



# Meru Foundation eTORUS Newsletter

Number 44 – March 2009

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## From The Editor



### ***The Alphabet that Changed the World: Progress Report***

The content of our book manuscript for North Atlantic/Random House is now essentially complete: we have a beginning, a middle, and an end, and all the topics this book will cover have been written. Now, we are in process of editing our manuscript for structure and consistency – the time-consuming "nuts and bolts" part of creating a book. Our goal is to have *The Alphabet that Changed the World* on the shelves by the end of 2009.

### **Meru and the Economy**

As is widely the case, Meru's contributions have been impacted by the current markets. To continue publishing and furthering our research, Meru needs to reach new people who have the means to offer substantial support. But we also depend on our growing general readership – those of you who can help by purchasing our DVD's and books, and by spreading the word about this research.

**Meru President and media director Bill Haber's video clips from Meru's video library on YouTube:**

<http://pop.youtube.com/filmguy2121>

We continue to see good results from Meru's videos on YouTube; many of you are receiving eTORUS for the first time as a result of ordering our books or DVD's. For those of you new to Meru's newsletter, we have an archive of past issues located at <http://www.meru.org/Newsletter/journalindex.html>.

Here are some things you can do for Meru Foundation, even in these difficult times:

1) If you're a past supporter who hasn't contributed recently – please take another look, and if you feel our work is something you want to succeed, help us by making a contribution or a monthly pledge. You can make a contribution through our secure-server website, [www.meetingtent.com](http://www.meetingtent.com), or through PayPal via the "donate" or "monthly" buttons on the upper-right hand corner of our home page at [www.meru.org](http://www.meru.org).

If you would like to speak with us personally about this work, or about making a more substantial contribution, we'd be pleased to talk with you – contact Levanah Tenen at 781-784-3462 (Boston area), or Meru President Bill Haber at (925) 787-2434 (California).

2) Whether or not you can make a contribution now, please join the effort to increase awareness about this research. If you have your own e-list or blog, if you are connected with a publicity agency or radio station, if you have skills in "Web 2.0" marketing – then you have what Meru Foundation needs to keep this work alive. Please continue forwarding our YouTube video clips, and if you can arrange for additional advertising or radio interviews, please get in touch with us.

3) If you know someone you feel might have a serious interest in our research – either as a colleague or as a funder – please direct them to Meru Foundation's introductory packet, at <http://www.merueline.info/common/MeruIntroPacket.a.20oct08.pdf>. Please encourage your contacts to follow up with us for more information, and to respond to their particular questions and concerns. And please feel free to call or email us personally, if you have a friend in mind and would like to discuss a coordinated approach.

I want to thank all of you for your interest in our work – and for your help.

—Levanah Tenen, ed.

**Continue to Page 2 for Stan Tenen's essay:**

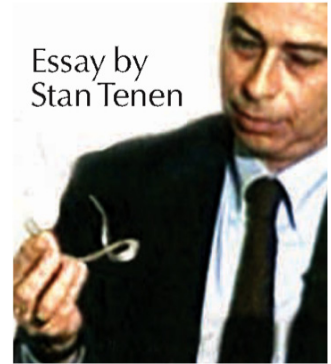
***Fish do it – Birds do it – Bees do it: On Flocking, Swarming, and Schooling***



# Fish do it – Birds do it – Bees do it

## On Flocking, Swarming, and Schooling

In [The Shape of Information](#) (*Noetic Journal*, Vol. 3 #2, April 2002) I present the idea that intrinsic to every choice is a unit of what I call “the shape of information”. This “shape of information” represents the negentropic (information-providing) gradient between Singularity and Wholeness. For the plants, this is the information in the difference between the photons that come from the sun, and the photons the earth radiates back to the sky (as Roger Penrose points out in *The Emperor’s New Mind* and *The Road to Reality*).



This illustration by Oscar Senn was inspired by Fig. 27.9 (p. 705) in Roger Penrose's *The Road to Reality: A Complete Guide to the Universe*, where Penrose discusses what we are calling the negentropic gradient in much greater technical detail.

From Penrose's description [*notes added in italics*]:

"The Earth gives back the same amount of energy that it receives from the Sun, but what it receives from the Sun is in a much lower entropy form, owing to the fact that the Sun's yellow light [*the tight-wound waves/rays at upper right*] has higher frequency than the infrared [*long orange waves/rays at upper left*] that the Earth returns. . . . Plants make use of this low entropy energy in photosynthesis, thereby reducing their own entropy, and we take advantage of the plants to reduce ours, by eating them, or eating something that eats them, and by breathing the oxygen that the plants release. This ultimately comes from the temperature imbalance in the sky that resulted from the gravitational clumping that produced the sun."<sup>2</sup>

In *Shaar Hayichud Vehoemunah*, R. Shneur Zalman of Liadi, quoting Psalm 84:11, tells us that “Hashem-Elokim (Lord-God) is [like] a sun and a shield.” I express this contrast between Singularity and Wholeness, and the gradient line between them, in [Man Bites Dog](#) (published in *B'Or HaTorah* #14E) and in the *Integrity* poster, below. The gradient is along the line *Qav* that emerges from the constriction within the *Ain Sof* that initiates creation.



A  
POINT  
OR BIT, BEING  
SO SMALL, MARKS  
INFINITE CONTRAST WITH THE ALL.

My point in *The Shape of Information* is that the geometry of the *First Hand* model is a physical invariant, a kind of universal constant that should show up everywhere where information shows up. The search for invariants is of central importance in physics. In a simple sense, mathematical constants like  $\pi$  and  $e$  are also invariants.

In [Meru Foundation eTORUS #34 \(9 May 2006\)](#), I presented the poster-essay [Deborah the Bee-Speaker](#). The word for “bee” and the word for “word” in Hebrew are the same word, and as it turns out, the “waggle dance” that bees use to communicate the location of food (with respect to the sun) is a simple version of the torus knot of “continuous creation” from Genesis that generates the *First Hand* pointer. In other words, the bees’ communication system is a natural embodiment of the “shape of information”.

Seeley, Visscher, Passino, Group Decision Making in Honey Bee Swarms  
American Scientist, June 2006, Vol. 94, No.3, pp.220ff, Figure 3

**In the field**  
Sun  
reference direction  
Nest  
Flight path  
Food patch  
115°

**On the comb**  
Waggle dance  
Upwards  
reference direction  
Orientation during wagging & sound  
115°

MERU Models  
Flower  
Tree  
Pasture  
דבר

FIRST HAND

NOTE:  
For us, the "Sun" is the Source of Light-Consciousness in our mind.

Continuous Creation

AN IDEALIZED FRUIT

Visscher, U.C.Riverside Honey Bee Laboratory: <http://bees.ucr.edu>.  
From: Visscher, P.K. 2003 Dance Language, pp.284-288, V.H.Resh, R.T.Carde, eds.  
Encyclopedia of Insects, Academic Press. <http://bees.ucr.edu/images/dancediagram.gif>

Excerpted from the poster-essay, [Deborah the Bee-Speaker](#), on Meru Foundation's website at <http://www.meru.org/Newsletter/BEE1.C.FLAT.28apr06.pdf>



Another invariant (in a sense) that we have discussed is the toroidal topology of first cause. If we start with a uniform isotropic homogenous medium, more or less an empty space filled with nothing but “cosmic jello” (pure relationship, which itself consists of no thing), and we try to make a distinction that will last, we find that the only way to do this is to introduce a small disturbance (which, compared to the previous no thing, is an infinite change). This disturbance is a movement or a flow in a particular direction which causes the rest of the space to fall through itself in the form of a torus (a doughnut). Toroidal flow identifies the first distinction in “cosmic jello”. This is often demonstrated in undergraduate physics labs by the use of a bellows which projects a smoke ring across the room.



This *Zeroblaster* toy, which produces smoke rings, is based on a piston-type bellows. Photo is courtesy Zerotoys, Inc. For a video of this device in action, see [www.zerotoys.com/newsite/ZEROZZYA.wmv](http://www.zerotoys.com/newsite/ZEROZZYA.wmv) .

The smoke ring shows how the air is moving, with the air – which is highly insubstantial – being an approximation of the space of no thing. This smoke ring, in traveling across the room, establishes a linear direction of movement.

This no thing-to-smoke-ring-to-linear motion recapitulates the “shape of information,” in that these are the elements that make up the circle and line that forms the *First Hand* model, and in that the 3,10 torus knot which the *First Hand* model is taken from has the form of a smoke ring.

The Nov. 26, 2006 issue of *Science News* includes an article by Erica Klarreich, *The Mind of the Swarm: Math explains how group behavior is more than the sum of its parts*.<sup>1</sup>

p. 347:

Since ancient times, scientists and philosophers have pondered how animals coordinate their movements, often in the absence of any leader. Coordinated groups can range in scale from just a few individuals to billions, and they can consist of an intelligent species or one whose members have barely enough brainpower to recognize each other.

Despite these differences, similar patterns of motion appear again and again throughout the animal kingdom. This congruence in behavior has led researchers to speculate for about 70 years that a few simple rules might underpin many sophisticated group motions. However, establishing just what these rules are is no easy matter.

"Imagine a space alien looking at rush hour traffic on the L.A. freeway," says Julia Parrish of the University of Washington in Seattle, who studies fish schooling. "It thinks the cars are organisms and wonders how they're moving in a polarized way without collisions. The reason is that there's a set of rules everyone knows.



p. 348:

[. . .]The individual ants are following the same rules, points out Stephen Pratt, who studies collective animal behavior at Arizona State University in Tempe. "In the old days, the focus would have been on what has changed about the animal when it goes from one state to another," he says. "What's new is to move the question up a level and ask how changing a single environmental variable, like density, can cause these dramatic changes in group behavior."

Positive feedback and nonlinearity, which are ingredients in a wide range of animal interactions, enable animal groups to generate behaviors that are more than the sum of their parts, Sumpter says.

### GLOBAL SWARMING

Phase transitions, far from being limited to ant colonies, appear to be a ubiquitous feature of animal groups. In 2002, for instance, Couzin and his team showed that a few simple rules for fish interactions yielded phase transitions between swarming behaviors.

Basing their work on a particle-interaction model from physics, the researchers represented each fish as a single particle. They assumed three rules about how the particles interact: Each fish tries to avoid colliding with other fish, stays with the group, and aligns its swimming direction with that of nearby fish within some defined zone around itself.

Variations of these rules have been studied for decades, but only recently has computer power grown to the point where researchers can simulate the movements of, say, 10,000 fish.

The researchers also assumed that fish can modify their sensitivity to their neighbors, that is, the size of their alignment zones. The team found that as the individuals' alignment zones grow, the school's architecture undergoes two sharp transitions.

When the alignment zone around each fish is negligible in size, so that the fish barely pay attention to their neighbors' directions, each fish swims in a random direction within the group. At a certain critical size of the alignment zone, the fish suddenly start following each other to produce a doughnut-shaped swarm. As the alignment zone continues to grow, the fish start swimming in parallel, as in a migration.

"The model switches very dramatically and quickly between patterns," Couzin says.

p. 349:

[. . .]The positive feedback built into the alignment-zone model helps explain how an animal swarm achieves behavior that is more than the sum of its parts.

p. 349:

"For humans, to reach consensus is very complicated – it requires language and recognition capabilities," cousin says. "But animals can do it using very simple behavioral rules."

This simplicity has important implications. Couzin says, "It means natural selection is much more likely to find this kind of consensus behavior" than it would if consensus building required fancy cognitive skills.

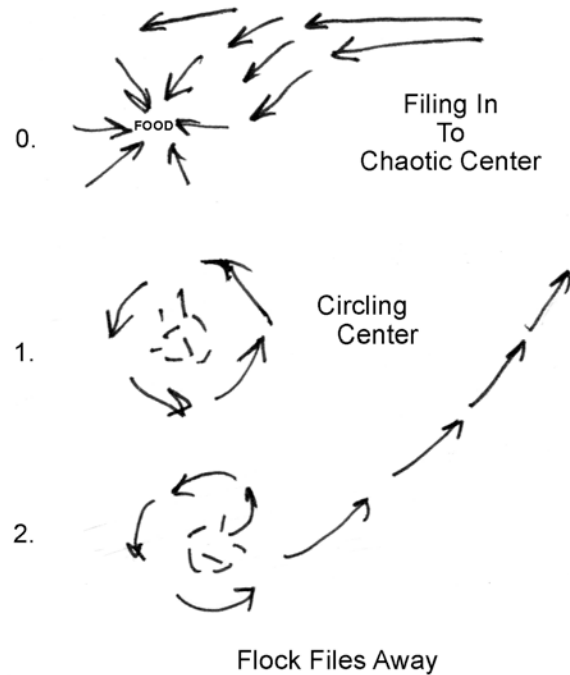
Notice the three phases and two transitions. As the alignment zones of the "fish" grow, the swarm changes from random motion (*Ain Sof*) to a doughnut-shaped swarm (smoke-ring) to swimming in parallel as in a migration (linear motion).



Alignment zones are not “things”. They express how the particles relate to each other. *Ain Sof*, the space of no thing, is the space of pure relationship: i.e., topology.

This is amazing. Fish, birds, and insects that swarm produce the three phases that generate the “shape of information”: the 0. *AinSof* / No Thing 1. Ring 2. Line. (For additional material on the circle-and-line, see [Squaring the Circle](#) on Meru Foundation's website.)

### TURKEYS IN THE YARD



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Observing a flock of wild turkeys exhibiting this three-phase "flocking behavior".

The dynamics of simple swarming creatures recapitulate the same negentropic gradient as Roger Penrose tells us holds for the plants, and R. Shneur Zalman of Liadi and the Psalms tell us holds for us.

Swarming and schooling behavior in small fish could easily have been investigated in the ancient world. All that is required is a pond of guppies, and a single guppy or two controlled by a stick or string from above (like a puppet). So, this natural dynamic of independent simple creatures could have been noted and investigated and made use of in other contexts by people in the ancient world. We already know that the invention that made the Bronze and Iron Ages possible was the bellows, and it is the bellows that produces smoke rings.

The dynamics of smoke particles in the air, or small point-like “fish” particles in the sea, is similar to what we would expect in a uniform isotropic homogenous space of no coherent or discernible thing (*Ain Sof*). If the space is no more than a sea of abstract points in relationship that have no mass, then smoke particles in air, or “fish particles” in water, can model it. This is closer to topology than to physics, because it is dealing with entities that are pure relationship, closer to nothing than to physical objects, that have no shape of their own. It enters physics at the lowest and most elegant level, because the physics involves the same topology, although no longer in an idealized space of no thing.

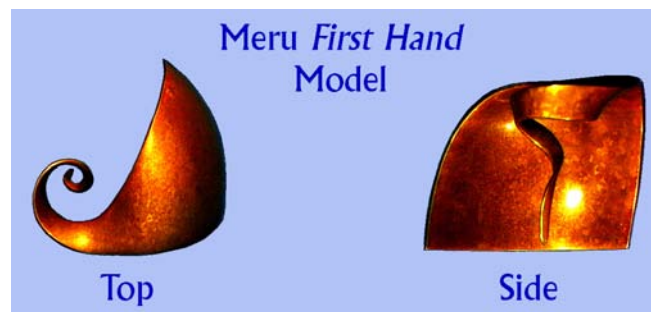


This three-part swarming behavior is a kind of ignition. There are two thresholds where there are phase changes, and they are brought about when the alignment zones are increased. What we have is a natural positive feedback, resonance, and coherent addition of whatever small initial signal there may be (as described in the research reported above). It seems reasonable to consider the possibility that something similar happens in our mind when ideas and feelings are ignited from small seeds. An epileptic fit may be an undesirable form of swarming run amok.

Of course, I'm speculating broadly here. But my point is that perhaps the bees and the birds and the fish are providing examples of how intelligence emerges from simple entities that appear to have very little of it to start with. There may be implications for artificial intelligence.

If consciousness is not in any one neuron, nor in the few neurons of the fish, then perhaps it is an emerging swarm, storm (smoke-ring), and cascade in the matrix of neural relationships.<sup>3</sup>

All, in the shape of information.



*The Shape of Information*  
Extending from Singularity to Wholeness  
(Thumbtip to Fingertips)

### References:

1) Excerpts from: *"The Mind of the Swarm: Math explains how group behavior is more than the sum of its parts"*, by Erica Klarreich. *Science News*, week of Nov. 25, 2006; Vol. 170, No. 22, pp. 347-349. This article is available online only to subscribers; however, biologist Iain Couzin has many of his fascinating papers on flocking, swarming, and schooling posted on his web page at <http://www.princeton.edu/~icouzin/>.

2) Roger Penrose, *The Road to Reality: A Complete Guide to the Universe*, ©2004 Roger Penrose. New York: Alfred A. Knopf, ISBN 0-679-45443-8. Excerpted from the caption to Fig. 27.9 in Ch. 27, *"The Big Bang and its thermodynamic legacy"*, p. 705.

3) Recent research indicates that consciousness is distributed throughout the entire brain. The following is from the 18 March 2009 issue of *New Scientist*:

ELECTRODES implanted in the brains of people with epilepsy might just have resolved a question about the mysterious process of consciousness.

Signals from the electrodes seem to show that consciousness arises from the coordinated activity of the entire brain. The signals also take us closer to finding an objective "consciousness signature" that could be used to probe the process in animals and people with brain damage without inserting electrodes.

The complete article, by Anil Ananthaswamy, is available at

<http://www.newscientist.com/article/mg20127004.300-whole-brain-is-in-the-grip-of-consciousness.html>





Thank you for reading this issue of the Meru Foundation eTORUS Newsletter.

To contact us,  
please email, write, or call:

Meru Foundation  
PO Box 503  
Sharon, MA 02067 USA  
+1-781--784-3462  
[meru1@well.com](mailto:meru1@well.com)  
[www.meru.org](http://www.meru.org)



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