Gnarly Computation
by Rudy Rucker
Industrial Light and Magic
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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

(Thunder’s Mouth Press, 2005)
My Book Title is a Dialectic Triad

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

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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. The “lifebox” simulation.
The “Stairway to Heaven” Pattern for Viewing Everything As a Computation
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 Computation 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 A New Kind of Science.
• **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
CAPOW: Continuous Valued CAs
Theoretical Consequences

• (Wolfram’s Principle of Computational Equivalence). Most naturally occurring processes are universal computations. **Nature is rich.**

• (Principle of Unpredictability) **Most natural processes are unpredictable**, that is, They can’t be emulated faster than they occur.

• (Godel’s Incompleteness Theorem for Nature) Given any scientific theory of the world $T$, And given any complex natural process $P$, **There are statements about process $P$ which theory $T$ is unable to prove or disprove.**
Takeaway for Designers

• Nature uses unpredictable, gnarly computations, they “look right.”

• Stable patterns emerge in all sorts of computations, and you needn’t worry why.

• If a complicated algorithm can achieve a given effect, a very simple algorithm can do it too. Focus on appearance, not hidden reasoning.

• Lots of exploration still to do. Mechanized searches of computation space are fruitful.
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. Accept change.

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

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


Book sample, software and more at [www.rudyrucker.com/lifebox](http://www.rudyrucker.com/lifebox)

Blog: [www.rudyrucker.com/blog](http://www.rudyrucker.com/blog)