ON THE QUANTUM MECHANICS OF DREAMS AND THE EMERGENCE OF SELF-AWARENESS

(revised) by

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ABSTRACT

This paper explores and offers a quantum mechanical model for the emergence of self-awareness from holographically-generated dream images. Self-awareness arises from the ability of a simple memory device, an automaton in the brain, to obtain images of holographically-stored glial cell memories and, most importantly, through a quantum mechanical process, to also obtain images of itself. Each self-image is composed of a quantum-physical superposition of primary glial cell images and an image of the automaton containing those images. These self-reflective images are ordered according to a hierarchy based on increasing levels of self-inquiry conducted during the dreaming process. Thus higher levels of the automaton's self-awareness are achieved by integrating images of itself on lower levels of the hierarchy. A comparison of the model with the observed dream self-reflectedness scale put forward by Rossi is made.

THE PHYSICS OF SELF-AWARENESS

In the past few years I have been researching the relationship of physics and consciousness.[1] My work has led me to a novel model of the self as a hierarchy of levels

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[1] Wolf, Fred Alan. *Taking the Quantum Leap: The New Physics for Nonscientists.* San Francisco: Harper & Row, 1981. Revised Edition, New York: HarperCollins, 1989.

of awareness. This idea is based in part on the work of Nobili and in part on the work of Albert. Nobili's work[2] shows that ionic wave movement (that is similar in form and structure to quantum waves but different from them in certain essential details[3]) occurs in the glial cells of the brain making it an ideal medium for supporting and producing holographic imagery.

-----. "The Quantum Physics of Consciousness: Towards a New Psychology," *Integrative Psychology*, Vol. 3, pps. 236-247, 1985.

-----. *The Body Quantum: The New Physics of Body, Mind, and Health.* New York: Macmillan, 1986.

-----. "The Physics of Dream Consciousness: Is the Lucid Dream a Parallel Universe?" *Lucidity Letter*. Vol. 6, No. 2; December, 1987. pp. 130-135.

-----. *Parallel Universes: The Search for Other Worlds*. New York: Simon & Schuster, 1989.

-----. "On the Quantum Physical Theory of Subjective Antedating." *Journal of Theoretical Biology*, Vol. 136, pps. 13-19, 1989.

-----. *The Eagle's Quest: A Physicist's Search for Truth in the Heart of the Shamanic World*. New York: Summit Books, 1991.

-----. "The Dreaming Universe." *Gnosis.* # 22 (Winter, 1992), pp. 30-35.

-----. *The Dreaming Universe: A Mind Expanding Journey into the Realm Where Psyche and Physics Meet*. New York: Simon & Schuster, 1994.

-----. "The Body in Mind." *Psychological Perspectives*, Issue 30, 1994, pp. 22-35.

[2] Nobili, Renato. "Schrödinger wave holography in brain cortex." *Physical Review A* Vol. 32, No. 6, p. 3618-26. Dec. 1985.

[3] Nobili proposed that Na^+ and K^+ transport through glial cells in the form of oscillating currents producing wave patterns--in which the motion of the sodium ions effects the movement of the potassium ions and vice versa--that satisfy a Schrödinger Wave equation. He found that contrary to lightwave holography, Schrödinger wave holography was far more efficient in producing holograms in glial tissue. He also discovered that the close proximity of signal sources and receptors (which is in itself in good agreement with other neuro-physiological cortical diagrams) in the cortex was ideal for both production of reference waves and information wave recovery. Complete details for the mechanism for glial imaging/holography are in his paper.

Albert's work[8] shows that quantum automata can not only remember objective properties but also hold memories of themselves. This self-reflective property, in combination with the holographic model, suggests a mechanism for the arising of the self as a hierarchy within the brain.

A BRIEF DESCRIPTION OF GLIAL MEMORY CELLS

The brain generates electrical wave activity as exemplified by the records of electro-encephalograms (EEGs). By looking at individual neurons' electrical activity we see that there are quite active movements of electrical charges, mainly of sodium (Na^+) and potassium (K^+) ions, that pass from one side of a neural membrane to the other as a nerve pulse travels along the axon of the neuron.

Besides neural cells, that do not undergo cell mitosis(cellular division), there are glial cells that do. No one quite knows exactly why they are present[4]. Some studies indicate that these cells perform a metabolic function[5]. When Albert Einstein died, his brain was autopsied and it was discovered that he had a larger then normal amount of glial cells associated with his visual cortex. This led many to speculate that glial cells had something to do with intelligence and possibly Einstein's enhanced ability to visualize very abstract concepts. Einstein had often written that before he wrote down any mathematical expression, he "saw" or conceptualized the new idea. This speculation about the connection between glial cells and visualization may have some foundation in truth.

Some researchers have shown that glial cells do more than provide nourishment to neurons. Peculiar movements of ions have been detected in glial cells and it is now suspected that these ion "transport" processes affect the bioelectrical activity of neurons

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[4] There is some recent evidence that these cells are involved in some sort of memory function and they may be instrumental in the development of tumors.

[5] See Pribram, Karl H. *Languages of the brain. Experimental paradoxes and principles in neuropsychology*. Monterey, CA: Brooks/Cole Publishing co., 1977. pp. 34-47.

and of the whole cerebral cortex.[6] Research on multiple sclerosis, a disease which is associated with the breakdown of glial cells also indicates that memory processes and motor processes are deeply affected thus suggesting that glial cells indeed do more than just provide nourishment and supporting tissue for neurons.[7] In Nobili's model, glial cells act as the medium for holographic waves and are therefore capable of storing holographic memory.

ALBERT'S AUTOMATA: A BASIS FOR SELF-AWARENESS

Based on the many-worlds interpretation of quantum physics[8], Albert explained how quantum mechanical automata might be constructed and used as computer memory elements.[9] Albert indicated that these automata are capable of observing self-reflective states without disrupting themselves in the recall process. Yet they cannot necessarily observe objective states in other automata without disrupting them and thereby changing their memories and causing them to "jump" into different and usually random states.

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[6] See Nobili, *ibid.* p. 3619.

[7] See Pribram *ibid*, pp. 34-47.

[8] See my earlier book, *Parallel Universes,* for a more detailed discussion of the many worlds concept and Albert's automaton.

[9] See Albert, David Z. "How to Take a Photograph of Another Everett World." in New Techniques and Ideas in Quantum Measurement Theory, ed. D.M. Greenberger, Vol. 480, *Annals of the New York Academy of Sciences,* December 30, 1986. Also see: Albert, D.Z. "On Quantum-Mechanical Automata." *Physics Letters.* Vol. 98A p. 249-252 (1983). Also see Deutsch, D. "Quantum theory, the Church-Turing principle, and the universal quantum computer." *Proceedings of the Royal Society of London*, Vol. A 400, pps. 97-117 (1985). Also see Albert, David Z. *Quantum Mechanics and Experience*. Cambridge MA: Harvard University Press, 1992, Ch. 8.

SELF-REFLECTIVE QUANTUM PHYSICAL NEURAL STATES

My model is based on Nobili's and Albert's theoretical work. Let me first put the basic idea of the model into words. I assume that such automata exist in the brain. They may be glial cells or they may consist of structures consisting of spaces between the neural walls. They could also be boutons within the synapses of neurons. Other possibilities may exist.[10] Whatever they are, the key insight into self-awareness arises from their ability to obtain and record images from holographically-stored glial cell memories and, most importantly, to also obtain images of themselves while holding quantum physical complementary images. This property is unique to self-reflective automata.

Each self-image is ordered according to a hierarchy based on levels of self-inquiry. Higher levels of the automaton's self-awareness are achieved by integrating images of itself on lower levels of the hierarchy. When such an inquiry occurs, a jump from a lower to a higher level takes place as the new self-reflective image becomes part of the device's record of previously obtained self-reflective images. Thus each jump upward integrates images from all of the lower levels resulting in a sequence of images beginning with the lowest, simplest images and ending with the highest, complex images.

The lowest or "zero" level consists of non-self-reflective images and superpositions of images. According to the uncertainty principle, it is not possible for an automaton to obtain a single image and a superposition of images simultaneously. At the first self-reflective level, images and the records of the automaton containing those images are superimposed resulting in a bounded "emotional" memory. At the second level, these emotional memories are integrated into "thought" forms. At the third level, these thought forms are integrated into "archetypes." At the fourth level, these archetypes are integrated into "super-archetypes." In principle the process is never-ending.

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[10] Recent work by Hameroff suggest that micro tubules within the cytoskeleton of neural cells act like wave guides for photons leading to holographic information processing mechanisms. See: Hameroff, S.R. *Ultimate Computing: Biomolecular Consciousness and Nanotechnology.* Amsterdam: North Holland, 1987.

I suggest that this self-reflective aspect, which exists as a necessary consequence of the **parallel worlds interpretation of quantum theory**, is a deep clue to our own self-conscious nature and that the dream is a laboratory in which the differences between self-reflective and unreflective perception (non-self-reflective) can possibly be measured.

THE MATHEMATICAL STRUCTURE OF SELF REFLECTION

Suppose that the object that the automaton interacts with, and thereby obtains a measurement of, is an ionic wave pattern simulating a holographic image in a glial cell. This wave pattern can be observed in several complementary ways depending on what the automaton wishes to extract from the cell.

Now suppose that the cell contains a holographic record of a superposition of images. To keep this as simple as I can, I will assume that there are only sixteen primary images, W_i, where "i" is a counter index. These sixteen can be superimposed into eight pairs, E_i, (120 different pairings[11]) where each pair constitutes a secondary image. These eight secondary images can be superimposed into four tertiary images, F_i, (28 different pairs) and so on. Thus the secondary images are complementary to the primary images and tertiary images. The tertiary images are complementary to both the secondary and primary images, and so on.

Although an automaton cannot hold simultaneously multiple images consisting of complementary observations of another automaton, it turns out that it can do so for complementary observations of images built up self-reflectively. **An automaton is capable of "knowing" complementary observables of itself, but it cannot obtain and "know" complementary observables of another automaton**.

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[11] I don' t wish to make a big deal of this. There are 120 ways of producing unique pairs of 16 objects. The important point is that I **assume** some pairing of the w_i's produces the E_i's and some pairing of the E_i's produces the F_i's and so on.

The superposition of two images, say W_1 and W_2, is also an image that we label "E_1". To make this a little dramatic, and perhaps reflective of some people's memories, let W refer to women images, and E to emotional images. Let this superposition, W_1 and W_2, reflect some aspect of the person's life while living with these two women, say mother and sister. Of course there are many images in a person's memory. We are only looking at two specific images. Perhaps the sister image, W_2, reflects a younger crying child and the mother image, W_1, reflects an hysterical woman. Now there is no **experienced** emotional content to these separate images. They are just pictures.

But the younger crying sister image, W_2, and the hysterical mother image, W_1, when taken together create the emotional image "unhappy woman" which we have symbolized by the letter E_1. There may also be an E_2 image consisting of the superpositions of say, the first girlfriend image, W_3, and the second girlfriend image, W_4. These latter images taken together composing E_2 might reflect another emotional state that the person observed in woman, say, a joyful woman image.

Other images could exist. A superposition of the two emotional images E_1 and E_2 would make up a thought-form image, F_1. Since this image consists of both the unhappy and the joyous emotions it could represent a state of feminine or motherly understanding. A superposition of thought-form images, say F_1 and F_2, would represent an archetype say "goddess" image, G_1. And a superposition of archetypal images, G_1 and G_2 , would stand for the super-archetypal "woman" image, S_1.

In the language of quantum physics, complementary observable-operators ***W, E, F, G,*** and ***S,*** operate on sets of complementary glial cell states: the woman identity states, W_i, women emotional states, E_i, woman though-form states, F_i, and so on. If the glial cell contains a specific image, W_1, and a woman image is called forth, a quantum-mechanical operator ***W*** "operates," and the glial cell yields the image, W_1, which will be incorporated into the memory of the automaton. This produces a composite state of both the glial cell and the automaton that is the product of their separated states. We label this state,

$$W_1^{(0)} = [W_1]W_1 \qquad \text{(eq. 1).}$$

The block brackets "[ ]" signify the automaton and whatever is inside of them is now a memory of the automaton. The superscript "(0)" means that a level "0" interaction has occurred between the automaton and the object of its inquiry. In this case that object is the image contained in the glial cell. Thus the state, $W_1^{(0)}$, is a coupled state of automaton and glial cell in which the automaton reflects the state held by the glial cell.

Now suppose that the glial cell contains a superposition of two woman images, W_1 and W_2, corresponding to the state of emotion, E_1. What happens if the automaton interacts with that cell? If it is under the instruction to obtain a woman image, and, according to quantum rules, it can only obtain a single image, W_1 or W_2, it will do so, obtaining one or the other at random according to the Copenhagen interpretation.

Now we come to the parallel "worlds" idea of quantum physics. In one "world" it obtains the image record, W_1, and in the other "world" it obtains and records the image, W_2. In the parallel "worlds" interpretation the superposition of the automaton and the glial cell in the two worlds is also an observable which means that it is, itself, a possible memory record capable of being measured by yet another automaton or even by the automaton itself. This state is

$$E_1^{(0)} = W_1^{(0)} + W_2^{(0)} = [W_1]W_1 + [W_2]W_2 \qquad \text{(eq. 2).}$$

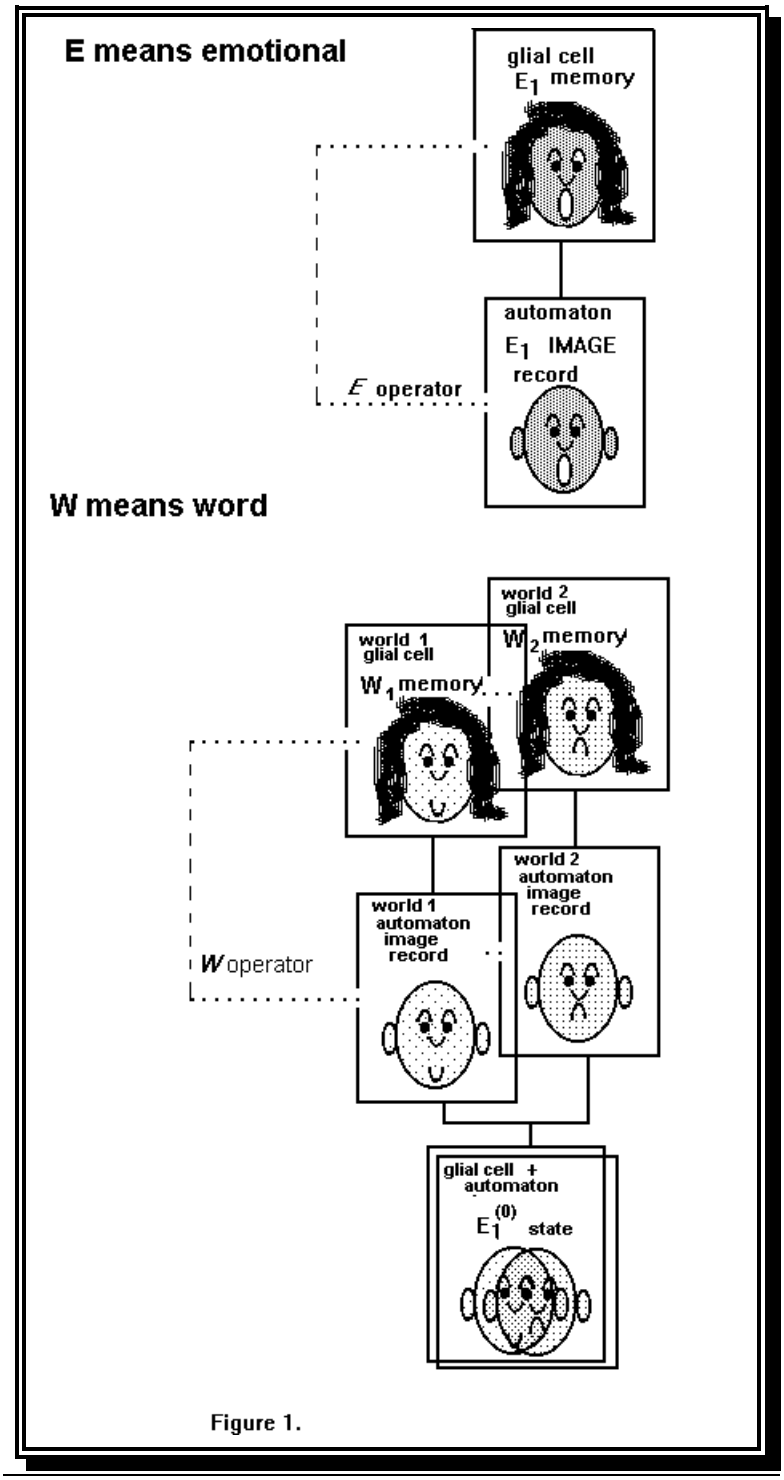
E means emotional
glial cell
E_1 memory
automaton
E_1 IMAGE
record
E operator
W means word
world 2
glial cell
W_2 memory
world 1
glial cell
W_1 memory
world 2
automaton
image
record
world 1
automaton
image
record
W operator
glial cell +
automaton
$E_1^{(0)}$ state

Figure 1.

[INSERT FIG. 1. CAPTION: **FIGURE 1. THE AUTOMATON INTERACTING IN TWO COMPLEMENTARY WAYS WITH A GLIAL CELL CONTAINING A MEMORY.** WHEN THE ***E*** OPERATOR IS USED, THE EMOTIONAL WOMAN IMAGE IS RECORDED BY THE AUTOMATON AS A SUPERPOSITION OF WOMAN IMAGES W_1 AND W_2. WHEN THE ***W*** OPERATOR IS USED, THE IMAGES, W_1 AND W_2 ARE OBTAINED SEPARATELY IN PARALLEL WORLDS. THE SUPERPOSITION OF THE GLIAL CELL AND AUTOMATON STATES COMPOSE THE STATE $E_1^{(0)}$.]

However note that $E_1^{(0)}$ and E_1 are not the same. $E_1^{(0)}$ refers to a state involving both the automaton and the glial cell, while E_1 refers to a state involving only the glial cell.

QUANTUM SELF-INTERROGATION

Now we come to a very interesting aspect of all this: what story would the automaton tell if asked about its memory. In one version of the story (world II), the automaton would yield a crying sister image and simultaneously the glial cell would yield the same image. In another version of the story (world I), the automaton would yield the image of an hysterical mother and the glial cell would likewise yield the same image.

How would such an interrogation occur? There are two ways: 1) Interrogation by a second automaton, and 2) self-interrogation. And in each interrogation there are two complementary questions that can be asked: a) What image exists separately in the glial cell and in your memory? This question is about the W_i states. Or: b) What image exists compositely? This question is about the emotional composite state, $E_1^{(0)}$.

Consider 1a). A second automaton is brought in to attempt to determine the woman image in the glial cell and then compare it with the record in the first automaton. It finds the image of the first automaton and the glial cell record match exactly. Or 1b) the second automaton can ask about the emotional state of the first automaton and the glial cell taken together. In that case it will know that there is an unhappy woman image present, but it will not know which image is present.

All the second system "knows" is that the first automaton and the glial cell have related and as a result they together are in the state, $E_1^{(0)}$, and it, the second automaton simply "knows" that but not which woman image is present. If it attempts to determine the woman image it loses its knowledge of the emotional state. The image and the emotional states are complementary observables for the second automaton.

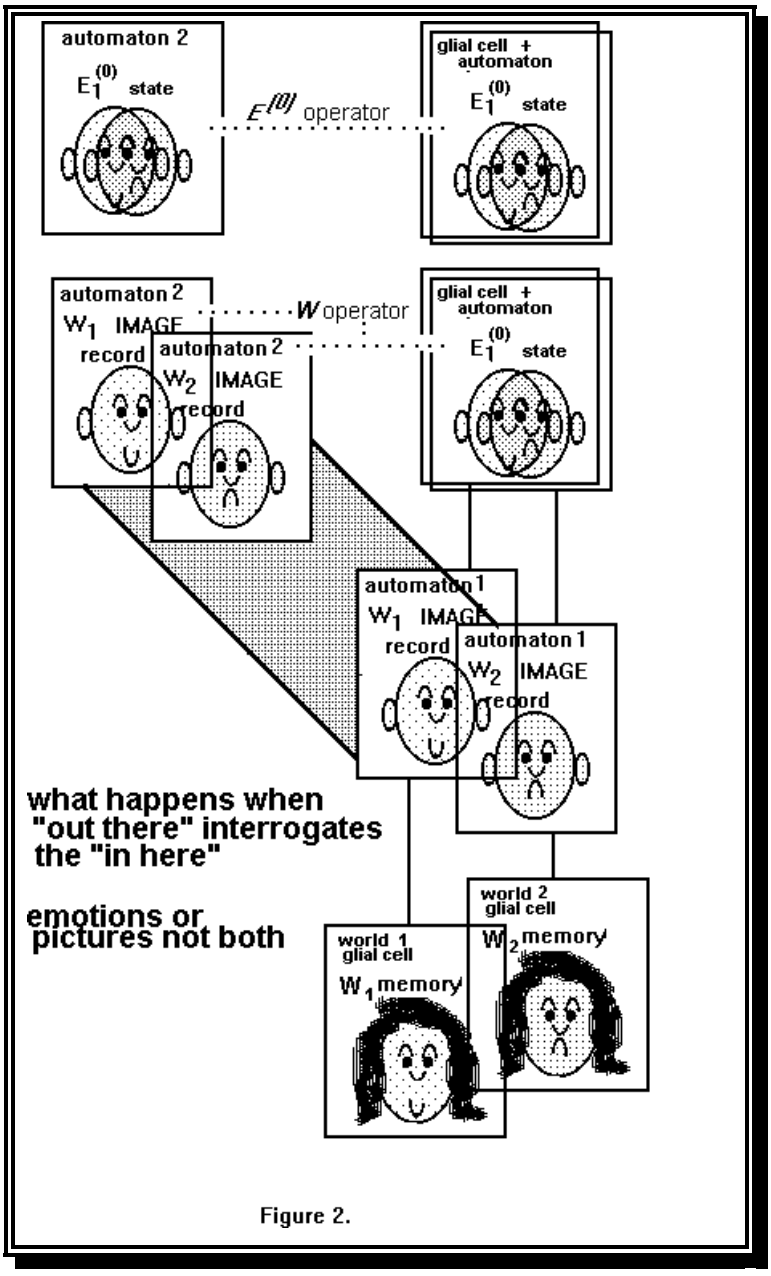

Figure 2.

[INSERT FIG. 2 . CAPTION: FIGURE 2. **INTERROGATION BY A SECOND AUTOMATON.** WHEN AUTOMATON 2 INTERROGATES THE SYSTEM COMPOSED OF THE FIRST AUTOMATON AND GLIAL CELL, IT CAN DO SO IN TWO COMPLEMENTARY WAYS. IF IT INQUIRES ABOUT THE EMOTIONAL STATE, $E_1^{(0)}$, USING THE OPERATOR, $\boldsymbol{E^{(0)}}$, IT OBTAINS AN EXACT DUPLICATE OF THE EMOTIONAL STATE. IF IT INQUIRES ABOUT THE WOMAN IMAGE STATE, W_I , USING THE OPERATOR, $\boldsymbol{W}$, IT, TOO, IS SPLIT INTO TWO PARALLEL WORLDS, OBTAINING IN EACH WORLD A SINGLE WOMAN IMAGE, W_I , IN AGREEMENT WITH THE FIRST AUTOMATON AND GLIAL CELL. WE NOTE THAT THE TWO AUTOMATA MUST INTERACT, AND IN DOING SO, THE SECOND AUTOMATON MUST "BREAK IN" TO THE MEMORY OF THE FIRST AUTOMATON, THUS DISTURBING ITS MEMORY CONTENT, CONSISTENT WITH THE UNCERTAINTY PRINCIPLE.]

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If a billion automata come along and do the same thing as the second automaton does, then they too will either enter into each of the two parallel worlds and find that a single image of woman is present or they may simply agree with the second automaton that the system of the first automaton and glial cell are in an unhappy woman emotional state.

But now we are going to ask the first automaton to do what we asked of the second in 1b) above. That is, to record and remember something that, it turns out, could not be done by an outside automaton. This record is the interior "emotional" state superposition of itself and the glial cell in **both worlds taken together**.

In other words we are going to ask the automaton to record the state,

$E_1^{(0)} = [W_1]W_1 + [W_2]W_2$, and put that in its memory. When it does that, it makes its first self-observation and jumps one level upward, from "0" to "1". Then the composite state of the automaton/glial cell becomes,

$$E_1^{(1)} = [E_1^{(0)}]E_1^{(0)} = [E_1^{(0)},W_1]W_1 + [E_1^{(0)},W_2]W_2 \quad \text{(eq. 3).}$$

Here the "(1)" signifies that the automaton has made its first level self-inquiry. The state, $E_1^{(1)}$, is quite interesting when we take into account what it means. In each world the automaton "knows" both the woman image it has observed in the glial cell, and in fact has created by its observation, W_i, and simultaneously it "knows" the emotional state, $E_1^{(0)}$, consisting of itself holding both composite images taken together, one in each world. It has in effect in each world knowledge of its own existence in another world symbolized by having both images inside of one bracket, $[E_i^{(0)},W_i]$. Possession of simultaneous knowledge of the emotional state of its composite "self" and the image state of the glial cell is a jump in levels from "0" to "1". This is the first level of self-reflection.

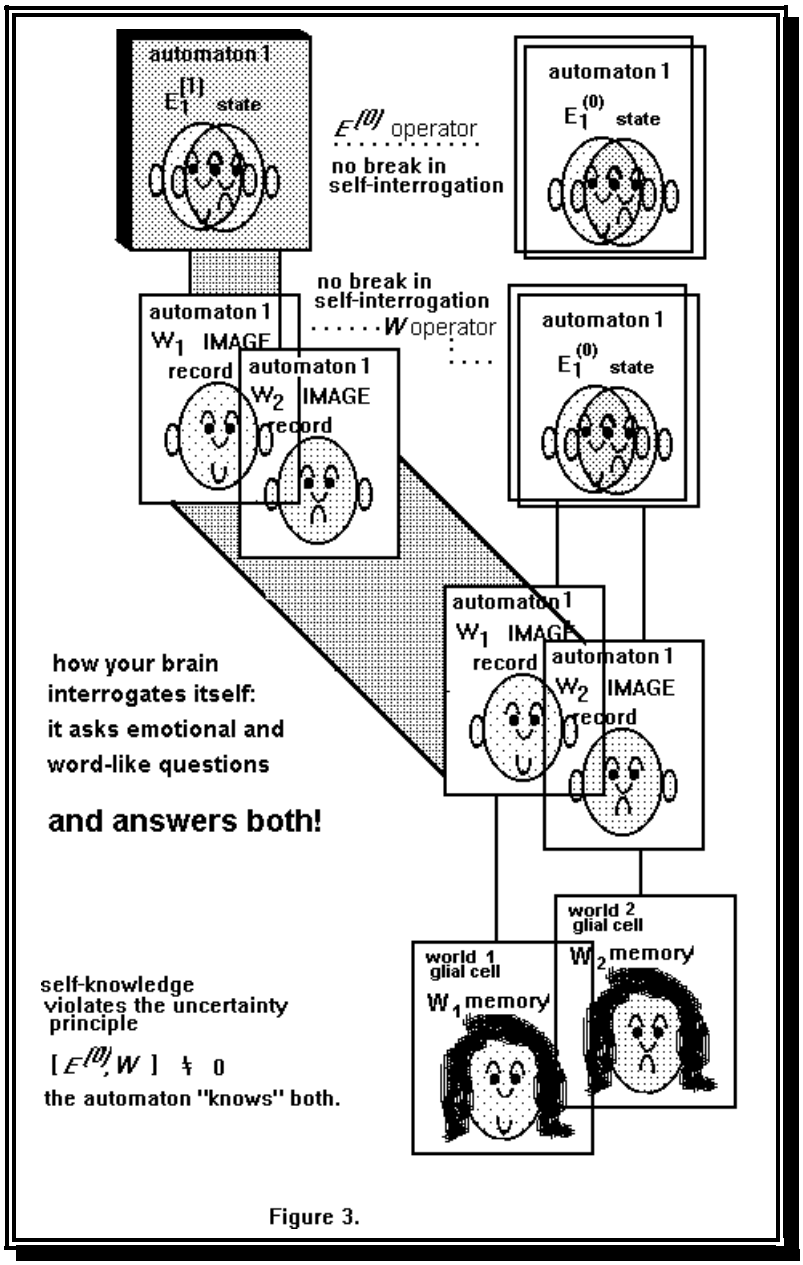
automaton 1
$E_1^{(1)}$ state
$E^{(0)}$ operator
no break in self-interrogation
automaton 1
$E_1^{(0)}$ state
no break in self-interrogation
W operator
automaton 1
W_1 IMAGE record
automaton 1
W_2 IMAGE record
automaton 1
$E_1^{(0)}$ state
automaton 1
W_1 IMAGE record
automaton 1
W_2 IMAGE record
how your brain interrogates itself:
it asks emotional and word-like questions
and answers both!
world 2 glial cell
W_2 memory
world 1 glial cell
W_1 memory
self-knowledge violates the uncertainty principle
$[E^{(0)}, W] \neq 0$
the automaton "knows" both.

Figure 3.

[INSERT FIG. 3. CAPTION: **SELF INTERROGATION BY THE AUTOMATON YIELDS SECRET KNOWLEDGE.** WHEN THE AUTOMATON INTERROGATES ITSELF, IT CAN ALSO DO SO IN TWO COMPLEMENTARY WAYS. IF IT INQUIRES ABOUT THE EMOTIONAL STATE, $E_1^{(0)}$, USING THE OPERATOR, $\boldsymbol{E^{(0)}}$, IT OBTAINS KNOWLEDGE OF THAT STATE, HOWEVER, IN DOING SO, IT IS ALSO OBTAINING KNOWLEDGE OF **ITSELF** AS WELL AS THE GLIAL CELL. IF IT INQUIRES ABOUT THE WOMAN IMAGE STATE, W_I, USING THE OPERATOR, $\boldsymbol{W}$, IT, ALREADY SPLIT INTO TWO PARALLEL WORLDS, OBTAINS IN EACH WORLD A SINGLE WOMAN IMAGE, W_I, ALREADY IN ITS MEMORY. IN DOING SO, THE AUTOMATON NEED NOT "BREAK IN" TO ITS OWN MEMORY. THUS, EVEN THOUGH $\boldsymbol{E^{(0)}}$ AND $\boldsymbol{W}$ DO NOT COMMUTE, THE AUTOMATON KNOWS BOTH $E_1^{(0)}$ AND W_1 IN WORLD 1 AND BOTH $E_1^{(0)}$ AND W_2 IN WORLD 2. THIS DOES NOT VIOLATE THE UNCERTAINTY PRINCIPLE BECAUSE THE INFORMATION IS NOT COMMUNICATED TO THE ENVIRONMENT. IT IS PRIVATE, NON-OBJECTIVE OR SUBJECTIVE INFORMATION.]

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The appearance of this state, $E_1^{(1)}$, marks the boundary between self and non-self. It is the first act of self-reflection and when it takes place, as I pointed out, the automaton jumps levels. Next I speculate on how that jump in levels would be experienced.

Before the level jump, the emotional state, E_1, a glial cell memory, was recorded, but not experienced. These recorded but not experienced emotional states, E_i, constitute a basis for the **unconscious mind**. When the automaton obtains the woman images, W_i, the eigenstate $E_1^{(0)}$ is created, but not recorded. Instead, in each world a woman image, W_i, is recorded.

After the level jump, the emotional state, $E_1^{(0)}$ is recorded and experienced as $E_1^{(1)}$ resulting in a **self-reflected feeling**. When the automaton looks at its own memory, the unhappiness is now "felt" by the automaton. Furthermore the automaton "knows that it knows" and "knows" at the same time.

Now $E_1^{(1)}$ is a self-reflective state where the superscript "(1)" refers to the fact that it is a **single** self-reflection. Undoubtedly there is an aura of uncertainty surrounding this state since it is a memory of something real and "unreal" at the same time as far as the automaton is concerned in each world. The other world for it reflects upon its world and in doing so provides a recognition of itself via this reflection.

ASKING AND KNOWING

Suppose a second automaton attempted to obtain the total information found in automaton one. Could it do so without altering the records of the first automaton? The answer is "no." The attempt of the second automaton to obtain records of the woman image would put it into both parallel worlds where the separate woman images were held (See Fig. 2). The attempt to determine the emotional state of the first automaton and glial cell could also alter the memory of the first automaton's record.

This is a very interesting aspect concerning asking and knowing. Before the second automaton is involved, the first automaton, as a result of interacting with the glial cell and then itself, contains memories of both its emotional state, $E_1^{(0)}$, and an identity state, W_i, in each world. The state of the system is unchanging so long as no one outside makes any inquiries. In the asking comes the inevitable disturbance regardless of who asks, if that information is passed outside of the first automaton. The second automaton may alter the system in inquiring and, even if the first automaton asks of itself, "What's going on?", the system also may be altered. Thus the mere asking of a question can change the memory[12].

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[12] We might inquire how an automaton would interrogate itself. In each world it contains knowledge of two non-commuting observables. These combinations of data are thus known and stored as memories, simultaneously. Presumably as long as the self-interrogation process did not involve communication of that knowledge to the outside world, it could interrogate itself *ad infinitum* without altering its memory in either world. However if it attempts, in the process of interrogation, to communicate what it knows to the environment outside of itself, or if the self-interrogation necessarily involves such communication, then it would invariably alter its own memory in each world.

The ability of an automaton to know information depends on the identity of the automaton. The self-knowledge state, consisting of information taken from two worlds, peculiar to quantum automata, does not exist in classical memory elements. I suggest that at this remarkably simple level, we are seeing the arising of a delicate and primary self-concept. It comes about via secret knowledge, awareness of something that actually exists in parallel worlds simultaneously known only to the automaton in both worlds.

Now suppose we consider the other "woman" images. Just as the unhappy woman image E_1 was a superposition of hysterical mother, W_1, and crying sister, W_2, there is also an emotional state "happy woman", E_2, consisting of images W_3 and W_4 taken together. The self-joy emotional state would be written,

$$E_2^{(0)} = [W_3]W_3 + [W_4]W_4 \quad \text{(eq. 4)},$$

where the subscript "2" refers to the second emotional state.

After self-observation of the joyful emotional state, the state becomes,

$$E_2^{(1)} = [E_2^{(0)}] = [E_2^{(0)},W_3]W_3 + [E_2^{(0)},W_4]W_4 \quad \text{(eq. 5)},$$

again the subscript "2" refers to the second emotional state.

And there is also the "thought-form" image, F_1, consisting of

$$F_1 = W_1 + W_2 + W_3 + W_4 = E_1 + E_2 \quad \text{(eq. 6)}.$$

Thus in a similar manner there are thought-form memory states of the combined automaton and glial cell that can be created in the same way that the unhappy emotional state was created.

By superposing the self-reflecting emotional states, $E_1^{(1)}$, and $E_2^{(1)}$, we create a new thought-form state,

$$F_1^{(1)} = E_1^{(1)} + E_2^{(1)} \quad \text{(eq. 7)}.$$

If the automaton attempts to self-reflect on this state as well, we have a second self-reflection occurring creating a jump in levels and the new self-reflection state,

$F_1^{(2)} = [F_1^{(1)}]F_1^{(1)}$ (eq. 8).

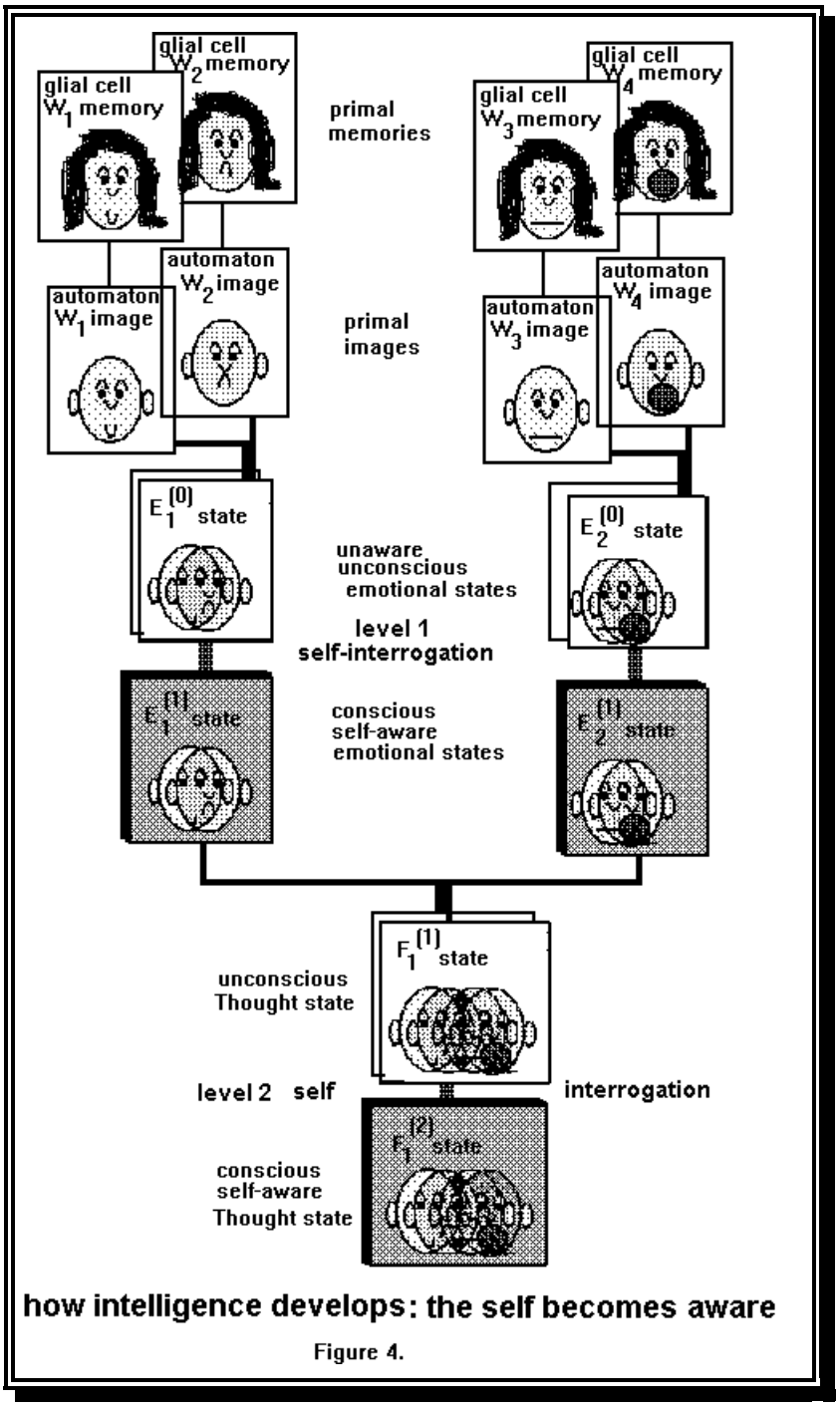

Figure 4.

[INSERT FIG. 4 CAPTION: **THE FORMATION OF THE HIERARCHY OF SELF-IDENTIFICATION.** BY COMBINING FOUR PRIMAL IMAGE STATES, W_I, INTO TWO EMOTIONAL STATES, E_I, AND COMBINING THOSE INTO A SINGLE THOUGHT-FORM STATE, F_I, A MIND AND ITS IDENTITY AS AN OBJECT OR PERSON IS CONSTRUCTED. AT EACH LEVEL OF THE HIERARCHY, AN OPPORTUNITY IS PRESENTED FOR SELF-REFLECTION. EACH SELF-REFLECTION RESULTS IN AN EXPERIENCE OF THE STATE JUST ABOVE IT. THUS UNCONSCIOUS EMOTIONAL STATES ARE FELT, MADE CONSCIOUS, WHEN THE AUTOMATON SELF-INTERROGATES AT THE LOWEST "(0)" LEVEL OF IMAGING RESULTING IN THE "(1)" LEVEL OF FEELING. FELT EMOTIONAL STATES, LEVEL (1) INQUIRIES, ARE SUPERPOSED TO LEVEL (1) THOUGHT-FORMS WHICH REMAIN UNCONSCIOUS AS THOUGHTS UNTIL A SELF-INQUIRY IS PERFORMED AT LEVEL (1) RESULTING IN EXPERIENCED, CONSCIOUS, THOUGHT-FORMS AT LEVEL (2).]

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Thus following this procedure, we have an ascending[13] ladder of levels and associated self-reflecting states. A level remains unconscious until self-interrogation occurs. The self-interrogation takes place at every level resulting in unconscious superpositions of images becoming conscious. At the (0) level all images are objective, unconscious, and are found in the glial cells only. These images consist of the woman identity states: W_i, woman emotional states: E_i, thought-form states F_i, archetype states, G_i, and even the super-archetype state, S_1.

At the first self-reflection level we have conscious self-reflected emotional states, $E_i(1)$, and unconscious emotional states, $E_i(0)$, composed of superpositions of primal images. Thus we begin to see a general picture of the structure of the relationship of conscious content to unconscious content of the mind arising at each level.

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[13] Note that the "zero" level is shown in the figures as the highest on the page. Hence moving lower in the drawing is actually moving higher in the hierarchy. I apologize for this unnecessary confusion.

At the second self-reflection level we have the **unconscious** thought-form self-reflective state: $F_i^{(1)}$ composed of the **unconscious** superposition of the **conscious** self-reflections of the first emotional state and the **conscious** self-reflection of the second emotional state. Here we see a principle that may be indicative of the Freudian model of repression: emotional material resulting in conscious emotions or feelings produce, through the superposition principle, unconscious thought-forms. Self-reflection on this level results in the unconscious thought form, $F_i^{(1)}$, becoming conscious, $F_i^{(2)}$. A superposition of the **conscious** second-level self-reflection thought-form states, $F_1^{(2)}$ and $F_2^{(2)}$, results in an **unconscious** second level archetypal state,

$$G_1^{(2)} = F_1^{(2)} + F_2^{(2)} \quad \text{(eq. 9)},$$

from which a jump to the third conscious archetypal level,

$$G_1^{(3)} = [G_1^{(2)}]G_1^{(2)} \quad \text{(eq. 10)},$$

is possible.

Again following the same procedure, a superposition of **conscious** self-reflective archetypes at level (3), $G_1^{(3)} + G_2^{(3)}$, yields an **unconscious** super-archetypal image,

$$S_1^{(3)} = G_1^{(3)} + G_2^{(3)} \quad \text{(eq. 11)}.$$

Self-reflection of the super-archetypal image leads to a jump to the conscious fourth level,

$$S_1^{(4)} = [S_1^{(3)}]S_1^{(3)} \quad \text{(eq. 12)},$$

and so on.

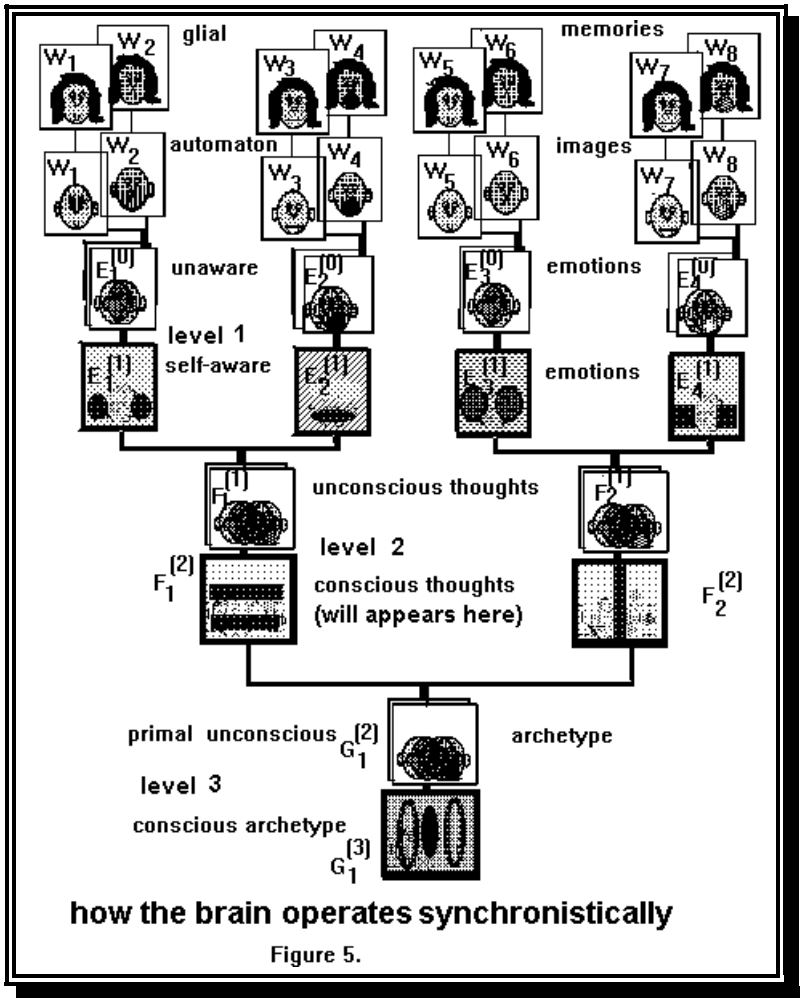

Figure 5.

[INSERT FIG. 5. CAPTION. FIGURE 5. **HOW CONSCIOUSNESS AND UNCONSCIOUSNESS EXISTS AT ALL LEVELS OF THE HIERARCHY.** HERE WE SEE A MORE COMPLEX HIERARCHY BUILT UP FROM EIGHT PRIMAL IMAGES RESULTING IN FOUR EMOTIONAL STATES EACH CONSCIOUS AND CONSCIOUS, TWO THOUGHT-FORMS STATES, BOTH CONSCIOUS AND UNCONSCIOUS, AND A SINGLE ARCHETYPE STATE, THAT BECOMES CONSCIOUS ONLY WHEN A SELF-INQUIRY OCCURS AT THAT LEVEL.]

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THE ARISING OF IMAGES IN DREAMS

As put forward by Rossi, the major stages of the processing of self-reflection[14] take place during dreams. Although my descriptions of five stages of self-reflection differs somewhat from Rossi's, the intent is to show that some overlap clearly exists. At this stage no attempt has been made to make more than a gross comparision. During an ordinary dream, processing would be taking place at the lowest levels of image production wherein no sense of self is present, i.e., the dreamer is unconscious of having a dream. This would correspond to the formations of non-self-reflecting states, level (0), where the dreamer is not aware of being present in the dream and the dream is experienced unconsciously with little sense of identification of self and other. The images would be seen, but not self-reflectedly experienced since no self has been defined. This would constitute unconscious data processing. I say unconscious, meaning un-self-reflecting. The images would be there but they would have no meaning.

At level (1) the dreamer becomes involved in the dream. Moments of conscious and unconscious dream experience would result. This would correspond to jumps between level (0) and level (1) and the formation of images mostly in the lowest level. When level (1) was reached, emotions would be felt during the dream, but as soon as the dreamer ascended levels, only images would be present. By jumping between levels (1) and (0) various emotions could be aroused and sensed consciously during the dream. Meaning arises when the self appears. Such events would appear as enlightened or intense awareness. When level one is achieved the dreamer not only sees the images, she or he also possesses feelings about them that can be associated within space and time boundaries. These are perhaps primarily body images and would be emotionally felt. Perhaps this is a clue to illness arising from emotional causes probably inititated during early childhood.

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[14] Rossi, Ernest. *Dreams and the Growth of Personality*. *New York: Brunner/Mazel, 1972, 1985.* Also see: Moffitt, Alan. "The Creation of Self: Self-Reflectedness in Dreaming and Waking," *Psychological Perspectives,* Issue 30, 1994, pp. 42-69.

At level (2) the dreamer is able to have thoughts during the dream. Here thought-forms arise and jumps between levels (0), (1), and (2) occur, resulting in a range of states of conscious and unconscious thinking, feeling, and observing. Thought adds much greater meaning to the emotions and the observations. Just as images come from sensory inputs, thoughts and feelings are capable of outputting in terms of expression of words and feelings. Unconscious thought forms integrate or superimpose conscious emotions and thus tend to have no emotional content per se. However, as thoughts are expressed in words, i.e., self-reflection occurs, emotions can and often do arise, sometimes unexpectedly. This would be due to a jumping from level (2) to level (1) as a result of inquiry. Most likely the jump downward in the hierarchy involves a disruption of the higher (lower on the drawing in Fig. 5) level functioning. Thus, during the wake state, when words move us to emotional action we are descending to a "lower" (higher on the Figure) level of self-awareness.

At level (3) the dreamer is able to simultaneously be aware of the previous levels of participation and observation during the dream. Here the sense of self more fully emerges as the dreamer deals with archetypal images. Again there is full access to the lower levels.

At level (4) the dreamer consciously reflects on the fact that she/he is dreaming. This would be the super-archetype state corresponding to lucid awareness during the dream.

At each level the automaton is able to record images from lower (higher on the Figure) levels or images of the highest (lowest on the Figure) level it is capable. The balance is quite delicate as I see it and the tendency would be to descend levels (move upward in the Figure) more readily than to ascend them (move downward in the Figure). My intuition suggests that these levels are somewhat akin to energy levels of atomic systems, and concepts involving entropy may be applicable. Descent results in less self-awareness (greater entropy) and therefore a requirement for more automaton-mechanical behavior. Ascent results in greater choices, to become aware of existence in other

"worlds", and more complex imagery with a higher number of paradoxical features simultaneously knowable.

Remember any attempt to observe these images coming from different levels in another automaton destroys the images. It is only through the passive awareness within oneself that simultaneous knowledge of all of the images is possible. Also remember that any attempt in asking about one's state of awareness and communicating this to the outside world in this model alters the state in correspondence with the uncertainty principle[12]. This could have profound effect on dream research where the researcher attempts to communicate with the dreamer while a dream is in progress.

Of course there would be more levels requiring the formation of more complex images, and as I would imagine, greater mind-ability. This would be reflected in neurophysiological data corroborating the observations of lucid dream researchers.

At the highest level, possibly reachable by training as LaBerge suggests[15], or through meditation techniques as Transcendental Meditation practitioners indicate, we reach a state of "pure" awareness with surprisingly no images present. This may come about through some form of focusing on the highest level image. What this image could be, I can only guess. We could call it God awakening from the dream.

ACKNOWLEDGMENT

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[15] LaBerge, Stephen, Ph.D. *Lucid Dreaming: The Power of Being Awake & Aware in Your Dreams*. Los Angeles, California: J. P. Tarcher, 1985.