" - polite chuckles, "Number 8" - surprised giggles, "Number 73" - gails of laughter, - "Number 10" - a long dead silence, until someone remarks "Poor Bill, he never could tell a joke". The currently fashionable answer to our questions above, which owes a lot to the so-called "information theory" created by telephone engineers, is in essence not so different from this story. Inside our heads there is supposedly a "language of thought", whose "words" and "phrases" and "sentences" constitute the *content* of spoken and written language, a content independent of the outward form which conveys it. Since the language of thought is locked inside one's head, one's thoughts must be transferred via another medium to the heads of others. Here's where the joke book comes in: it constitutes the shared *context*, which is located in one's heads too, and selects the outward tokens of thoughts. Thus the only thing actually communicated is a bare selection among a pre-established list of alternatives.

Samson, in his book "Writing systems" (Stanford Press 1985), contends that writing is just another medium for language messages. Actually, for him writing is twice removed from thought because it copies speech, which is the medium proper. A comparison of what we know of written and oral traditions makes this view of writing quite implausible. Whatever it may be, writing is no mere recording device; it has its own distinctive role. But Samson's view is quite in keeping with the Enlightenment view of language as a medium for

thought. If one believes that thought has its primary medium in the brain, then speech is a second-level medium and writing a third-level medium.

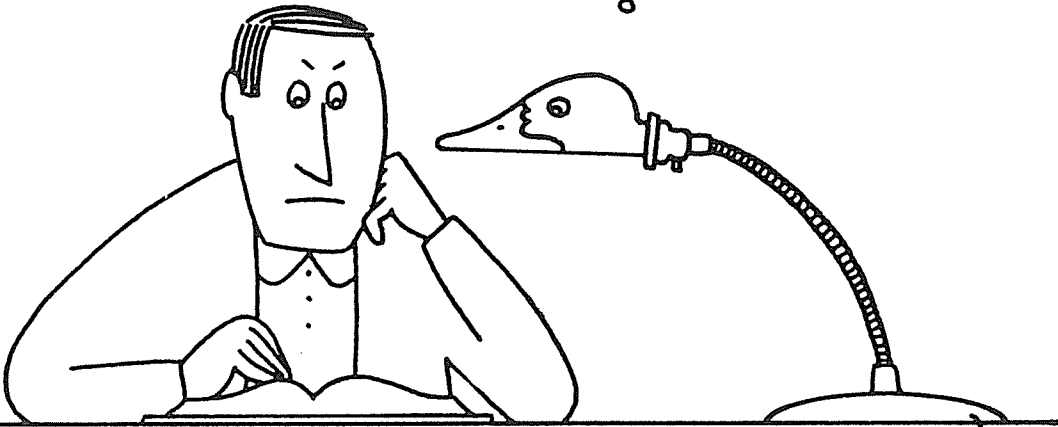
Since the Enlightenment, language has been treated as a medium for thought. Communication is understood as transmission of thought via language; language is the medium and thought is the message.

People believe that man's pursuit of rational thinking has made technological progress possible. Indeed the present situation with computers and other electronic media is the dream of the Enlightenment come true. Finally the Ego, which is rationality at work, creates a technology to control the world, i.e. the cogitatum.

We suggest that this common belief has it backwards. It is not that rational knowledge created new technology, but rather that new technology made rationality and knowledge possible. Specifically, we claim that the practice of writing by hand led to rationality. Similarly, printing, and the subsequent proliferation of publications, led to knowledge as we currently understand that term. With this reversal of perspective, our familiar servant suddenly becomes a stranger. If technology makes rationality possible, then what is technology? ●

THAT MAKES  
SENSE.

SOPHISM OF THE  
WORST SORT.



C. Barzotti



# ON ETTER'S FLYING BANANAS

Herman Mueller

In his paper "The abandonment of simultaneity,"<sup>1</sup> Pierre Noyes asks, "If the atoms so isolated are in fact independent of their surroundings, how is it possible for them to influence those surroundings?" In the musings of my own on a somewhat different topic I had asked a similar question: Since my body is a teeming tenement of interdependent, differentiated phenomena, where or what is the irreducible essence of a person? What, I wanted to know, is the "me" of me?

Thousands, millions, billions,  
in this firmament which is me,  
all these separate beings. In  
which of their constellations  
am "I"?

All these separated beings going about their differentiated tasks without my willing or consciousness in the colossal industry going on within me. Who's in charge here? If all these entities -- atoms, corpuscles, enzymes, neurons, etc. -- are busily pursuing their own specialized tasks and are fated to do so by a helical braid, and I am a composite of all this automated industry, at what point do we encounter the irreducible entity called "me," and what is it? An aura that is given off like the heat emanating from a teeming tenement?

But all these activities, I might be forgiven to say, are mechanical, and for the most part can be measured and weighed; and even my brain activity, which one might suppose is the "me" of me, can be monitored day or night in its frenzied pursuit of a career quite independent of "me."

But there still remains something else, and I am not speaking of emotions, though they may be a grosser or degenerate cousin of this phenomenon, which is ageless and universal. I have such a keening for the infinite, *eine Sehnsucht*. My soul sets up such a wailing down the corridors of time and space. I would go back. Surely, that's beyond any logic and has not been encapsulated in an equation, as yet. But it *is* the essence of "me."

In a resonating piece, "Science without Logic,"<sup>2</sup> Tom Etter postulates that "The new 'bit string' physics of the ANPA group has actually put the matter in doubt." He goes on to say, "this new law might fairly be called the *insanity principle*, for if it is right, the sanity principle is wrong." This made my musings more comfortable. But then, still later, in duking it out with Hegel, Etter says, "...it is the sentences that fix, mold, indeed create, the things called alternatives; it requires a particular sentence to make the openness of experience into a particular *opening*."

Yet the history of science and invention is replete with stories that may most often be apocryphal, of concepts, formulas and inventions springing full-blown into one's consciousness. No sentence there; just the gestalt.

Perhaps somewhat akin to this, I can compose myself in a state in which I can watch my mind working. I can observe the thought come bubbling up from the ooze of non-thought, and, breaking away from the undefined roiling, float up into my awareness. Now I am at a stage I call pre-articulation. I can look at the entire thought suspended there; I comprehend it completely in all its dimensions, and then it falls to me to make the decision whether I will articulate it, "put it into a sentence," to give it Etter's reality.

But sentence-making is a sieving process, retaining only the larger elements of thought; most of the shining nuances slip through the coarse mesh. The choice is mine: to let the unarticulated thought float by like a cloud, or, to change the metaphor, reel it in.

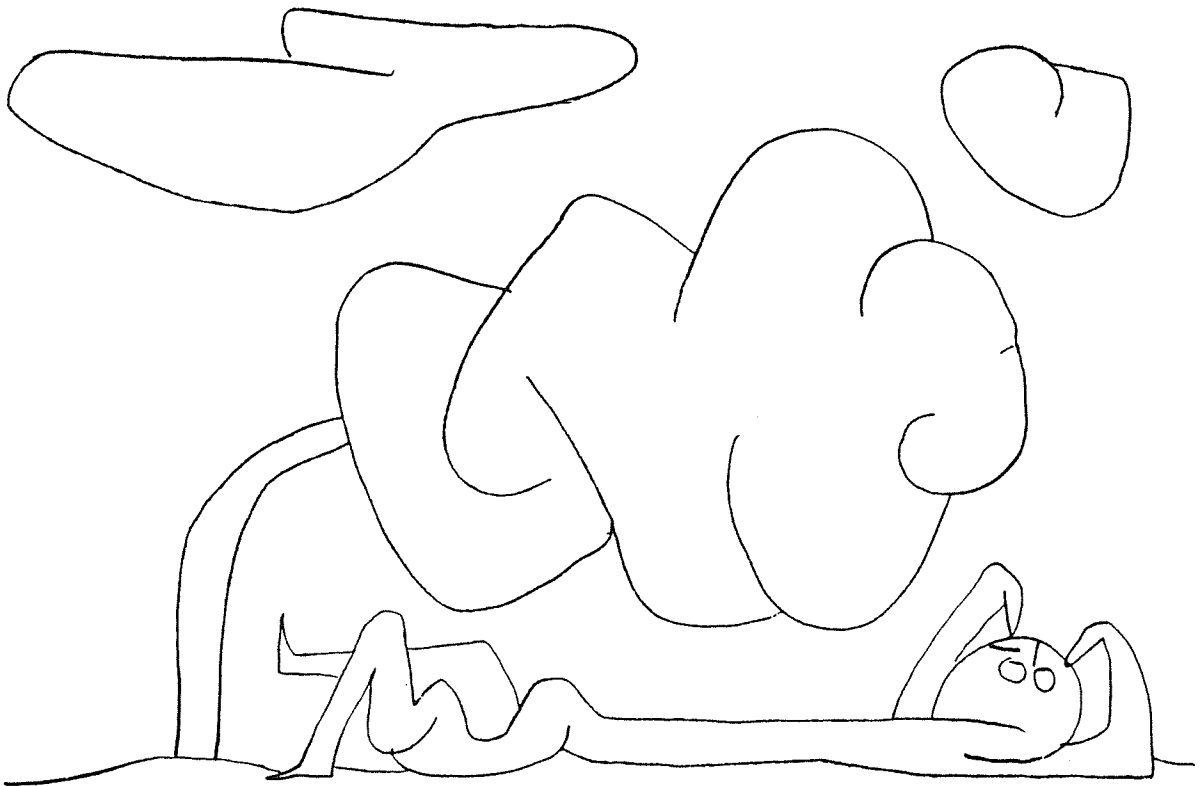
So this process, demonstrable, replicable by anyone who chooses to lie there and develop the knack of it, refutes Etter's statement "...it requires a particular sentence to make the openness of experience into a particular opening."

But if I can create, or better, capture or encompass a thought wholly in my mind as it floats up there, without *reducing* it to a sentence, aren't we confronted with something else? It is a gestalt. The tree doesn't need us in the forest to fall. No *sentence* or word is needed in the process I describe in order to "fix, mold...create." It is there. Pre-articulation.

It is at a later stage that we embark upon the process that the French poet Anton Artaud was alluding to when he wrote: "From the simple fact of thought to the external fact of its materialization in words. Words, shapes of sentences, internal directions of thought, simple reactions of the mind - I am in constant pursuit of my intellectual being. Thus as soon as *I can grasp a form*, however imperfect, I pin it down, for fear of losing the whole thought. This why, out of respect for the central feeling which *dictates* (italics mine) my poems to me and for those strong images or figures of speech which I have been able to find, in spite of everything I propose these poems for existence."<sup>3</sup>

But we must go back one further step and ask: before the conscious intention to act or to think about something, there is a selection process. What elects the subject at any instant; what changes the subject or entertains a multitude of thoughts?

The process may be likened to the operation of a stockroom. The pre-thought inventory is vast; incoming orders are an unremitting barrage. Who-what-where is sending the orders for this pre-thought merchandise? We must remember that it's only *after* the pre-thought item is put on the counter that we consider whether we will take it - articulate it - or send it back. By the time we pick up the item and articulate it, the process is already well along. J.Z. Young<sup>4</sup> reports a fascinating "discovery that a readiness potential (RP) occurs before a person makes a *voluntary* action...and electrode attached to his head shows the readiness potential charge in his brain began an average of 350 milliseconds before the time [the subjects] reported they 'intended' to act." Elsewhere he says: "The importance of Libet's observation is that they show that the brain is at work *before* a subject's intention to act."



This brings us full circle. Before the articulated sentence, before the full blown unarticulated thought, there is another activity, and finally, doesn't *that* call for an activator?

I have read that we go in and out of consciousness during our so-called waking hours. Perhaps it's not a flickering consciousness, but a pulsating existence in several universes simultaneously, and the reason I find this quicksilver "me" is that the whole of "me" is not here. It pulses in and out in other time and space continua.

In my search for the part of me which is "me," the irreducible entity, I seem to find the evidence only of still another busy tenant. Or is it that we have only evolved, or should we say, discovered how in this time frame to use the grosser part of a whole band of sensitivities? We are only operating in the AM frequency, with only the best of us touching the finest fidelities of FM. We're stuck in the visible light of our mundane animal/mechanical existence, and when we have discovered how to utilize the entire spectrum, we will come closer to finding the "me" of me and the irreducible "you" that is inhabiting the busy tenement that carries your name.

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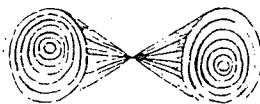
1. H.P. Noyes, *Theoria to Theory*, 9, 23-32 (1975).

2. T. Etter, *ANPA West*, 1, #1, 12-15 (1988)

"...our monkey brains, which were not designed to contemplate abstract truth but to manipulate bananas and coconuts, had to be pressed into the service of manipulating "things" like states, times, and changes... In the late Middle Ages theory had gotten out of hand; the atmosphere was thick with unattached abstractions, with flying bananas, so-to-speak."

3. Susan Sontag, ed., Antonin Artaud: *Selected Writings* (Univ. of California)

4. J. Z. Young, *Philosophy and the Brain* (Oxford University Press).





## GROUNDING THE BANANAS

A Reply to Herman Mueller

Tom Etter

A mathematician I know has a recipe for getting across hard mathematical ideas: First you tell your audience something clear and simple that they can grasp and focus on. Then you confess that you lied, and explain how it *really* is. Herman Mueller is perfectly right in his refutation of my statement "... it requires a particular sentence to make the openness of experience into a particular opening." Mia culpa, I lied. His example makes his point, though I would make it more prosaically: just watch a cat who has planted himself halfway through an opened door on a rainy day - no sentences could possibly express the alternatives "in" or "out" more eloquently. After this confession, it would now seem to be encumbant on me to explain how it really is. Ah, if only I could! Let me at least try to clear up a few misconceptions.

In my "flying bananas" article, I wasn't trying to solve the general problem of how language relates to thought and to the objects of thought; my aims were much more modest. My real focus was on the concept of alternative, and on how being able to manipulate sentences as if they were bananas gives us the illusion that "... alternatives just sit somewhere like cups on the table, waiting to be seen, and that the logic of our sentences describes their pre-existing arrangement", to quote myself. The background of my concern here, which I now realize should have been made more explicit, is the mess that you get into when you try to think in this traditional way about alternatives in quantum theory.

It's true, there *are* alternatives that in a certain sense resemble bananas and cups and saucers, namely those having to do with *choosing* bananas and cups and saucers - "Shall I eat the green banana or the over-ripe one?" etc. For physics, an important class of such alternatives are those in which the objects are holes or openings: does the electron go through hole A or hole B? If a building has two doors A and B, the number of people who go inside, assuming no one climbs through a window or slides down a chimney, is the number who enter through door A plus the number who enter through door B; let's call this rule the sum rule. Now the sum rule can be translated into a fact about the alternatives A and B, which we express by saying that they are distinct, i.e., mutually exclusive. The really weird thing about quantum mechanics is

that the sum rule for distinct alternatives appears to break down!

I say appears to break down, but here we must be careful - no one has ever actually seen electrons violating the laws of arithmetic while going through distinct holes. In fact, whenever we "see" electrons, by which I mean detecting and making a record of where they go, they act just like people entering a house. Herman Mueller writes "The tree doesn't need us in the forest to fall." Apparently electrons do need us, or if not us in person, at least some process that resembles our seeing and writing down what we see, in order to be on their good behavior.

How do we know that electrons misbehave if we can't ever catch them in the act? The physicist would answer with a technical account of what is now a massive body of circumstantial evidence. We don't need technicalities, though, to grasp the general form of this evidence, which can be understood from a simple analogy.

Suppose that we own a restaurant in a busy airport which has a front door A and a back door B, facing on different corridors. For a while A is the entrance, and we get 1000 customers a day. Then A is closed for remodelling, and B becomes the entrance; the daily customer count drops to 900. Figuring on catching passers-by from both isles, we make both doors into entrances. What happens? Our customer count, instead of going higher, sinks to a mere 100!

Various explanations are suggested. Maybe tastes have changed, or maybe it's just a fluke. When we go back to a single entrance the previous counts return, however. Maybe it's that people just don't like two-entrance restaurants. But this doesn't figure either, since each door is invisible from the other, and our customers are passers-by who have never seen our restaurant before. We decide to get to the bottom of the mystery by posting employees outside the doors to watch and listen to the passing pedestrians. We try this first under single-entrance conditions. As before, 1000 people a day come in when A is the entrance and 900 when B is, and our eavesdroppers overhear the expected remarks: "I'm hungry, let's eat here.", "Oh, this looks like a nice place to sit down.", etc. Now we try again opening both entrances. To our surprise, the overheard remarks continue in exactly the same vein. More surprising still, the customer count, instead of dropping to 100, goes to 1900! Ah, it was just a fluke after all, we say, and bring our outside observers back inside to wait on our crowded tables. Immediately the count plummets to 100. It would seem to be time to call in Sherlock Holmes.

The mystery of the 100 customers is essentially the quantum mystery of the interference of probability amplitudes. What is its solution? It's interesting that for us in the modern world this question arises so automatically. It simply goes without saying that a solution exists. No matter how bizarre the phenomenon, no matter how hard it may be to find the explanation, there *must be* an explanation of some kind. Sherlock Holmes, as

the heroic champion of this faith, is one of the truly mythic characters of modern times. However, with the quantum mystery he has met his match.

What needs to be explained is not just that opening both doors reduces the number of customers, but that it gives exactly the difference between the front-door and back-door counts, under conditions when we would expect their sum (and indeed get their sum if we are watching the customers enter!). Furthermore, this is true not only for our restaurant but for all restaurants, regardless of their particular counts. Physicists have come up with Sherlock-Holmes-type solutions, known as hidden variable models, for various particular interference situations - wave interference for electron diffraction, non-local influences for Bell theorem phenomena etc. - but these solutions all seem arbitrary and situation-bound in a way that is incongruous with the great simplicity and generality of what they are trying to explain. Could it be that there simply is no explanation?

Most physicists would probably go along with that, or at least not find it shocking. Their profession, in the context of our analogy, is closer to the restaurant business than to the detective business; it's enough that they have rules to work with which accurately predict the number of their customers, never mind why these rules work. If this sounds like a criticism, let me hasten to add that I believe that their attitude shows a healthy common sense. But I also believe that Sherlock Holmes has one more job, his last and greatest case, which is not just to accept but to *explain* the limits of his powers.

All the technical talk about quantum logic, pre-logic etc. belongs to Sherlock Holmes' last case, which will be continued in our next issue. For the present, let me conclude by bringing the discussion back to Herman Mueller's article. He says that my doubts about logic make his " .. musings more comfortable." This strikes me as like someone who is choking on dust saying that it makes him more comfortable to hear about the coming flood. Don't kid yourself folks, our "musings" depend as much on logic as our most rigorous proofs, perhaps even more.

He has one sentence that I find quite eloquent: "In my search for the part of me which is "me", the irreducible entity, I seem to find evidence only of still another busy tenant." That's just what Sherlock Holmes finds: "readiness potentials", "pre-thought inventory", "thought", "consciousness", "other universes" etc. - evidence of a very busy tenant indeed, but where is the "I"? Discussion about such things, which constitutes most of the current "science" of "mind", is just what I mean by the term flying bananas. What of all this will really survive the flood? Where is the ground? The words that seem to me truly grounded are just the ones that Herman Mueller, deferring to science as it has reached him, thinks must be explained: "I" and "me" - to which I would also add "you", "us", "it", "them", "this" and "that". His best instincts, like everyone's, tell him that science has it upside down. Let's hope that these best instincts can shape science's next phase. ●

# ON TO QED

H. Pierre Noyes, SLAC

The time has come to make a frontal assault on the best protected fortress of the physics establishment — quantum electrodynamics (QED). In 1974 my advice<sup>[1]</sup>, was that

“We should learn from our comrades in Southeast Asia that we must ‘know our enemy’ and attack where he is weak, not where he is strong. The strongest point in the defense of local field theory [my then current and continuing enemy, among others] is obviously QED [Quantum Electrodynamics], so we should leave this [attack] to the last and try to outflank it by finding weaker points.”

By 1989 we are in a much more advantageous strategic and tactical situation.

I tabulate below the major victories already achieved<sup>[2,3]</sup> — none of which can be reached by standard methods. Conventional theories take as brute facts the general structural results which we have *established*. Our gravitational theory and cosmology are in accord with observation, and we find both more plausible than the conventional pictures. The way we view elementary particle structure has a simpler and more self-coherent origin than the received wisdom allows. All of our quantitative results are for numbers that standard theories have to take from experiment, and often do not allow to be calculated. This solid body of firm conclusions gives us a very strong strategic position. What is lacking is some decisive calculation that goes *beyond* what conventional theory has achieved in a region where it assumes *novel* theoretical or experimental predictions are possible.

The results now in hand open up a number of possible exciting physical applications of and improvements in our theory. I will discuss several of these in my paper<sup>[4]</sup> for ANPA WEST 5. Among these, the breakthrough achieved by McGovern last year in calculating the fine structure constant<sup>[5]</sup>  $\alpha$  offers a unique tactical opportunity for us to make calculations in quantum electrodynamics that are outside the grasp of conventional physics.

The fine structure constant  $\alpha = e^2/\hbar c \simeq 1/137$  encapsulates much of nineteenth and twentieth century physics and chemistry. The symbol  $e^2$  represents the laws of electrochemistry and chemical valence, as discovered by Faraday, and the square of the electric charge on the particulate electron as discovered by J.J.Thompson. The limiting velocity  $c$  (the velocity of light) refers back to Maxwell and Einstein. Similarly Planck’s constant  $h = 2\pi\hbar$  was the start of quantum mechanics. In 1966 Amson, Bastin, Kilmister and Parker-Rhodes computed the first approximation  $1/\alpha = 137$ . Together with the 1978 Parker-Rhodes calculation of the proton-electron mass ratio now opens up most of the physics of here and now to attack by our theory. Discrete and combinatorial physics (our theory) is ahead



of conventional methods because establishment physicists have to take “ $\alpha$ ” from experiment; the highest ambition of particle theorists is to calculate both the weak ( $\beta$ - decay) and strong (quark) interactions and the particle mass ratios using only this number  $\alpha$ .

Bohr showed that the electron mass  $m_e$  taken together with  $c$ ,  $h$  and  $\alpha$  are enough to explain the visible and ultraviolet light (line spectrum) emitted and absorbed by hydrogen. But these spectral lines have a doublet “fine structure” measured by  $\alpha^2$  — hence the name. This fine structure was computed by Sommerfeld in 1916, and in an apparently different way by Dirac in 1929. The next correction is called the “Lamb shift” and involves  $\alpha^3$ , but by the time one tries to compute  $\alpha^4$  effects both the strong and the weak interactions have to be taken into account. At this point one needs to calculate millions of terms, which means that even the algebra has to be done on super computers. Hence in our view QED is defended by four rings of fortifications — the effects proportional to  $\alpha$ ,  $\alpha^2$ ,  $\alpha^3$ ,  $\alpha^4$ . Each class of effects is about a hundred times smaller than the last, and usually much more than a hundred times harder to calculate.

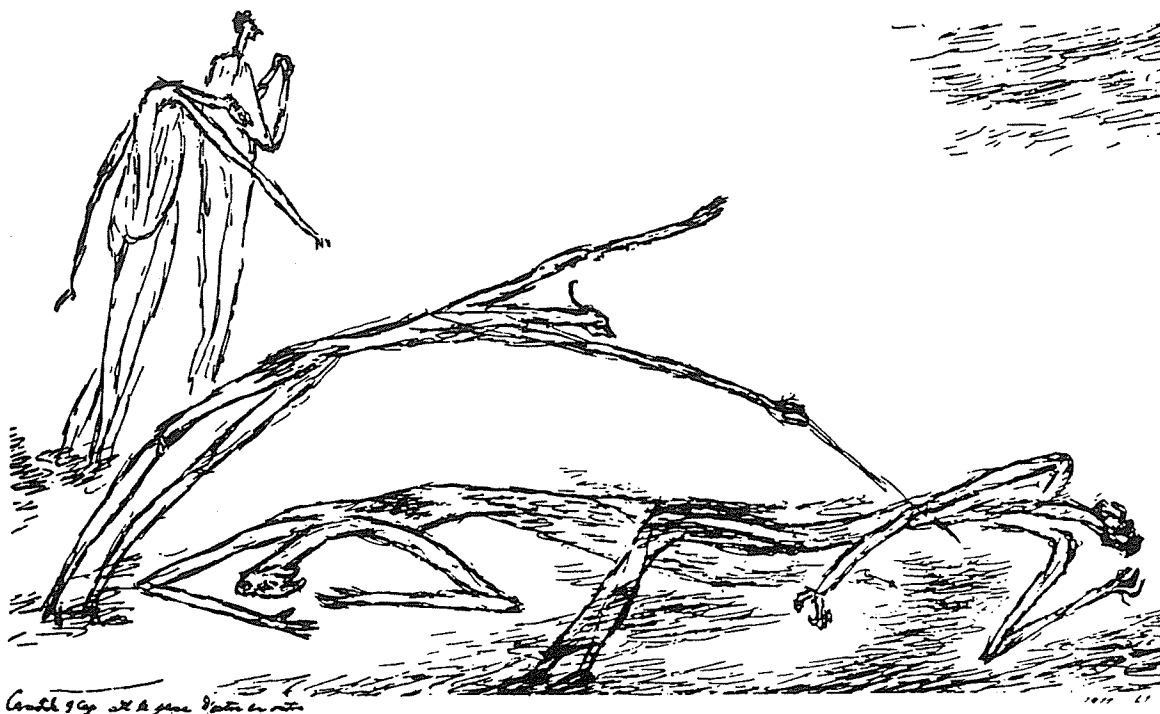
Conventional calculations have succeeded in achieving agreement with experiment for many effects of order  $\alpha^3$  and some of order  $\alpha^4$ . Models of both the weak and the strong interactions generalized from QED have had some striking successes — thanks to a generous input of empirical data. The success was bought by considerable technical complexity. The fine structure constant measures the probability of emission and absorption of radiation; yet when the same particle emits and absorbs this radiation, the effect is infinite. Such effects can be made finite by adding additional infinite terms to the theory crafted to cancel the calculated infinities; this process is called “renormalization”. Sophisticated “non-Abelian gauge theories” have recently bounded this confusion at the cost of predicting a “vacuum” energy density  $10^{120}$  times too large to meet the cosmological requirements. Herculean efforts are needed to keep the (model) universes from shutting themselves down before they can gasp. We are plagued by none of these difficulties.

Assuming that the conventional theorist has successfully found his way through the mine field described in the last paragraph, he still has difficulty properly connecting the basically non-relativistic (low velocity) model of the hydrogen atom (Bohr or Dirac) to these very high (virtual) energy effects. A current problem for him is “positronium”. Positronium is an atom made up of the familiar negatively charged electron and its positively charged “anti-particle”, the positron. Together they annihilate, and “all is gamma rays” (like when the Teller and the anti-Teller meet), but before this happens, they emit light (spectral lines) which Bohr could compute; a first approximation to the fine structure can be obtained by following Sommerfeld or Dirac. But this is not enough. One way the bound state problem

shows up is that  $\alpha^3$  terms in the calculation of the decay lifetime of positronium have not yet been articulated. They would have to be a hundred times larger than expected in order to explain the experimental results. This fact in itself shows that the conventional method of calculation is breaking down: even the  $\alpha^2$  term is suspiciously large.

Trouble now exists close to the heart of quantum field theory. This fact became manifest at an auspicious time for us. Thanks to McGovern<sup>[5]</sup>, we have already breached the second ( $\alpha^2$ ) line of defense surrounding QED. Some mopping up operations are still needed; a lot of technical development will have to be carried out before we can tackle positronium directly. The significant fact is that *we now know how to make relativistic bound state calculations* in a simple way. Apparently all that is needed is a lot of hard work. I now raise the cry: On to QED! Seize the time! ●

\* \* \*



## WHERE WE ARE

H.P.Noyes

### *General structural results*

- 3+1 asymptotic space-time
- transport (exponentiation) operator
- combinatorial construction of  $\pi$
- limiting velocity
- supraluminal synchronization and correlation *without* supraluminal signaling
- discrete events
- discrete Lorentz transformations (for event-based coordinates)
- conservation laws for Yukawa vertices and 4- events
- crossing symmetry

### *Gravitation and Cosmology*

- the equivalence principle
- electromagnetic and gravitational unification
- the three traditional tests of general relativity
- event horizon
- zero-velocity frame for the cosmic background radiation
- mass of the visible universe:  $[2^{127}]^2 m_p = 4.84 \times 10^{52} \text{ gm}$
- fireball time:  $[2^{127}]^2 \hbar / m_p c^2 = 3.5 \text{ million years}$
- critical density: of  $\Omega_{vis} = \rho / \rho_c = 0.01175$  [ $0.005 \leq \Omega_{vis} \leq 0.02$ ]
- dark matter = 12.7 times visible matter [10??]

### *Unified theory of elementary particles*

- quantum numbers of the standard model for quarks and leptons
- gravitation:  $\hbar c / G m_p^2 = 2^{127} + 136 = 1.70147... \times 10^{38}$  [ $1.6937(10) \times 10^{38}$ ]
- weak-electromagnetic unification:  
 $G_F m_p^2 = 1 / [256^2 \sqrt{2} m_p^2] = 1.07896 \times 10^{-5} m_p^{-2}$  [ $1.02684(2) \times 10^{-5}$ ];  
 $\sin^2 \theta_{Weak} = 0.25$  [0.0229(4)]
- the quark-lepton generation structure
- generations weakly coupled with rapidly diminishing strength
- color confinement — quark and gluon masses not directly observable
- $m_{u,d}(0) = \frac{1}{3} m_p$
- the hydrogen atom:  $(E / \mu c^2)^2 [1 + (1/137 N_B)^2] = 1$
- the Sommerfeld formula:  $(E / \mu c^2)^2 [1 + a^2 / (n + \sqrt{j^2 - a^2})^2] = 1$
- the fine structure constant:  $\frac{1}{\alpha} = \frac{137}{1 - \frac{30 \times 137}{50 \times 137}} = 137.0359674... [137.035963(15)]$
- $m_p / m_e = \frac{137\pi}{14 \left(1 + \frac{2}{7} + \frac{4}{49}\right) \frac{4}{5}} = 1836.151497... [1836.152701(100)]$
- $m_\pi \leq 274 m_e$ : [ $m_{\pi^\pm} = 273.13 m_e$ ,  $m_{\pi^0} = 264.10 m_e$ ]

## 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 major areas of thought and experience within a natural philosophy 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 same 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.*

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