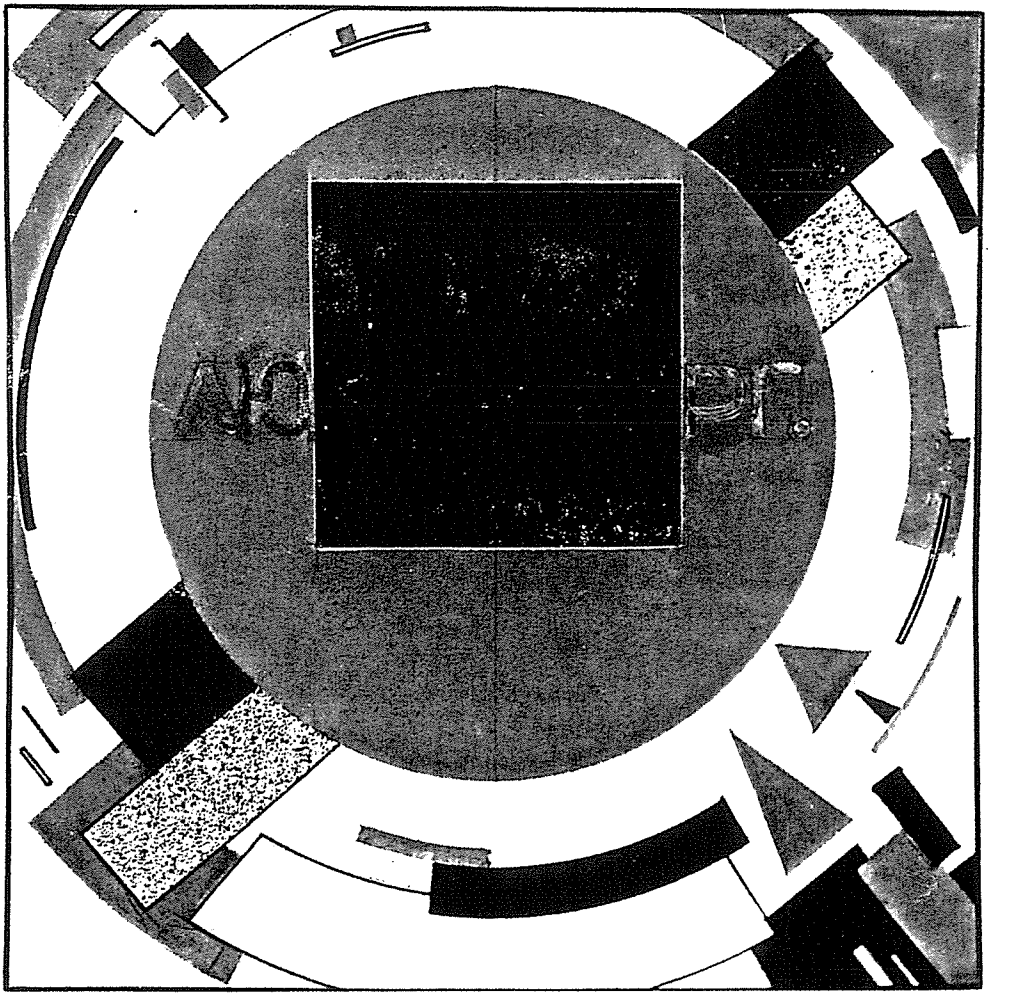
ANPA WEST

Journal of the Western Chapter of the Alternative Natural Philosophy Association



Volume Four, Number One – 1994

ANPA WEST

Journal of the Western Chapter of the Alternative Natural Philosophy Association

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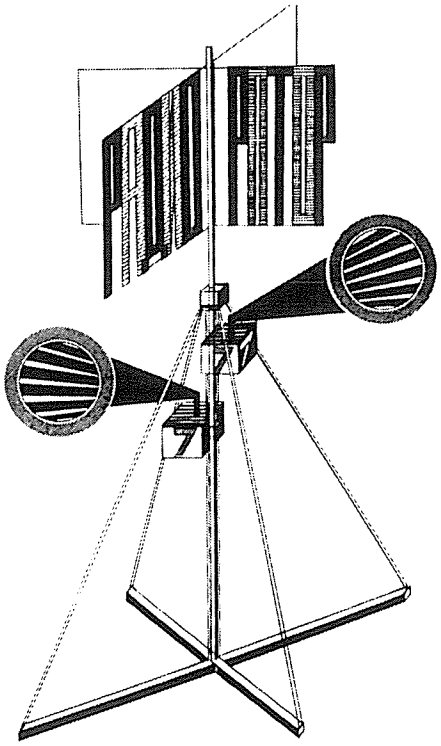
A NOTE ON OUR ILLUSTRATIONS

On the cover of our last ANPA WEST Journal, and in this issue, we have featured work by Russian artists active during the extraordinary period between 1910 and 1930. It was a heady time for the avant garde. Women like Popova and Sofronova, men such as Chagall and Lissitzky, found themselves at the center of a cultural euphoria such as few artists ever experience. Unfortunately, by 1934, as modernism in Russia was destroyed in favor of "social realism," this dynamic early period became embarrassing; much of the work of artists featured here was destroyed, and the entire epoch was almost forgotten.

We at ANPA WEST feel ours is the beginning of another time of profound change in the world and in the way scientists, in particular, are looking at their work. There is an excitement in the air that finds a resonance in the art of these early revolutionaries.



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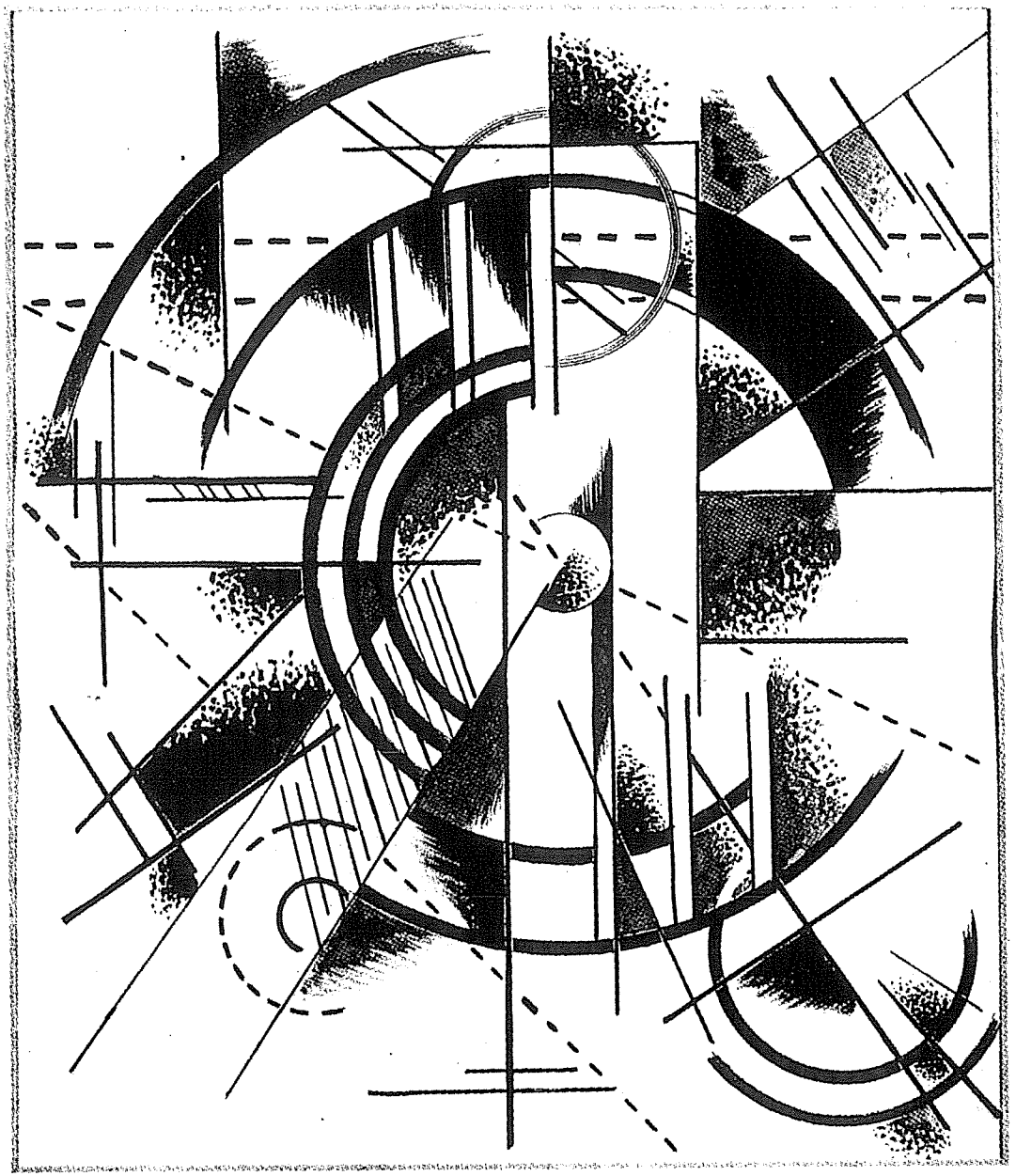


Liubov Sergeevna Popova, *"Spatial Force Construction"*, 1920.

The Dialectics of Freedom

Pierre Noyes, SLAC

Ray Birdwhistell, one of the most distinguished of the creators of kinesics, saw human communication as composed of many channels of coherent behavior segmented asynchronously into units of durations varying from a few milliseconds up to four generations. Behavior patterns cannot change within an individual segment. But when the breaks between two or more types of these laminated segments overlap, choice and change become possible. He called this *the dialectics of freedom.*

I became acquainted with Birdwhistell's views when I had the privilege of sitting in on daily discussions between him, the ethologist John Crook and the linguist Ken Pike over a period of several months. I have briefly reported on these discussions in a paper published by *Theoria to Theory* (9, 23-32 (1975)) entitled "The Abandonment of Simultaneity", which I concluded with the remarks:

"...Since it is clear that simultaneity and punctiform space must be abandoned, this might imply that something equivalent to the calculus, but operating on the laminated set structure rather than on space-time, must be invented. One purpose of this paper is to point up this necessity; unfortunately my own mathematical talents are too limited to see how to proceed further than pointing out the problem..."

Thanks to the work of many people both inside and outside of ANPA, I believe that the mathematics needed for this task is now available. I spell out my reasons for this belief in this paper.

Recent work on classical determinism and quantum coherence has produced a paradoxical twist. The older view of quantum mechanics contrasts the fundamental uncertainty it predicts with the rigidly deterministic world of Newton and Einstein. Modern views tend to reverse these characterizations.

The older view stemmed from the Bohr-Einstein interchanges on the foundations of quantum mechanics. The debate led Einstein to remark that "God does not play at dice". Bohr felt that the truth was that we could never reconcile classical, deterministic physics with quantum mechanics; they were complimentary. He also said that "Truth and clarity are complimentary". Peierls has adjoined the remark that "Bohr always erred on the side of truth."

In the eyes of most practicing theoretical physicists Bohr had won the debate by 1935. Most physicists shifted their research interests to problems that they found to be both more exciting and more pragmatically rewarding.

The legacy of this debate was, for many years, the idea that indeterminism and in that sense irreducibly chaotic behavior lay at the heart of quantum mechanics. Eventually quantum mechanics was believed to be the fundamental theory and classical physics only an approximation. But this left two puzzles behind: if quantum mechanics is fundamental, why (as Bohr believed) is it necessary to assume the validity of classical physics in order to formulate the laws of quantum mechanics? and conversely, why is it so difficult to derive the classical equations from a well defined approximation within quantum mechanics? Or, why does classical determinism works so well in the every day experience?

The contemporary paradox is that we now are beginning to realize that solutions of classical equations are almost invariably chaotic rather than deterministic, while macroscopic quantum coherence has become, in a sense, even more rigid than classical determinism.

John Bell reopened the Bohr-Einstein debate. He reformulated — and from a theoretical point of view resolved — the issue in the a way that Einstein would have liked least: local determinism and classical statistics cannot be made compatible with quantum mechanics. Bell's Theorem had the additional virtue of suggesting to Clauser that the question could be tested *experimentally.* Clauser had minimal support for his experiment, even for a graduate student. Yet, for most of us, his experiment proved that Einstein was *wrong.* No generally accepted subsequent experiment has done more than to confirm Clauser's result to higher accuracy in both the experimental and the logical sense. Since the

quantum mechanical prediction for the observed correlations is *unique*, while the allowed range for classical theories is broad, these results make part of my case for the claim that quantum mechanics is more rigid than classical determinism.

The recent work on classical determinism I have in mind was made possible by the creation of very fast computers. Although investigations of this problem have a long history going back to work by Poincaré in the 19th century, the full force of the analysis of classical "deterministic" systems, which now can be recognized by the use of the buzz-word "chaos", has as yet struck only a few people as profoundly important. What is now known is that the future motion of most systems whose behavior is supposed to be "determined" by classical equations cannot in fact be predicted without supplying as much information about the initial state of the system as the "prediction" is supposed to yield. This renders "prediction" and hence "determinism" in the usual sense almost meaningless for most classical systems.

This fact impacts our beliefs about the foundations of quantum mechanics in a very direct way, as McCauley has recently pointed out:

"...Born and Heisenberg argued strongly that physics should not be based on nonobservable concepts — because of this Max Born argued for the elimination of the continuum concept from physics. By restricting to computable numbers in classical physics, we take a small step in that direction. It means that formal Hilbert space theory cannot be the final foundation for quantum mechanics, because Hilbert space is built on the generalization to function spaces of the idea of the continuum, the completeness of the real number system (a space is complete when all the limits of all convergent sequences in the space also belong to the space). But this introduces noncomputability into the foundations of quantum mechanics, because almost all functions that can be defined are noncomputable (see Turing, 1937)."

— J.L.McCauley, *Chaos, Dynamics and Fractals*, Cambridge University Press, 1993, p.302.

In contrast to classical systems, the evolution in time of quantum systems has usually been discussed in such a way that the uncertainties in the starting

point — which cause the rapid loss of information in chaotic classical systems — can be ignored. The deterministic evolution of the quantum state is assumed without question. The unpredictability is supposed to arise when the system is "observed" by a macroscopic classical system which freezes the result into some fixed, historical and repeatedly accessible material memory. Quantum mechanics then predicts the probability of finding in this memory one particular example of the outcomes which the theory allows as possible. This process of "observation" is called "wave function" collapse. Von Neumann followed this collapse back into the brain of the observer, and by implication to his "mind". We still suffer from the irrational speculations that this woolly thinking opened up to the dances of more and more woolly "masters".

This eagerness to grasp for "scientific support" for irresponsible and irrational wishful thinking reminds me of my father's chuckles when he told me about a 19th century British physicist, whose name I remember phonetically as "Crooks". This man had contributed significantly to late 19th century investigations of the electromagnetic spectrum, including as I recall X-rays. When he was knighted, he was given the Latin motto *Ubi Crooks, ibi lux* [Where Crooks is there is light]. But Crooks was also well known for his attempts to put investigations into paranormal phenomena on a "scientific" basis. I remember my father's delight in telling me that irreverent Englishmen rephrased his motto as *Ubi Crooks, ibi spooks.*

I hope that recent work of mine, which was reported at ANPA 15 in September, and is to appear in the maiden issue of a new journal called *Physics Philosophy Interface* to be published in Calcutta early next year by the Institute for Advanced Study in Science and Philosophy, may help to advance our understanding of these deep questions. I love light-hearted polemics, as I hope my remarks above make clear, but I have an even higher regard for rational consensus. My work stems from an unlikely root which goes back to the time when the pattern for over three decades of research into elementary particle physics and physical cosmology was set by the successful creation of "renormalized second quantized relativistic field theory". The predictive power of this theory has continually expanded during this whole period. Yet I think it fair to describe the theory as one in which you add infinities with one hand and take them away with the

other in order to produce a finite result in agreement with experiment to high accuracy. Mathematicians are still arguing as to which hat the real rabbit was hidden under, and how it got there in the first place.

In 1948 Feynman showed Dyson a "proof of Maxwell's Equations" which Feynman refused to publish during his lifetime. The proof starts from non-relativistic quantum mechanics and Newton's second law, yet ends up with the relativistic Maxwell equations in free space. As Dyson remarks:

"The Maxwell equations are relativistically invariant, while the Newtonian assumptions ..... which Feynman used for his proof are nonrelativistic. The proof begins with assumptions invariant under Galilean transformations and ends with equations invariant under Lorentz transformations. How could this have happened? After all, it was the incompatibility between Galilean mechanics and Maxwell electrodynamics that led Einstein to special relativity in 1905. Yet here we find Galilean mechanics and Maxwell equations coexisting peacefully. Perhaps it was lucky that Einstein had not seen Feynman's proof when he started to think about relativity."

— F.J.Dyson, *American Journal of Physics*, **58**, 209 (1990)

Resolving the mystery starts by realizing that if we write Newton's second law for a *single* particle as force per unit mass (acceleration), describe field as the acceleration of a single *test-particle* whose ratio of charge to mass is fixed, and characterize single-particle quantum mechanics in terms of action per unit mass (i.e Planck's constant divided by the unique mass in question), then Feynman's proof only refers to length and time measurements. As is well known, if all we measure are lengths and times, it does not matter whether we use meters, feet, miles, light-years ..... for lengths or seconds, months, oscillations of a quartz crystal, years,.... for times, so long as we are consistent. This is called *scale invariance.*

In spite of the arbitrariness due to scale invariance, we can still single out a unique velocity by identifying it with the maximum velocity at which *information* can be transmitted independent of the units used. Similarly we can measure the area per unit time swept out by a line from a center to the particle when it

is moving past that center with constant velocity. The constancy of this ratio is a special example of Kepler's second law. This allows us to define a second independent quantity which can always be determined no matter how we measure length and time. Remarkably, once we also fix the finite accuracy to which we can measure these two units (assuming some currently available technology), we get the formal properties called "quantum mechanics" above, but without the usual absolute limits on size associated with Planck's constant (Bohr radius, nuclear radius, Planck gravitational length,...). Further, the formal steps given by Dyson in his reconstruction of Feynman's proof loose their paradoxical character, as do the steps taken by Tanimura (S. Tanimura, *Annals of Physics*, **220**, 229-248 (1992)) in his extension of the Feynman proof to establish Einstein's gravitational geodesic equations. In short:

Fixed, finite measurement accuracy implies both Maxwell's electromagnetism and Einstein's gravitation.

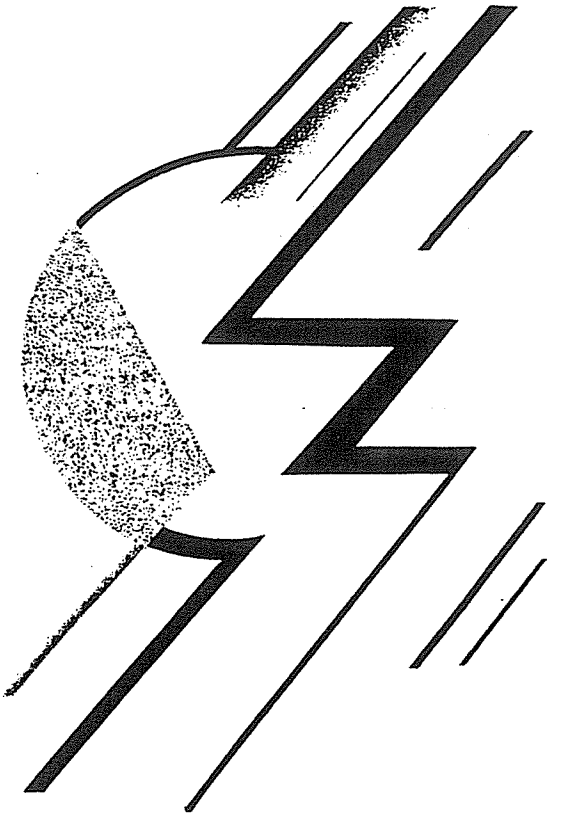
We can now return to our paradox, and take another step toward resolving it. I assert that, from a modern point of view, any physical phenomena which go beyond what can be predicted from the action of electromagnetism and/or gravitation on a *single* particle *necessarily* bring in Planck's constant. Quantum phenomena set an *absolute* scale to the universe, which tells us under what circumstances the classical, *deterministic* equations are valid. In particular, as noted in our definition of chaos, this phenomenon arises when we try to get solutions out of the classical equations to such high accuracy that all the information is already contained in the initial conditions. If this fine grained specification violates the quantum restrictions, the classical equations break down, and *we must use quantum mechanics.*

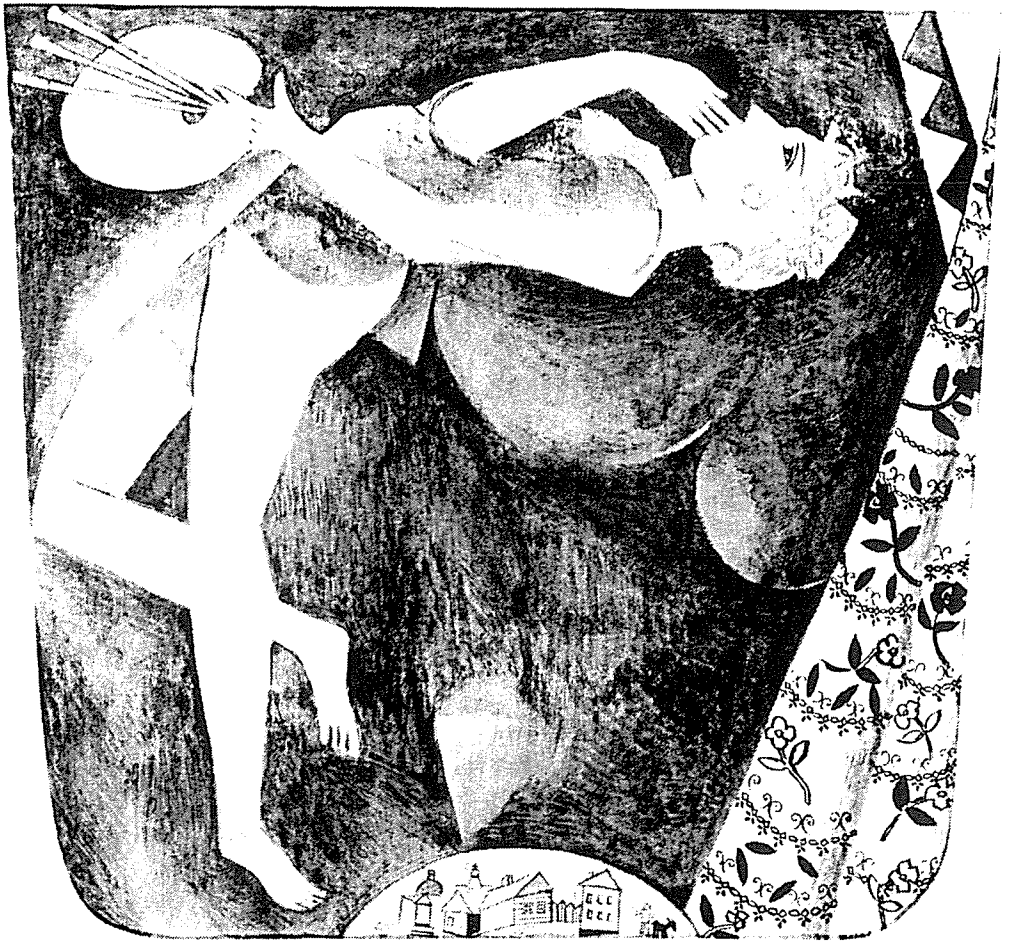
Now we have come "full circle" to a higher point on our spiral of growing understanding. Classical determinism is self-contradictory once quantum phenomena are recognized. But quantum phenomena are *coherent*— a seamless whole for systems to which the theory applies. Thus they are more stable — and in that sense "more deterministic" — than the equations of classical physics allow. But if we go beyond the "coherence length" for these quantum systems,

we get an assortment of laminated structures to which an approximate version of classical physics can be applied.

It is at the join between the two modes of description that our ability to manipulate the systems to what we hope is our advantage arises, as is made clear in recent papers on "controlling chaos". This is analagous to the behavior analysis of Birdwhistell with which we started. I dedicate this paper to his memory.

This work was supported by the Department of Energy, contract DE-AC03-76SF00515.





The Painter: To the Moon
Marc Chagall, 1917

REMOTE CITIZENS OF THE MOON, PART II:

MOON CITY

by Tom Etter

There's been much debate over whether the space program should continue to send human beings into space, with all the expense and danger that this involves, or should concentrate on space exploration by means of remote-controlled devices. What I'm proposing here is a third alternative: that we stick mostly with the remote-controlled devices, but that we use them also to build our future space colonies! The plan here is to create an infrastructure for life on the Moon and beyond with only a nominal expenditure of the Earth's resources, and to ensure that our exodus into space, when eventually it happens, will take us to a well-prepared habitat at least as hospitable to terrestrial life as the Earth itself. The key to this plan is a technology that I'll call *virtual tele-robotics.* This is a computer age update of an old idea, that of *telepresence.*

Telepresence means interacting with things or people at a distance as if they were present. Taking the word in the broadest sense, we are telepresent at a football game when we watch it on TV, or to each other when we speak to each other over the phone. But the word has acquired a more specific modern sense that involves being linked not only to remote eyes and ears but also to remote arms and legs (or wheels), i.e. to a *tele-robot.*

As far as I know, the first useful tele-robots were built by the A.E.C. for handling radioactive materials. Tele-robots are an obviously attractive way to get things done in dangerous or noxious places, and we have all heard about them at work in the form of deep-water submersibles and moon rovers. When I was an undergraduate in the late forties it seemed as if this technology was about to take off, and I recall many late-night discussions about "little hands" for micro-surgery, remote "King Kongs" for construction and mining etc.

Why aren't such things commonplace today? Of course part of the answer is

simply cultural inertia. But another reason is that the technology is harder than we thought it would be. One problem is that human reflexes are very carefully matched to the scale and design of human bodies and are easily thrown off; for instance, the slightest delays in the feedback loops to a tele-robot can lead to tremors and palsies. The remote bodies themselves are complicated, hard to design, expensive and unreliable. Like solar energy, tele-robotry hasn't yet inspired the kind of passionate enthusiasm that moves a new technology beyond its tentative beginnings.

Perhaps this is just as well. There's actually a much better way to work at a distance, using a new technology that is a close relative of virtual reality. The idea here has two parts. First we replace the physical tele-robot by a *virtual tele-robot* in a computer. Then we link this computer to remote-controlled physical tools so that the virtual tele-robot can use them, thereby indirectly putting them into our own hands too. By adding this second layer of remote control between our remote body and its physical actions, we overcome the above problems completely and greatly improve our ability both to see and to act at the remote worksite, as we shall see.

Virtual reality is telepresence in a computer model. It's a simple idea once you focus on the right gestalt, but it does take one by surprise at first. I distinctly remember one day in 1951 when, as I was walking across the lawn in front of the college library, it suddenly hit me: put the tele-robot *into* the computer model! I had known about both telepresence and computer modelling for years before this realization, but had never before put the two together in just this way. No doubt many others had this same realization around that time, though I believe it first appeared in print in a 1965 article by computer scientist Ivan Sutherland of M.I.T.

Until quite recently it was very hard to explain virtual reality to anyone but techno-freaks. The thought of being "in" a computer just doesn't "compute"; it doesn't jibe with our instinctive sense of what is possible. Apparently our instincts are losing out though, since VR has now become a buzzword of pop culture.

One of the mistakes many people make when they first hear about virtual reality is to classify it as a kind of artificial dream, another and better way to escape from the "hard reality" of real life. Indeed the so-called real life of those of us raised in a scientific culture owes much of its hardness to the brutal rejection by science of the dream-like aspects of the world we experience, and if artists can use virtual reality to put our waking thoughts into better harmony with our dreams, then more power to them. But we mustn't confuse such art with an escape into the *privacy* of dreams. The

visual world you encounter in the computer is just as much *outside* of you as the chairs and tables in your living room, or the books in your library. Furthermore, the other people whose virtual bodies you encounter in the computer are just as much *other* people as those you encounter on the bus, or in a family reunion, or on the battle-field.

Virtual reality is something of a misnomer. It's only the places and things in a virtual world that are virtual, or to use a more traditional and accurate word, *fictitious.* The people who are telepresent in that world are perfectly real, even though they meet each other in a very new guise. Your electronic body in the computer is, in effect, your *tele-costume;* what other people see is you in costume, but it's still you. On the other hand, the earth, sky, mountains, trees, houses, chairs, tables, cars, streets, cows, birds, flowers etc. are pure stage scenery.

What I am calling *virtual tele-robotics* is like virtual reality except that it's not just the people in the computer that are telepresent, *everything* is telepresent. That is to say, the earth, sky, mountains, trees, houses etc. in the computer are *real* earth, sky, mountains, trees, houses etc. which have virtual bodies just like we do. We interact in the computer with these physical things by means of their virtual bodies, just as we interact with each other by means of our virtual bodies. The situation is that of real people (us, for instance) inhabiting a real place (the moon, for instance) by having their virtual tele-costumes inhabit its virtual tele-costume!

Virtual tele-robotics, or VTR, isn't pie in the sky; indeed it's very much a current reality, though under a variety of other names. The most ambitious current VTR project is the Virtual Planetary Exploration System being developed at NASA Ames Research center in Mountain View CA, where information from cameras on planetary rovers is accumulated into a vast data bank used to generate virtual environments that in turn are used to plan and guide future remote explorations. This second phase has so far only been tested on Earth. Doctors have experimented with virtual representation of body parts as the sensory link to remote manipulators for micro-surgery. And the Air Force, which was a pioneer in VR research and developed today's most advanced systems of VR display, has used it to supplement the direct visual environment of fighter pilots with virtual images of enemy planes etc. constructed from radar data.

This new technology is clearly upon us, but what I haven't seen yet is a clear recognition of the new gestalt that defines it. VTR is not virtual reality, because virtual reality means telepresence in a purely fictional environment. Neither is it tele-robotics in the old sense; an old fashioned tele-robot, like a fishing line, is simply a physical

tool that extends our reach. VTR is an altogether new and different relationship between people and places! To make this more concrete, let's take a quick look at Virtual Moon City in the early 21st century.

What we see on the actual Moon is a bee-hive of activity, mostly underground in a vast network of tunnels that serve as mines, factories and conduits for mag-lev transportation. On the surface are space-ports and solar collectors plus a few industries that use solar furnaces, and then of course a large fleet of moon rovers exploring and mapping the unsettled terrain. There is also a large computer which maintains a detailed data bank representing everything that's going on based on data coming from a huge array of sensors.

These sensors, which are at the heart of the project, are of many kinds. They of course include television cameras and microphones. They also include job-specific devices such as thermometers, ultra-sound probes, x-ray probes, chemical samplers, seismic detectors etc. But perhaps most important are the so-called *trackers,* which are devices that accurately measure the distances between specific points on moving objects (tracker technology is already well underway today in connection with gloves and body suits for VR). Trackers can use magnetic fields, light, ultrasound etc. and are capable of very high accuracy at short distances, which is important in manufacturing and assembly. But they also supply a very efficient means for continuously updating changing visual representations of the real scene. In the case of a rigid object, you only need to tell the computer what it looks like once and the computer can continue to show its changing appearance based on only six tracker-supplied parameters (you'd need a million or so parameters to do the same thing with a TV camera!)

An alien landing on the Moon would find there a bustling industrial metropolis and space-port, in many ways resembling those he had visited on Earth. But he would find one thing strangely missing: people! Where are the inhabitants?

And indeed there are inhabitants, millions of them. But they are scattered all over the Earth, clothed in their VR garments which are plugged into a terrestrial computer that is linked to the Moon computer and shares its data bank. This terrestrial computer transforms the abstract data objects in the Moon computer into virtual objects that the inhabitants can see, hear and touch. That is, it creates their sensory environment. It also decodes their actions into commands which are then processed by the Moon computer to tell the physical tools on the Moon what to do.

In brief, it supplies the inhabitants with their Moon bodies. With these wonderful bodies they can truly perform miracles: they can instantly go anywhere in Moon City, be any size, see through walls, *walk* through walls, fly through solid rock, see sounds, touch sights, hear x-rays: the physical data from the Moon sensors can be transformed into sensory encounters of any imaginable kind. They can also act: they can push, pull, carry, hammer, drill, assemble, break, melt, sculpt, trash etc. What do such acts accomplish? Here there is always a choice: they can be only make-believe, try-outs, practice, just having fun, or they can be for real.

When the inhabitants of Moon City act for real, they turn into *workers.* For instance, if you pick up a hammer and break a rock, a short time later a physical hammering device on the Moon hits the real physical rock whose virtual "costume" you have just broken. But what if the real rock doesn't break? A short time later its virtual costume reverts to its unbroken state and you try again. In the case of a more delicate operation, like screwing a nut on a bolt, what happens is a bit more complex. Because of the time delay in sending signals to and from the Moon, there's no way in which you can use your own reflexes to ease the nut into place and feel its threads match those of the bolt. Rather, your action must be transmitted to the Moon as a command that triggers a kind of programmed reflex in the Moon's computer that in turn coordinates various tools to accomplish the physical action. What is at work here is low-level automation involving local feedback loops to position the physical wrench, set tension etc. Designing such programmed reflexes is something you do in make-believe mode; you must then of course test them for real.

The amount of automation on the Moon depends on the task. Automata are very good at precise repetitive work and will dominate the factories there as on Earth. Among their many intellectual deficits, the most glaring is their total lack of common sense, so people will be needed to keep a constant eye on them. And people will be needed for all jobs involving the unexpected: exploring, mining, construction, allocation of resources etc. In the early years of Moon City a lot of unexpected things are bound to happen, so the workers will have plenty to do.

Unlike old-fashioned tele-robots, the physical tools on the Moon can and should be rather simple erector-set stuff: things like jack-hammers, shovels, grippers, jigs, drills etc. mounted on crude arms and transporters. There's no reason for complex humanoid mechanisms; much better to use software and remote human skill to coordinate simple devices into complex working units. Remember, the human vantage point and hands-on control is provided by the *virtual tele-robot,* who can see the worksite far better than any actual eye on the Moon, since it draws on the entire remote

data bank. By simplifying the physical tools, the whole technology can be made quite fault tolerant. So a mine caves in and you lose a few scoops and hammers – no big deal, especially after the factories get going. How they get going, and how the whole enterprise gets going, is something we'll look at in Part III; for now we're just looking at how it keeps going and grows.

Moon City is not just fun and games; it is real mines and factories that can send their products to Earth and build fleets of spaceships to build mines and factories on the other planets and beyond. It's obviously a very lucrative proposition for those on Earth who reap its benefits, which could be everyone. So why leave Earth at all? Why risk our hides? Putting workers physically on the Moon is a total waste, since they can do a far better job on Earth. Given the inevitable improvement of VR, there's nothing we could see or do there that we couldn't see or do just as well here. Then why not be content to inhabit outer space in the comfort of our terrestrial living rooms? Indeed, when we don our VTR suits, the physical objects of our perceptions and actions are actually on the Moon, so why can't we just *declare* ourselves to be there?

At the heart of this last question is the deeper question of how information is related to matter. Can information take the place of matter? Our instincts say no: matter matters. When we pay six million dollars for a Van Gogh, it's for the actual canvas and paint; a reproduction, no matter how good it is, even if it conveys exactly the same visual information, simply won't do. Ditto the Moon, say our instincts. Within a mindset dominated by computer science, this is incomprehensible. Fortunately a new science is on the horizon that will give our instincts back their due (I have written about this in several other articles.)

Being there is more than *exchanging signals* with what is there. *Being in touch* is more than *exchanging information.*

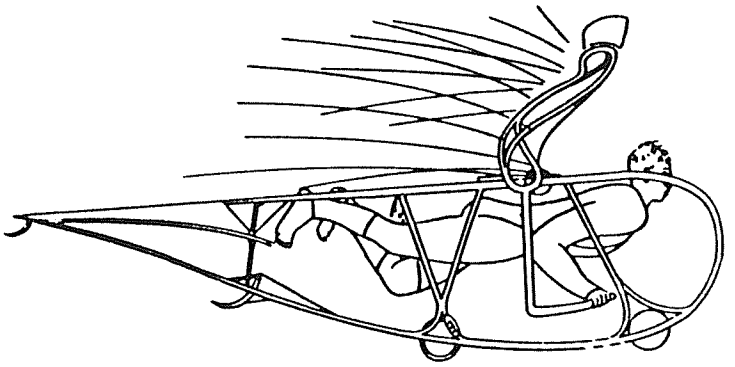
But there are times when we do have to separate. A great cook, no matter how sublimely in touch she may be with her ingredients, can't go into the pot with them when they cook. The separation is only temporary, though; the point of great cooking is the feast to come. Our job in Virtual Moon City is cooking the Moon.

Coming next in part III: *Getting There.*

On Haley's Comet Coming Back

by Herman Mueller

How nice it would be,
this old man thinks,
if one's dust were dumped
in a programmed intercept,
to marry our provincial soil
with the foreign cargo
in the comet's tail;
and then, when it
came roaring back again,
those last few people who
carry on down here still —
those poor thin seeds of
our diluted spoor —
might on some quiet evening's
walk look up at the light
of our excited atoms,
whipping out again in
their long exhilarating curve,
carouselling endlessly
in the place that gave us birth
and thus all unknowing,
join hands with us again.



The "Letatlin", 1929–1932. This flying machine, which used moving wings rather than a propeller, was made after close study of birds and in probable consultation with rocket pioneer Tsiolkovsky. It was meant, in the words of the artist, "to give back to man the feeling of flight."

WHAT IS ANPA?

Fred Young, President

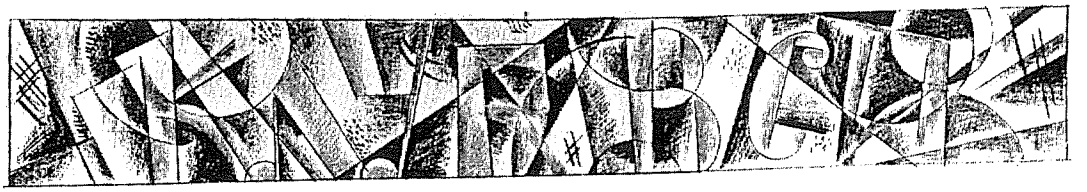
ANPA is a professional society for researchers who are dissatisfied with certain aspects of academic science. For example, individual academic disciplines exhibit behavior reminiscent of religions. they pass teachings down through successive generations of graduate students. These "teachings" are the apparent factual bases of the individual disciplines. Eventually these teachings solidify and are no longer modified by new facts. They now stand outside of the iterative process through which they were developed. A discipline can no longer evolve if the evolution requires thinking from a different perspective than the teachings indicate. Academic disciplines begin to protect these teachings much like a religion protects its holy book(s). They ridicule those who would approach the problems of interest from a different perspective. Academic disciplines also protect their turf by using excessive jargon and attempting to differentiate their discipline from all other disciplines. For example, the neutron research society recently segmented into the slow and fast neutron research societies.

In contrast, what is actually occurring now in both science and business is convergence. Digitizing information accentuates the similarities rather than the differences in various subjects, and suggests that computational models are useful for interdisciplinary research. Major progress in science now requires interdisciplinary thinking. However, researchers who would be able to make major progress come up against the religious aspects of academic science; they are ridiculed, ostracized and even excommunicated if they approach their research from a forbidden angle or use methods from other disciplines in ways which are not officially sanctioned by the "thought and opinion leaders" in their particular discipline. This behavior of academic departments and their associated researchers makes perfect sense as typical primate politics. The academic researcher observes certain cultural mores as does the individual in a neighborhood. Neither wants his neighbors down the block or down the hall at the university to whisper about strange behavior. In addition, the young academic wants to get tenure and must conform to the politics the department. This behavior produces a mode of scientific evolution reminiscent of that described by Kahn in *The Structure of Scientific Revolutions.* Namely, periods of steady progress punctuated by paradigm shifts. In keeping with the continuing discovery of the fractal properties of complex systems, it is likely that the Kuhnian view must be modified to reflect a fractal distribution of scientific discoveries rather than the model of simple progress punctuated by paradigm shifts. The disregard for interdisciplinary research among academics has a different origin. Although it is also an example of primate politics, in this case it involves the

protection of the territory of any specific academic department.

In this scenario, for a researcher in an academic department, the degree of ostracism will be directly proportional to the extent to which a discovery creates a new paradigm or threatens an existing one. Because discovery often involves questioning the assumptions that form the basis of a discipline the most talented and serious researchers are often forced to work from outside the system. However, as soon as one leaves the world of officially sanctioned science he enters a world also populated by crackpots and flakes. Here one can find a variety of organizations with no quality control and lots of pseudoscientists clamoring to be heard. In this world, success depends on loudness and persistence rather than quality or correctness. Fringe researchers do not apply any rigorous methodology. Prominent examples include most alternative health, consciousness, and psychic energy researchers. The serious investigator would not waste their time on such frivolous and simple minded activities.

There has to be a place for serious researchers who are trying to construct theories that do not necessarily rest on the current teachings of any academic discipline yet can stand up to the most rigorous criticism, analysis, and scrutiny. Researchers who are in this category can join the Alternative Natural Philosophy Association (ANPA). ANPA is the academic society for any serious researcher who wants opinions uncontaminated by the local dialects of academic discipline. This open minded, fundamental and rigorous approach fits well with the modern trends of chaos theory and nonlinear studies. ANPA is aware of the fractal nature of scientific evolution. It understands that scientific discoveries come in many sizes which challenge prevailing models to a greater or lesser extent. We welcome rigorous, multidisciplinary, and fundamental research from any coherent perspective, and we apply rigorous critical, analytic scientific methodology and will provide a critical audience.



ANPA WEST 10

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

February 19–21, 1994 – President's Day weekend
Cordura Hall, Stanford University

This year's conference will feature reports on some exciting new research in the foundations of quantum mechanics, consciousness, and diverse topics in physics and biology. We have also developed an enlarged format for the meeting to enable members to talk with each other and share ideas in a more complete way. Visitors and new members will be particularly welcome.

Tentative List of Speakers

☐ **Saturday**
Pat Suppes: *Isomorphism Between Discrete and Continuous.*
Fred Young: *From Cellular Automata to Quantum Cellular Automata.*
Wm. A. Silverman, M.D.: *The Line Between Knowing and Doing in Medicine: Dilemma at the End of the 20th Century.*

☐ **Sunday**
Pierre Noyes: *Stapp's Quantum Dualism, the James–Heisenberg Model of Consciousness.*
Tom Etter: *Pauli's New Science: Irrationality, Synchronicity, and Mind–Stuff.*
Acacio de Barros: *Diffraction Interference Between Photon Trajectories.*

☐ **Monday**
Eddie Oshins: *Technical Comments on Quantum Psychology + the Metalogic of Second Order Change.*
Herb Doughty

As yet unconfirmed: Michael Manthey, Alvarez de Lorenzana, Keith Bowden.
Further speakers and topics to be announced.

Preregistration will be $20; registration at the meeting, $25.
Graduate student fee adjustable.

For more information or preregistration, contact Fred Young, 128 Lyell St., Los Altos, CA 94022 – FAX: 415 949–5504, Phone: (415) 949–7428

If you wish to present a short (10 minute) paper on Monday, please send a copy a week in advance to Fred Young. Papers selected by the local committee for oral presentation will be scheduled for at most 40 minutes followed by 20 minutes of discussion. Any papers, 20 sheets or less and ***camera ready,*** which are given to the Secretary before Saturday, will be considered for the INSTANT PROCEEDINGS the next day. Copies may be purchased for cost, which must be prepaid on Saturday.

ANPA 16

Saturday afternoon, September 10 to Tuesday, September 13, 1994
Wesley House, Jesus Lane, Cambridge, England
Banquet, Monday evening

Registration 20 pounds, ANPA dues 20 pounds. If you wish to attend and/or present a paper, please inform: **Faruq Abdullah,** E. E. College, City University, Northampton Square, London EC1V 0HB — FAX: 071–477 8568

ILLUSTRATIONS

Cover: El Lissitzky, (for Rosa Luxemburg), 1919.

Inside Cover: Gustav Klucis, Design for a Radio Orator, 1922.

Page 2: Liubov Sergeevna Popova, *"Spatial Force Construction,"* 1920.

Page 9: Antonina Sofronova, (untitled) 1922.

Page 10: Marc Chagall, *"The Painter: To the Moon,"* 1917.

Page 17: Vladimir Tatlin, line drawing of the air bicycle "Letatlin", 1929–1932.

Page 19: Popova, Banner for the Union of Russian Poets Club, 1921.

ALTERNATIVE NATURAL PHILOSOPHY ASSOCIATION

Statement of Purpose

1. *The primary purpose of the Association is to consider coherent models based on 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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