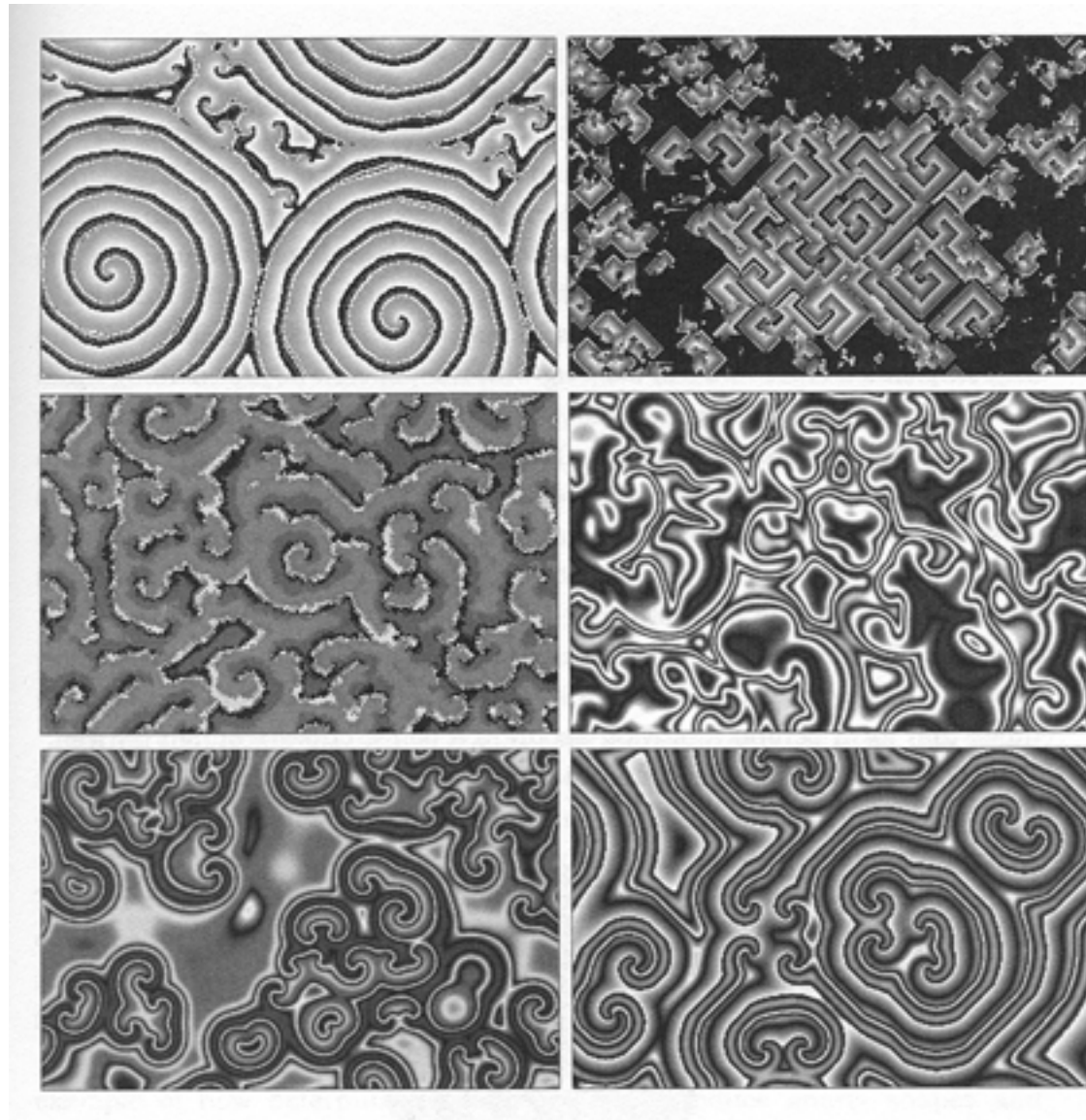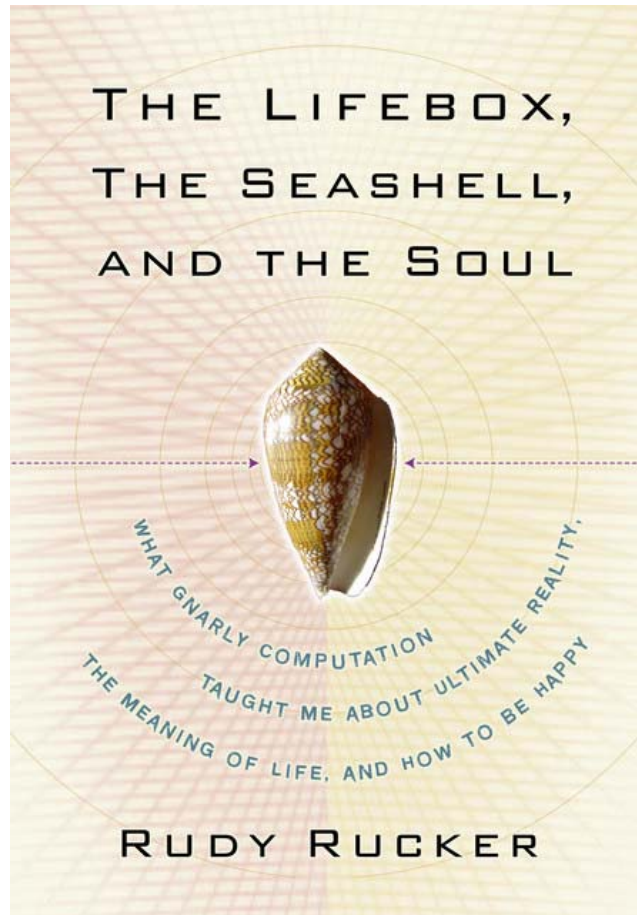# *Gnarly Computation*

## by *Rudy Rucker*

## Media Lab MIT

## Oct 31, 2005



www.rudyrucker.com

THE LIFEBOX,
THE SEASHELL,
AND THE SOUL

WHAT GNARLY COMPUTATION
TAUGHT ME ABOUT ULTIMATE REALITY,
THE MEANING OF LIFE, AND HOW TO BE HAPPY

RUDY RUCKER

*The Lifebox, the Seashell and the Soul*

**What Gnarly Computation
Taught Me About
Ultimate Reality,
The Meaning of Life, and
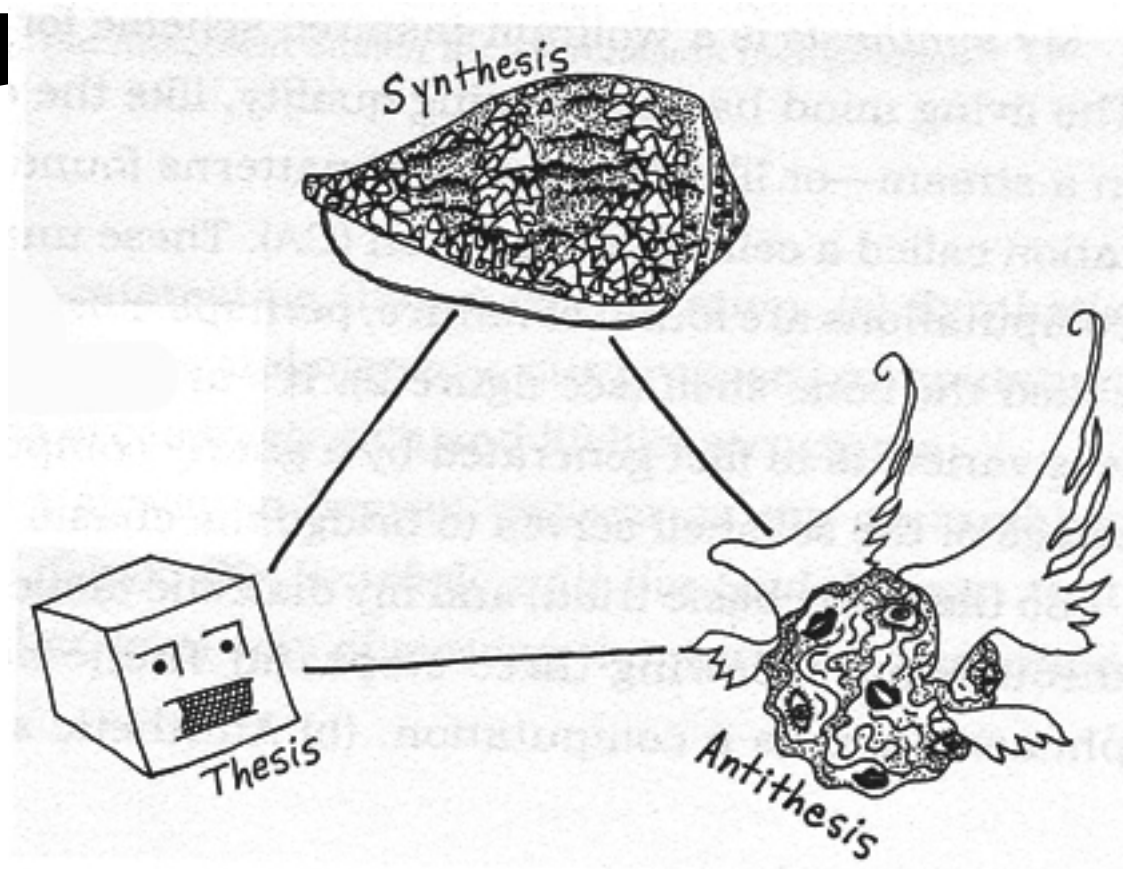How to be Happy**

**(Thunder's Mouth Press, 2005)**

# My Book Title is a Dialectic Triad

The *Thesis*, the *Synthesis*, and the *Antithesis*

~

The *Lifebox*, the *Seashell*, and the *Soul*

# Dialectic Triad

# THESIS: "Universal Automatism" The world is made of computations.

❑ A *computation* is a process that obeys finitely describable rules.

❑ The world consists of *many* computations at high and low levels.  There need not be  a single underlying master computation.

❑ The *human mind* is made of computations: percepts, emotions, intentions, plans, consciousness as a self-symbol in a feedback loop.

# *Ordo Sciendi*, or,
# The Stairway to Heaven
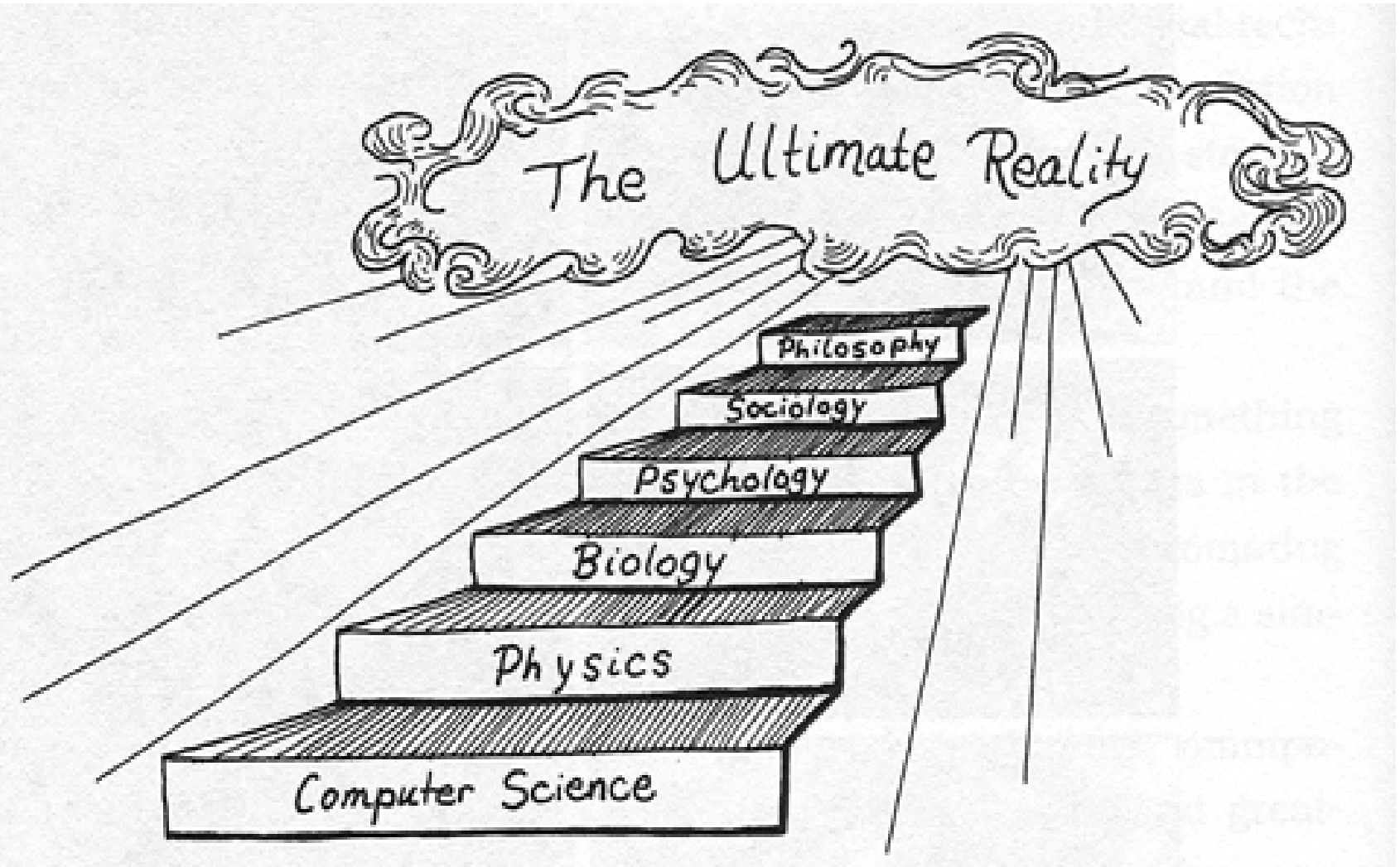
# ANTITHESIS: Life Doesn't *Feel* Like a Computation

- The feeling of being alive.  "I am."
- Consciousness as merging with the world.
- Dreams.
- Visions of God.
- The soul.
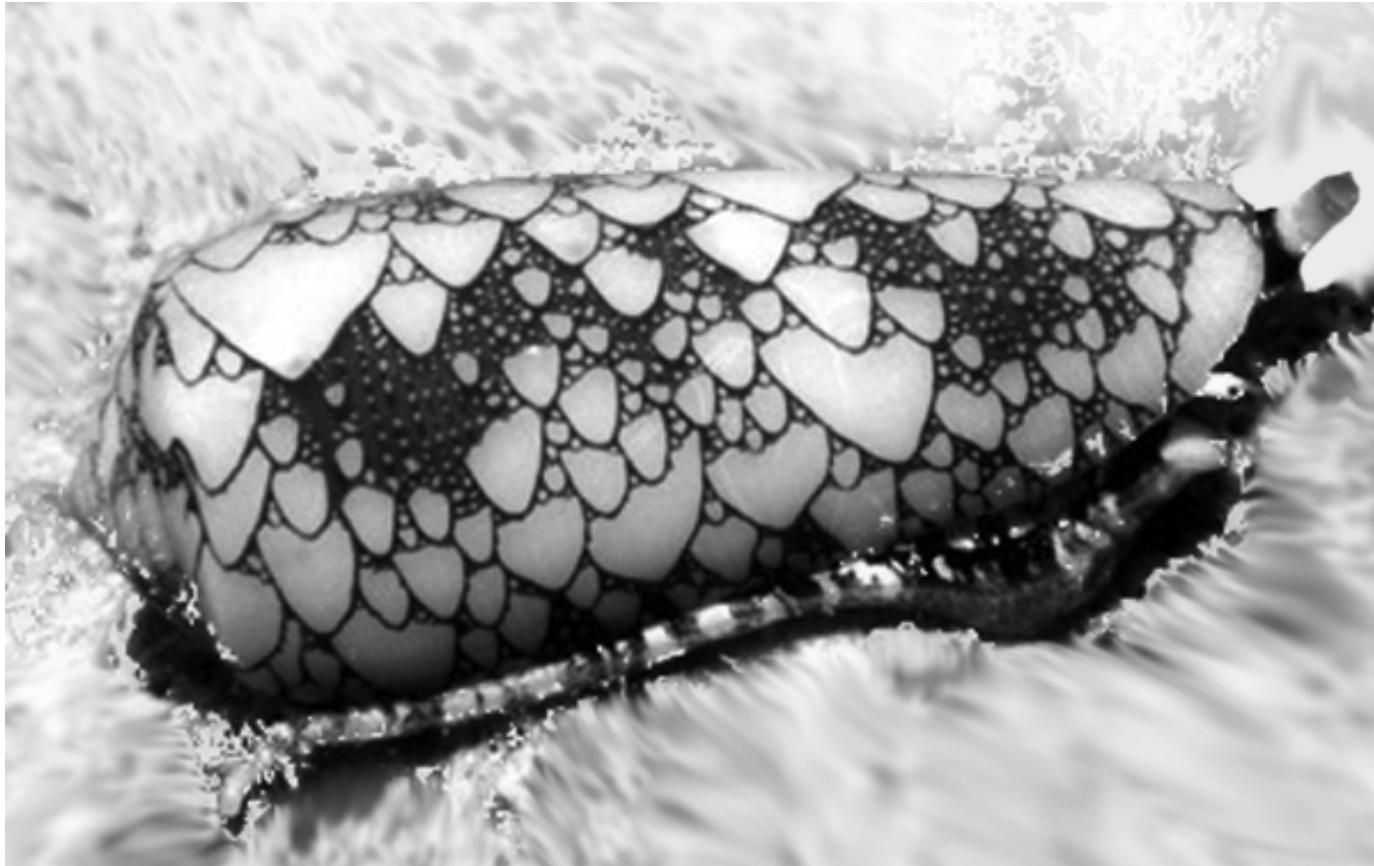- And what about quantum mechanics?

# SYNTHESIS:
## *Gnarly* Computations Are Lifelike.

**Example: Free Will**

- Suppose a gnarly AI lifebox simulates a person.

- Gnarly computations are *deterministic*.

- But gnarly computations are *unpredictable*.

- The AI can think it has free will.

# Why "Seashell"?

Cone Shells Show Naturally Occurring Gnarly Computations.
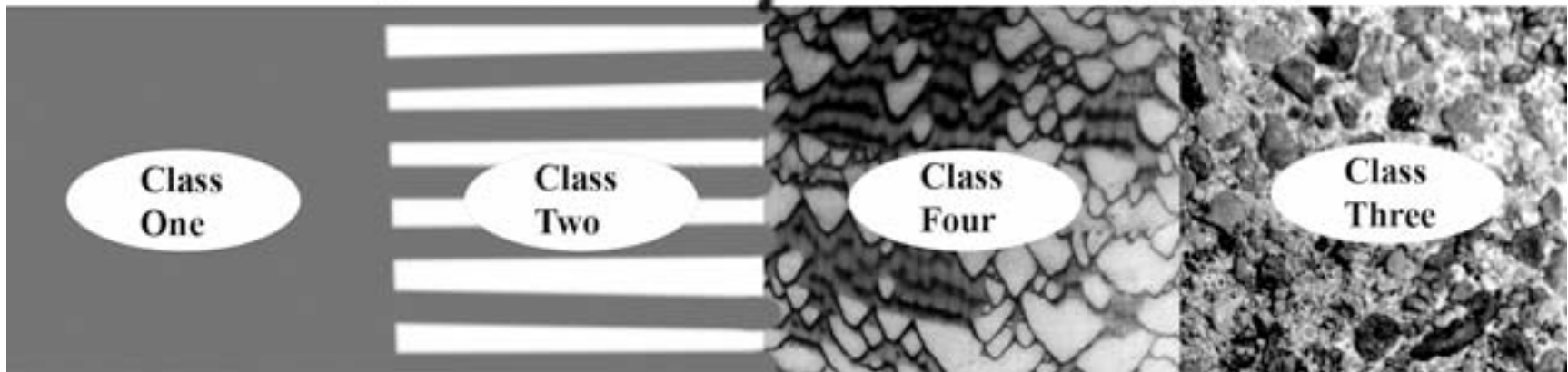
# Science Needs
# A Taxonomy of Computations

- What kinds of **computations** exist?

- If everything is a computation, this study gives insight into what kinds of **phenomena** can exist.

- This is experimental computer science in an **observational** sense. Stephen Wolfram led the way with his <u>A New Kind of Science</u>.

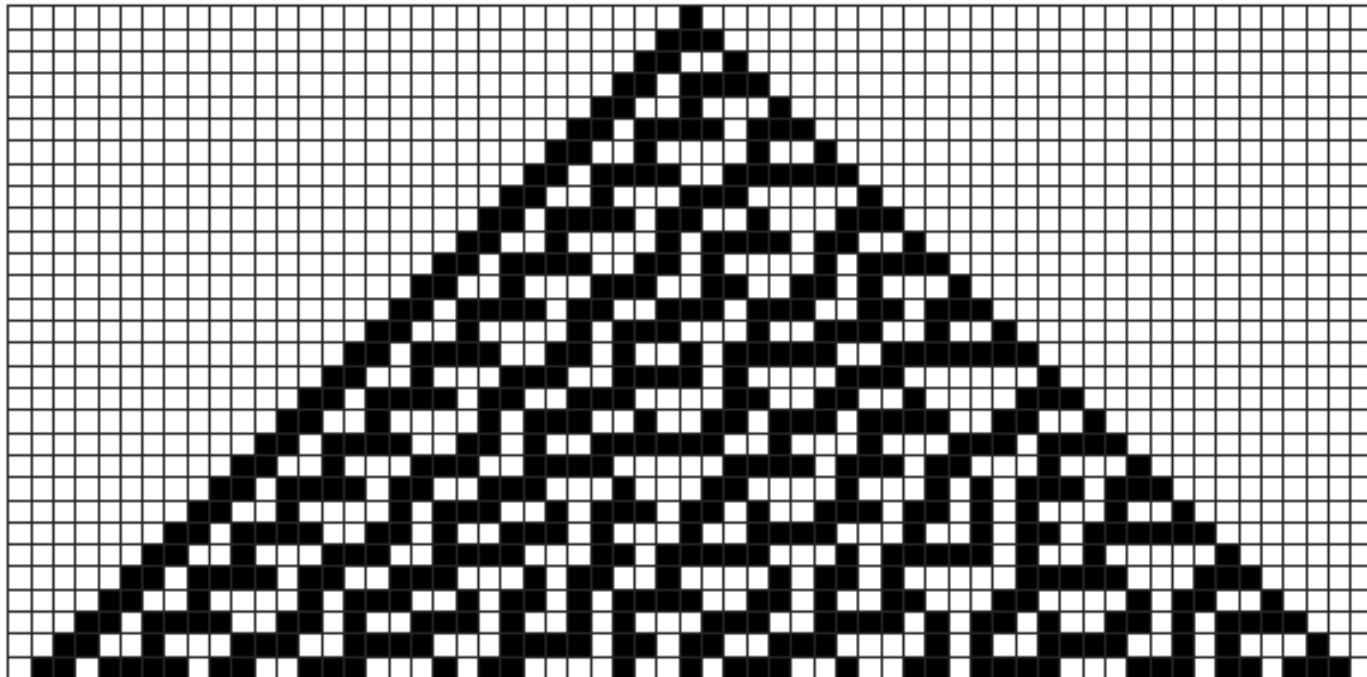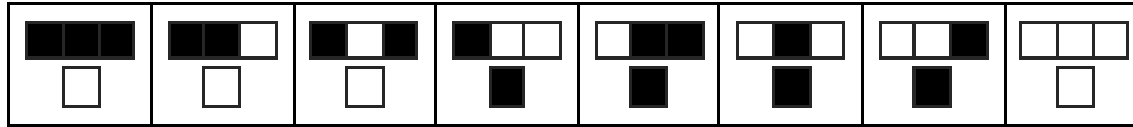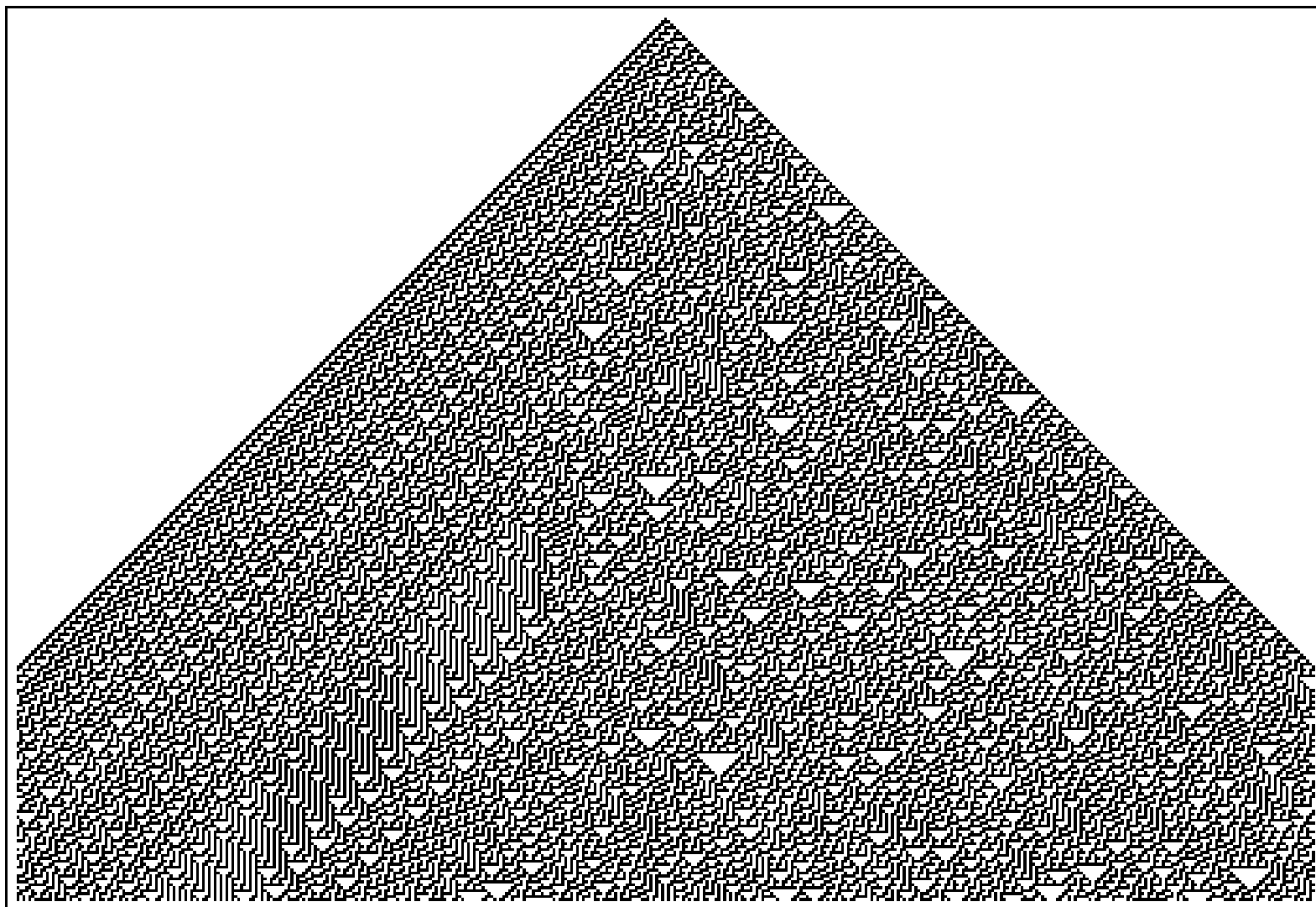| Simple | | Complex | |
|---|---|---|---|
| Class One | Class Two | Class Four | Class Three |
| Too Cold | | Gnarly | Too Hot |

- **Simple (Too Cold):** Dies Out or Repeats. Wolfram classes 1 and 2.

- **Gnarly (Just Right):** Complex moving patterns. Natural processes. Wolfram class 4.

- **Looks Random (Too Hot):** "Seething Dog Barf" --- Bill Gosper. Wolfram class 3.

# CA Rule 30 is Pseudorandom
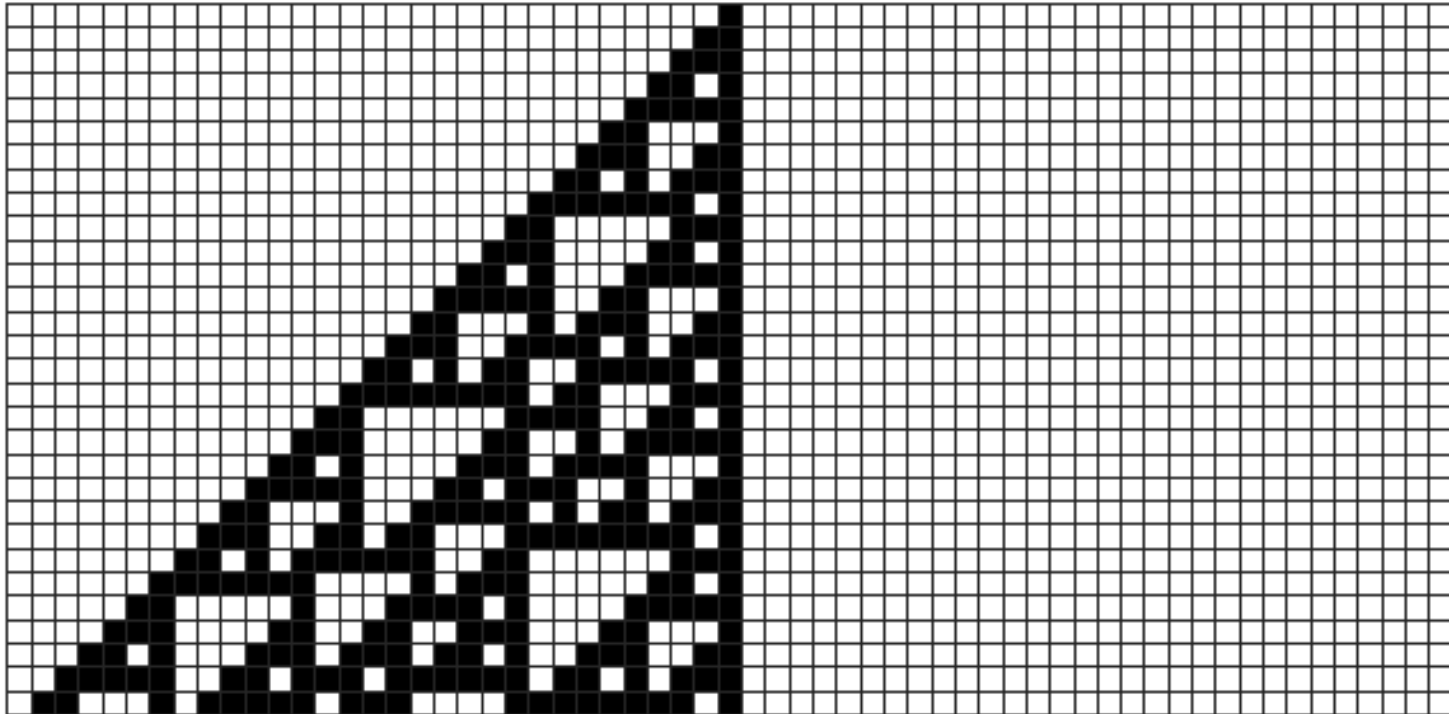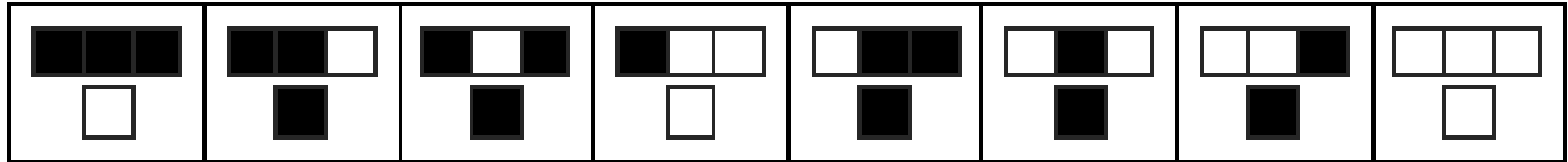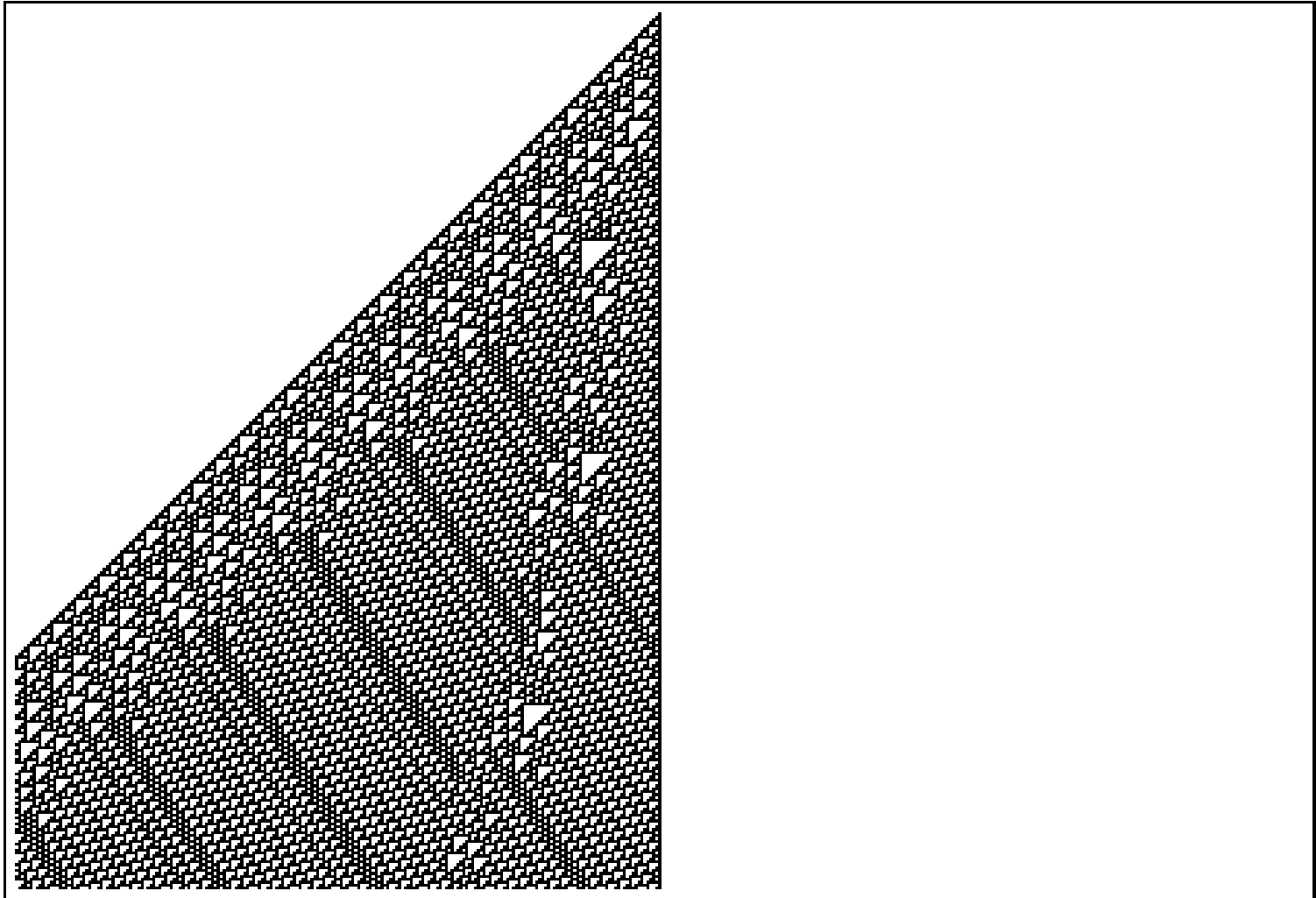# (Too Hot, Seethes, Class 3)

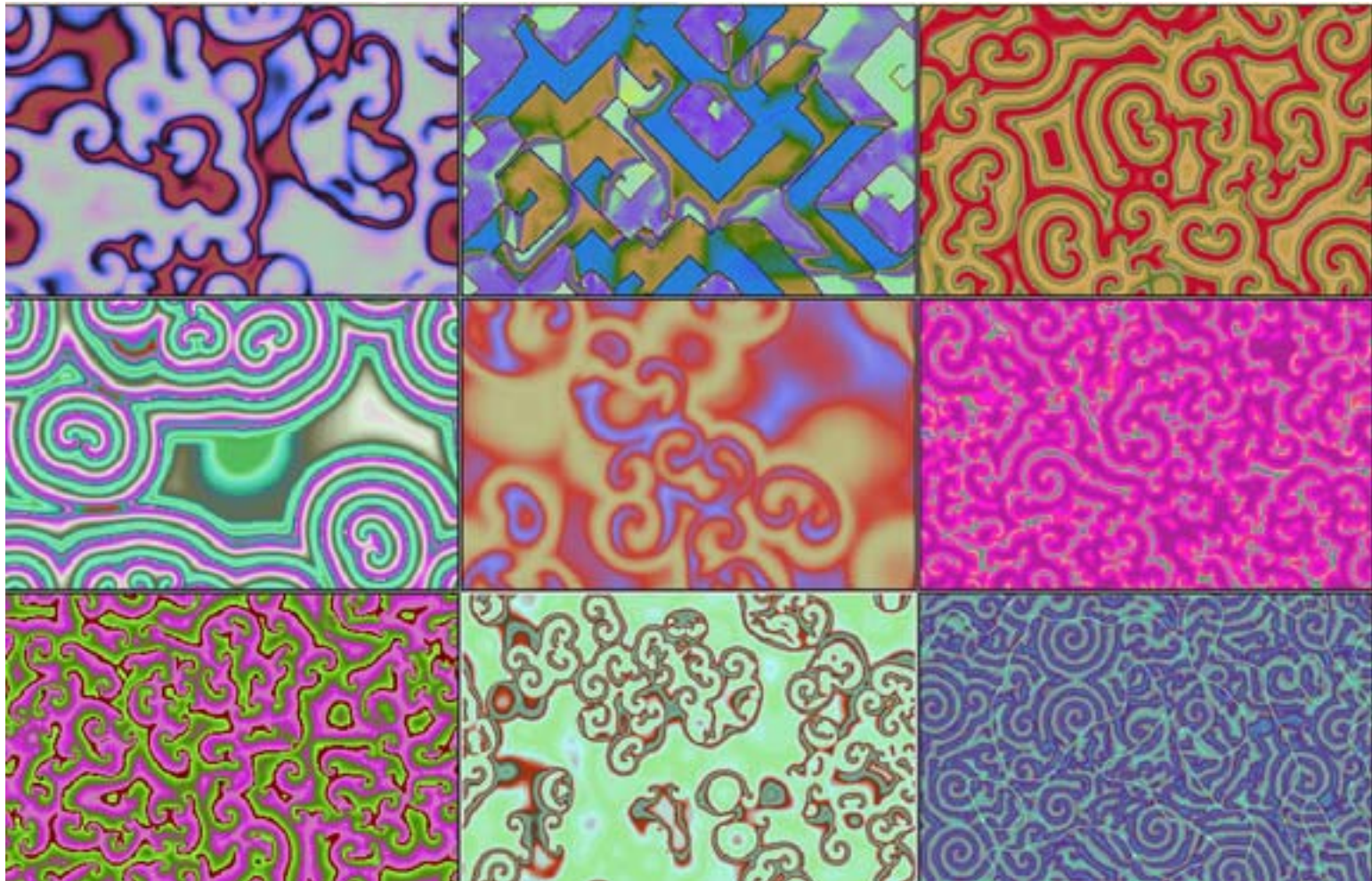# Rule 30 Seethes

# Rule 110 Has Gliders
# (Gnarly, Class 4)

# Gnarly Rule 110 Is Provably Computation Universal!

# Gnarly 2D CAs:
# CAPOW Zhabotinsky Scrolls

# Limitative Consequences

- Formally uncomputable problems are **absolutely unsolvable**.  Probably quantum computation isn't going to help.

- (Wolfram PCE). Most naturally occurring processes are **universal** computations.  Nature is rich.

- Most natural processes are **unpredictable** (irreducible), that is, they can't be emulated much faster than they occur.

- Given any formal theory and any complex natural process, there are statements about the process which are  **formally undecidable** by the theory.

# Sunny Prospects

- Nature uses **complex, gnarly solutions**, and we can too.
- **Stable patterns emerge** even when we use we use computing systems that we can't understand.  Make CS more empirical.
- Use gnarly CA rules to grow **new materials**.
- Lots of **basic science** still to do on the taxonomy of computation.

# How to Be Happy

► *CS*.  **Turn off the machine**.
   Nature computes better than a beige, buzzing box.

► *Physics*.  **See the gnarl**.
   The world is full of rich, chaotic computation.

► *Biology*.  **Feel your body**.
   Your body is the most complex device you'll ever operate.

► *Psychology*.  **Release your thoughts**.
   Avoid repetition.  Don't overvalue logic.

► *Sociology*.  **Open your heart**.
   Others are complex universal computations like you.

► *Philosophy*.  **Be amazed**.
   The universe is a miracle, forever transcending science.

Rudy Rucker,
***The Lifebox, The Seashell and the Soul:***
*What Gnarly Computation Taught Me About Ultimate Reality, the Meaning of Life and How to Be Happy*
(Thunder's Mouth Press, 2005).

Book sample, software and more at www.rudyrucker.com/lifebox

Blog: www.rudyrucker.com/blog