Technical Comments on Quantum Psychology & the Metalogic of Second Order Change‡

by

Eddie Oshins †
Visiting Scholar, Department of Physics
Stanford University
Stanford, CA 94305, USA
and
Research Associate, Mental Research Institute
555 Middlefield Road, Palo Alto, CA 94301, USA

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Abstract

The present paper provides a technical elaboration and extension of the author's papers "Quantum Psychology & the Metalogic of Second Order Change" (Oshins, 1989; 1995). The historical use in psychology will be clarified regarding: (1) logical levels and (2) nondistributive lattices. A brief review of the MRI Strategic Therapy perspective will be given. The present author's quantum psychology model of fundamental, irreducible, metalogical ambiguity of competing, complementary constructs is surveyed. The difference in interpretation between the MRI brief therapy approach and Oshins' quantum psychology approach to second order change will be described. The author's quantum psychology approach of metalogical ambiguity will be appied to the relation between double binds and Orlovian doubt states.

Section I: Introduction

In my earlier papers on quantum psychology and the metalogic of second order change (1988, 1989c; 1995), I have discussed the history of evolution of my own ideas regarding my approach to metalogical ambiguity and the Bateson, Jackson, Haley and Weakland (1956) double bind theory and the Mental Research Institute brief therapy model (Haley, 1961, 1972, 1973; Watzlawick, Beavin, Jackson, 1967; Watzlawick, Weakland, & Fisch, 1974; Weakland, et. al., 1974). The development both of my own ideas and those of Bateson, et. al., and the MRI brief therapy group were rooted in trying to model Epimenedes paradox and the related ideas of logical levels and to apply these to human behavior.

Regarding my own work in quantum psychology,[1] which uses the mathematics of nondistributive, atomic lattices, many people have incorrectly assumed this work to be an application of von Neumann's "quantum logic"[2] (Birkhoff and von Neumann, 1936; von Neumann, 1955) to psychology. I assume this is due to the similarity between my mathematics and that of von Neumann and to a philosophical or projective effort by some physicists to attribute quantum ideas to psychology.[3],[4]

As regard to the work of Bateson, et. al., and the MRI brief therapy group, it is sometimes assumed that the original use of the paradoxes involved in a therapeutic context is either due to Brown (1973) or to Wiener

‡ In Fred Young (Ed.), The present paper (Mental Research Institute Tech. Report: MRI.Doc.1994/Q-Ψ.01.3b) is a revision [rev. 3b (3/94)] of the original paper, including comments from the conference.

† The author was principal investigator of the quantum psychology project at the Mental Research Institute.

(Bateson, 1968/1951, pp. 193-197, 1979, pp. 58-60 & 116-117; Haley, 1961, pp. 66-67; Heims, 1977, esp. pp. 150-153; Heims, 1980, pp. 304-308) at the 1946 cybernetics conference. Wiener had been interested in feeding the "This statement is false" example to a computer and concluded that it would *temporally* oscillate between true and false until it ran down. Bateson had been interested in the phenomenon of "deuterolearning" or "learning about learning." He noted to Wiener that deuterolearning appeared to involve two logical levels in a manner similar to the Epimenedes paradox. This began an interchange which lasted for several years and was a precursor to the double bind hypothesis. In 1952 Bateson wrote to Wiener (Heimes, 1977, pp. 150-151) inquiring:

> "... is it not conceivable that to pose a paradox to the machines [computers] might be therapeutic? ... [leading] to the possibility that the psychotherapist ... might be able to select that category of paradoxes which would in fact exercise the particular part which is stuck in the particular patient. ... Suppose the stuck part to be such that paradox is generated in the machine, even when nonparadoxical problems are presented, what sort of psychotherapy would you administer? (This actually seems to be a rather common type of pathology — and incidentally, is a pathology which might be generated by the type of therapy suggested above.)"

Bateson was later to recall in a letter to Heims that Wiener had suggested that a:

> "telephone exchange could be called "schizophrenic" in a formal sense if it mistook numbers mentioned in the conversation between subscribers for those numbers which are the names of subscribers. The double-bind idea was born out of the question 'how would one teach a telephone exchange to make this error?' "

It is important to be clear that a double-bind is not merely a conflictual, "lose-lose" situation as some have naively suggested (Oshins, 1981, 1989a,b and references therein). The difference has been clarified by Haley (1961, p. 71):

> "If faced with a 'damned if does and damned if he doesn't' situation, a person may choose the lesser of two evils. But when faced with two conflicting levels of message, he cannot choose one without the other. If I say to someone, 'I will be angry if you obey me and I will be angry if you disobey me,' he can choose one or the other. However, if I say to someone, 'I want you to disobey me,' he has no alternative choices nor is he faced with a contradiction. He cannot choose the least bad of two possibilities. His bind is this: if he obeys, he is disobeying, and if he disobeys, he is obeying."

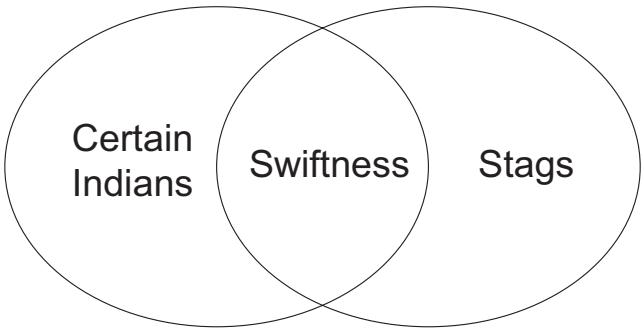
Within the context of deuterolearning, an individual who is repeatedly thus bound when situations in which he perceives a necessity to accurately discriminate an "alternative" and is unable to step out of the context to comment on its infeasibility, according to the doubtle-bind theory of schizophrenia, learns to perceive interaction with his environment as hopeless, unworkable, and unreal (Bateson, et. al., 1956).

The original impetus for the metalogical structure of second order change as formalized by the MRI group (Watzlawick, Weakland, & Fisch, 1974) is due to Ashby[5] (1956, p. 43) Ashby's model, though, was based upon feedback within a classical set theoretic context. This led to the MRI conception of second order change as based upon "reframing" the construct system of the patient such that destructive feedback loops were destroyed while being supplanted by alternative (constructive) feedback loops.

On the other hand, my own interpretation in terms of nondistributive, atomic lattices (Oshins, 1981, 1989c, 1994, to appear) suggests that one a particular type of reframing might involve introducing competing complementary constructs, which will be discussed below. In the manner of a system of filters, one would thereby literally reframe the cognitive filters in a manner that changes the competing metalogical construct system to a more fortuitous complementary system. One still could think in terms of feedback loops and all the rest of a classical formulation. The difference is that now one would be considering linearly dependent constructs whereas in a classical system all constructs are compatible.

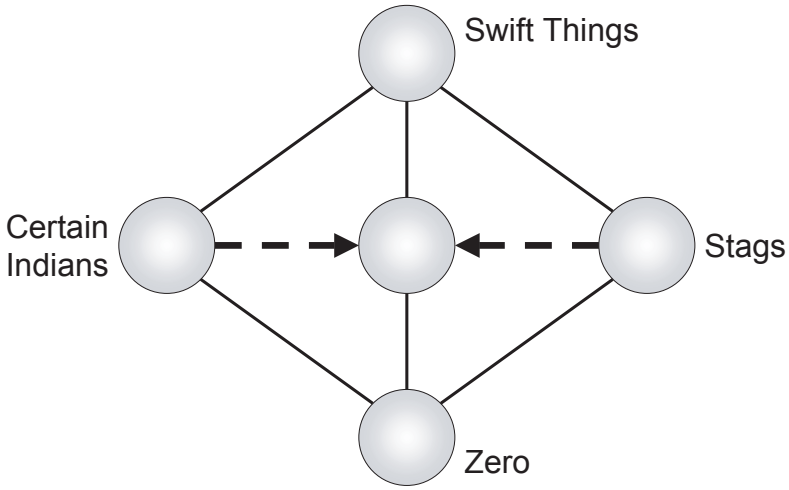
I add that to my knowledge the use of logical levels first appears in von Domarus' 1924 thesis under F.S.C. Northrop[6] (von Domarus, 1965, pp. 380-381; McCulloch, 1965, p. 2 & p. 198). Von Domarus, here, was interested in the phenomena of *induction*. In particular, he considered what he referred to as "metabasis eis allo genos" which "is always some transformation from relata to relation or vice versa." He offers the following lovely example: "two ONES = one TWO." "Two" changes from an adjective to a noun while "one" changes from a noun to an adjective.

This is important within the context of schizophrenia since von Domarus conceived of the deficit as involving the "fallacy of the undistributed middle term." An example given by von Domarus (1944, p. 110; Oshins, op. cit.): "'Certain Indians are swift' 'Stags are swift' [therefore] 'Certain Indians are stags'." Von Domarus conceived of this principle in formal terms as overlapping Venn diagrams:



Von Domarus' Venn diagram representation for Von Domarus' principle

On the other hand my interpretation was in terms of a nondistributive, atomic lattice, in which two atoms are identified:



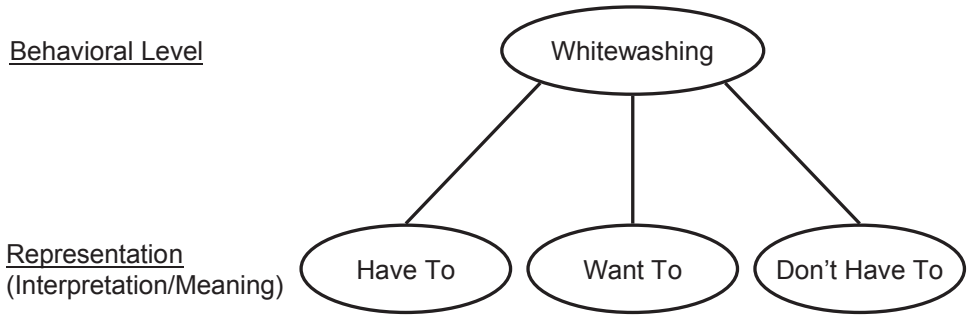
"Certain Indians" and "Stags" are identified

The Metalogic of MRI's Strategic Therapy Perspective (1987a,b, 1988, to appear, 1989c, 1995

The Mental Research Institute pioneered an approach to cybernetic communications based upon principles of systemic interaction, and strategic, offtimes paradoxical, interventions. This led to the development of brief or strategic therapy and helped to initiate the family therapy movement.

The following principles are fundamental to their approach: (1) Interactive whole systems: "... problems that people bring to psychotherapists ... [usually are] situational difficulties between people — problems of interaction (Weakland, et. al., 1974, p.147)"; thus, they shifted "from the observation of the individual to the observation of a system and to ... the needs of a system rather than the needs of a person (Haley, 1961, p.78)"; (2) Metalevel problem reframing: "there are two different types of change: ... [first-order change] occurs within a given system and ... itself remains unchanged, and ... [second-order change] whose occurrence changes the system itself ... thus change of change (Watzlawick, et. al., 1974, pp.10-11)"; and (3) Pragmatism and avoidance of insight about causes: problem conceptions and interventions are based upon "what is going on in the systems of human interaction ... Correspondingly, we avoid the question 'Why?' ... [since it] tends to promote an individualistic, voluntaristic, and rationalistic conception of human behavior, rather than one focused on systems of interaction and influence (Weakland, et. al., 1974, pp.150-151, 155; Also, Watzlawick, et. al., 1974, pp.83, 86)" in the present.

A prototype of problem reframing is Tom Sawyer's restructuring of his chore to whitewash a huge fence, not as a burden, but as a desirable opportunity worth paying for (Ibid., pp.90-91): "Like it? Well, I don't see why I oughtn't to like it. Does a boy get a chance to whitewash a fence every day?" This resulted in his friends paying him for the privilege of painting the fence. We can depict this metalevel reframing, thus:



Or, consider the example of a "hostile" women's "frigidity" towards her husband. Successful intervention consisted in supporting the wife's "overprotectiveness" towards her husband, framed as: clearly "he would not know how to cope with the impact of her uninhibited sexuality (Ibid., pp.102-103)." This redefinition of the same circumstances led to her sexual acting out her hostility, thereby "defeating" the "problem".

In these cases, I draw particular attention to the following formal features: (1) metalogic: "... to express or explain something requires a shift to one logical level above what is to be expressed or explained. No explaining can be accomplished on the same level, a metalanguage has to be used (Ibid., p.79)."; (2) reframing: "Reframing means changing the emphasis from one class membership ... to another, equally valid class membership, or, especially, introducing ... a new class membership into the conceptualization of all concerned (Ibid., p.98)."; and (3) second-order change: "As long as the solution is sought within this dichotomy of a and not-a, the seeker is caught in an illusion of alternatives ... The formula of second-order change ... is 'not a but also not not-a' (Ibid., pp.90-91)." Later, I shall explain how quantum psychology provides a structure which accommodates this metalogic of incompatible frames.

On Complementary Constructs

The Quantum Psychology of Fundamental, Irreducible Ambiguity (Oshins & McGoveran, 1980, and references therein; Oshins, 1984a, 1987a,b, 1988, to appear, 1989a,b,c, 1995; Hilgard, 1989). In 1976, I introduced a quantum logic (nondistributive lattice) approach to representing primary processes. In particular, I focused on modeling von Domarus' principle of "identification by predicates" which was alleged to represent the paleologic syllogisms attributed to schizophrenic thinking. The prototype is the paleological syllogism, "I am a virgin. The Virgin Mary was a virgin. I am the Virgin Mary."

In their pioneering 1943 paper, "A logical calculus of the ideas immanent in nervous activity," McCulloch and Pitts (Oshins, 1987/1984a, p.70-71) had proposed a neuronal model identifying neuronal events with a classical propositional logic; this was the precursor to current, black box, neural net models. As pointed out by von Neumann (Ibid.), "McCulloch-Pitts ... proves that ... there is no difference between the possibility of describing a real or imagined mode of behavior completely and unambiguously in words, and the possibility of realizing it" in this manner.

As an alternative to psychoanalytic related efforts at representing von Domarus' principle with classical set theory and to the McCulloch-Pitts endeavor, which in principle, avoids ambiguity, I proposed a nonclassical realization as a (Dirac) linear superposition of rays,[7] or, equivalently, as a nondistributive, quantum logic (lattice). In a quantum lattice, the classical distributive law [A and (B or C) = (A and B) or (A and C)] is replaced by the Principle of Complementarity, in a projective geometry:

> "If one does not distinguish between two unit predicates A & B, there will always exist a third possible unit predicate C such that (A or B) = (B or C) = (C or A)", ie. they are equivalent "perspectives" (Jauch, 1968, pp.105-108, 121-126). Thereby, Oshins reinterpreted the above example as a type of equivocation: "I ≡ Virgin Mary (modulo virginity)."

Since this law is applied according to an empirical description (Schwinger, 1970), I proposed an underlying physical deficiency, with empirical consequences, to account for this faulty conclusion-forming process.

I (1987, pp.24-25; Also, Heisenberg, 1958, pp. 181-185) pointed out that for the predicates A and not-A to be not empirically distinguishable, one could not operationally conclude from "A or not-A is true" that "A is true" nor that "not-A is true", since then the A/not-A construct system itself would then be distinguished. This provides a metalogic: Classically, it follows from [<<'statement-A' is 'true'>> is <<'false'>>] that [<<'statement-A' is 'false'>>]. Such inference is not valid in quantum logic since neither A nor not-A need be contextually appropriate. Thereby, Oshins postulated a principle of fundamental, "irreducible" ambiguity.[8] Additionally, Oshins (1987, pp.15, 24; 1980; Also, Orlov (1982)) has interpreted the paradox of "This statement is false" as "This statement is 'true or false"' does not necessitate that "This statement is 'true"' nor that "This statement is 'false"'. It is irreducible to either alternative, and the truth valuation induces a transition in the truth value.

An Introduction to The Nature of Complementarity. The fundamental consequence of Planck's introduction of the "quantum of action" into physics was that "phenomenon ... refer only to observations obtained under circumstances whose description includes an account of the whole experimental arrangement [Emphasis added] (Bohr, 1987a/1954, p.73)." This "forces us to adopt a new mode of description designated as complementary in the sense that any given application of classical concepts precludes the simultaneous use of other classical concepts which in a different connection are equally necessary for the elucidation of the phenomena (Bohr, 1961/1929a, p.10)."

Bohr (Ibid., 1961/1929b, p.96) pointed out that "this mode of description is perhaps familiar to us from psychological problems." Indeed, William James' earlier use of the concept of complementarity in a psychological context (Oshins, 1987, pp.17-18) had been an important influence on Bohr.[9] As noted by Bohr: "the nature of our consciousness brings about a complementary relationship, in all domains of knowledge, between the analysis of a concept and its immediate application (Bohr, 1961/1929a, p.20)." Other psychological examples of complementarity include: (1) "when we reflect about a decision and the motives for our decision or when we have the choice between enjoying music and analyzing its structure (Heisenberg, 1958, p.179)."; (2) "justice and charity ... [for] any occasion which calls for the strict application of law has no room for the display of charity and ... benevolence and compassion may conflict with all ideas of justice (Bohr, 1987a/1954, p.81)."; (3) "seriousness and humour (Ibid., p. 79)"; and (4) "'thoughts' and 'feelings' (Bohr, 1987a/1938, p. 27)."

To Bohr, perhaps the most fundamental of all instances of complementarity involved "the space-time coordination and the claim of causality (Bohr, 1961/1927, p.54)". Oshins has likened this complementarity between the locational or situational degrees of freedom and the causal degrees of freedom to a complementarity between a "What?" and a "Why?". He has suggested such underlies the distinction between the MRI approach and the traditional psychoanalytic search for "the cause" as described earlier.

Double Binds and Doubt States (Oshins, 1987b, pp.15, 19-25)

I shall now present the formal structures of double binds and of Orlovian doubt states. Then I shall suggest some empirically meaningful aspects for future research.

Necessary Ingredients for a Double Bind (Bateson, et. al., 1956). A double bind situation requires: (1) Two or more persons; (2) Repeated experience; (3) Primary negative injunction; (4) Secondary injunction conflicting with the first at a more abstract level (such as by nonverbal, analogic means), and like the first enforced by punishments or signals which threaten survival; (5) Tertiary negative injunction prohibiting the victim from escaping from the field; (6) Finally, the complete set of ingredients is no longer necessary when the victim has learned to perceive his universe in double bind patterns.

Necessary Ingredients for an Orlovian Doubt States (Orlov, 1982). Yuri Orlov has described a type of intrinsic ambiguity to information which he calls "doubt states" when there is "inadequate resolution to resolve"

a situation, eg. "To be or not to be?" (Ibid., p.43). I have distinguished such an "ambiguous state" from a fuzzy logic-type (Zadeh, 1965; Oshins, Adelson, & McGoveran, 1984; Oshins, et. al., 1989[/1992]) of pathological ambivalence, "I am and I am not." (Oshins, 1981). The latter statement seems more akin to the original Venn diagram approach of von Domarus discussed earlier. That these are fundamentally different is pertinent to a scientific effort at understanding schizophrenia since the differing formal structures will lead to differing empirical predictions.

From Orlov's perspective (Ibid., p.46): "the earliest type of doubt to appear in the evolution of life ... is doubt that the information from the sense organs is interpreted correctly. For an individual to experience this type of doubt, it is necessary that: (a) there are information signals; (b) these signals evoke at least two competing associations ... and the individual is not indifferent to at least one of them; (c) it is necessary to make a decision as to whether ... that one to which the individual is not indifferent ... is correct; (d) the resolution is inadequate to choose between the competing associations ... ; (e) the individual ... cannot entrust the decision making to ... random acts (i.e., he is convinced that he must do it himself)."

Illustration of an Orlovian Doubt State[10] (Ibid., pp. 43- 46). Orlov suggests that when an adult says to a child, pointing at a pack of wool: "This is a wolf." If the phrase "wolf", has some meaning for the child, and it is essential to him to decide whether it is a wolf, then he may find himself in one of three states:

(1) He believes the adult's statement is certainly true:

$$\Psi_1 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

(2) He is certain it is not a wolf, believing the adult's statement is certainly false:

$$\Psi_2 = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

(3) He has insufficient information to solve the dilemma — he lacks sufficient resolution. The adult is known to be insincere, or there is a sign that he was kidding:

$$\Psi_3 = \begin{pmatrix} a \\ b \end{pmatrix}, \quad |a|^2 + |b|^2 = 1; a, b \quad \text{are complex numbers} \neq 0.$$

The spinor ray Ψ_3 which describes "This is a wolf." is an elementary doubt state. If forced to choose, $|a|^2$ is the probability he will say "True" and $|b|^2$ is the probability he will say "False". The child manifests this doubt state by words ("This — is it a wolf???"), intonation (ie. ???), facial expressions, and other ways that form a continuum [i.e., the inner automorphisms of the algebra of the observables] — an (analogical) nonclassical proposition — an adequate manifestation of which cannot be rendered classically.

Toward an Empirical Understanding of Double Binds and Doubt States. Orlov has proposed measures for certitude of experience and for the destructive or constructive interference of doubt states (Orlov, op. cit., p. 45, eq. 25,; Oshins, 1987b, p. 23), which I have termed "Orlov inequalities"[11] since they might carry the importance in psychology that "Bell's inequality" does in physics. (Oshins, op. cit., p. 15). In Orlovs example he considers an ensemble of identical test children and *two* different objects, 1 and 2, which are *separately* presented to the individual children such that each child sees only one such object. The experimenter inquires "Is there a wolf?" This provides a experimental estimate of $|a_1|^2$, i.e. that the child answers "Yes" for object 1, and $|a_2|^2$, i.e. that the child answers "Yes" for object 2.

Next, sample children are shown both objects simultaneously and asked "Is there a wolf?" The relative frequency of the answer "Yes" is measured, determining $|a_3|^2$. Here the doubt state of an individual tested child is:

$$\begin{pmatrix} a_3 \\ b_3 \end{pmatrix} = \frac{1}{\sqrt{2}} \left[\begin{pmatrix} a_1 \\ b_1 \end{pmatrix} + \begin{pmatrix} a_3 \\ b_3 \end{pmatrix} \right],$$

where $|a_1|^2 + |b_1|^2 = |a_2|^2|b_2|^2 = |a_3|^2 + |b_3|^2 = 1$ for normalization.

Substituting $a_k \equiv A_k e^{i\alpha_k}$ and k = 1,2,3., one obtains

$$A_3^2 \equiv |a_3|^2 \equiv |a_1 + a_2|^2 \equiv |A_1^2 + A_2^2 + 2A_1A_2\cos(\alpha_1 - \alpha_2)|.$$

The measured values of $A_1^2, A_2^2, and A_3^2$ enable one to calculate $\alpha_1 - \alpha_2$. The criteria for constructive and destructive interference will be then determine the "Orlov Inequalities":

$A_3^2 > (A_1^2 + A_2^2)/2$, for constructive interference, and

$A_3^2 < (A_1^2 + A_2^2)/2$, for destructive interference.

One can find $\beta_1 - \beta_2$, etc., in a similar manner.

I have previously noted the similarity between the necessary ingredients for an "Orlovian doubt state" and those of a "double Bind." (Oshins, 1981, 1988, to appear, 1987b, pp 19-23) and suggested that the difference may lie in the locus of control of the decision (Rotter, 1966; Oshins, 1981, 1988, 1989c, to appear, 1994, to appear). Oshins (1987b, p.15) also has pointed out the need to distinguish between "removable ambiguity" and "intrinsic ambiguity," which follows complementarity.

Conclusion

In this paper, I have overviewed the MRI's strategic therapy approach in terms of my quantum psychology model of operational, metalogical ambiguity. The structure of complementarity has been discussed, as has the relation between double binds and Orlovian doubt states. Since these formal structures have empirical correlates, I have suggested that quantum psychology might provide a tool for the further investigation of these important areas of psychology. Quantum psychology has the potential to shed light on such areas as creativity (from doubt) and psychopathology (from binds).

NOTES

1. As I discussed in Oshins (1991, ft. nt. 6): "Originally referred to as "genuine stupidity logic" (Oshins and McGoveran, 1980) Historically, my model was not developed as an adaptation of nor application of quantum physics. It began (Oshins, 1989 a,b,c; Hilgard, 1989) by trying to resolve conflict within the psychological literature as to the nature of schizophrenia as a logical phenomena. The method involved resynthesizing various properties of Brown's Laws of Form (1973) and Zadeh's (1965) "fuzzy logic".

"The extension to a quantum theory occurred in the late 1970's and early 1980's, in part, as a competing, physically meaningful, parallel processing, alternative to Pribram's "hologram hypothesis". Additionally, I had hoped to draw attention among physicist to the plight of Yuri Orlov (eg. Oshins, 1983c). Orlov's related approach, called "wave logic" (Orlov, 1975, 1981, 1982; Oshins 1983a), was initially a mathematical attempt to apply group theory to logic. Orlov insisted that "WAVE LOGIC IS NOT A LOGIC OF QUANTUM MECHANICS. Noncommuting operators of the wave logic relate to the same object and have a sense of

equivalent propositions expressed in different languages. Noncommuting operators of quantum mechanics relate to different objects" (Orlov, 1975).

"Although his wave logic approach may have not considered relating the operators to different objects, it seemed to me that this was an unnecessarily restrictive requirement. I was interested in the types of noncommuting interactions between observing and observed systems, ie the individual and his or her environment and the boundary forming processes between them (Bohr 1961/29, p. 99; DeWitt, 1971, p. 220; Kubie, 1953; Oshins 1989b, footnotes 7 and 10; Rotter 1966. I adapted some of Orlov's ideas into my own and introduced his ideas into psychology. I introduced the term an "Orlov Direction of Meaning" as the direction reflected by the diagonalizable matrices which I suggested could realize fuzzy logic (Adelson, D. 1984; Oshins & McGoveran, 1980; Oshins, et. al. 1984; Oshins, et. al. 1989/1992).

"When Orlov himself began to apply his ideas to psychology (Orlov 1981, 1982; Oshins 1983a), [at first he temporized, proposing 'we postulate that the doubt states are quantum-mechanical states of the brain. But it is also possible that 'the doubt field is an independent entity which cannot be reduced to quantum-mechanical functions of brain particles. Consciousness is a system which observes itself and evaluates itself — being aware, at the same time, of doing so. The present physical theory does not have an apparatus to describe such systems. Thus it is not excluded that new variables ('doubt variables) may need to be introduced in order to describe such a system. (Orlov, 1982, p. 38). I do not believe in self-reference in the same manner as Orlov. Specifically, I believe that one refers only to an image of oneself, not to oneself! In any case, due to his imprisonment, I was unable to inquire of Orlov to resolve his apparent wavering over whether he wanted to assert a quantum model or a quantum-like model.

In his next paper (Orlov, 1981) — which was published earlier —] Orlov still insisted that "Our hypothesis is that the experience of doubt is not of a quantum mechanical nature, and stems from those signals which the logical system sends when it discovers both the impossibility and the necessity of making a decision in a state with insufficient resolving power." (Orlov, 1981, p. 88). Since Orlov had not presented a reason for rejecting a quantum approach to psychology and since I had been able to resolve certain conflicts within the psychological literature while integrating for the first time several disparate areas of psychology — such as spatial frequency data which Pribram had been interested in with Shepard's (1981, 1983; Shepard and Metzler, 1971) theory of "mental rotations" — in a formally simple manner, I became more convinced that if I could show a basis for using quantum physics in psychology, I could provide a tool for physicists in fighting for Orlov's freedom from the Soviet prison camp. Since Professor Sidney Drell had urged me to find an empirical basis for my ideas, if I hoped to get the attention of physicists, and since I had already provided a basis to believe in spinor representations in the brain, I turned my attention to possible magnetic effects, ultimately proposing several ideas for experimental inquiries using SQUID (Superconducting Quantum Interference Device) technology (Oshins, 1984a)."

2. In this regard, at the 9th Western regional meeting of the Alternative Natural Philosophy Association, Etter (1993) incorrectly attributes the introduction of a spectral representation to *truth* to von Neumann (1955). This is incorrect. In his quantum logic approach, Von Neumann does make a spectral representation of observables but not of truth which is an attribute of propositions about observables. The only mention of truth by von Neumann is in terms of the partial ordering of the lattice whereby the "identically true" proposition I refers to the identity proposition that "the system considered *exists*" and the "identically false" proposition 0 refers to the nul proposition that the system "does *not exist*" (Birkhoff and von Neumann, 1936). To my knowledge the first use of a spectral representation for truth valuations in psychology is my own 1976 effort (Oshins and McGoveran, 1980) and the independent effort by Orlov in mathematics (Orlov, 1975) and in psychology (Orlov, 1982, 1981).

3. I point out that not only is my own approach not an application of von Neumann's quantum logic/nondistributive lattice approach but that nondistributive lattices date back to 1890, originally by Schröder (Jammer, 1974, pp. 348-350). The simplest example of a nondistributive lattice is Korselt's 1894 example of the LUB of any pair of distinct, collinear points determines the same line (Universe of Discourse) but the GLB of any

such pair gives the null space. That nondistributivity occurs for any triplet of such points follows trivially. [Taken from Jammer's The Philosophy of Quantum Mechanics.]

4. Regarding one of many such efforts, Hilgard (1987, pp. 795-796) writes: "[Although] This is not the place to review the popular and pseudoscientific literature that continues to mount and is played up in the popular press ... [the]question is whether or not there is any substance in the claims that would lead to a possible alternative paradigm for psychology. Because the aberrant results are accepta ble to those who are committed to beliefs in psi, the believers are convinced that they are on a totally new track in science. ... He is but one of a number of physicists who appear to assume that once one has given up the assumption that science seeks some final truth, almost any fantastic theory may be welcome. In this he shares the views of others who recognize how incomprehensible the phenomenal characteristics of quantum mechanics are so that it must be in the realm of quantum physics that the explanation of parapsychology may lie ... This led [J.A.] Wheeler to write ... that the honest work in the quantum theory of obsevation was being almost overwhelmed by the distorted ideas put forth by those who were trying to find a link between quantum theory and parapsychology." I have identified such aberrant associations with von Domarus' principle (Oshins, 1991).

On the other hand, there are many respectable and insightful analogies. As examples, consider Bohr (1961, 1987a,1987b), Heisenberg (1958), Orlov (1981, 1982) among others (Finkelstein, von Weizsacke, Watanabe, etc.). Although he recognizes the fraudulent efforts of many, Hilgard remains open to the possibility that quantum physics might apply to psychology (Hilgard, 1989; Oshins, 1989a)

5. This was pointed out to me by Paul Watzlawick (1994, personal communications). The analogy Paul used is that a car has two kinds of change. In one kind the driver increases the speed by pushing on the accelerator. In the other kind the driver changes the gears which changes the nature of the acceleration when the accelerator is applied giving something akin to a change of change.

6. My first awareness of this comes from McCulloch's (1965, p. 2) comment that he (McCulloch) first came to learn "to understand the logical difficulties of true cases of schizophrenia and the development of psychopathia" from von Domarus in 1930 at Rockland State Hospital. This clearly was fascinating to me because the model that I adopted for primary process, unconscious thought was based upon von Domarus' principle of identification by predicates. In the McCulloch-Pitts model of neural nets the concept of "ambiguity" is explicitly nonadmissable. On the other hand, I explicitely introduced a principle of metalogical ambiguity as a realization of the von Domarus principle (Hilgard, 1989; Oshins, 1981, 1984a, 1987a,b, 1988, to appear, 1989a,b,c, 1994, to appear; Oshins & McGoveran, 1980; Oshins, Adelson, & McGoveran, 1984; Oshins, et. al., 1989/1992)

Professor Northrop was helped me locate this reference and to provide me with numerous related references (September 28, 1980 letter from F.S.C. Northrop to E. Oshins).

7. Although "The holographic hypothesis on brain function ... takes the form of superposition (Pribram, 1971, p.142)", this is a superposition of light (ie. vector fields) not of rays, and, thereby, is irrelevant to a quantum context.

8. See also Bohr (1961/1929, p.17): "only with the help of classical ideas is it possible to ascribe an unambiguous meaning to the results of observation."

9. There is an extensive literature on the notion of complementarity in its physical, psychological and philosophical contexts (Bohr, 1961, 1987a, 1987b; Heisenberg, 1958; Oshins, 1987; von Weizsäcker, 1980). In Drieschner axiomatics of experience the principle of complementarity is referred to as the "Axiom of Indeterminacy." (Ibid., p.211).

10. I point out three errors in this paper (Oshins, 1988, to appear): (1) the third equation in (11) should

$= 0$ not 1 since it is representing the orthogonality of the indicated states; (2) in equation (24), A_3 should read A_3^2; and (3) the first reference should read (1975) not (1978a).

11. I am grateful to George Mackey and Arlan Ramsay for conversation on this matter (December 21, 1983) and to Arlan Ramsay for encouraging the measurement of this inequality (March 9, 1984 letter from A. Ramsay to E. Oshins).

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