

Origin

Q: What drew me to coin the word “ArtScience” and develop the process and practice of Metaphorming?

Artist's Statement

In 1975-76, I experimented with creative-critical thinking manifested in the Arts & Sciences. I played with various formal works of “Art” and works of “Science” that were characterized as such, either *adding* scientific information to the artwork, or *subtracting* information from the sciencework. The net effect startled me! *The art became science, and the science became art.*

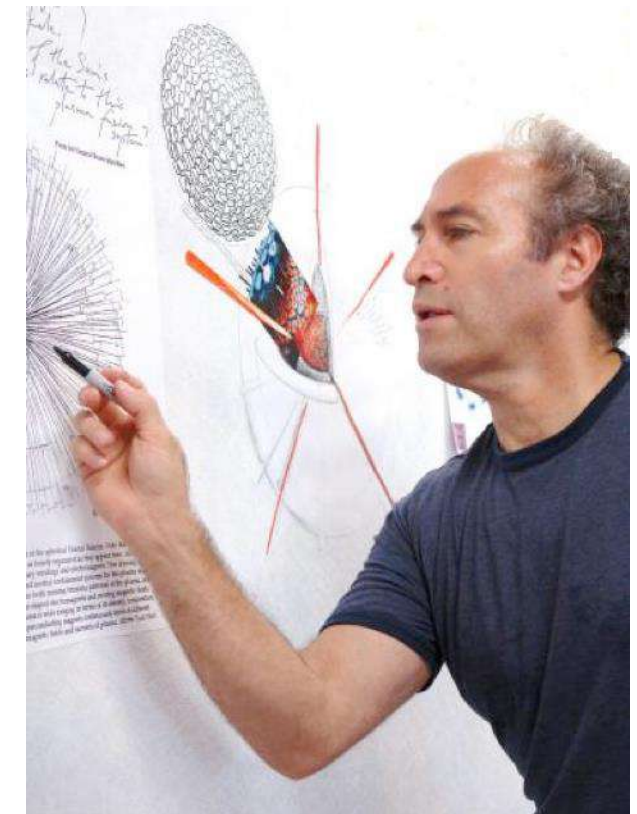
It's now 2026, a mere 51 years later, and I find I'm still absorbed and fascinated by that fundamental transformation of information (data, knowledge, ideas, concepts, events, etc.). It delights me to see how central this transformation is to the phenomena we call “aesthetic experience,” in which all sorts of natural ambiguities arise in the human mind that can't be explained away or described with words and numbers, as the mind gropes to grasp or make sense of what it's experiencing. Or, as we playfully indulge our physical senses, allowing them the “simple pleasures” of enjoying experiences that move us or inspire us to dream and imagine endless possibilities.

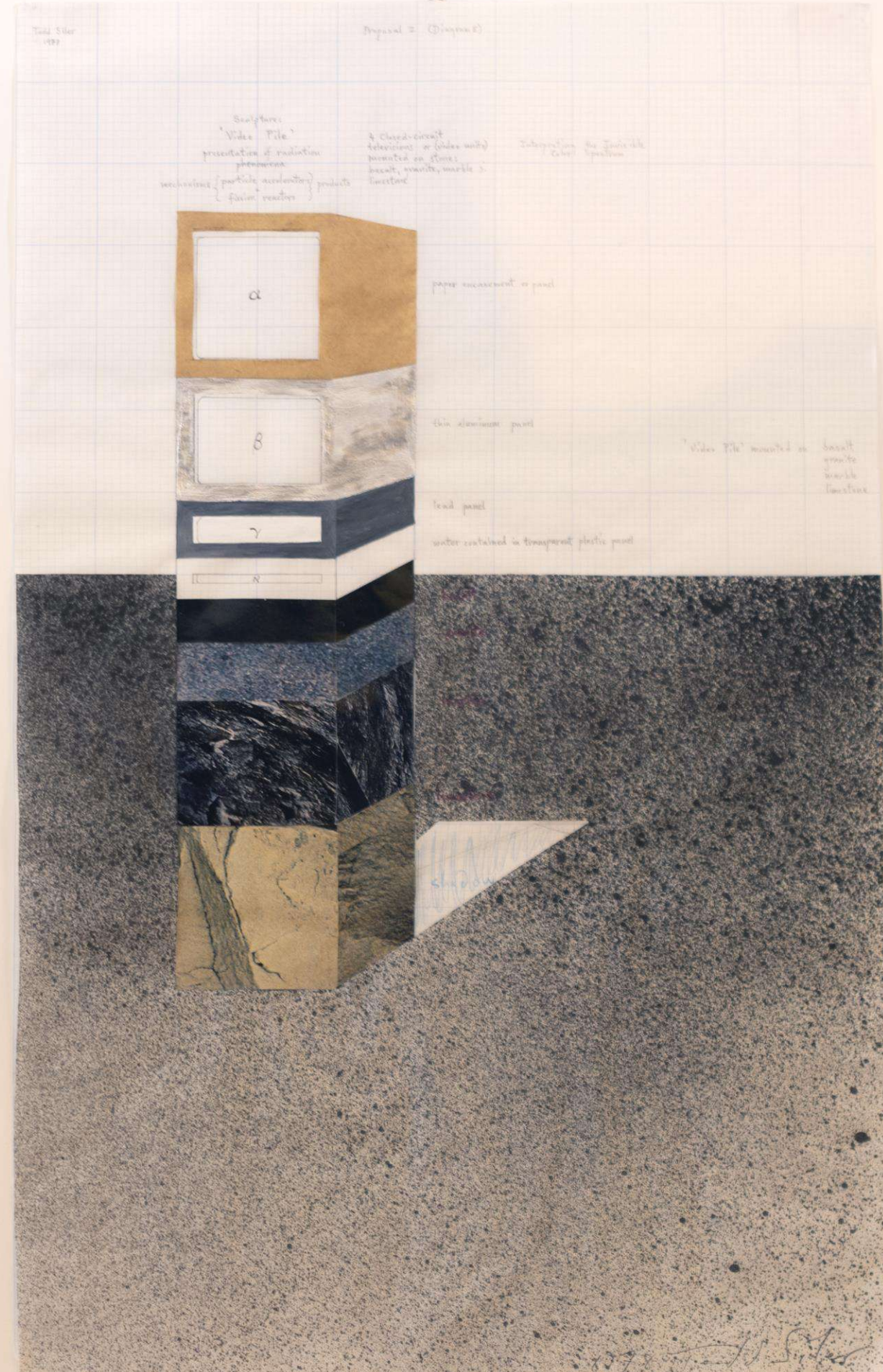
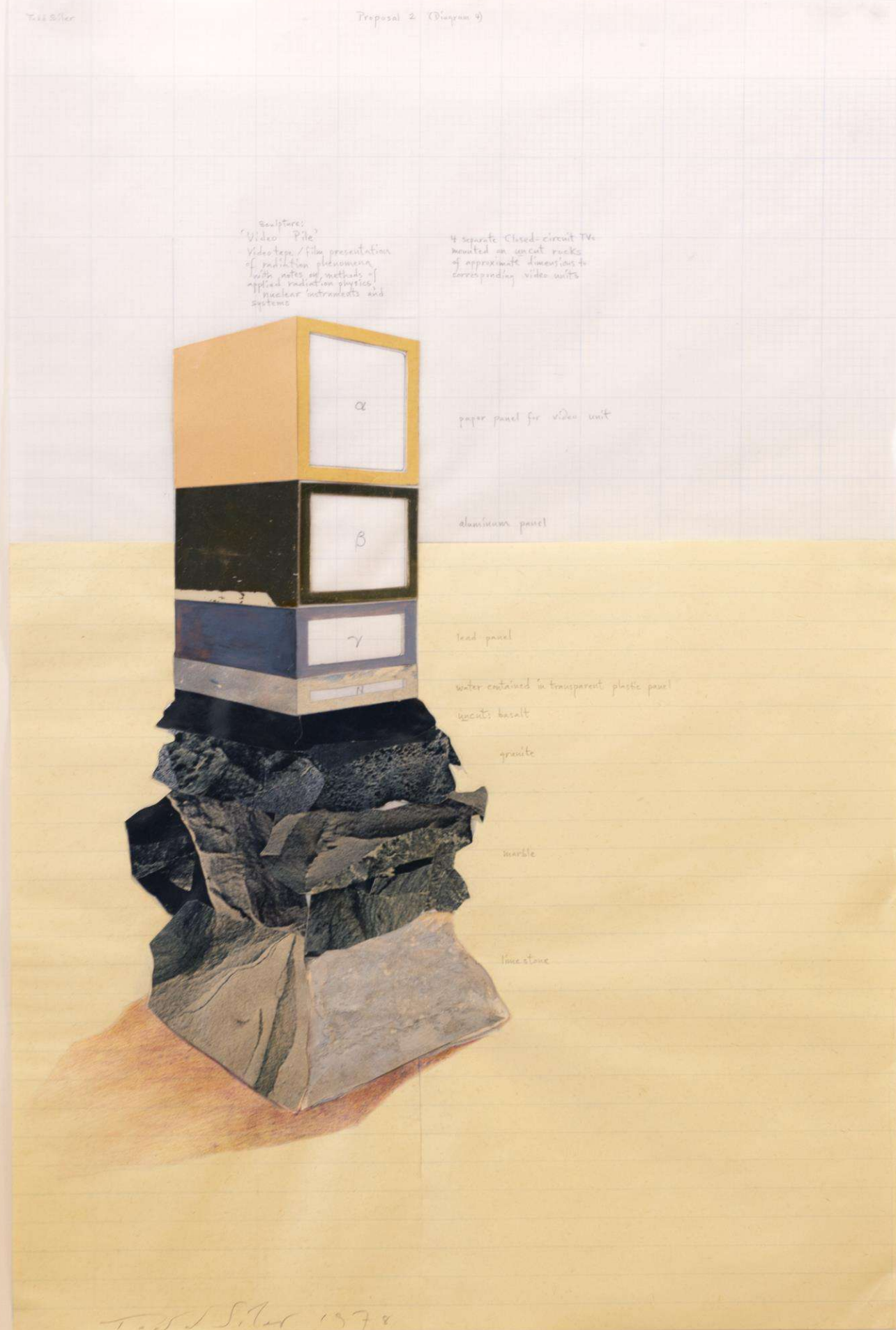
In art, anything goes because imagination goes with everything! Art is not only what you make, *it's what you make of it and with it, too!* That same basic truth holds for those who are open to experiencing science, technology, engineering, mathematics -- and, for that matter, all human knowledge -- *without* categories, compartments, walls, and self-imposed limits we call natural boundaries.

Today, we're discovering that **Art** encompasses All representations of thought, which includes all symbolic representations and expressions of human knowledge, human endeavors and human experiences. It embodies everything every human being commonly associates with the whole of Life-Reality-Nature.

My ArtScience adventures invite audiences to experience those unpredictable, “aesthetic accidents” that underscore most original discoveries. Albert Szent-Gyorgyi, the 1937 Noble Prize-winner in Physiology or Medicine, once noted: “A discovery is said to be an accident meeting a prepared mind.” **ArtScience** aims to prepare our minds for unexpected encounters with discovery.

One of many current examples is this creative collaboration: www.ArtNanoInnovations.com

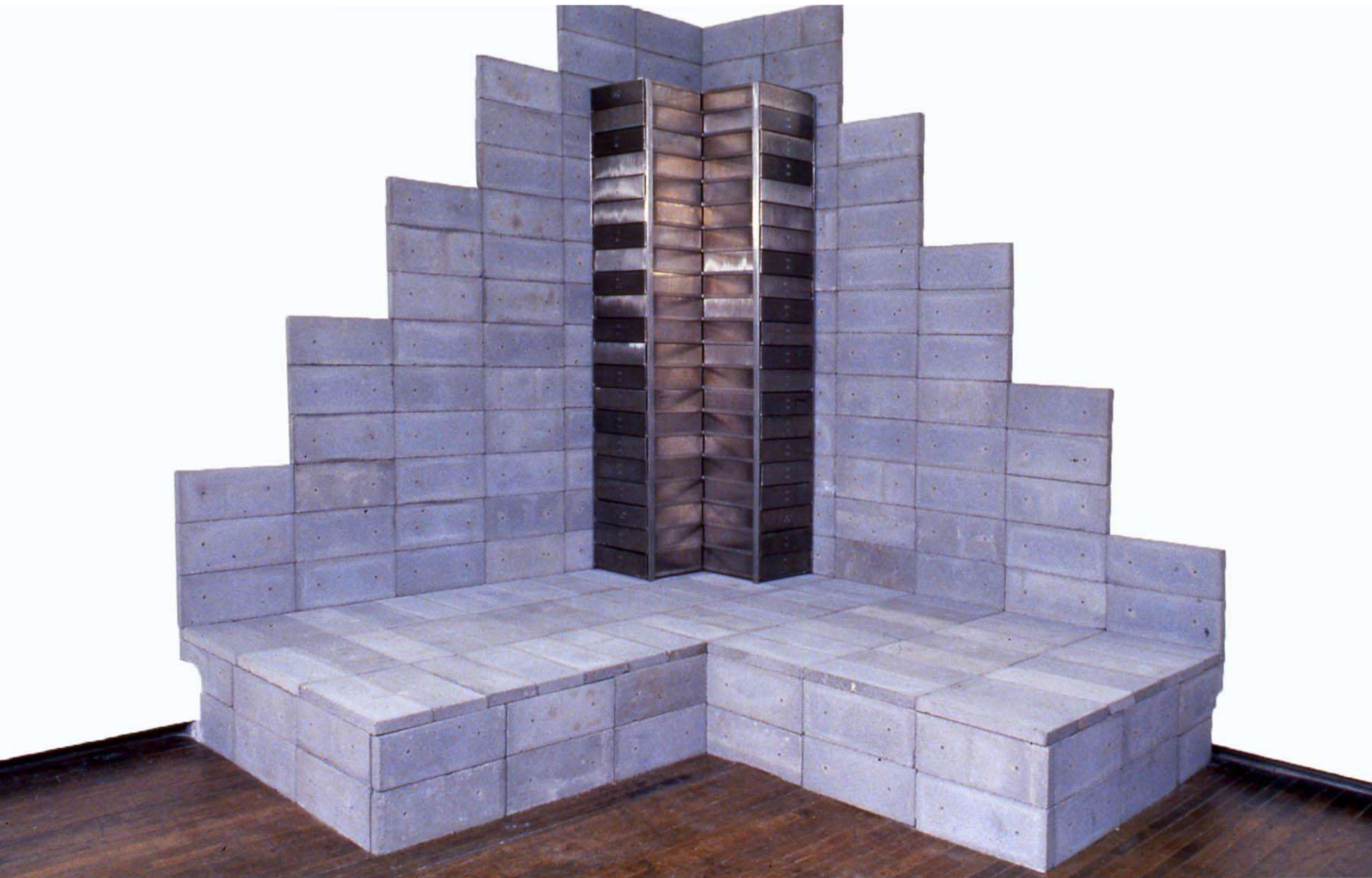




Todd Siler, "Nuclear Video Pile" (1977-78) Ink on paper with collage, 17" x 22". Proposal for Masters of Science in Visual Studies, Center for Advanced Visual Studies at M.I.T., 1979. (ArtScience Abstracts)



"The Encoded Monolith" in *Savage Boundaries* (1990.) Mixed media. Courtesy of Ronald Feldman Fine Arts, New York



The Encoded Monolith (1979-1991) Stainless steel with engraved numbers from a Radian protractor; 800 drawings, paintings, visual notations encased in 42 drawers, applying ArtScience process; 10ft. x 10ft. x 10ft.





Todd Siler, "Thought Assemblies" (1979-82) mixed media on synthetic and natural paper, 9ft. x 127ft. Installation view: Musee D'Art Moderne de la Ville de Paris, France. 1982 (Courtesy of The Picower Institute for Learning and Memory at M.I.T.)



Todd Siler, **Panel#9, Thought-Assemblies (1979-82)** Mixed media on synthetic paper and canvas, 9ft. x 127ft.
(The Picower Institute for Learning and Memory at M.I.T. and The M.I.T. Art Collection, Cambridge, MA.)

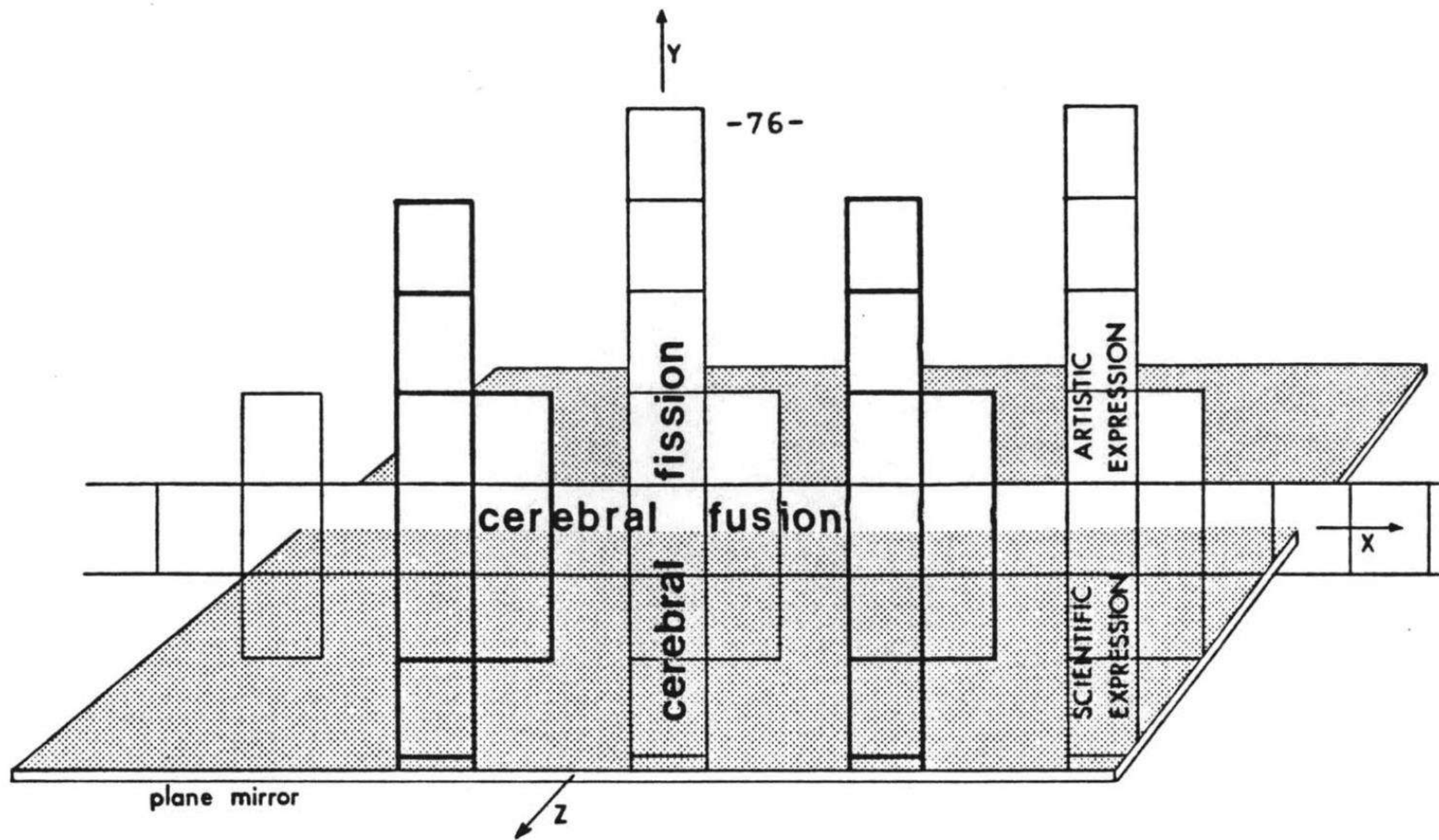
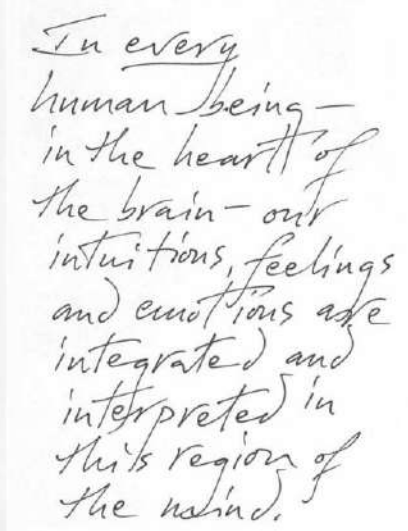


Fig. 27a A diagram indicating the information portrayed in the artwork "Thought Assemblies" shown in Fig. 26. The work consists of three interactive axes. Presented on the X-axis is information based on intuition and perception about the brain. Intersecting this plane is the plane mirror, or Z-axis, which reflects vertically above and below the X-axis. Above the X-axis, the information is abstracted and implied, thus entering the realm of art.

Below the X-axis, qualifying and quantifying information is added, entering the realm of science. "Thought Assemblies" indicates that analytic and artistic thought can proceed from the same frame of insight-perception and that these two modes of thought converge. As an exercise in topology, if the artwork were folded to form a tube and then the ends of the tube were brought together to form a torus, the farthest points at both ends of the X- and Y-axes would be contiguous.



A large, curved, white structure resembling a giant letter 'C' or a partial ring. It is covered in a colorful, abstract pattern. Handwritten text indicates 'approx. 145' perimeter' and '37' Diameter'. A person is standing inside the structure, and a vertical dimension line on the left indicates a height of 12'.

©1979-2014  "Thought Assemblies" mounted on The Limbic Lobe



©Todd Siler, "The Brain Theater with Thought Assemblies emerging from The Limbic Brain" (1979-2014) CU Art Museum, University of Colorado, Boulder. Photo: Jeffrey Wells.



©Todd Siler, "The Brain Theater with Thought Assemblies emerging from The Limbic Brain" (1979-2014) CU Art Museum, University of Colorado, Boulder. Photo: Jeffrey Wells.

"*Breaking the Mind Barrier* will change the way you see the natural world; it will change the way you see yourself." —Mary Lee Grisanti, author of *Rare Earth*

BREAKING THE



**A BRILLIANTLY
ORIGINAL WAY
TO THINK ABOUT
ART, SCIENCE,
THE MIND, AND
THE UNIVERSE
TODD SILER**

MIND BARRIER

"...cuts across many disciplines, from art and psychology to genetics, computer science, systems theories and cybernetics." —*Publishers Weekly*

TODD SILER

AUTHOR OF
THINK
LIKE A
GENIUS



BREAKING THE A BRILLIANTLY ORIGINAL WAY TO THINK ABOUT ART, SCIENCE, THE MIND, AND THE UNIVERSE MIND BARRIER

SCIENCE

"This is a work of rare genius. It speaks to our longing for a comprehensive and unified understanding of the world and its content, including ourselves."

—STEPHEN L. CHOROVER, PH.D., PROFESSOR OF PSYCHOLOGY, M.I.T.

Drawing on a range of disciplines from art to Zen Buddhism and brain science to physics, Todd Siler, author of *Think Like a Genius*, explores how we decode the universe by decoding the brain—and vice versa.

Using his internationally acclaimed artworks, he shows how the things we create, from art to science to simple tools, are reflections of the brain—while the brain is a reflection of the larger universe. Lively and original, *Breaking the Mind Barrier* is must reading for anyone interested in the origins of Siler's pioneering work and will intrigue readers seeking a better understanding of the deep connections between mind and matter.

"This book will probably do more for encouraging creativity in young minds than any I can think of. . . . It is time to realize that what science does best is create art, and what art does best is envision new science. Siler's book makes this evidently clear."

—FRED ALAN WOLF, PH.D., AUTHOR OF
THE DREAMING UNIVERSE

"Siler aims to achieve for our day what Alexander von Humboldt, in *Cosmos*, 1845, did for his. Humboldt sought to confirm the guiding hand of God. Siler does not make that claim, but he gives some pretty good evidence."

—DR. JAMES ACKERMAN, ARTHUR KINGSLEY PORTER PROFESSOR
OF FINE ARTS, HARVARD UNIVERSITY

In 1986 **TODD SILER** became the first visual artist to receive a doctorate from M.I.T. He is a member of the advisory board for the Council on Art, Science, and Technology at M.I.T. His artworks are in numerous collections, including the Metropolitan Museum of Art, the Museum of Modern Art, the Guggenheim Museum, and the Pushkin Fine Arts Museum in Moscow. *Breaking the Mind Barrier* was nominated for the 1994 University of Louisville Grawemeyer Award in Education.



A T O U C H S T O N E B O O K
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VISIT US ON THE WORLD WIDE WEB <http://www.SimonSays.com>

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Cover illustration courtesy of Image Bank

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U.S. \$16.00
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The New York Times

Book Review

February 3, 1991
Section 7 Copyright © 1991
The New York Times

Noted With Pleasure

The Metaphoric Universe



Todd Siler argues that the metaphor is as essential to scientists as to writers. This is from "*Breaking the Mind Barrier: The Artscience of Neurocosmology*" (Simon & Schuster).

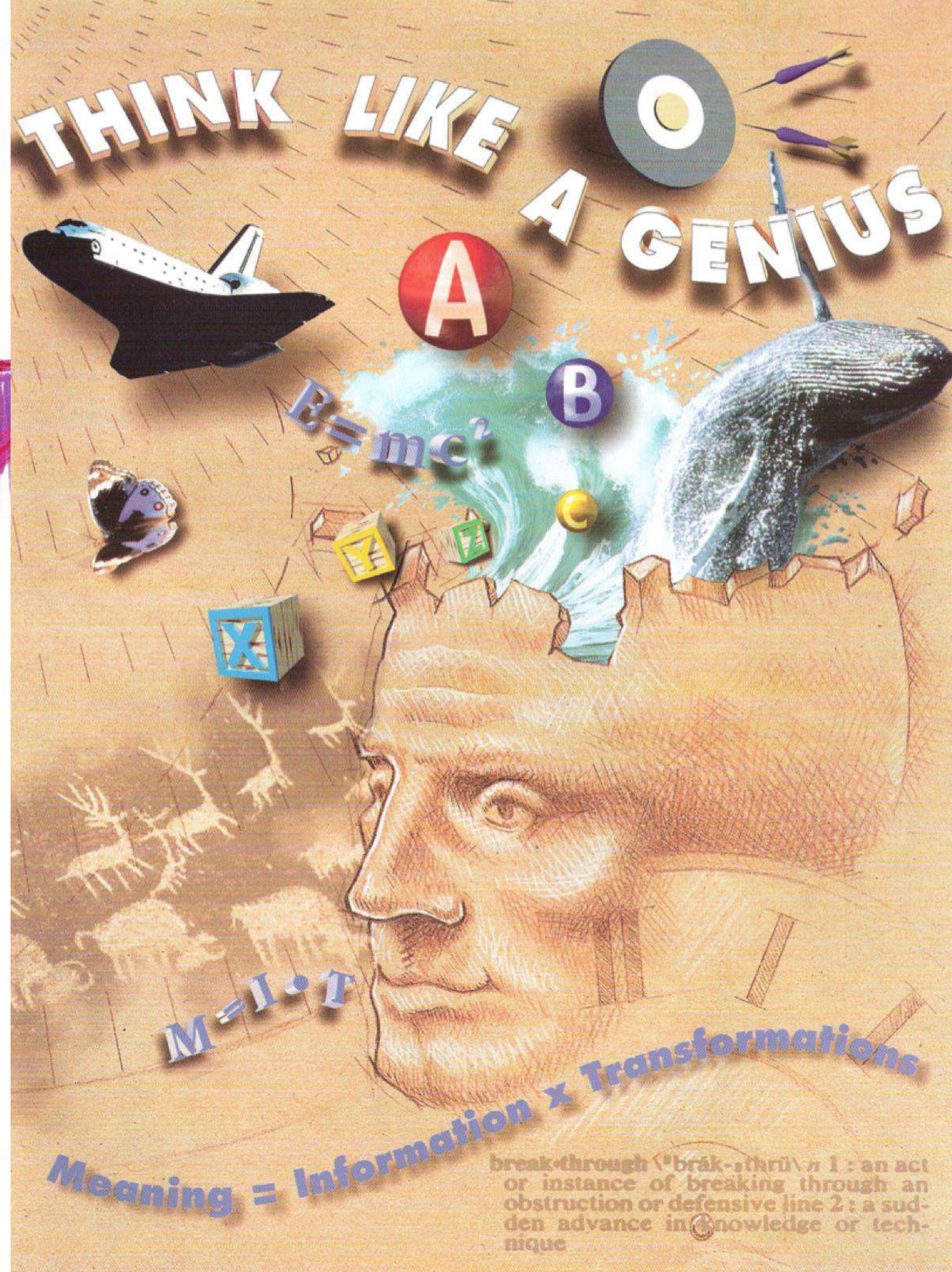
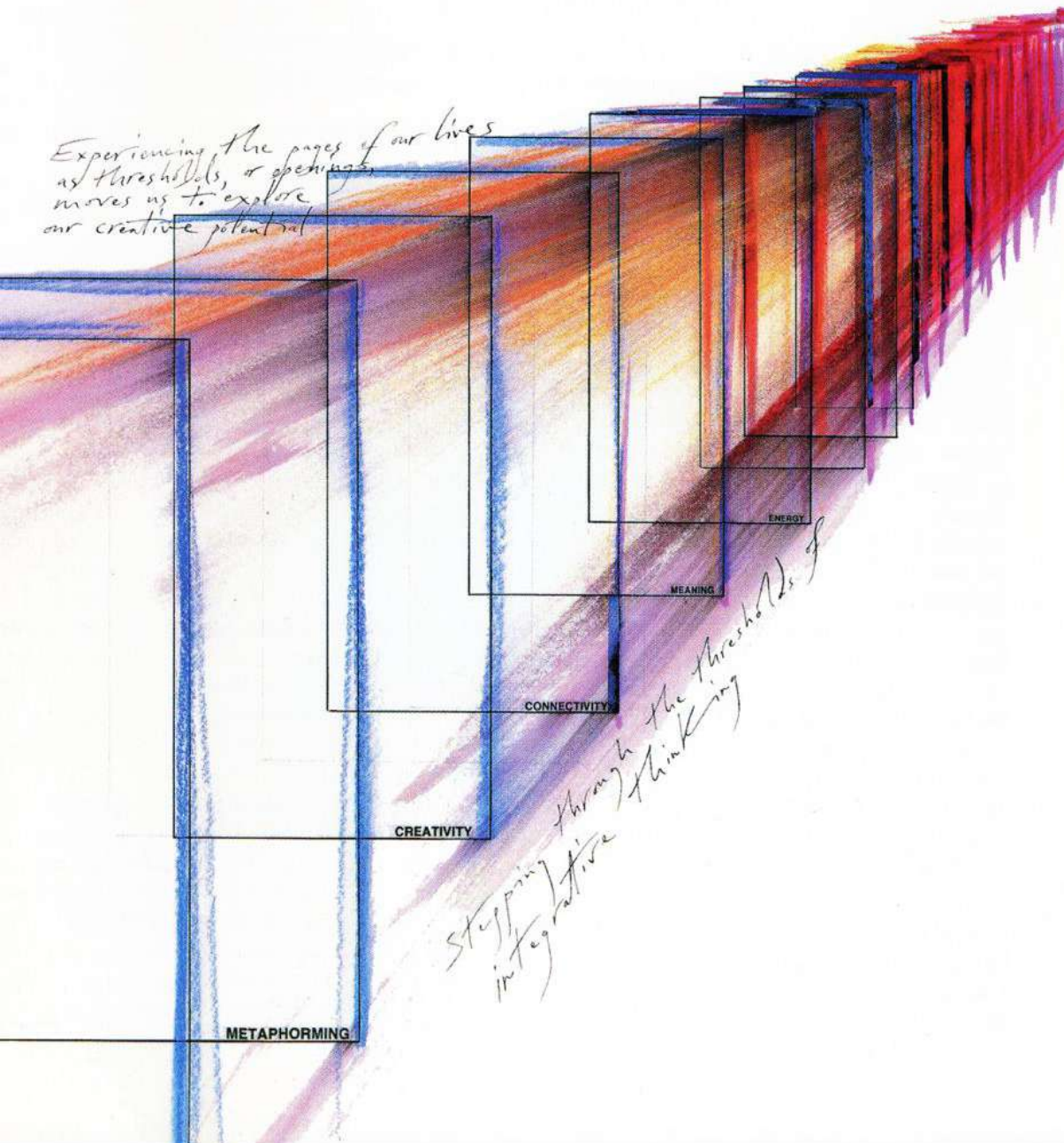
A rich metaphor can be a gold mine for hypotheses relating the properties of different systems. Such is the case of the German astronomer Johannes Kepler's concept of the "music of the spheres" that helped the science of astronomy listen anew to its description of the universe. Kepler's metaphorical views of the cosmos . . . identified a number of unsuspected relations between familiar things: arithmetic, geometry, music, and astronomy. Kepler approached astronomy through metaphor, as he intended to "uncover the magic of mere numbers and so demonstrate the music of the spheres," the harmonious nature of the cosmos. His speculations, which were based on the rigorous astronomical observations of Nicolaus Copernicus and Tycho Brahe, provided the seminal thinking for Isaac Newton's theory of gravitation. And this theory opened the door to modern science — a door that Kepler's contemporary the Renaissance scientist Galileo had built from his belief in systematic, experimental evidence. □

The Big Idea

How does the ArtScience process and practice of Metaphorming help realize human creative potential?

THE ARTSCIENCE PROGRAM

Integrating diverse fields of knowledge.
Stimulating creativity and innovation.
Enriching the experience of learning.
Improving communication.
Fostering collaboration.



Keynote Addresses

NAEA

Houston, TX

April 7-11, 1995

ArtScience:

Integrating the Arts and Sciences
To Connect Our World and Improve Communication

Todd Siler
April 10, 1995

National Art Education Association (NAEA)
Keynote address on "ArtScience and the Art of Education,"
annual convention, Houston, Texas, 1995; pages 27-42

TODD SILER
USA



ISTANA
SINGAPORE

MESSAGE

Civilizations progress when men and women dare to dream and do what others thought were impossible. In the past, advancement in the fields of science, art, government, education and industry was led by a small number of creative thinkers. Today, with the need for quicker responsiveness and an information-driven society, it has become imperative for everyone to think critically, creatively and to apply that thinking.

Brain research in the last decade has led scientists to conclude that man is only using one to four percent of his brain potential. There is thus great potential to tap and develop this vast intellectual resource and unleash the creative and innovative energies needed to meet the challenges ahead.

Singapore is therefore pleased to host the 7th International Conference on Thinking. This conference brings together a stellar array of talents, including eminent researchers and practitioners from education, business and technology. I hope that the synergy of ideas generated will lead to new initiatives and networking both within and across borders.

My congratulations to all who have contributed to making this seminar possible. I hope that all participants will have a stimulating and enriching week ahead. To the overseas delegates, my wishes for a very enjoyable stay in Singapore.

ONG TENG CHEONG
PRESIDENT
REPUBLIC OF SINGAPORE

**BORDERLESS
THINKING:
CREATING
A GLOBAL
LEARNING
SOCIETY**



**7TH INTERNATIONAL
CONFERENCE ON
THINKING**

Singapore International Convention
and Exhibition Centre
June 1 – 6, 1997

Hosted by
National Institute of Education
Nanyang Technological University
Singapore



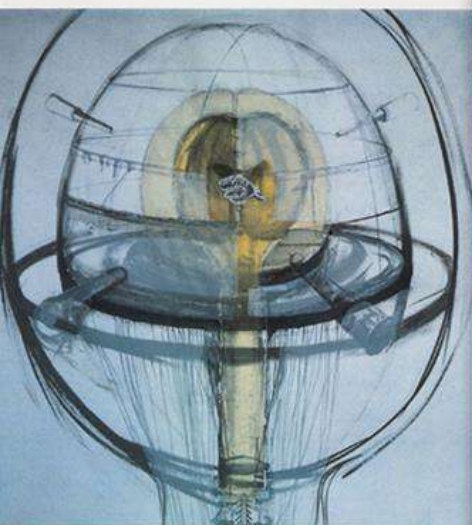
CONFERENCE PROGRAMME

MOVING BEYOND THE BOUNDARIES OF OUR SEPARATE WORLDS: THE ARTSCIENCE OF LEARNING, CREATING AND COMMUNICATING

There are countless reasons for fully integrating the arts and sciences with life. Perhaps the most pressing reason is to foster creativity which underlies and enriches the experience of learning. By cultivating our imaginations we can learn to apply our knowledge in new and productive ways, while improving communication.

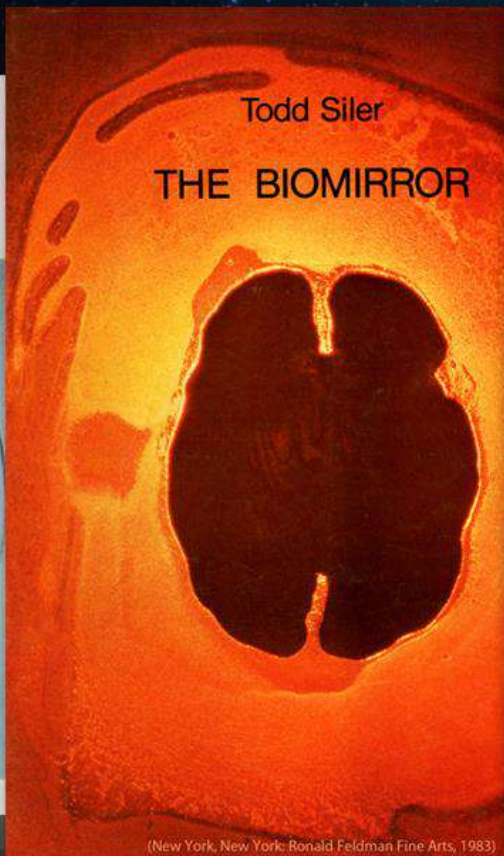
The ArtScience Program for lifelong learning explores the possibilities of uniting the arts and science to help us think, create, perform, and communicate at our highest level. This intensely visual presentation provides numerous examples of work that embody the scope and potential of this emerging field which focuses on illuminating the nature of the creative process and thinking.

Todd Siler
CEREBREACTORS

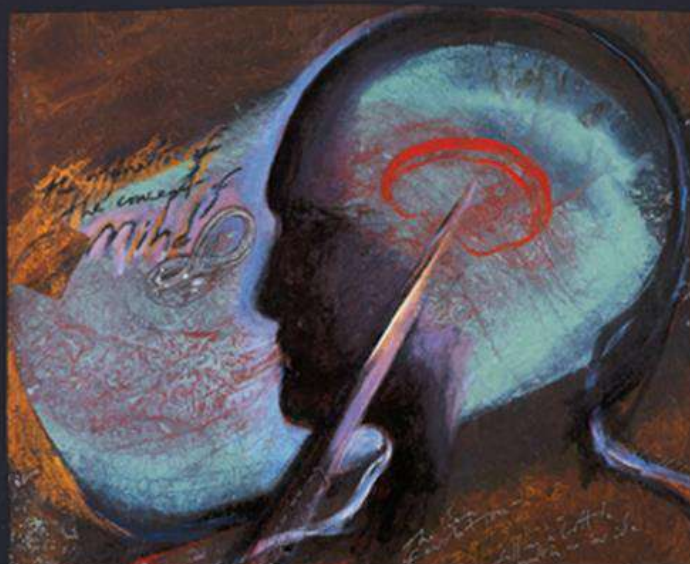


(New York, NY: Ronald Feldman Fine Arts, 1980)

Todd Siler
THE BIOMIRROR



(New York, New York: Ronald Feldman Fine Arts, 1983)



TODD SILER
Metaphorms: Forms of Metaphor

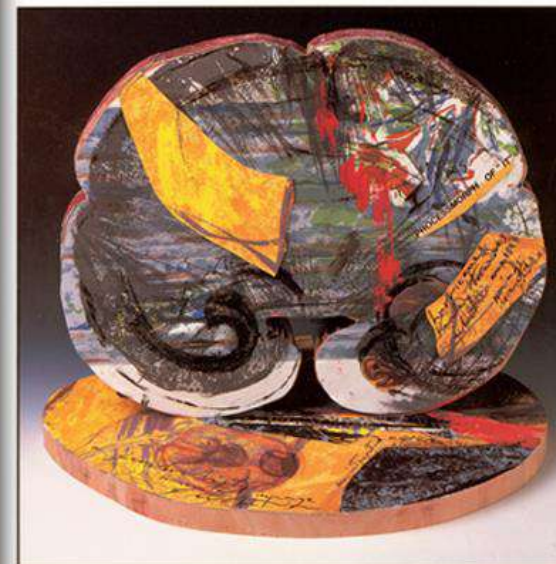
(The New York Academy of Sciences, 1988)

Metaphorms: Forms of Metaphor

TODD SILER

Ψ CEREBRALISM

CREATING A NEW MILLENNIUM OF MINDS, BODIES AND CIVILIZATIONS

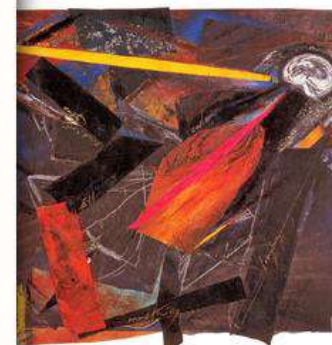


TODD SILER

(New York, NY: Ronald Feldman Fine Arts, 1993)

TODD SILER

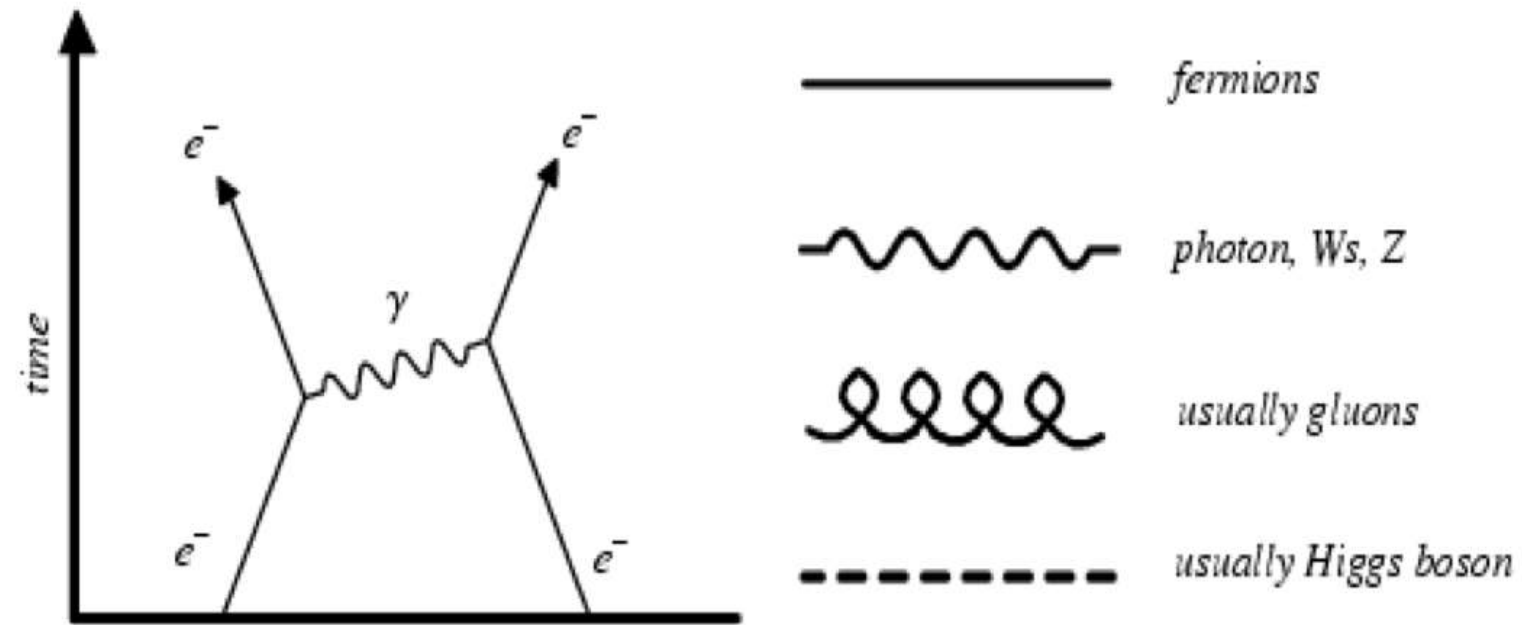
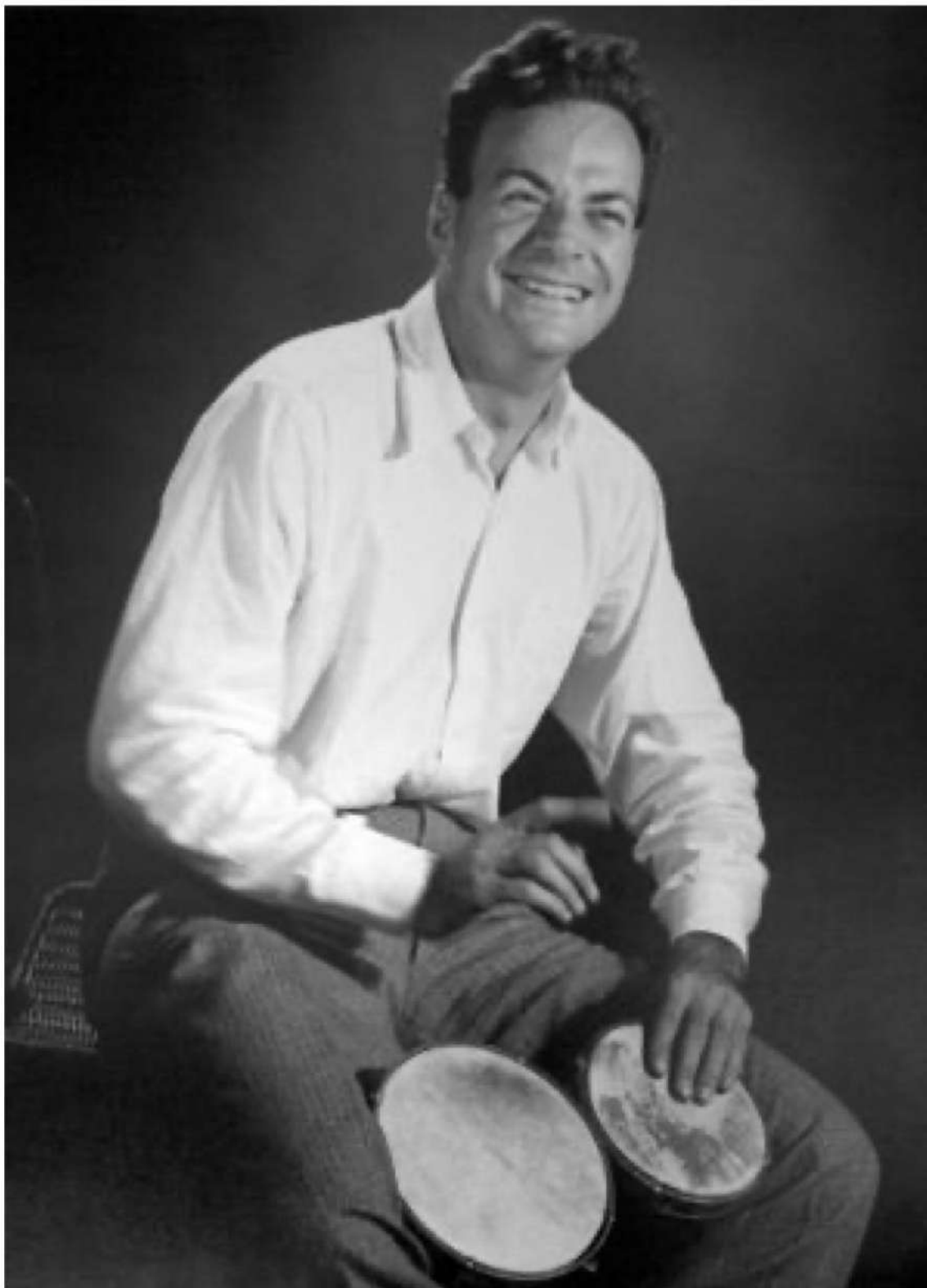
Metaphorming Worlds
隱喻化的世界



Todd Siler
陶德·塞勒

(Taipei, Taiwan: Taipei Fine Arts Museum, 1995)

陶德·塞勒
Todd Siler



visual, symbolic language of sub-atomic particles (Richard Feynman diagram)

"What I cannot create, I do not understand."

Richard P. Feynman, Nobel Laureate in Physics, 1965



"Everyone is born a genius." *R. Buckminster Fuller and Albert Einstein*



"Genius is everywhere, everyday, in everyone, in every way imaginable!" *TS*



"Genius is in *all* of our genes." *TS*



"What I cannot create,
I do not understand."

Richard Feynman

Metaphorming

Arts-based learning methods and tools for
catalyzing and cultivating innovative thinking

Todd Siler, Ph.D.



"Genius is what our genes do *for a living* and to live a creative life!" *TS*



"Genius sees through things, and sees things through." *TS*



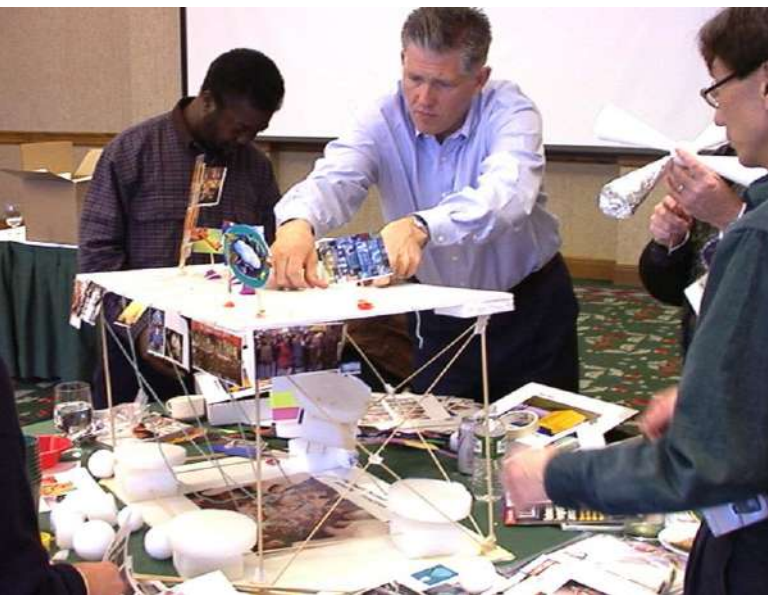
"Everyone is an artist." *Joseph Beuys*

Metaphorming



Metaphorming is the process of connecting Metaphorms to continually invent and innovate; to generate and communicate ideas; to solve problems; to freely express your thoughts and feelings; to create and share new knowledge; and to set and achieve goals.

“Metaphorms” are forms of metaphor, analogy, signs, symbols, numbers, stories, figures of speech, euphemisms, premises, models, and other connection-making devices that we use to express our thoughts, feelings, ideas, opinions, knowledge, and experiences.

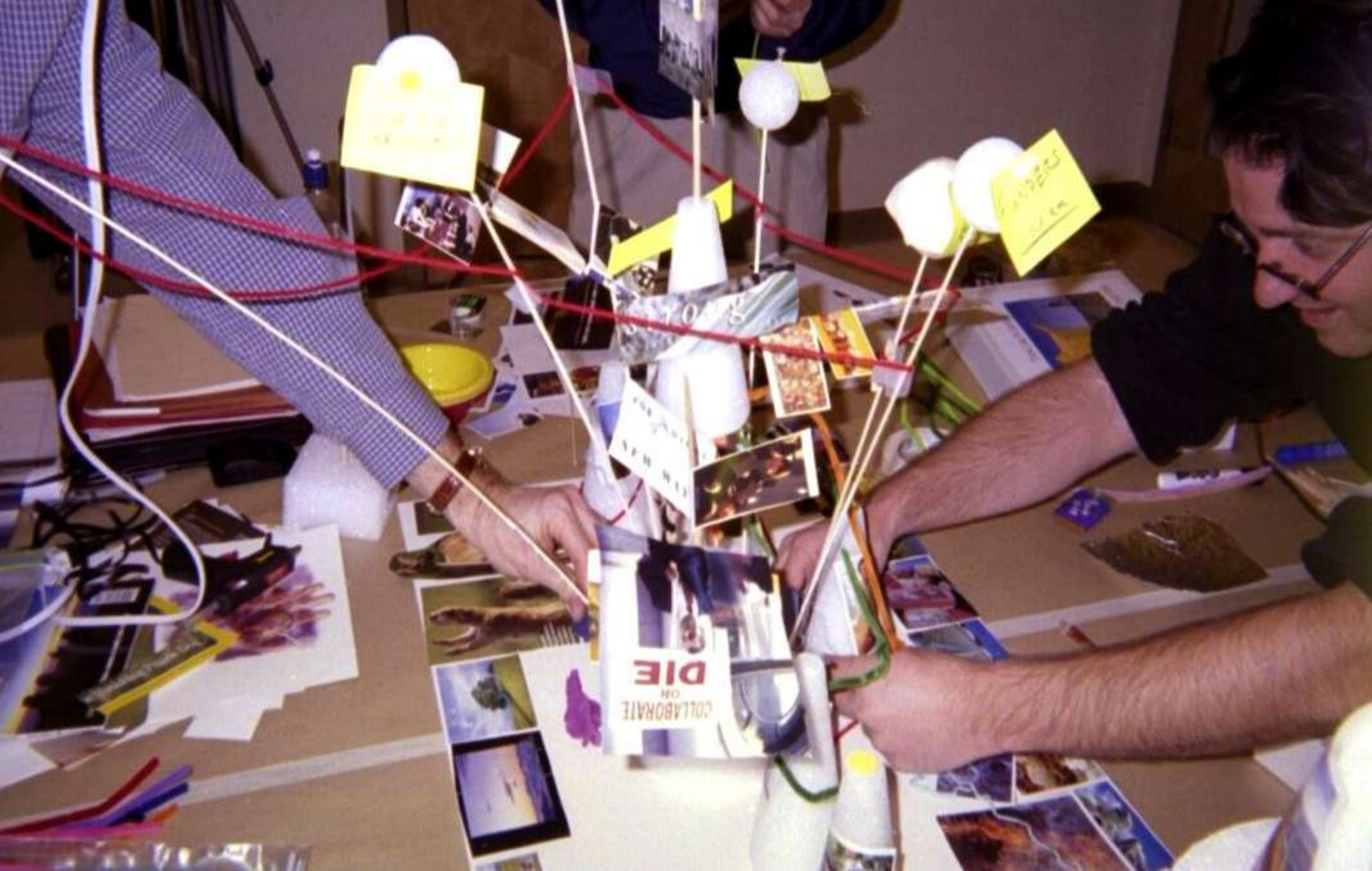


Everything is a Metaphorm! Everything human-made and nature-made can be connected to something else to create new meanings, purposes and uses. A symbolic model is an example of a metaphorm.

Metaphorming Workshop (Courtesy of Centennial Strategic Partners)

"Everything connects to everything else."
Leonardo da Vinci

Metaphorming refers to Methods and Apparatuses for Enhancing Affective & Cognitive Functioning and Its Manifestations into Physical Form and Translation into Useful Information



“The future didn’t just happen. It was invented.”

Will and Ariel Durant, co-authors of *The Story of Civilization*

"This book challenges the reader to think and perform on an inspired level. Siler's simple approach to individual 'genius' is the key to every great success story."

—Michael R. Bloomberg, CEO and founder, Bloomberg News

THiNK LiKE A GENiUS

The Ultimate User's Manual
for Your Brain

TODD SILER

"Siler's approach is simple, practical, fun, and most importantly, highly productive."

—Peter M. Senge, author of *The Fifth Discipline*

"*Think Like a Genius* is an excellent and practical guide for anyone who wishes to become more original in their thinking and to use creativity more effectively."

—Daniel L. Ritchie, Chancellor, University of Denver

LEARN THE EASY STEPS TO HARNESSING
THE INCREDIBLE CREATIVE POWER OF YOUR MIND
THAT CAN ENABLE ANYONE TO...

THiNK LiKE A GENiUS

- How you already think like a genius without even knowing it—page 5
 - The secret formula for genius: C.R.E.A.T.E.—page 22
- Ways to overcome the fear that inhibits the genius within you—page 58
 - How to transform the cynicism of *I can't do it* to the confidence of *I can do anything*—page 66
- Breaking out of mental ruts and daily routines that block your road to genius—page 76
 - How to turn the obvious into a work of art, a new insight, or a multimillion-dollar creation—page 92
 - Getting unstuck from the quicksand of indecision and procrastination—page 106
- The secret essence of every stroke of genius—page 164
 - And much more!

"An ingenious and useful tool for enhancing everyone's creative thinking."

—Mihaly Csikszentmihalyi, author of *Flow* and *Creativity*

AN ALTERNATE SELECTION OF BOOK-OF-THE-MONTH CLUB

Visit Bantam's website at www.bantam.com

Ballantine Bantam Dell Publishers

<http://www.penguinrandomhouse.com/books/167113/think-like-a-genius-by-todd-siler>

"An important reference tool for learning how to know what to know."
Ornette Coleman, jazz musician and composer

"Todd Siler gives us all the tools to be creators, not just in our lives, but of a vision worth striving for."
Jenette Kahn, President and Editor-in-Chief, DC Comics/Time Warner

"Read this book. Todd Siler has a great deal to teach all of us about the barriers to creativity and ways of overcoming them."
Stephan L. Chorover, Ph.D., Professor of Brain and Cognitive Sciences, Massachusetts Institute of Technology

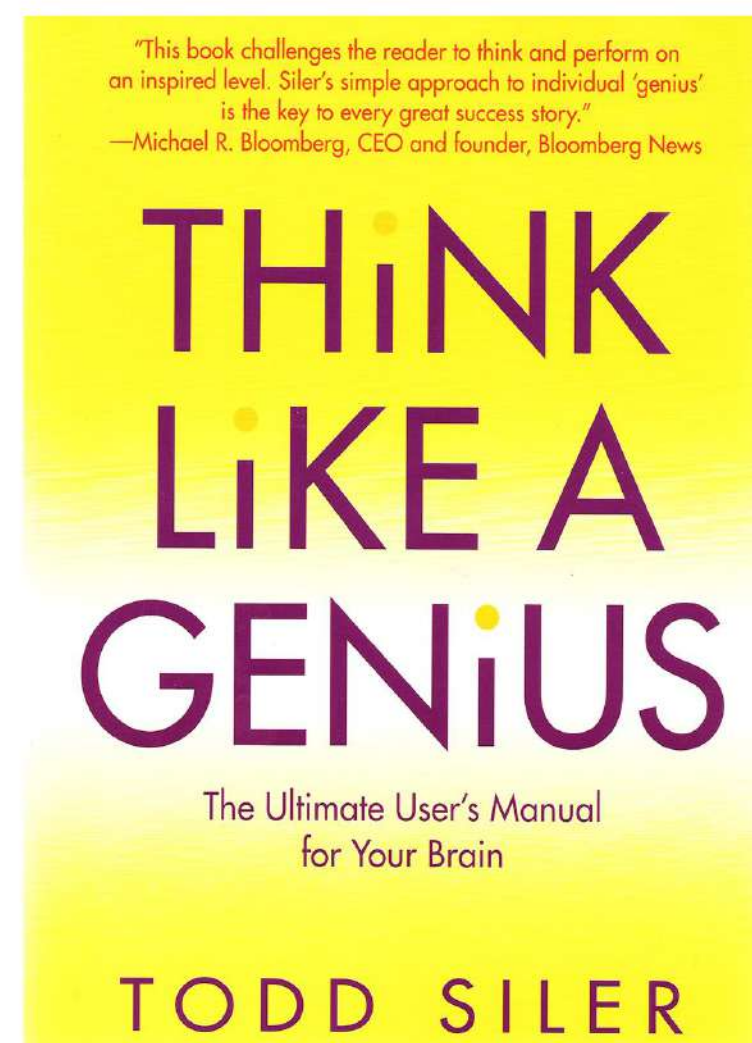
"Todd Siler's insightful book prompts us to look beyond the surfaces of our lives and work, to discover our deeper meaning, purpose, and contribution."
Mo Siegel, Founder and Chairman, Celestial Seasonings, Inc.

"This book offers hundreds of wonderful strategies for rethinking ideas and giving birth to new ones. It is a veritable library of fresh thoughts about the mysterious processes of invention."
Kenneth Snelson, artist

"Todd Siler's powerful book helps us touch and experience the heart of the creative process -- to know it intimately. He brilliantly shows us how to apply our imagination and knowledge to create a wealth of opportunities for improving our lives."
Lorin Hollander, concert pianist

"Todd inspires us to energize the least used talent of our brain: exceptional creativity, so readily activatable and rewarding."
Robert W. Galvin, Chairman of the Executive Committee, Motorola, Inc.

**Partial list of For-profit and Nonprofit organizations that have used facilitated
Metaphorming® Workshops and Think Like a Genius® Process**



(Bantam Books, 1997)

Ballantine Bantam Dell Publishers

<http://www.penguinrandomhouse.com/books/167113/think-like-a-genius-by-todd-siler>

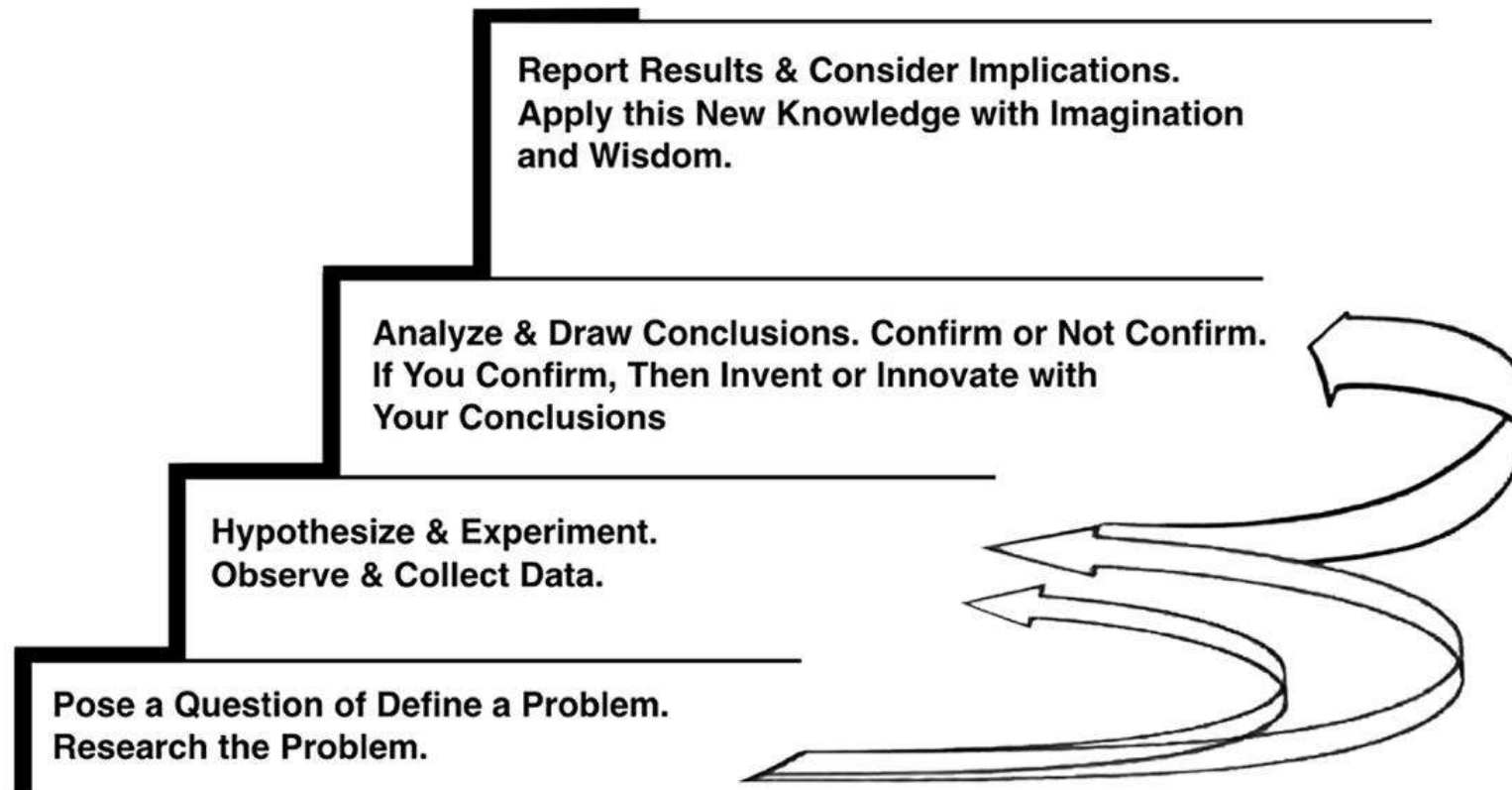
"Creative artists can rarely express what is at the root of their genius. Todd Siler is an exception: his concept of metaphorming is an ingenious and useful tool for enhancing everyone's creative thinking."
Mihaly Csikszentmihalyi, Author of *Flow* and *Creativity*.

"A rare combination of scientist and accomplished visual artist, Todd Siler invites each of us to rediscover the scientist-artist in ourselves. Siler's approach is simple, practical, fun, and most importantly, highly productive."
Peter Senge, Author of *The Fifth Discipline: The Art and Practice of The Learning Organization*

"These are insights of a genius into the methods of all genius. Todd Siler convinces us, with a breezy, easy-to-digest profundity, that we plain folks can apply these methods to free us to be the best we can be. That's ingenious." Larry Merchant, television commentator and author

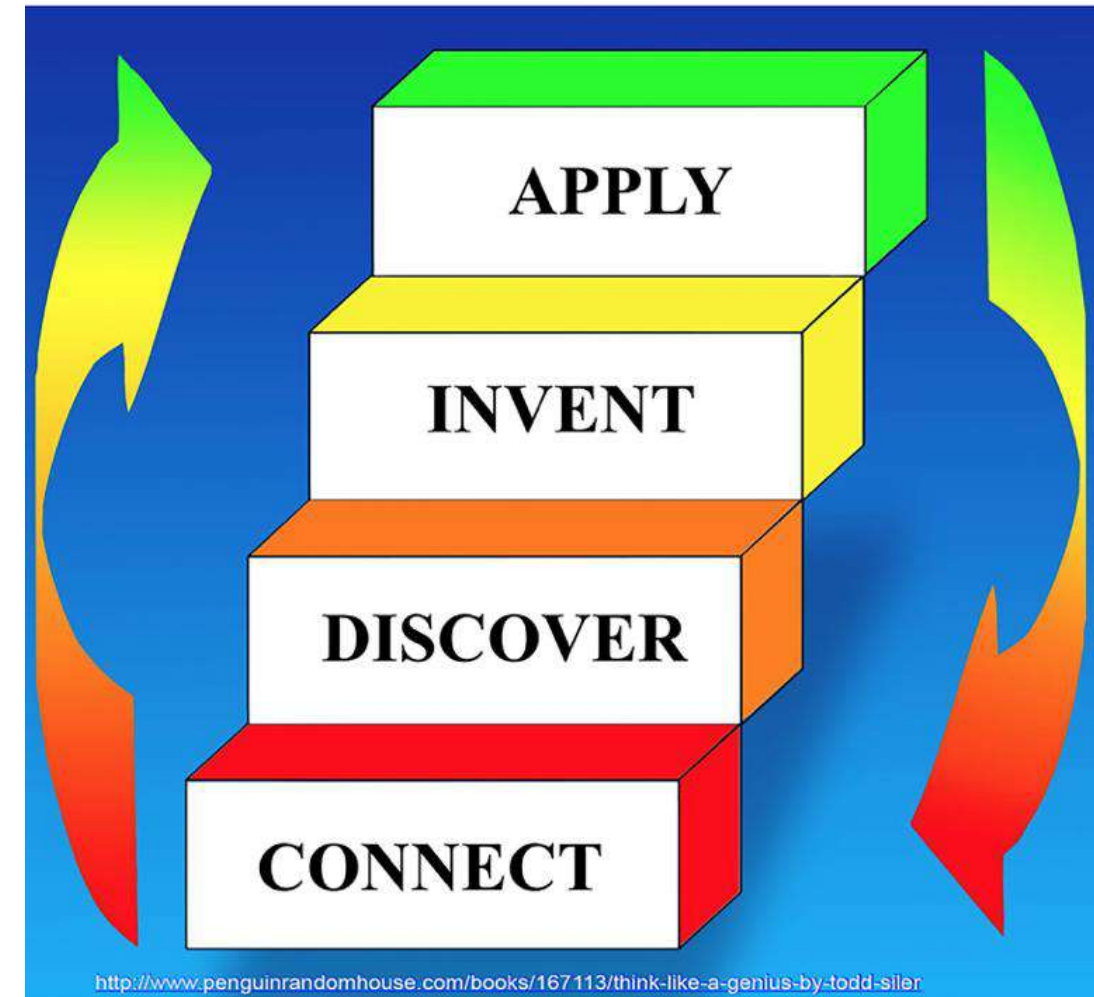
"Todd Siler's book may at first glance appear to be a 'How-To' Guide for those who wish to 'think out of the box'... It's much more! It's a tool for creating a more thoughtful box-less world! The insights in this book are invaluable. Todd is a genius and, in this book, he shares some of his 'trade secrets' with mere mortals like myself."
Dave Master, Training Manager, Warner Bros. Feature Animation

The Scientific Method



As the arrows suggest each step overlaps and is dynamic, nonlinear and interactive

The ArtScience Method



Metaphorming

Inspired by the most all-purpose, useful “generalization” of creative inquiry over the past 500 years (The Scientific Method), The ArtScience Method is open-ended, liberating and involves an experiential learning system. It accommodates a spectrum of styles of self-learning, self-discovery, self-expression and one’s use of potentially all symbolic languages. Moreover, it utilizes both arts-based and science-based methods and tools for inquiry and discovery, in order to generate and explore ideas, concepts, hypotheses, theories, as well as inspire innovative thinking and innovations.

Metaphorming begins by making
a Connection...and a Discovery.

It ends with an Invention
or Innovation...with
many Applications.

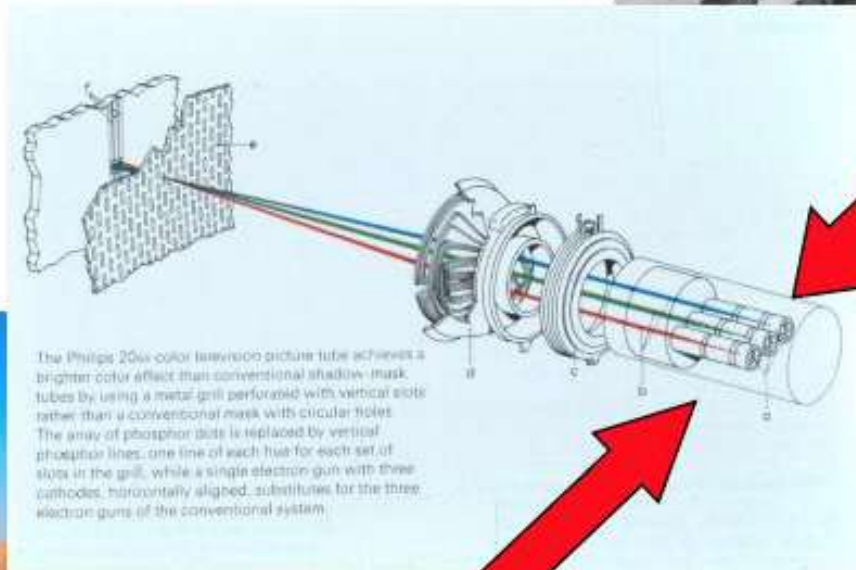


APPLICATION
(Applying your invention)

INVENTION
(Inventing something)

DISCOVERY
(Building on your discovery)

CONNECTION
(e.g., Seeing a pattern in nature)



(The true story of American inventor Philo Farnsworth's 1927 invention of fully functional all-electronic image pick up device (video camera tube) and all-electronic television system)



Todd Siler
Adventures in ArtScience
July 11 - November 9, 2007

Todd Siler

Adventures in ArtScience

July 11 - November 9, 2007



Breaking the Mind Barrier, 1985-1987



States of Mind, 1985-1987

There's a revolution underway that's uniting the creative powers of the arts and sciences to realize human potential. It's a revolution in understanding and communication. It's a revolution in innovation that aims at removing the barriers between our compartmentalized knowledge, professions and endeavors thereby enabling people to exchange ideas more easily and effectively. It's a revolution in possibilities that's producing new technologies, which allow us to collaborate in unprecedented ways across space and time. It's a revolution in knowledge creation and sharing that's empowering us to freely transform the world of data-information-knowledge-wisdom into new and personally meaningful, purposeful and useful things.

"ArtScience" is the name I call this burgeoning revolution that's been many thousands of years in the making. I coined this word a few decades ago to describe the process by which *art integrates science* and vice versa, in its adventurous acts of creative seeing and critical thinking that underlie inventing and discovering. This process strongly resonates with the spirit of the Italian Renaissance. That milestone in aesthetics and applied knowledge is most widely associated with the whole enterprise of integrative thinking and this unique synthesis of art-science-technology.

Adventures In ArtScience explores the power of integrative thinking that flows from art's natural partnership with science. It opens our minds and expands our vision of the arts and sciences leading role in tapping every human being's creative potential.

Today, art and science are seen as creative ways of knowing the world and representing what we know. Their similarities exceed their differences. Both foster openness and skepticism. Both form the foundations of knowledge and the paths to wisdom. Both show us how to explore and analyze what we are seeing; how to search life for meaning, and create meaning through our searches. Both enable us to express ourselves and communicate our tacit and explicit knowledge. Both encourage us to boldly reach with our imaginations in creating and sharing new knowledge through adventuresome collaborations.

Adventures In ArtScience builds on that basic, higher awareness to see the bigger picture of life and to understand how the complex parts of life's systems work as a whole. The mixed media drawings, paintings, sculptures, and visual documents of art installations all explore new ways of combining the complementary forces of the arts and sciences to foster innovation and promote understanding.

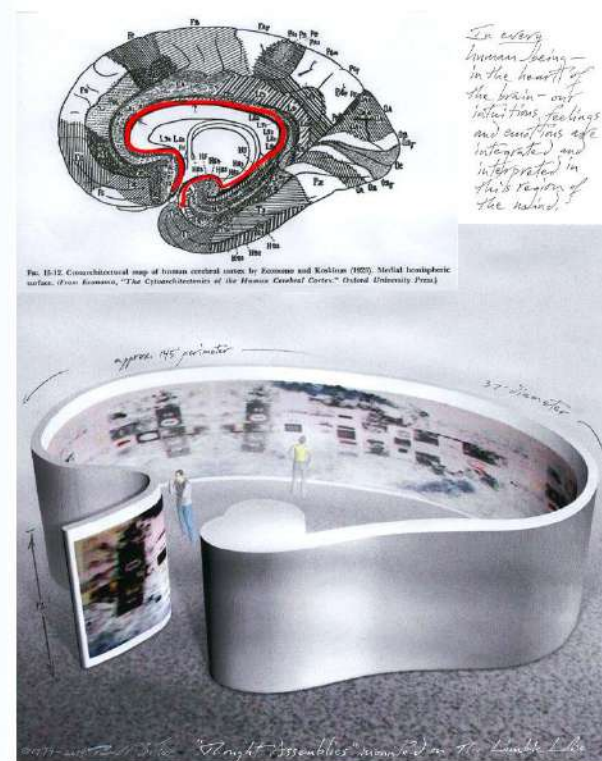
Each artwork shares my search for a deeper understanding of the world within and around us. Each challenges us to question everything we know about art and science, and everything we envision they can be with free minds and liberated imaginations.

This exploratory exhibition shows many views of the arts and their seamless integration with the whole of life.

It reaches for fresh insights into nature, life and reality—insights that are applicable and relevant to everyone's life.

Heeding “the call of the wild”—the innovative spirit of the 20th Century visionary artist, architect, inventor, engineer, and humanitarian, R. Buckminster Fuller—**Adventures in ArtScience** urges us to do one thing first above all: “Start with the universe. Any sub-categorization of it is arbitrary,” as Bucky once said. To which I would add: Start with the universe of the brain.

The metaphorical imagery of my artworks considers how the human brain transcends all categorical descriptions. The brain exists without barriers other than

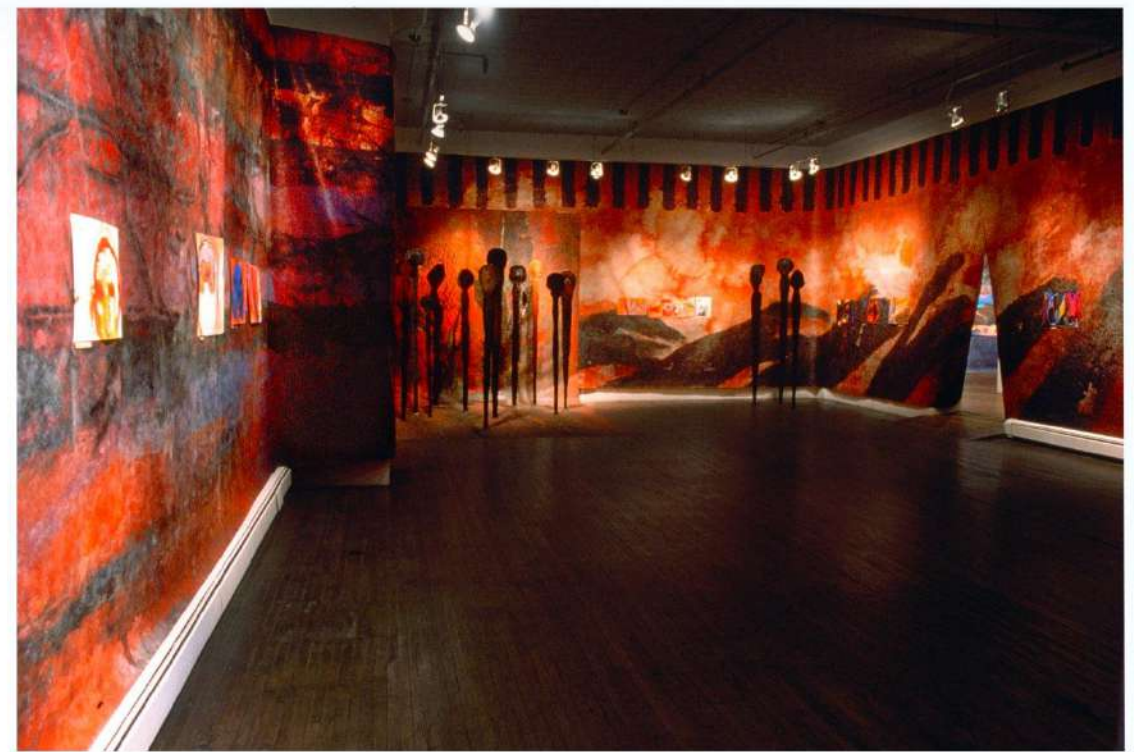


Thought Assemblies, 1979-1982
Installation drawing

our self-imposed ones. Inside its borderless world, bold ideas about the unity of nature form freely before they're expressed in some physical way through our symbolic creations.

"Look inward to see outward," the French Symbolist painter Paul Klee advised us in his books, *Nature of Nature* and *The Thinking Eye*, that foster creative critical thinking. "Let us develop: let us draw up a topographical plan and take a little journey to the land of better understanding," Klee wrote and then choreographed through his telltale lines of life.

That's what the artifacts of **Adventures In ArtScience** do: they take us on journeys into the center of our minds—taking us deep into the wilderness of creativity through cathedral forests of wonder. They offer an insider's view, so to speak, of the creative process, interpreting how our minds are connected to everything we create.



Radical Futures, 1993



Thought Assemblies, 1979-1982



Launching the Future of Innovation

On October 12th, 2013, in the soaring and light-filled atrium of San Diego's Art & Space Museum in Balboa Park, the Art of Science Learning launched its first Incubator for Innovation.

[Read More](#)

Chicago Incubator



Museum of Science and Industry

Worcester Incubator



EcoTarium

San Diego Incubator



Balboa Cultural Park

Art of Science Learning Exhibit



We're showcasing projects from all three incubators interactive experiences were visitors use the arts to spark ideas & solve problems.

Touring the U.S. in 2016

Phase 1



[Click on Videoclip](#)

CRITICAL THINKING

observation
empathy
pattern analysis
spatial manipulation

IDEATION

Improvisation
brainstorming
more ideas
unique ideas
disruptive ideas

artofsciencelearning.org/phase2-research-findings

COMMUNICATION

storytelling
drama
scenarios & personas
audience awareness
self-awareness

COLLABORATION

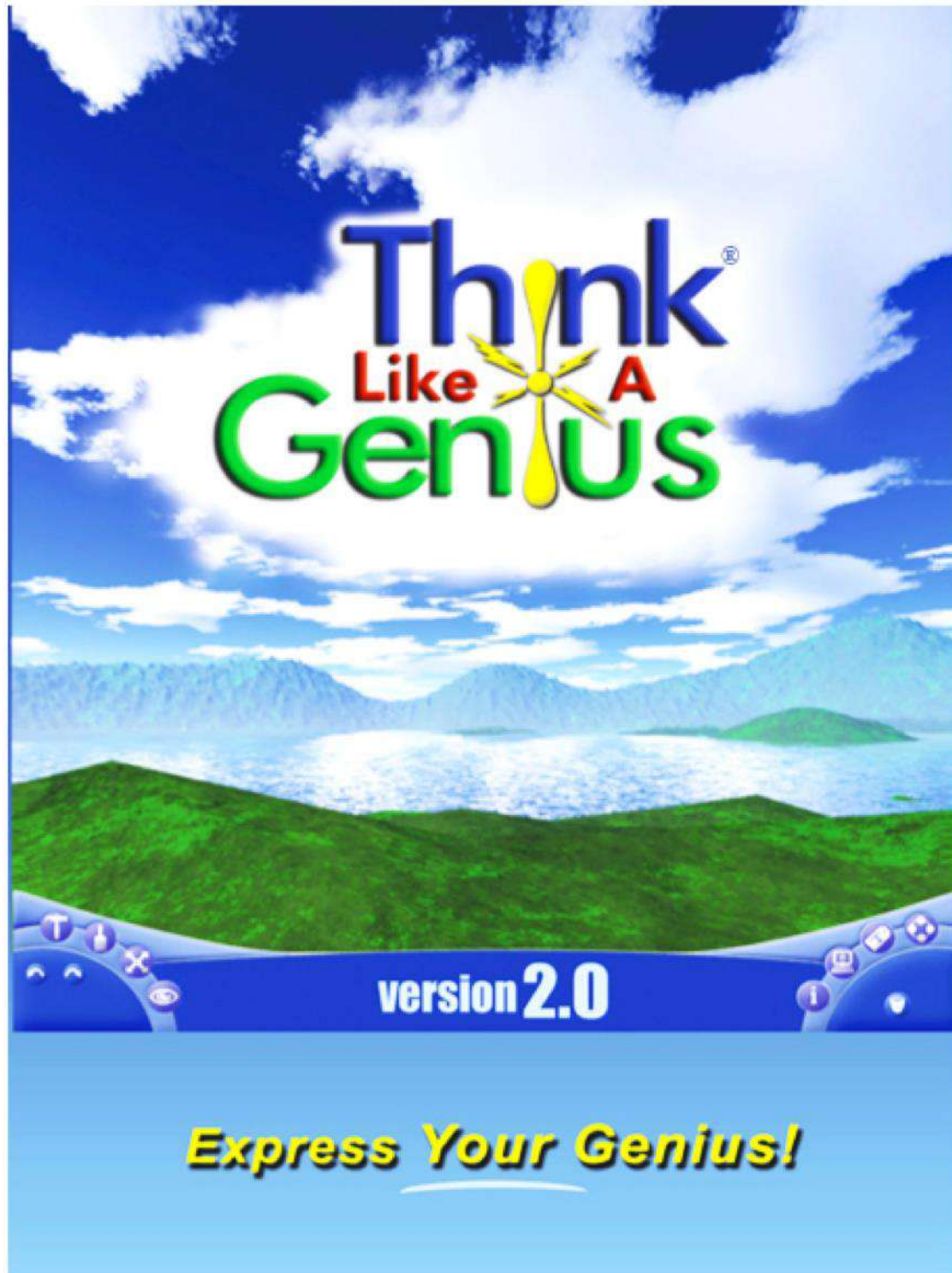
teamwork
flexibility
adaptability
process awareness
tolerance of ambiguity

Metaphorming:

Next Generation of Brainstorming Tools

Show-and-Share Ideas & Solutions To Global Challenges





Think Like a Genius software v2.0 enables everyone from ages 10 and up to discover and express their creativity in exciting, playful and productive ways. This versatile **3D Brainstorming tool** allows you to **create anything you want**—visualizing, communicating and sharing ideas, feelings, and opinions through the symbolic models you create. The models can be used for both personal or professional purposes. The software also serves as **an alternative to PowerPoint**.

- * **Make exciting, dynamic presentations;**
- * **Express your ideas, dreams and goals;**
- * **Invent, innovate and problem-solve;**
- * **Create 3D Visual Journals, Graphic Organizers, Mind Maps;**
- * **...and anything else you can imagine, including showing and sharing solutions to problems we all face.**

Note: The Think Like a Genius® software is based on and derived from Dr. Todd Siler's ArtScience® process of "Metaphorming," which fosters invention, innovative thinking and collaborative learning.

The software runs on a current Windows OS 10 machine. There is a unique **Activation Code #** for each copy that needs to be unlocked, In order for the software to work. Please send the Key # to this email address (toddsiler@alum.mit.edu), so we can unlock this "gift" and you can freely use it!

Make an object that represents your thoughts and feelings in response to this question:

“What’s the most urgent problem in the world today and how would you solve it—using your passions and interests?”

Think Like a Genius® (Metaphorming) software 2.0 A “Creative Operating System.”

This innovative design provides a wealth of opportunities and applications for real-time, network-based, collaborative, 3D modeling environment that everyday people can use as an expressive communications and creativity tool with global reach. It’s a “vehicle of imagination” that can be driven by *any* curious mind who feels it wants or needs to go to pursue one’s dreams and goals, Or simply: To relax and play again until you decide, again, whether to do one of four things: Express, Create, Communicate, and Collaborate—all at once!

The Work

What earlier ArtScience works were most impactful to me—inspiring me to continue my exploration for 50 years?

ArtScience

Catalyzing & Cultivating Innovative Thinking

Todd Siler

ArtScience® Adventures, Explorations, Productions 1975-2026



Breaking the Mind Barrier: The Symmetries of Nature (1985-86) in *Todd Siler Art of Thought*. Mixed media on synthetic canvas, steel cylinder with photo strobe and audiotape, 9ft. 39ft. x 3ft. Installation view: Saidye Bronfman Centre, Montreal, Quebec, Canada



Todd Siler, *Metaphorming Minds: Envisioning the Possibilities of Nature* (1991), a limited edition artist's book and portfolio of 37 multi-colored serigraphs on Arches 300gm paper (each print 16in. x 24in.) and 18 off-set reproductions of Siler's artwork with text, published Old Jaffa Press, Jaffa, Israel. The handbound book is an edition of 100. The box portfolio contains the same number of prints and is an edition of 130.

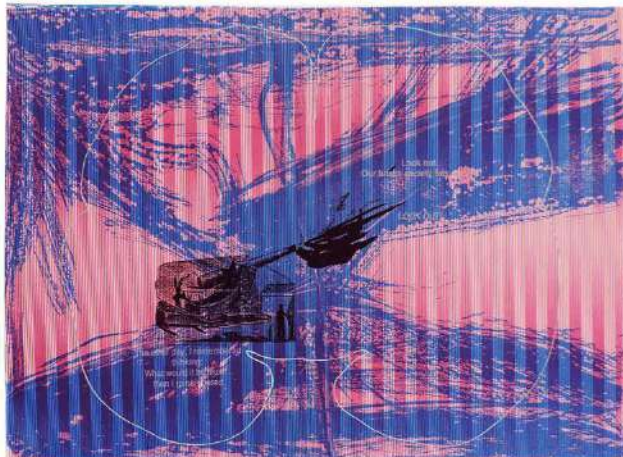
I had created during two of the most intense years in the history of the Middle East. When I embarked on this journey in January 12, 1991, threats of ss-1 Scud missile attacks on Tel Aviv jolted not only that raw region of the world, but also the fragile future of modern civilization. The visual notes, called "Possibilities," that fuel this soulful artwork are silent meditations on the ever-anxious state of the world. They prompt us to wonder where our global tribes of minds are heading in such a hurry, as we race towards an uncertain destiny. Here, the history of art mirrors the history of thought. And in this mirror reflection, we glimpse our collective preoccupation: groping to manage the ultimate "essential tension"—our conflicting passions for love and power.

In all our responses to terror there's always some pulse of promise and hope. That's core to the visual muse and narrative about the possibilities of human potential, which propels and implores us to dream of harmony, peace, prosperity, and excellence. In this artwork, waves of fearless positive thoughts wash over eons of turbulent emotions stirred by cynicism and agitated by doubt. Such is the churning seas of contemporary life... forever more.

The Artist's Book was featured in an exhibition at the M.I.T. Museum's "**50th Anniversary of the Center for Advanced Visual Studies (CAVS)**" (March 27, 2018 -- January 15, 2019), along with other artworks of mine. It is now part of the permanent collection of the M.I.T. Museum (Gifts of Edwin Prober and the Prober Family, Encino, CA). Also, a selection of "Mind Icons" from the folio are currently exhibited in *Mind Matters* at the Fulginiti Pavilion, Center for Bioethics and Humanities, CU Anschutz Medical Campus in Aurora, Colorado (September 12 -- November 21, 2019).



Mind Icon #1: "Influences"



Mind Icon #2: "Look Out. LOOK OUT!"



Mind Icon #3: "Building Communication"



Mind Icon #11: "Submerging Our Fears & Pleasures"



Mind Icon #10: "Exiting Plato's Cave"



Mind Icon #5: "No More Mindless Actions!"

Todd Siler Mind Matters

September 12 - November 21, 2019

Opening Reception
Thursday, September 12 from 4 - 7 p.m.

"Metaphorming Minds: Envisioning the Possibilities of Nature"
Discussion with the Artist and Exhibition Curator, Simon Zalkind

The Art Gallery
Fulginiti Pavilion for Bioethics and Humanities
University of Colorado Anschutz Medical Campus
13080 East 19th Avenue, Aurora, Colorado 80045
Tel. 303-724-3994
Map and directions at: www.coloradobioethics.org

Gallery Hours
9 a.m. - 5 p.m. Monday - Friday.
Free and open to the public.

 Center for Bioethics and Humanities
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS
Fulginiti Pavilion for Bioethics and Humanities
13080 East 19th Avenue • Aurora, Colorado 80045

Todd Siler Mind Matters

"I make art about the brain, and learn about the brain through art." - Todd Siler

The human brain is a biological construction of maddening, mysterious and elusive complexity. But as the neuro-scientific revolution has progressed, it has also become a cultural icon with symbolic and metaphoric associations providing a rich source of imagery and ideas for contemporary artists. Todd Siler is among the most ambitious and prominent among them. He produces, in a wide variety of mediums, extravagantly beautiful visual objects whose seductions are independent of their neural-scientific sources. However, at the center of his project is his multi-dimensional understanding of the centrality of the brain for all human endeavor and for the entire range of human experience and aspiration - aesthetic, emotional, philosophic, and environmental. The implications are staggering. As Siler states, "Every problem we encounter today is brain-related...created and resolved by this compact network of neural tissue that's perched on everyone's shoulder." In the process of organizing this exhibition, Siler and I have had many conversations about the philosophical, ethical, spiritual and affective dimensions of his assertions. Is the brain where the "I" abides? Are notions of free will, choice, empathy, love, imagination, "subjectivity," simply the consequence of genetically determined hard-wiring? - adaptations of the brain to respond to environment and experience? I hope that Siler and I will continue to argue and explore these issues together for a long time. They elude any easy resolution. However, when it comes to "cultural input" - the experience of art - Siler and I both agree that it is intimately fused in the deep labyrinths of the human brain. The assertion (fact?) that art has a solid biological foundation unites the views of modern neurobiologists with those of Michelangelo, Mondrian, Cezanne, Matisse - and Todd Siler.

Given Siler's strong foundation in cognitive and neural sciences, it's surprising to experience the fact that the works in this exhibition do not rely - as one might expect - on dazzling digital or technological manipulations. Siler is a polymath, and his art is informed by an astonishing level of sophistication in an enormous range of disciplines. However, his art-making techniques and his stylistic allegiances are refreshingly traditional. He paints on paper and canvas. He utilizes printmaking techniques that are centuries old. His sculptures are made of metal and function as discrete art-objects in a gallery environment. The calligraphic elements present in so many of Siler's works unite them to the notebooks of Da Vinci. His use of color and gesture can appear comfortably familiar in an art-historical context and suggest an oblique dialogue with so much of the art of the 20th and 21st centuries. Many Abstract Expressionist painters, for example, were also attempting to bypass the reigning philosophical logic that divides the mind from the embodied aspect of lived experience, looking instead towards the possibility of more integrated, holistic strategies for creating art - strategies that

restore us to the biological immediacy of sensation which becomes coherent when the brain assigns it meaning, utility and value. In Siler's art, science exists in a tangled relationship with beauty, and the power of his art is that that we can see this even if we don't always understand what we're looking at. These works emerge from his sustained observation within the methodologies of scientific research but also from his imagination - the brain, after all, contains the key to dreams. It would be surprising if the serious scientific study of art did not give us some insights into how the brain is organized. Conversely, as Siler demonstrates, the study of the brain provides substantial evidence that our appreciation of art - our responsiveness to "beauty" in general - can be correlated directly with activity in specialized areas of the brain.

In the May 1987 issue of *Artforum* critic Patricia Phillips wrote the following:

We all know that the human brain creates many marvelous and menacing things, but Siler's work transforms this fact into an idea of great consequence. He manages to evoke in us a palpable sense of wonder at the strange and delicate operations within the mind. The world does not exist independent of human cognition or symbolic activity. Siler's drawings and paintings do not suggest some a priori reality. He makes the idea of "world-making" visually concrete. He depicts through a recursive and additive vocabulary what others are just now attempting to describe.

As Phillips implies, Siler's art not only embraces and celebrates the natural sciences and their materialist framework but also suggests that our understanding of the "natural" is at the brink of a profound expansion. As far as I can determine, "science" is still far from providing a final answer to our deepest questions about subjectivity, love, consciousness/awareness, play, and the meaning(s) we attribute to the experience of being a being. Siler is a perfect narrator, host and guide here. His work strikes a terrific balance between pure visual seduction and a precisely informed knowledge of the exquisite capacities of the brain - an evolutionary triumph of neural engineering - to seek connection, creativity, discovery and the unifying capacities of imagination, of "wonderment."

Simon Zalkind, Curator

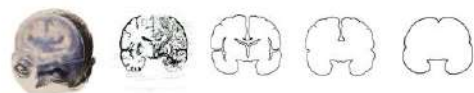
Artist's Statement

My art envisions the human mind as an embodiment of nature's creative process. It explores how the mind can connect everything it creates, producing new meanings and purposes for all things.
What's the most urgent global challenge today? Climate change? Or *changing minds*? Learning how we can change by adapting to our ever-changing natural and built environments? Actually, both depend on our understanding of the brain/mind-challenging the limits of our knowledge.
Everything we've created since the beginning of time is a product of the human brain and its creative process. How exactly, no one knows for certain. And yet, we intuitively know that every thing human-made reflects the brain's handwork.
Every thing, from concepts of "zero" to "infinity," from processes of Prehistoric Art to practices of Postmodern Art; from existential theories of "nothingness" to mathematical theories of "everything," from philosophies of peace to businesses of war, love and death.
Every problem and challenge we encounter is brain-related. Every solution and opportunity we create as individuals, families, teams, groups, organizations and nations are conceived by this compact network of neural tissue that's perched on everyone's shoulder.



Brain icon: *Peace of Mind Pacifying Aggression* (1990) White light hologram envisioning how the neural mechanisms of thought reflect the contents of thought. (Coronal section of the human brain at the level of the Thalamus.)

Every day, truth-seekers of all ages, cultures, backgrounds and perspectives search for insights into this infinitely puzzling "thinking tissue" that shapes and influences our lives. In fact, today we've boosted our capabilities by utilizing deep-learning thinking machines that aid human creativity, expanding the possibilities of our reality.
The brain beckons us to seek-and-see truths: to know ourselves as deeply as possible—as though our lives and future depend on it. Which they do. All the time.
Improving the state of the world and the human condition are "conditional." Either human beings care enough to learn how to learn, which includes practicing empathy by acting compassionately, or we accept the brutal reality of just the opposite situation: indifference, fear, ignorance, intolerance, and stupidity, which yield chronic conflicts and constant wars. Before we collapse. Again.
The first option is sustainable. The second isn't.
Ultimately, curiosity sparks creativity, enabling imagination to wonder: Will an open-mind always remain curious—imagining the possibility of anything while questioning everything?



The evolution of "Brain Icons," "Mind Icons," and relational "Metaphors."



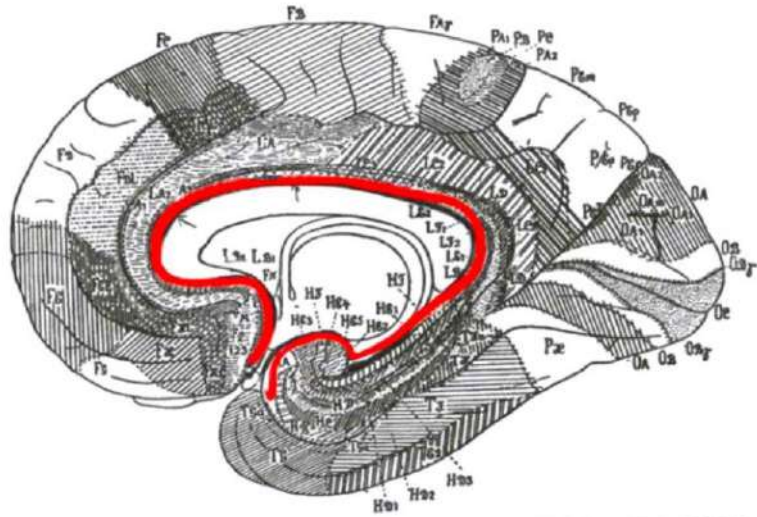
Mind icon: *Mirroring Beauty & Truth* (1995) Nambé metal alloy, 24" x 30" x 20"
(Coronal and Sagittal cross-sectional views of the human brain at the level of the Thalamus.)
The Brain Is What The Brain Creates. Its workings reflect the workings of all its creations.
The Mind Creates "Processmorphs": Things that are alike in process, but unlike in form or appearance.

What do we want
to evolve towards
as an intelligent species,

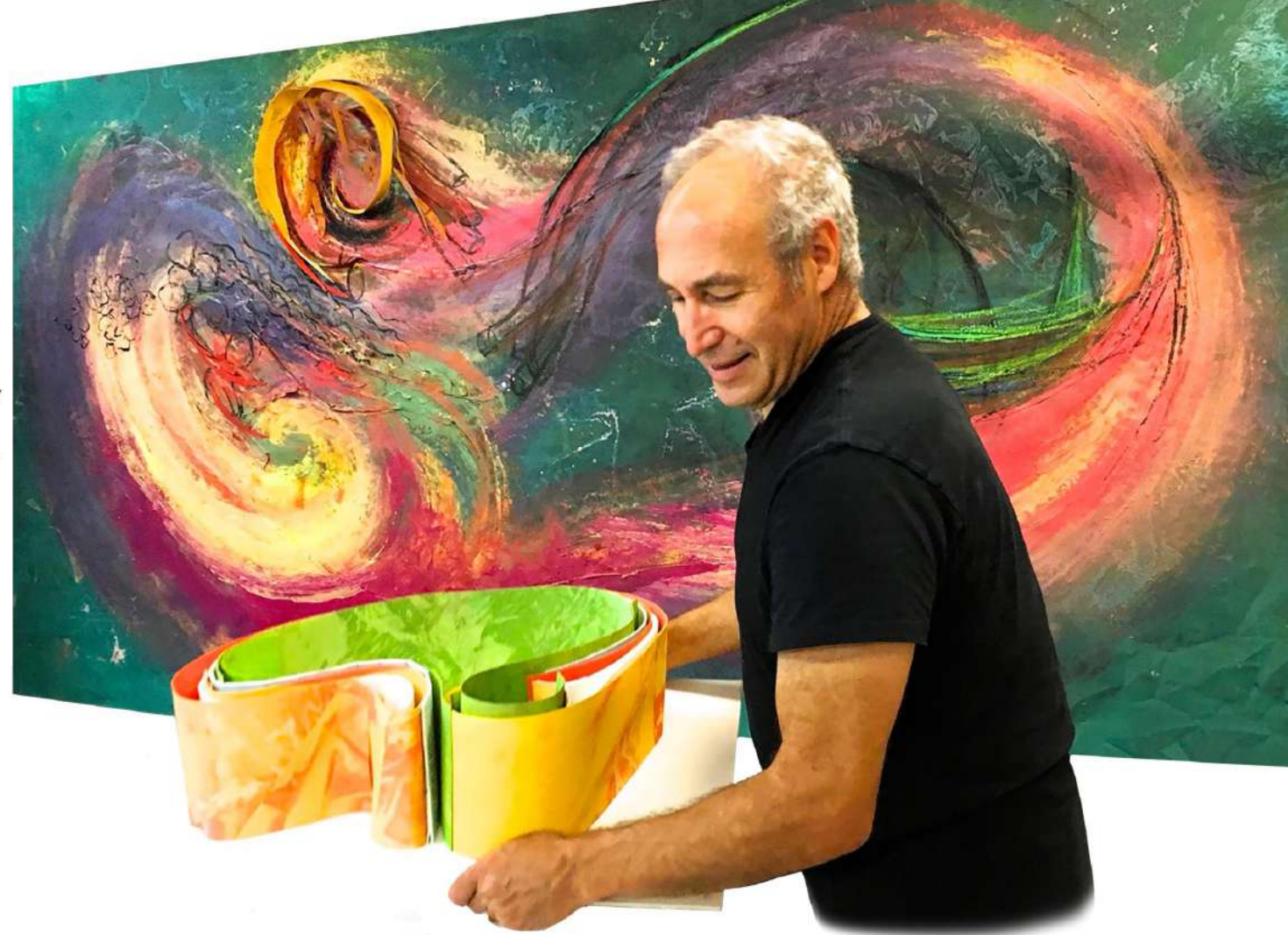
growing free
but directionless?

What do we want to be
as a civilization?

You mean, what do we want to become
when we grow up, when we mature?



In every human being — in the heart of the brain — our intuitions, feelings and emotions are integrated and interpreted in this region of the mind.



The Brain is an R&D Lab always open to wonder...with Imagination!

How is the human brain connected to everything it creates?

How are all of our creations connected to Nature?

How do the neural mechanisms of thought influence the contents of thought?



Todd Siler, **"The Big Bang of Consciousness,"** *Radical Futures* (1993) mixed media, 7ft. x 36ft. X 2in. Ronald Feldman Fine Arts, NYC

Metaphorming Nature

What Nature Makes
& What We Make
of Nature

CREATOR

CONNECTOR

CREATIONS



Universe



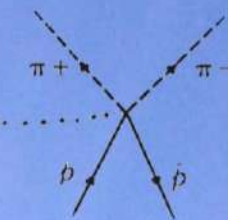
Examples



fusion reactors and reactions



fission reactors and reactions



particle accelerators

and other energy systems



View of Todd Siler's exhibition "Fractal Reactor: Re-Creating the Sun," 2006; at Ronald Feldman.

Todd Siler at Ronald Feldman

Todd Siler, both a scientist and an artist, turned the Feldman gallery into the inside of his head, or at least a lab log of sorts, for the run of his recent show there. The result had the slightly feverish, rather disheveled air of an enthusiastically installed school sized three-dimensional sections of his dream machine. The adjacent wall, covered in great sheets of black paper, resembled a blackboard scribbled over with silvery script. It was accompanied by drawings, such as a sphere pocked with numbered radiant circles representing oscillating fractal magnets.

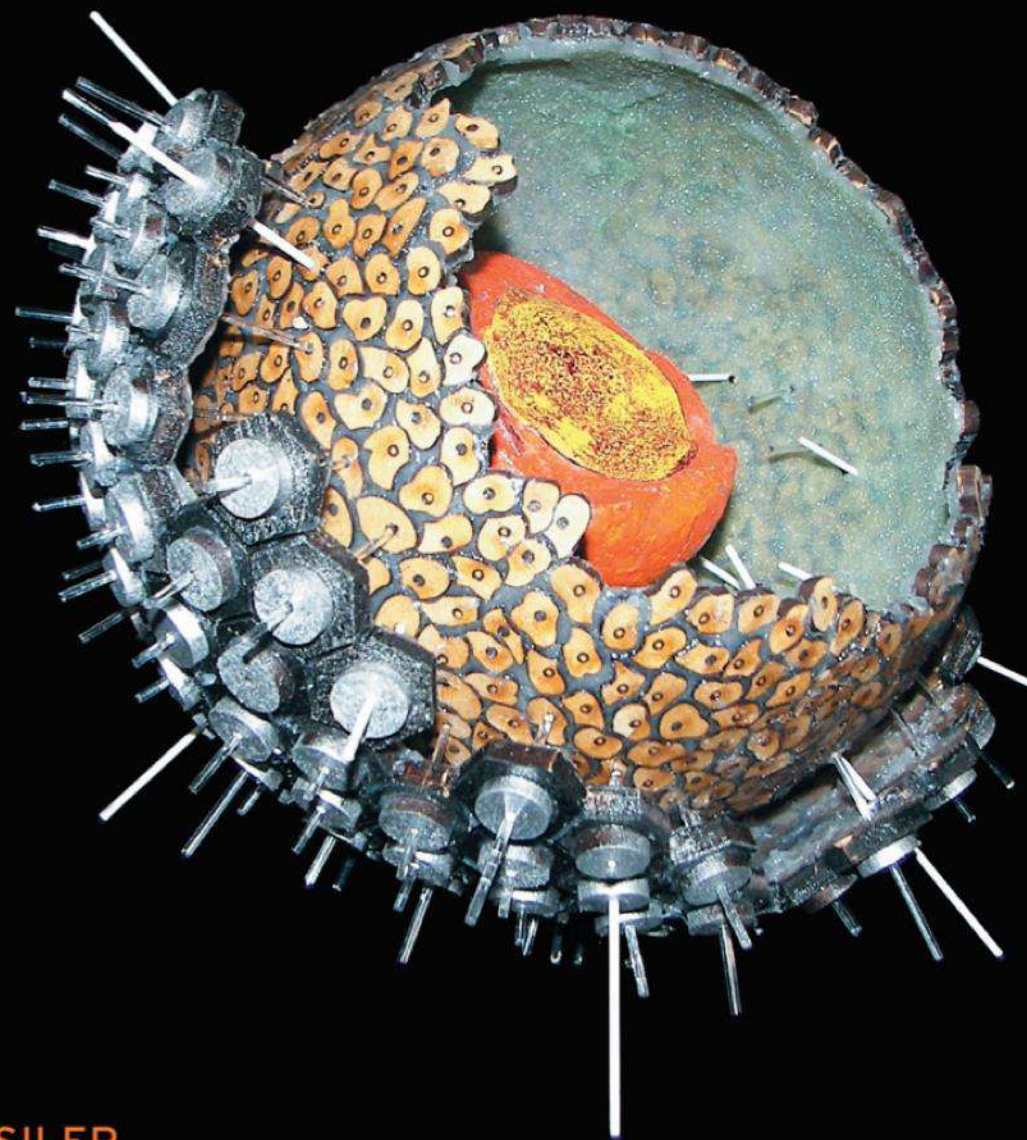
Another wall held four mixed-medium and collaged drawings depicting more fractal phenomena and annotated with handwritten hortatory quotes from Thomas Edison ("There is a better way. Find it.") and Jacob Bronowski ("The whole of science is the search for unity in hidden likenesses."). The titles included portmanteau words of the artist's invention, such as "metaphorm" and "simplexity."

There was a small, spherical model of the reactor (2000) that looked like a soccer ball cut so that the interior was revealed, and another more recent model that dealt with the device's nanotechnology. Siler has said that his fractal reactor can be made at any scale, from smaller than a pinpoint to mega-sized structures.

In another room, there was a video with nifty effects that explained once again—for the text-challenged—the science behind this effort. Here also, the walls were hung with many drawings. A few sculptural forms were suspended from the ceiling, including a wire tangle, *Anatomy of a Hot Plasma* (200 million degrees Kelvin), 2006, that seemed a cousin to Alan Saret's ethereal sculptures from the 1970s.

Essentially, Siler shows us how to begin to think about constructing a fractal reactor based on a thermonuclear fusion system, which he claims is more effective than fission because it is non-Euclidean and closely replicates the actual physics and geometry of a star. His system is efficient, clean and quite feasible, so it is much more economical than those it would replace. (Siler thinks he can build a functioning prototype for around \$10 million, which is much less than the cost of a nuclear reactor.) The unit is also self-sustaining once it reaches its break-even point, and it won't go into meltdown, so it is completely safe. This star system—unlike some others—does seem to be a better way. Certainly the premise is appealing, and so is the art, in a Buckminster Fullerish manner. But like all marriages, this one of art and science has its ups and downs. Maybe, though, Siler should run for president with Al (*An Inconvenient Truth*) Gore. I'd vote for them.

—Lilly Wei



TODD SILER

FRactal Reactor: RE-CREATING THE SUN SEPTEMBER 9-OCTOBER 7 RONALD FELDMAN FINE ARTS
31 MERCER STREET NEW YORK, NY 10013 212 226-3232 FAX 212 941-1536 FELDMANGALLERY.COM

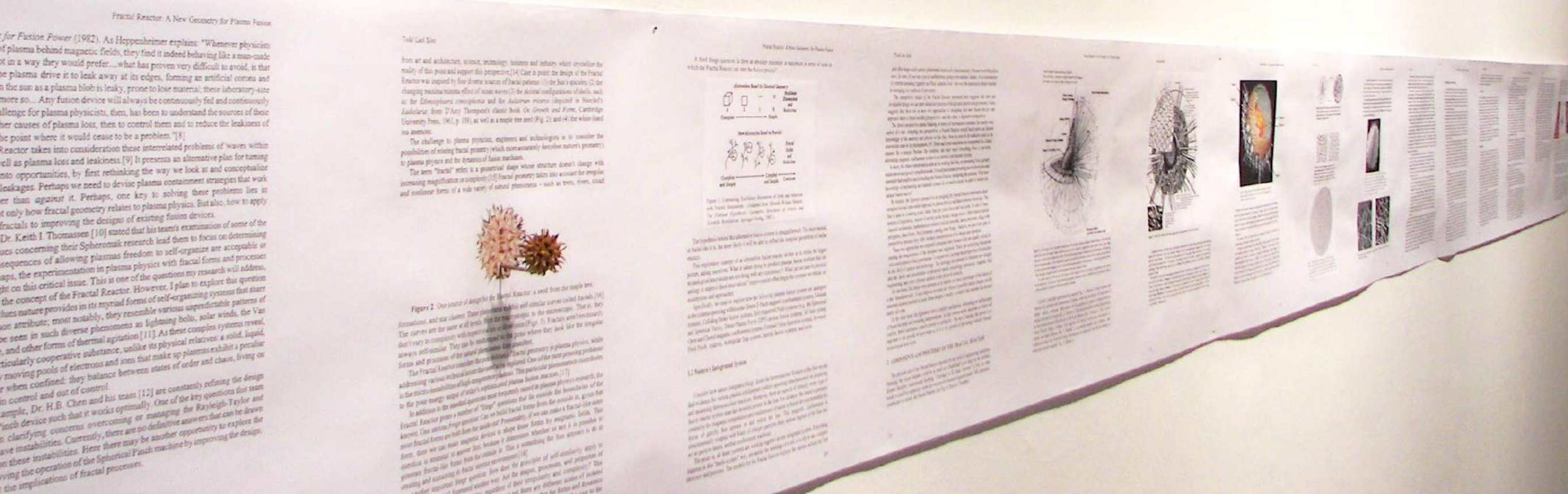
Full page advertisement in *ARTFORUM International*, September 2006



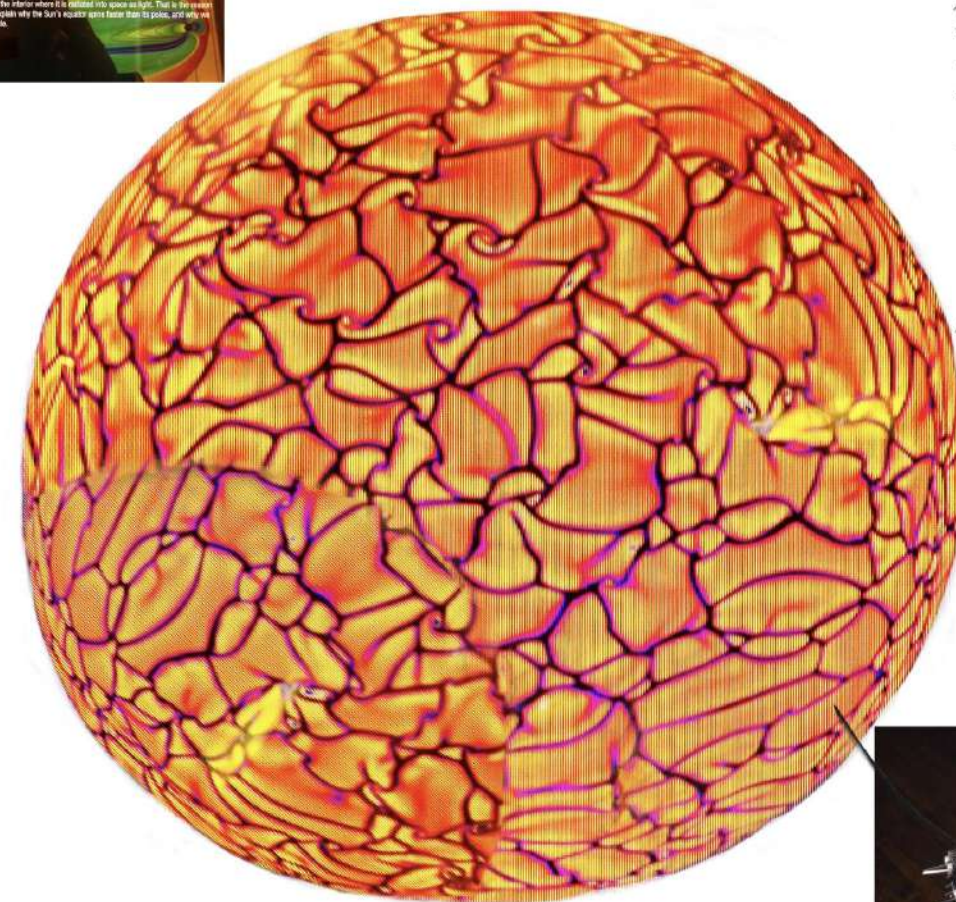
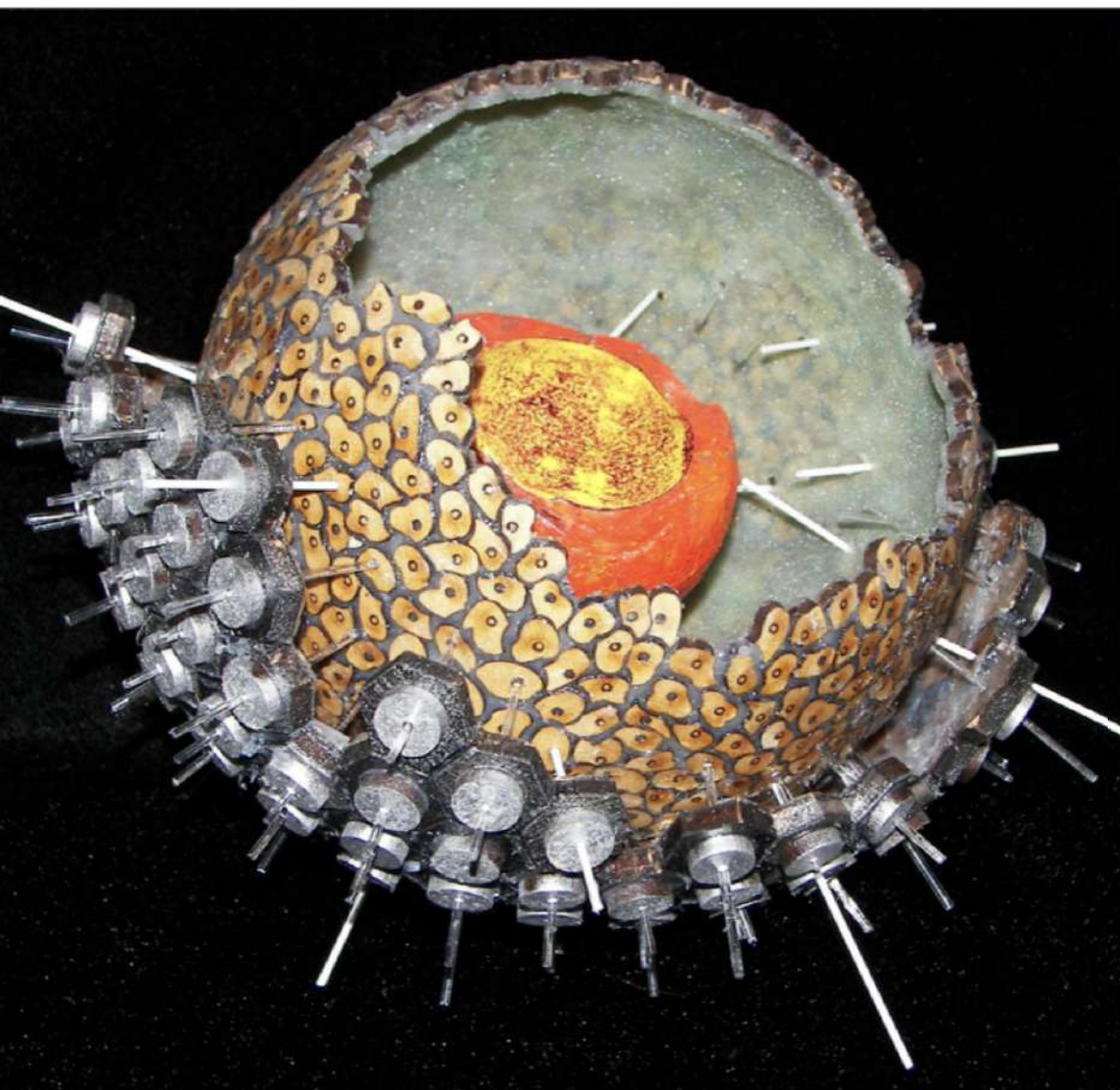
©Todd Siler, *Fractal Reactor: Re-Creating the Sun* (1996-2006) Ronald Feldman Fine Arts, New York, NY (Sept. 9 – Oct. 7, 2006)



©Todd Siler, *Fractal Reactor: Re-Creating the Sun* (1996-2006) Ronald Feldman Fine Arts, New York, NY (Sept. 9 – Oct. 7, 2006)

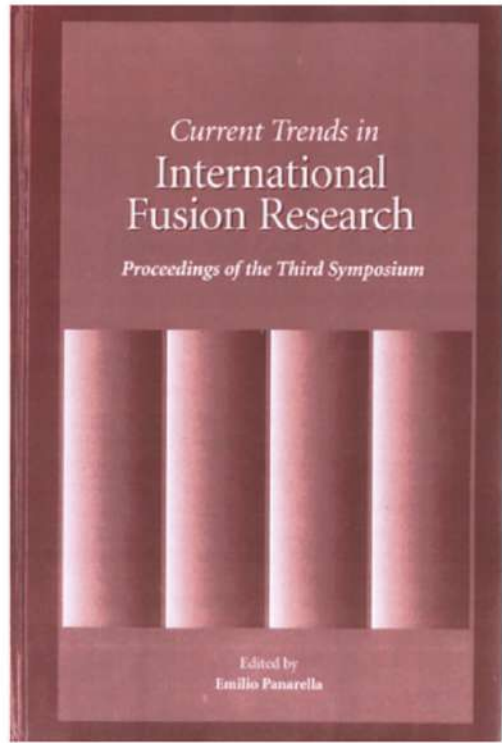


Todd Siler, **Artist's Conceptions and initial sketches for the Fractal Reactor** in my peer-reviewed concept paper, "Fractal Reactor: A New Geometry for Plasma Fusion," in *Current Trends in International Fusion Research – Proceedings of the Third Symposium*, edited by Dr. Emilio Panarella. (NRC Research Press, National Research Council of Canada, Ottawa); 18in.x 18ft.



Metaphorize it!
 What if Nature was showing
 us the blueprint for designing
 the fractal-shaped magnets
 needed to compress and contain
 hot, dense plasmas for
 generating and sustaining
 nuclear fusion, but
 we overlooked the clues
 to "the patterns" in our
 Solar Convection Models?
 You're looking at the template
 for the electromagnets(?) or
 superconducting magnets(?)
 of the "Fractal Reactor"!
 There they are! Designed by
 Nature, the "Mother of
 All Invention."
 Now, let's do what
 "Humanature" does best:
INNOVATE!

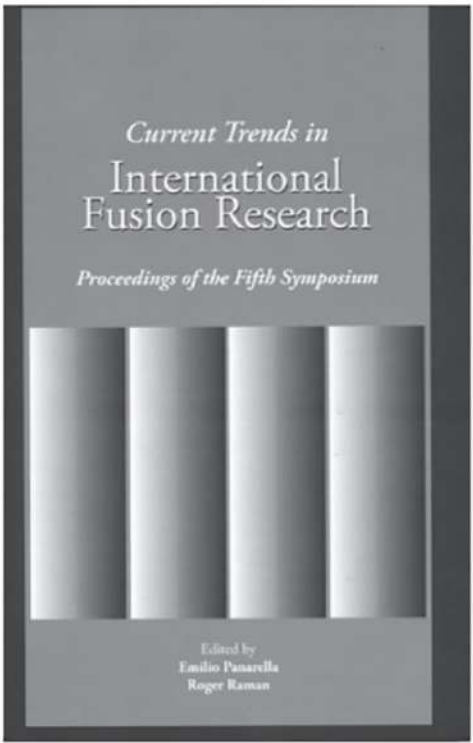




“Fractal Reactor: A New Geometry for Plasma Fusion,” Todd Lael Siler, in *Proceedings of the Third Symposium on Current Trends In International Fusion Research*, (pp. 105-120) edited by Emilio Panarella. (NRC Research Press, National Research Council of Canada, Ottawa, ON KIA OR6 Canada, 2003).



“Fractal Reactor: An Alternative Method and Apparatus for Plasma Fusion,” Todd Lael Siler, in *Proceedings of the Fourth Symposium on Current Trends In International Fusion Research*, (pp. 411-426) edited by Emilio Panarella and Charles D. Orth. NRC Research Press, National Research Council of Canada, Ottawa, ON KIA OR6 Canada)



“Fractal Reactor: An Initial Computational Model for An Alternative Plasma Fusion System,” Todd Lael Siler, in *Proceedings of the Fifth Symposium on Current Trends In International Fusion Research* [pp.289-312], edited by Emilio Panarella and Charles D. Orth. NRC Research Press, National Research Council of Canada, Ottawa, ON KIA OR6 Canada).



“Fractal Reactor: An Alternative Nuclear Fusion System Based on Nature’s Geometry,” Todd Lael Siler, in *13th International Conference on Emerging Nuclear Energy Systems*, [pp.239-246] edited by Prof. Dr.-Ing. Sumer Sahin, June 03-08, Istanbul, Turkey; ICENES 2007 Conference was hosted by Gazi University, Ankara and Bahcesehir University, Istanbul.



“Fractal Reactor: Re-Creating the Sun,” Todd Siler, in *Leonardo Journal of Art, Sciences & Technology* Vol. 40, No. 3, pp. 270-278 (The MIT Press).

The Friction

What major challenges did I encounter as the realm of “ArtScience” grows with complexity and implementation?

What ongoing challenges are we still struggling to understand and communicate to a worldwide public?



Todd Siler, *Radical Futures* (1993) Installation view: Ronald Feldman Fine Arts, New York, NY.



Radical Futures "The Rise and Fall of Civilizations Over Millennia" (1993). Mixed media. Courtesy of Ronald Feldman Fine Arts, NYC.



Todd Siler, ***Changing Minds*** (1997). Mixed media installation. Ronald Feldman Fine Arts, New York City



Todd Siler, *CHANGING MINDS*, Ronald Feldman Fine Arts, New York City, 1997



Beyond Conflict

A representation of how connection through art and science can move us through conflict and make sense of our life experiences.

Modern day conflicts are complex – they revolve around questions such as whose values are reflected in our society, what is equitable, who has power, and even what is true. If we are to make progress as a society on challenges such as climate change, food insecurity, water availability, or public health, then we need to find ways to collaborate and work across divides. A place where people can ruminate and debate. A place where debate doesn't turn into conflict. A place where conflict can be resolved. At the Institute, our work is about creating that place for productive dialogue and bridging divides in order to address collective action challenges facing our modern world.

It's okay to disagree, to debate, to want to go in different directions. What we want to avoid is the conflict that traps us in vicious cycles and stalls progress. "Conflicts are systems, a series of interlocking feedback loops that interact with each other. The forces are complicated and interrelated, like weather patterns. Which means that any change can affect the whole system, not always in ways we predict," writes Amanda Ripley in her book, *High Conflict*. Ripley then adds that the loops can be intercepted, and within those moments, we can find opportunities to disrupt the system. Perhaps find a new path forward, beyond conflict.

So how do we find those intercepts? Part of it is recognizing our own contributions, mindset, and emotions. We need to shift the focus away from us versus them. To stop the binary framing of issues as "either/or" and replace with "both/and" thinking. Thoughtful dialogue in a welcoming, inclusive space can also be a path toward preventing or overcoming conflict. But this must be done with intention, a collaborative process, and a goal of finding net advantages for all concerned.

Art can also be a useful way for reflection, connection, and a starting point for understanding. It allows people to find creative solutions to complex issues.

Todd Siler, a Denver-based artist, has a piece called, *History of Conflict Resolution*, now available for viewing at the Denver Museum of Nature & Science in the Leprino Family Atrium. Todd's work explores the nature of the human mind and creative process: how we think, create, learn, invent, innovate, and communicate. This piece, *History of Conflict Resolution*, represents how connection through art and science can move us through conflict and make sense of our life experiences.

There is no silver bullet for resolving or preventing conflict, but one hopes that we all try.

Kristan Uhlenbrock, Director, Institute for Science & Policy

Watch the artwork installation with commentary from Todd Siler.

Imagine how different our world would be if it were possible to prevent every feud from escalating into chaos, violence, and war. Imagine how much suffering and sorrow this prevention would spare us all, and help keep the peace. Art can connect everything and everyone in purposeful ways. Science can too, so brilliantly and powerfully! Both provide the means and tools to creatively inquire, discover, and build on evidence-based truths. They help enable us make sense of our unique life experiences and share them in productive ways that deepen understanding.

Todd Siler, Artist



The Institute for Science & Policy

A project of the Denver Museum of Nature & Science

The Institute for Science & Policy provides tools and forums for civil dialogue and scientific thinking around society's most complex issues. Scientists, policymakers, journalists, business leaders, and engaged citizens are encouraged to share perspectives online and in collaborative environments.

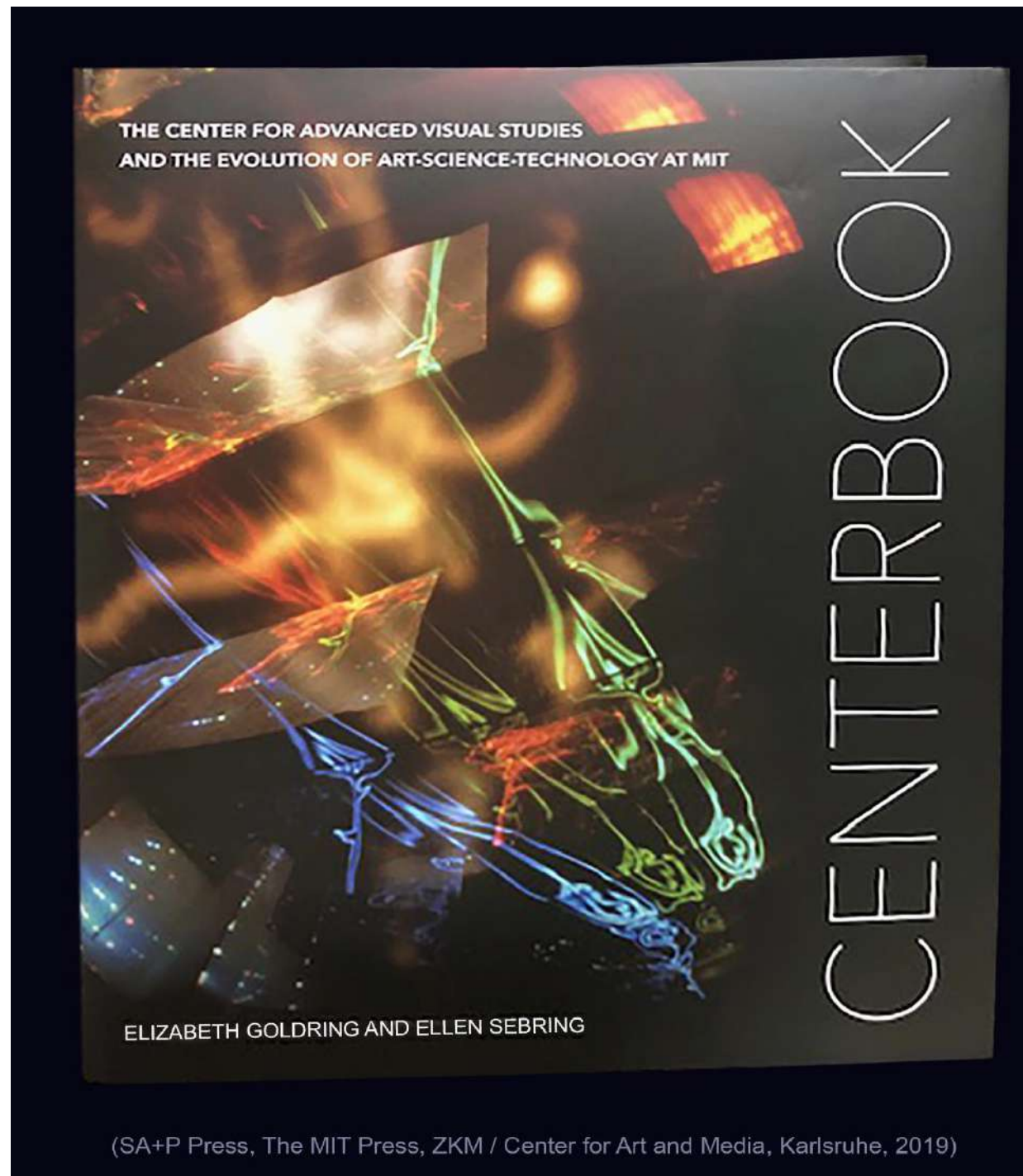
This installation offers one perspective on the roles of art and science in conflict resolution.

LEPRINO FAMILY ATRIUM



eself and the world, between oneself and others, and betw

Gyorgy Kepes, Founder of the Center for Advanced Visual Studies at M.I.T.,
pioneer environmental artist, and author of *The Education of Vision*



CULTIVATING ARTSCIENCE COLLABORATIONS THAT GENERATE INNOVATIONS FOR IMPROVING THE STATE OF THE WORLD

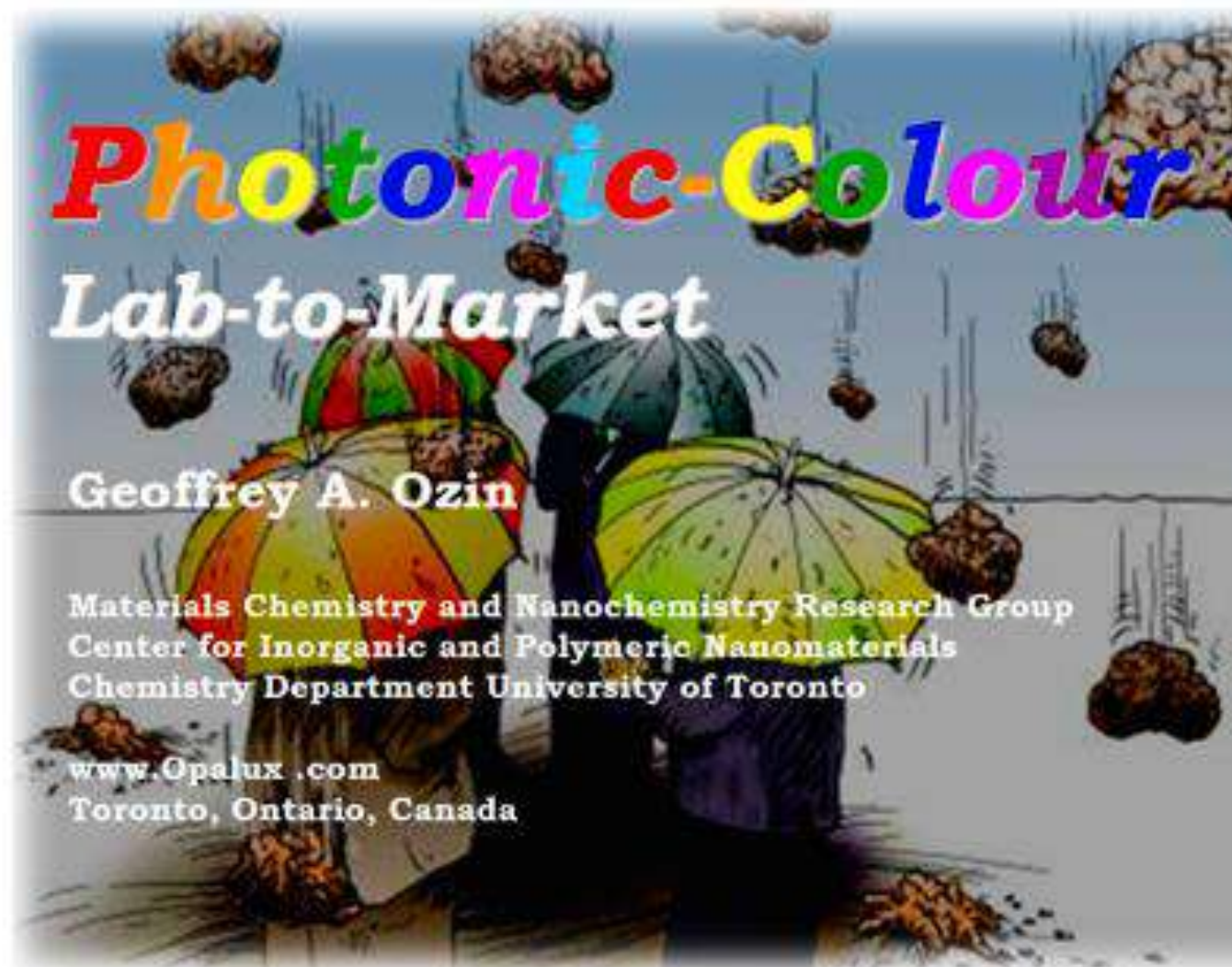
Todd Siler and Geoffrey Alan Ozin

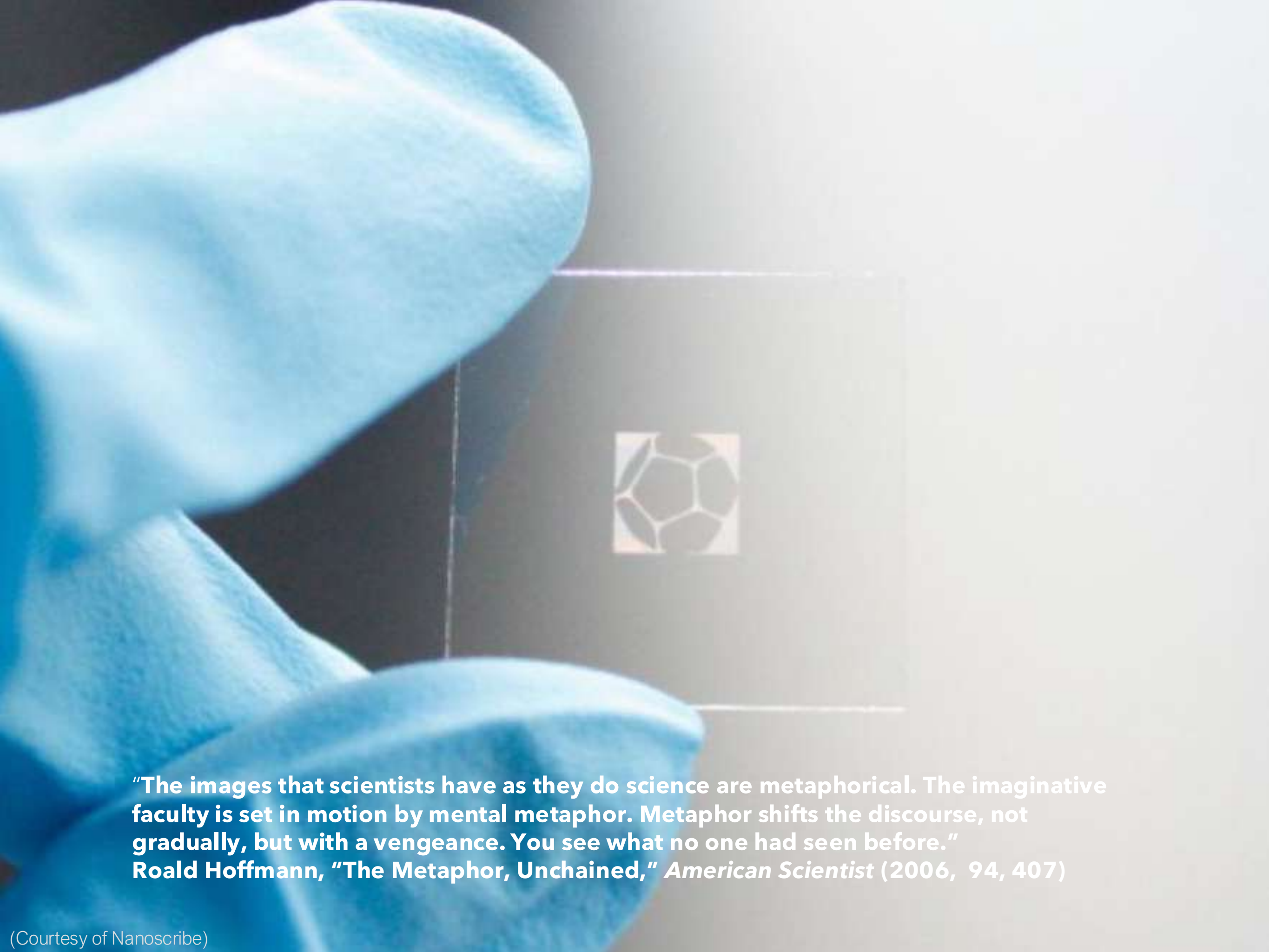
There's an art to catalyzing collaborations and a science to developing innovations that are naturally connected by the all-purpose process of creativity. This versatile process encompasses critical thinking, real-world problem-solving, discovering, inventing and innovating. The ArtScience collaboration described in this White Paper, the “ArtNano” Project, shows how two collaborators, a visual artist and a pioneer Nanochemist, integrate their exploratory work and empirical research using one-and-the-same process of creative learning and idea-generation. The ArtNano project considers the potential of numerous practical innovations in the field of Nanoscience and Nanotechnology that are designed to meet today's global challenges and our collective quest to invent a sustainable future. It also reveals the difficulties of communicating complex information to a worldwide public—in particular, the myriad strategies and technological means by which human beings ingeniously manipulate matter on an atomic and molecular scale to produce the smallest, multi-purpose functional structures and systems ever conceived. The collaborators reflect on their personal experiences conceptualizing the artworks for this project, providing some essential lessons learned from combining their complementary practices of connecting and transforming information (data, knowledge, ideas, concepts, theories, etc.). Additionally, they offer some recommendations for moving beyond common roadblocks to collaboration that form from self-imposed mental barriers, as well as our compartmentalized ways of knowing the world, and representing our knowledge.

“In December of 1959, the eminent physicist Richard Feynman described the future [of Nanoscience] in a groundbreaking talk about the physical possibilities for ‘making, manipulating, visualizing and controlling things on a small scale,’ and imagining that in decades to come, it might be possible to arrange atoms ‘the way we want.’ As an example of what would be possible, Feynman used physics to demonstrate theoretically that all of the accumulated information in all of the books in the world could be written ‘in a cube of material one two-hundredth of an inch wide—which is the barest piece of dust that can be made out by the human eye.’”

Preface: *In the Beginning There was Nano...*

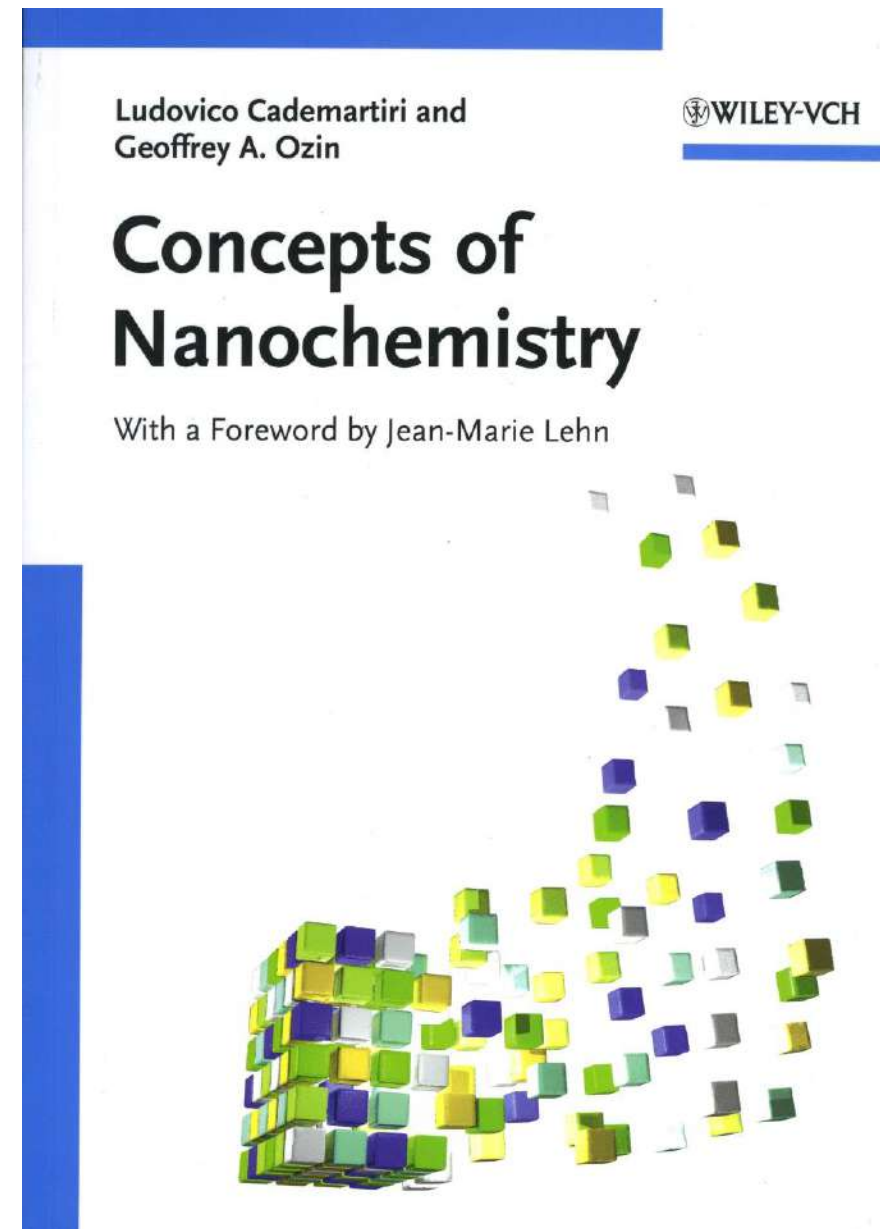
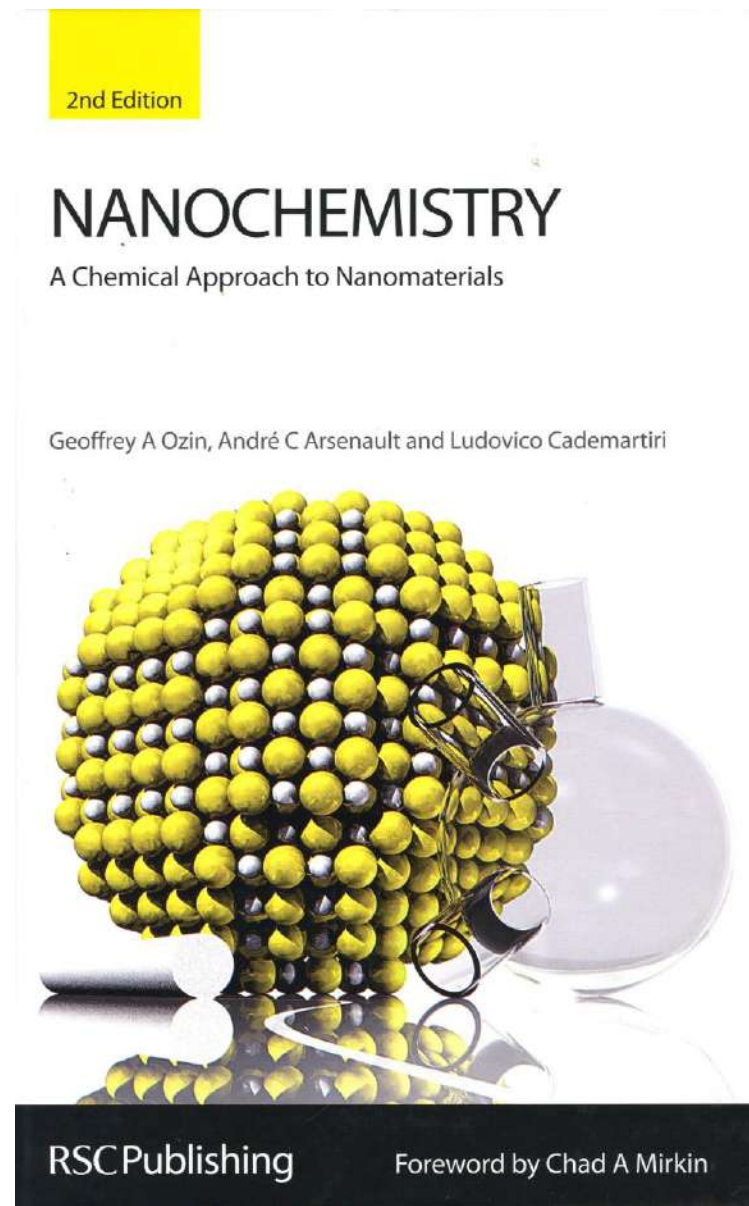
By Geoffrey A. Ozin, Andre C. Arsenault and Ludovico Cademartiri, *Nanochemistry: A Chemical Approach to Nanomaterials*. The Royal Society of Chemistry, 2009.



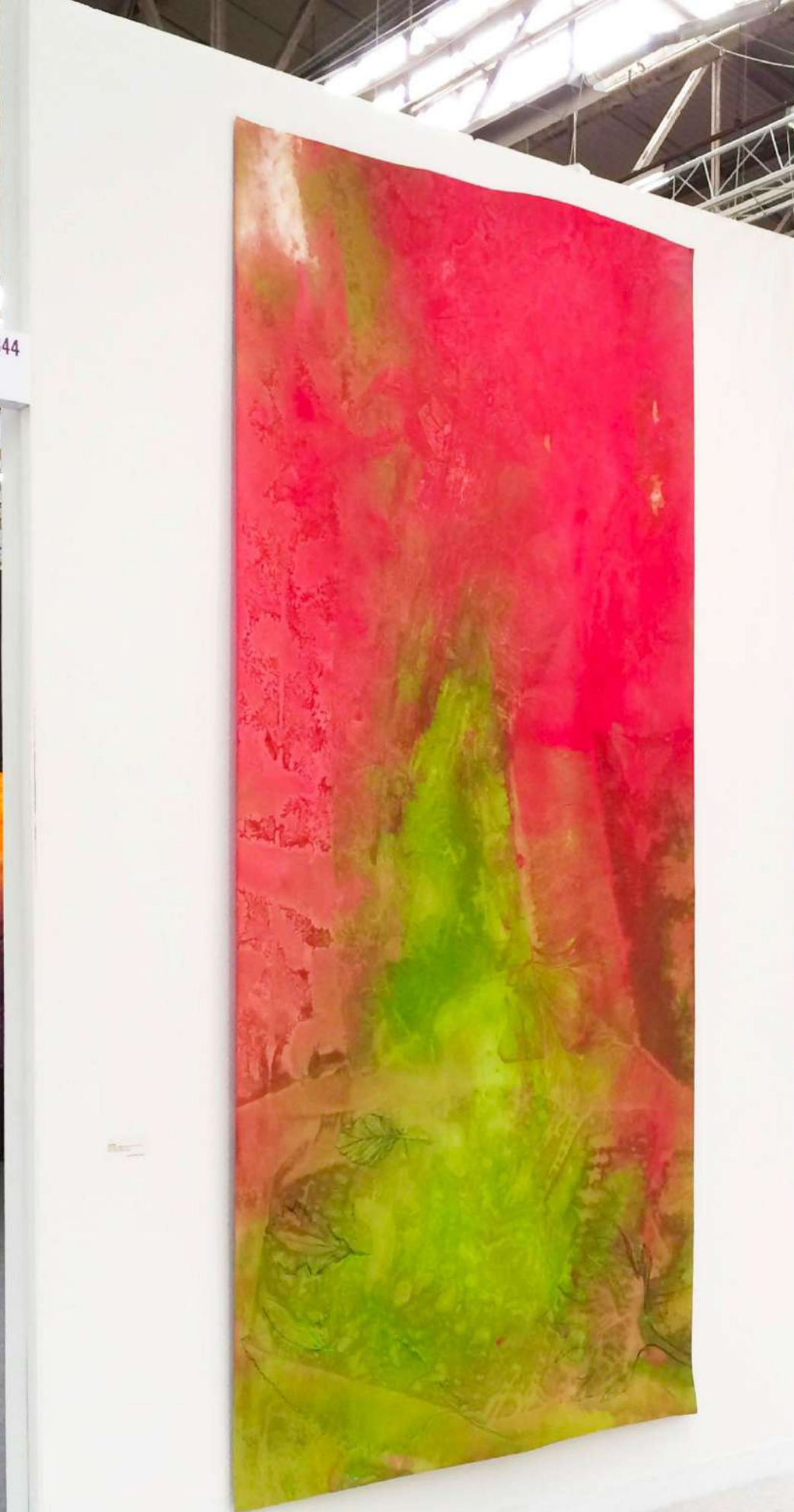


"The images that scientists have as they do science are metaphorical. The imaginative faculty is set in motion by mental metaphor. Metaphor shifts the discourse, not gradually, but with a vengeance. You see what no one had seen before."
Roald Hoffmann, "The Metaphor, Unchained," *American Scientist* (2006, 94, 407)

D'Arcy Thompson's ArtScience adventures in mathematical biology come to mind when reading pioneer nanochemist Geoffrey Ozin's descriptions of **six nano-concepts (size, shape, surface, self-assembly, degree of imperfection, and utility). These are used to produce four basic building blocks of nanomaterials (nanocrystals, nanowires, nanosheets, and nanotubes).** (Ozin, Arsenault, and Cademartiri, 2009; Cademartiri and Ozin, 2011).



In fact, this first textbook on Nanochemistry acknowledges the 'insightful 19th century research of Pieter Harting on synthetic morphology, Ernst Haeckel and D'Arcy Thompson on morphogenesis and Emil Fischer on the lock-and-key principle of molecular recognition,' to quote Cademartiri and Ozin (2009). Myriad combinations of these nano-concepts can create potentially infinite nanomaterials (1 to 100 nm).



"NanoWorld", Ronald Feldman Fine Arts at The Armory Show (March 5-9, 2014), New York, NY (www.feldmangallery.com and www.ArtNanolInnovations.com)



851

Sifang Art Museum

847

Beijing

Sifang Art Museum

847

Beijing

For One Weekend

848

Beijing

Ronald Feldman Fine Arts

844

New York





Imagine an "ivy" tower composed of nano-ivy plants naturally growing like any green energy system Nature has given us to model and make clean air.

How do you envision the CCS and CCR energy/power units working on all sizes and scales: from the personal to the public?

10 - 100 nm

ArtNano "NanoLeaf Processmorph (10 - 100nm)." A NanoLeaf does not have to resemble a biological leaf, to work like a leaf for Artificial Photosynthesis. (Processmorphs are things that are alike in process but unlike in form or appearance.)

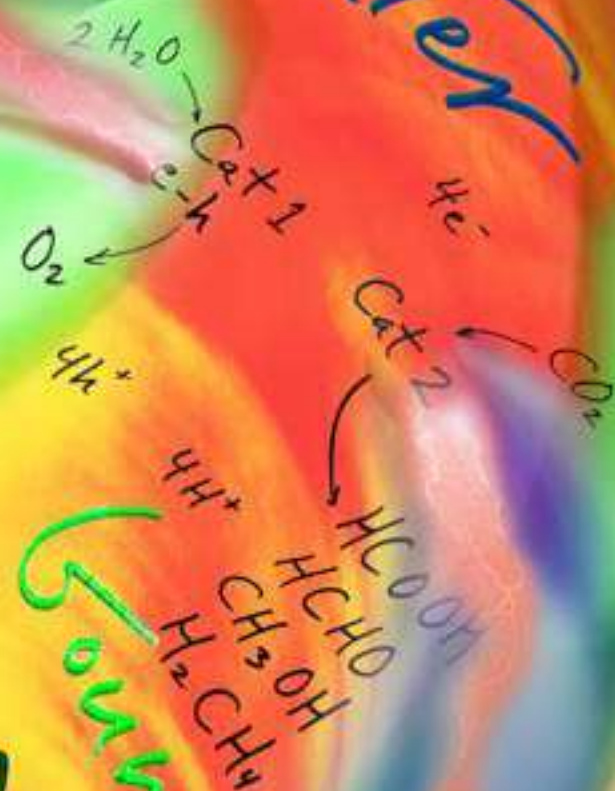
ArtNano[®]
INNOVATIONS

Converting Sunlight
Carbon Dioxide and Water

Oxidation

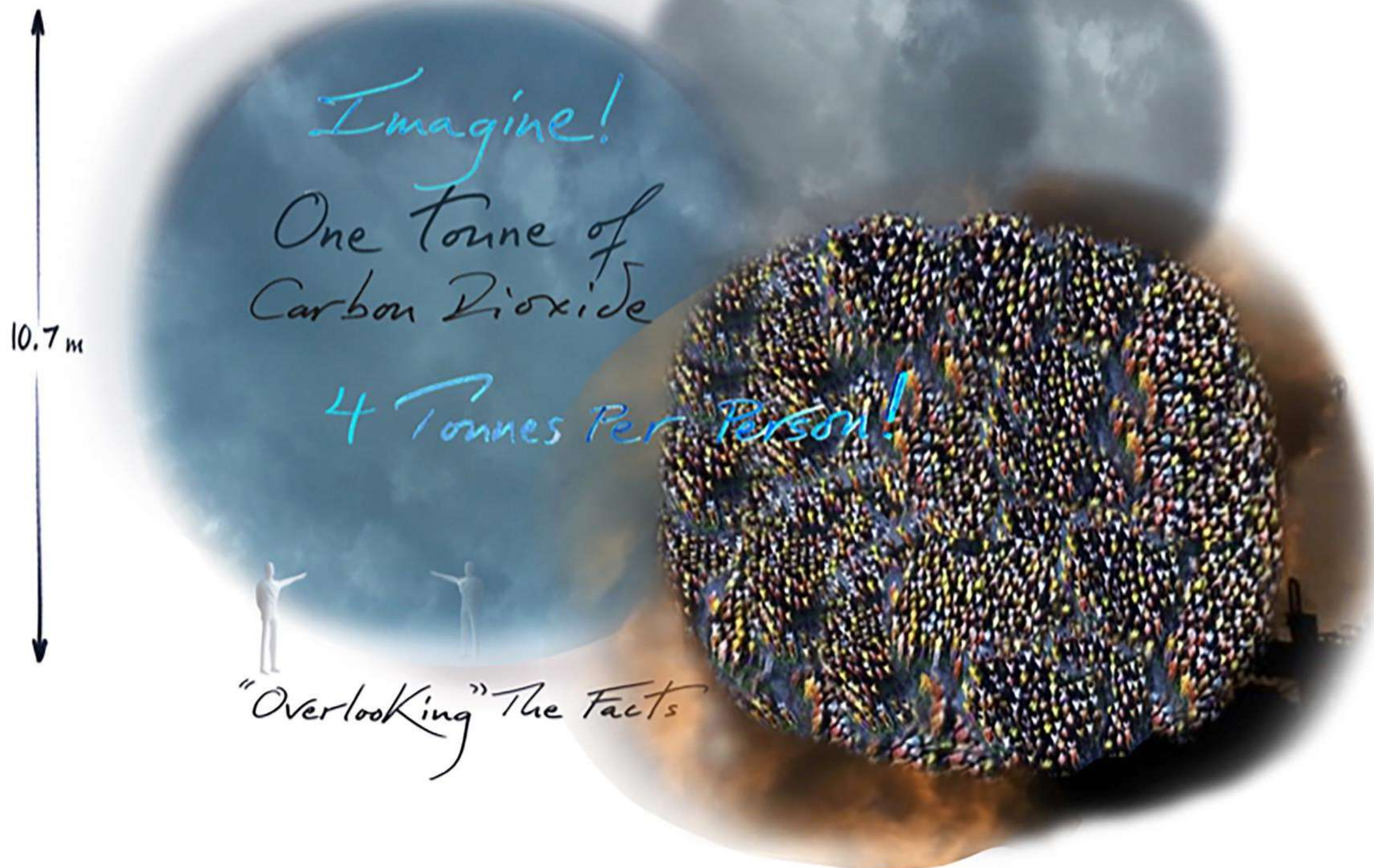
Triple phase

Reduction



Grasping Our Growing Gigatonne CO₂ Challenge

AUGUST 3, 2016 BY GEOFFREY OZIN





"NanoWorld", Ronald Feldman Fine Arts at The Armory Show (March 5-9, 2014), New York, NY (www.feldmangallery.com and www.ArtNanoInnovations.com)



Todd Siler, *Envisioning A Cornucopia of Nano-Neuro Innovations (1 to 100 nm) on the Horizon: Built From Bottom Up to Top Down* (2013) mixed media with collage elements on synthetic canvas. 6ft. x 12ft. x 5in. www.ArtNanoInnovations.com Photo: Lael Siler

WHAT WE MAKE OF NATURE



ART/TEKNE: Part 3

WHAT NATURE MAKES

METAPHORMING NATURE

Connecting Human/Nature's Creative Potential



University of Colorado
Boulder

CU Art Museum
218 UCB
University of Colorado Boulder
Boulder, CO 80309

TODD SILER IN COLLABORATION WITH GEOFFREY OZIN
SEPTEMBER 6–DECEMBER 20, 2014
UNIVERSITY OF COLORADO BOULDER

Installation view of The Brain Theater with Thought Assemblies emerging from the Limbic Brain, 1978–2014, in the CU Art Museum, on view September 6–December 20, 2014. Photo by Jeff Wells. © CU Art Museum.



Installation view of The Brain Theater with Thought Assemblies emerging from the Limbic Brain, 1978–2014, in the CU Art Museum, on view September 6–December 20, 2014. Photo by Jeff Wells. © CU Art Museum.



Installation view of The Brain Theater with Thought Assemblies emerging from the Limbic Brain, 1978–2014, in the CU Art Museum, on view September 6–December 20, 2014. Photo by Jeff Wells. © CU Art Museum.

feet, immersing viewers in real and imaginary structures generated by the billions of neurons that make up the brain's creative engine. The neural-like networks, or ganglia, in the gray matter are modeled on slides of cellular activity; yet they also resemble ocean currents and the cosmic depths. Collaged onto this monotype is a mosaic of paintings, sculptures, drawings and photomontages produced over the last four decades.¹

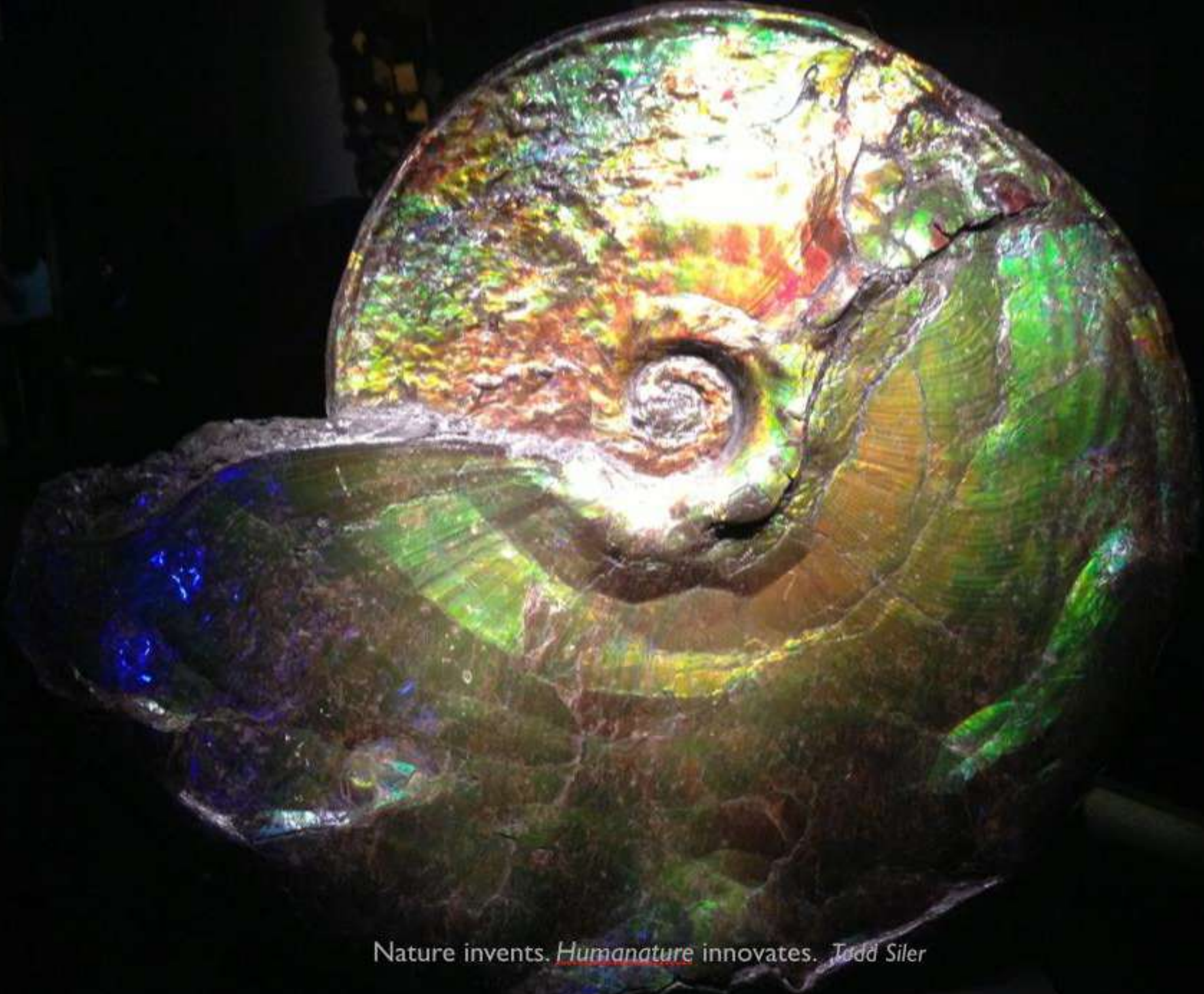
Siler's most recent artworks are created in collaboration with nanochemist Geoffrey Ozin and his solar research team at the University of Toronto. This collaboration began with a shared interest in how the integration of art and science can generate innovative frameworks for a

sustainable future. With the global population predicted to reach 9.8 billion by 2050, accompanied by mounting demand for fossil fuels to spur economic growth, the fate of humankind has become a major concern. Ozin's research in nanotechnology proposes that if we can mimic a process like photosynthesis in plants, then carbon dioxide ceases to be feared and becomes a resource. Siler's art gives form to these concepts, particularly how the brain connects and transforms everything nature creates in personally meaningful and purposeful ways. Ozin and his team's plan to replicate natural processes is visualized in *The Trillion Dollar NanoSolution to Global Artificial Photosynthesis* (2014).²

Todd Siler's large-scale installation *Metaphorming Nature* features a selection of artworks, based on metaphoric thinking, that interpret what nature makes and what we make of nature. The installation replicates the limbic system—the heart of the human brain—where intuitions, feelings and emotions are integrated and interpreted. Two distinct artworks produced more than three decades ago are combined here for the first time as originally envisioned. Within the brain-shaped gallery, *Thought Assemblies* consists of 515 standard-size sheets of paper with printed images, many painted over with brain icons, which interpret the history of human ingenuity shared by the science, technology, engineering, arts and mathematics (STEAM) disciplines.³

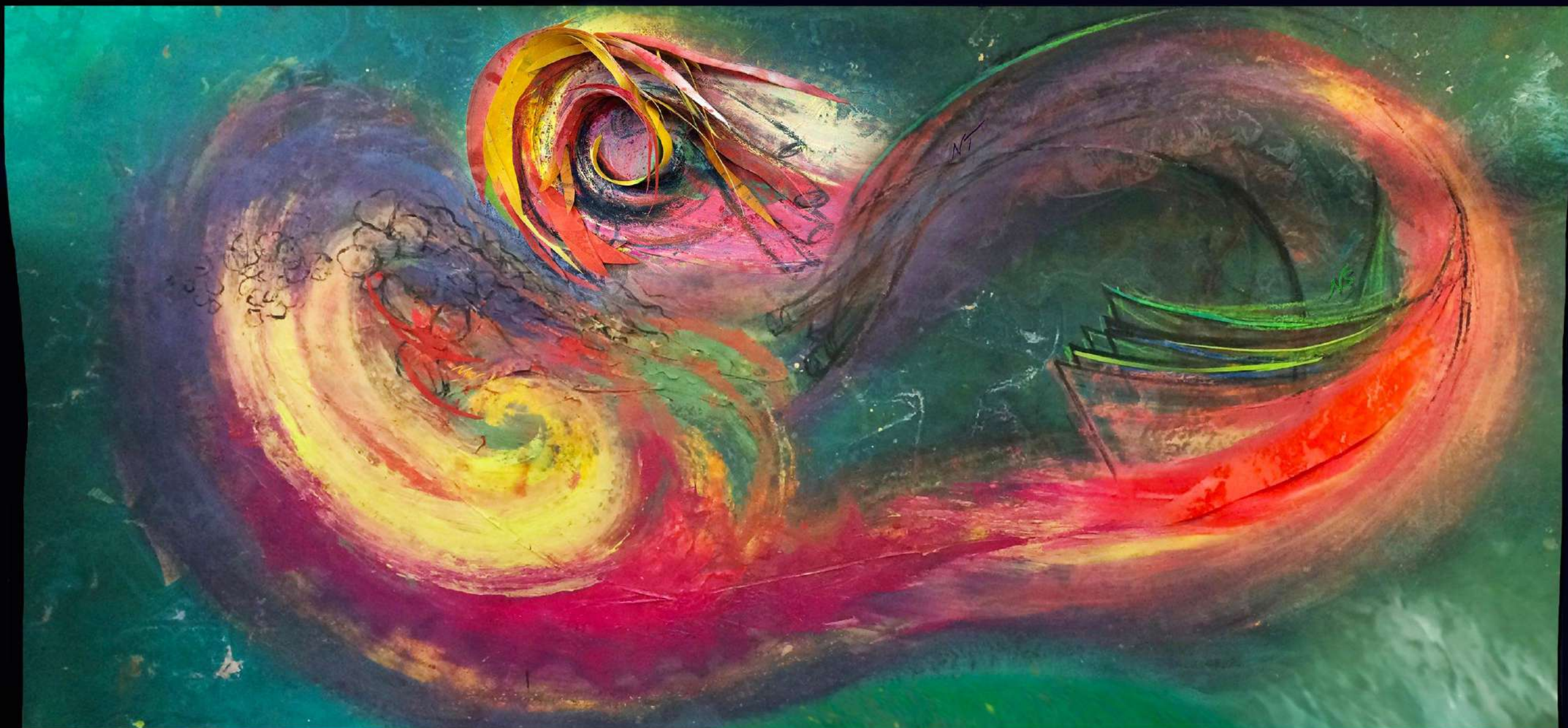
Siler highlights the human brain's handwork in everything it creates, connecting it all back to nature's inventions and innovations. Swatches of shifting colors form the backdrop to the images and tap into the range of human emotions triggered by color, light and aesthetic experiences. Siler interprets how neural mechanisms of creative thought influence thinking and feelings associated with our moods, memory processing, sleep and cognition. Reds and oranges represent the neurotransmitter dopamine, a chemical associated with reward-motivated behavior, while the blues and greens evoke the sense of well-being associated with serotonin.

The Brain Theater (1983) wraps around the exterior of the curved walls for more than 100



Nature invents. Humanature innovates. *Todd Siler*

Nature did it First. Nature has solved the problem of designing and synthesizing materials with structures that have been optimized to make them hard, tough and strong enough to house, protect and brace living organisms. Optimization of these properties, refined by slow evolutionary engineering, serves to enhance the chances of survival. *Geoffrey Ozin*



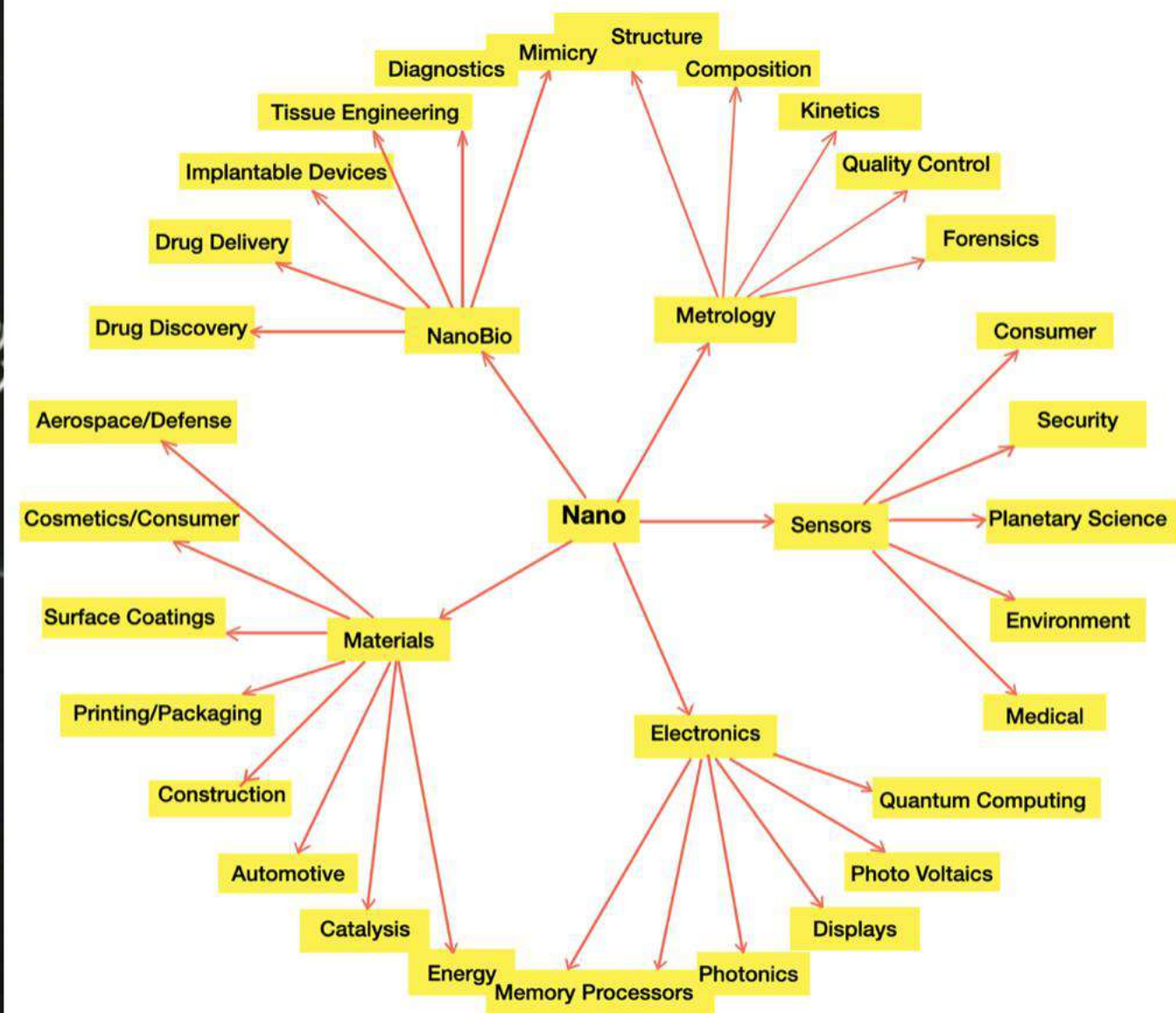
Todd Siler, *Synthesizing Nanomaterials (1 to 100 nm) for Technology Controlling Global Climate Change (2014)* mixed media on synthetic canvas with collage, 62" x 124" x 3" www.ArtNanoInnovations.com



Metaphorming Nature: Connecting Human-Nature's Creative Potential (2014) Todd Siler collaboration with Geoffrey Ozin. CU Art Museum, University of Colorado, Boulder)



Todd Siler, *Envisioning Minds & Nature Forming Nanomaterials (1 to 100 nm) That Form All Materials* (2014). Mixed media on synthetic canvas; painting (72 in. x 156 in.); sculpture (85in. x 22in. x 23in.) (Gift of Edwin & Barbara Prober to the UCLA Luskin Conference Center, Los Angeles)



(Courtesy of newton.umsl.edu showing some of the NanoScience Practicals.)

Todd Siler, *Artnano.Innovations: One Creative Process (Building from Atom-AtomClusters-Nanomaterials-Materials) with Infinite Applications of Nanocrystals (NC), Nanowires (NW), Nanosheets (NC), Nanotubes (NT)* (2011-13) www.ArtNanoInnovations.com

ArtnanoInnovations envisions and explores new ways of utilizing the tiniest functional structures (1 to 100 nanometers), which are composed from “four basic building blocks” of nanomaterials and scaled to bulk materials, to meet our most urgent global challenges, such as: **climate change, renewable energy technology and the emerging CO2 Economy, bioengineering systems, and advanced medicines** for treating devastating diseases. The diagram above (courtesy of newton.umsl.edu) show some of the NanoScience Practicals.

Looking Forward

Where I'm headed today in the realm of ArtScience explorations?

How is the *Think Like a Genius Process* (aka, *Metaphorming*) functioning in the Age of A.I.?

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Metaphorming TIME

A Selection of Artworks by Todd Siler

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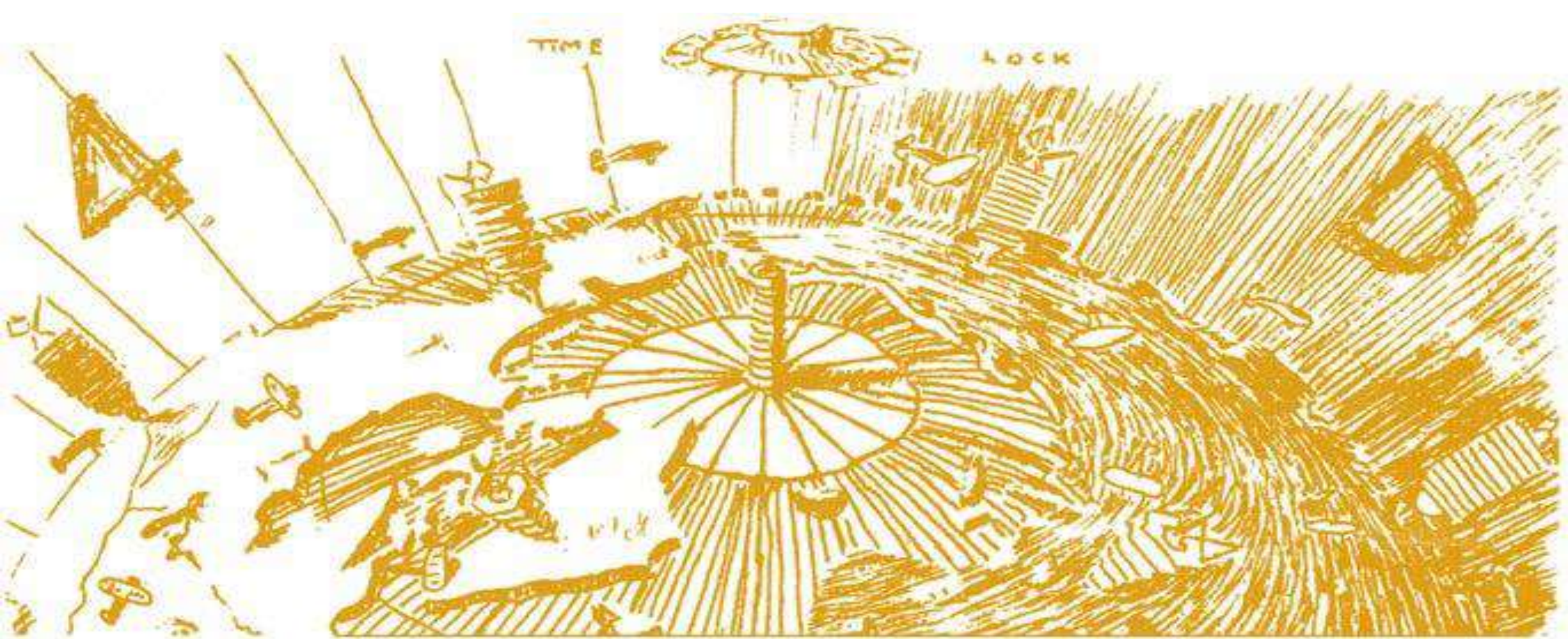


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Brochure



Metaphorming Ascension, 2007-25, Detail view, mixed media on synthetic canvas with collage, 15 ft. x 58 ft. x 3 in.



“If success or failure of the planet and of human beings depended on how I am and what I do...
How would I be? What would I do?”

– Buckminster Fuller, *The Buckminster Fuller Challenge*

ArtScience: Integrative Collaboration To Create a Sustainable Future

Bob Root-Bernstein, Todd Siler, Adam Brown, Kenneth Snelson

Leonardo, Volume 44, Number 3, June 2011 (The MIT Press), p. 192 (Article)

Interdisciplinary, transdisciplinary, cross-disciplinary, intermedia, transmedia, and multimedia involving integrative thinking are becoming ever more prominent within, throughout, and across the sciences, technology, and arts. The burgeoning of these new ways of conceiving knowledge and its products creates tremendous opportunities as well as general confusion about goals and objectives. In order to stimulate discussion about where new arts and sciences should intersect, we propose an overarching synthesis that we call “ArtScience”. (1) ArtScience is a new way of integrating all human knowledge through the processes of invention and exploration (2). It is both new and old; conservative and revolutionary; playful and serious. It enfolds the work of such liminal figures as Etienne Jules Marey, Loie Fuller, Harold “Doc” Edgerton, Alexander Calder, Lejaren Hiller, John Cage, Gerald Oster, Frank Malina, Lillian Schwartz, Buckminster Fuller, Gyorgy Kepes, and Piotr Kowalski, yet it proffers an infinite variety of future possibilities. ArtScience will move art out of galleries and museums, science from its laboratories and journals, into newly invented spaces and places. *La Laboratoire* in Paris (3), and *Symbiotica* in Perth (4), are already breaking this new ground by doing scientific exploration, engineering, design, and artistic display in a single space. Other novel venues will be invented.

In that inventiveness lies the excitement of ArtScience. Make of it what you will, as you make something new with it!

ArtScience Manifesto:

- 1) Everything can be understood through art but that understanding is incomplete.
- 2) Everything can be understood through science but that understanding is incomplete.
- 3) ArtScience enables us to achieve a more complete and universal understanding of things.
- 4) ArtScience involves understanding the human experience of nature through the synthesis of artistic and scientific modes of exploration and expression.
- 5) ArtScience melds subjective, sensory, emotional, and personal understanding with objective, analytical, rational, public understanding.
- 6) ArtScience embodies the convergence of artistic and scientific processes and skills, not from their products.
- 7) ArtScience is not Art + Science or Art-and-Science or Art/Science, in which the components retain their disciplinary distinctions and compartmentalization.
- 8) ArtScience transcends and integrates all disciplines or forms of knowledge.
- 9) One who practices ArtScience is both an Artist and a Scientist simultaneously, and one who produces things that are both artistic and scientific simultaneously.
- 10) Every major artistic advance, technological breakthrough, scientific discovery, and medical innovation since the beginning of civilization has resulted from the process of ArtScience.
- 11) Every major inventor and innovator in history was an ArtScience practitioner.

- 12) We must teach Art, Science, Technology, Engineering, and Mathematics as integrated disciplines, not separately.
- 13) We must create curricula based in the history, philosophy, and practice of ArtScience, using best practices in experiential learning.
- 14) The vision of ArtScience is the re-humanization of all knowledge.
- 15) The mission of ArtScience is the re-integration of all knowledge.
- 16) The goal of ArtScience is to cultivate a New Renaissance.
- 17) The objective of ArtScience is to inspire open-mindedness, curiosity, creativity, imagination, critical thinking, problem solving, and innovation through integration and collaboration!
- 18) The experience of ArtScience is self-learning through self-discovery, and the realization of one's creative potential.

ArtScience, in sum *connects*—creating new meanings and purposes for all things. The future of humanity and civil society depend on these connections. ArtScience is a new way to explore culture, society, human experience, that is synaesthetic experience integrated with analytical exploration. It is knowing, analyzing, experiencing and feeling simultaneously.

“The acute problems of the world can be solved only by whole men [and women], not by people who refuse to be, publicly, anything more than a technologist, or a pure scientist, or an artist. In the world of today, you have got to be everything or you are going to be nothing.” (5) Conrad Hal Waddington, biologist, philosopher, artist, and historian. (6)

Signed,

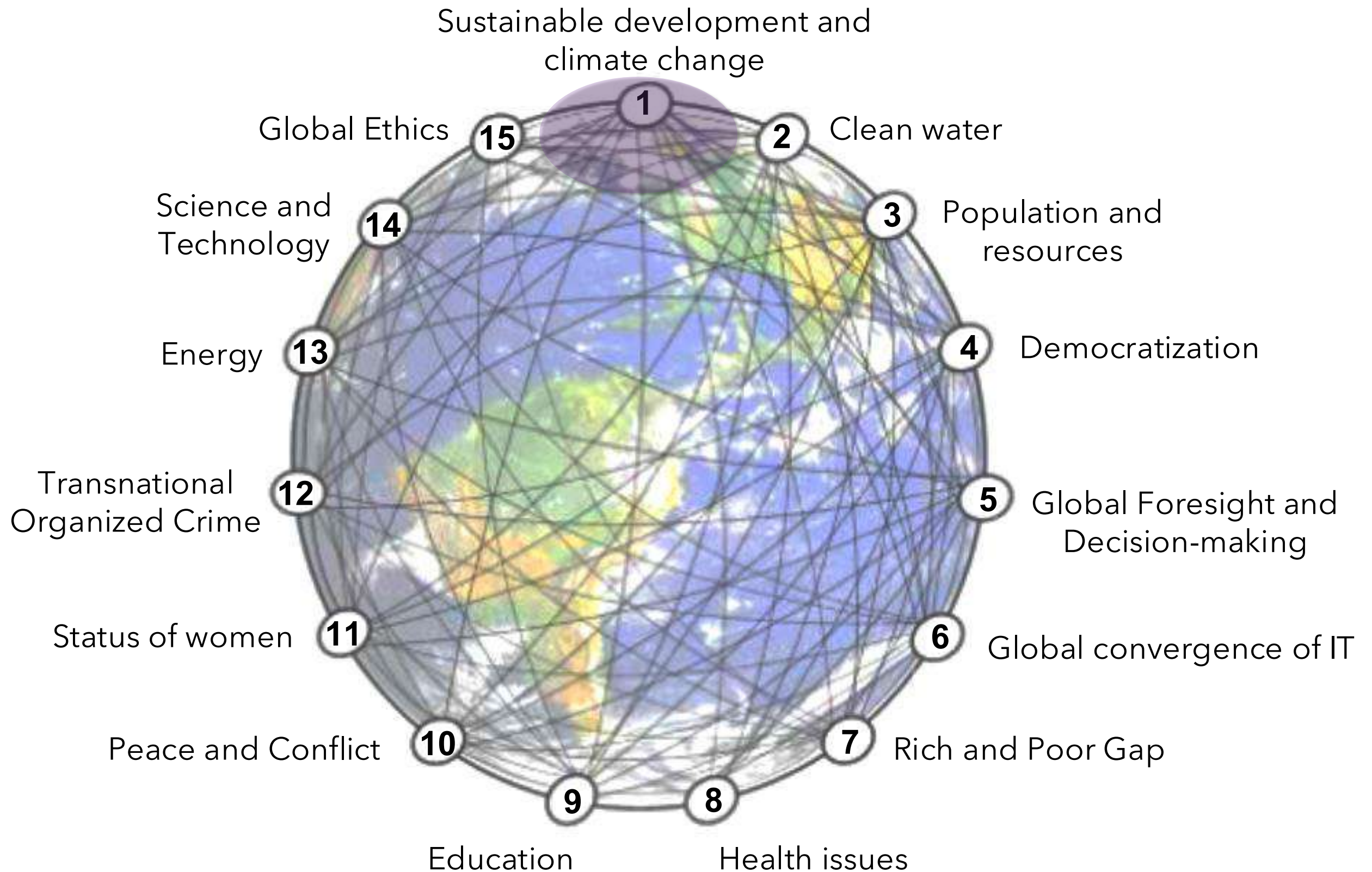
Bob Root-Bernstein
Todd Siler
Adam Brown
Kenneth Snelson

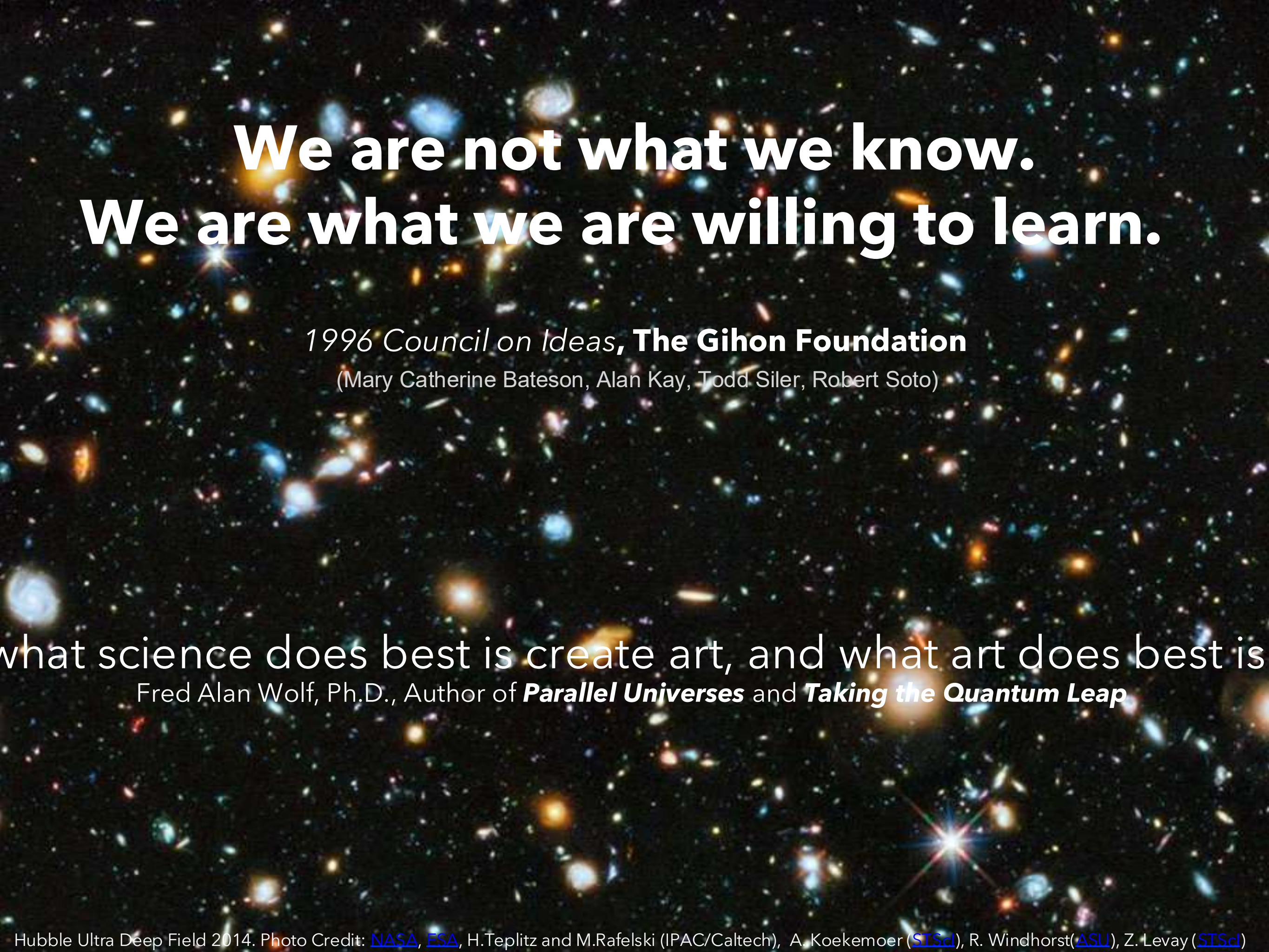
References:

- (1) Siler TS. *Breaking the Mind Barrier*. Simon and Schuster, 1990; Siler TS. *Think Like A Genius*. Bantam Books, 1996.
- (2) Root-Bernstein RS, Root-Bernstein MM. *Sparks of Genius*. Houghton Mifflin, 1999.
- (3) Edwards D. *ArtScience. Creativity in the Post-Google Generation*. Harvard University Press, 2009.
- (4) <http://www.symbiotica.uwa.edu.au/>
- (5) Waddington CH. *Biology and the History of the Future*. Edinburgh: University of Edinburgh Press, 1972, p. 360.
- (6) Waddington CH. *Behind Appearance. A Study of the relations between painting and the natural sciences in this century*. Edinburgh University Press, 1969.

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15 Global Challenges facing humanity



The background of the entire slide is a deep space image, specifically the Hubble Ultra Deep Field 2014. It shows a vast field of galaxies, stars, and nebulae in various colors (blue, orange, white) against a black background. The text is overlaid on this image.

**We are not what we know.
We are what we are willing to learn.**

*1996 Council on Ideas, **The Gihon Foundation***

(Mary Catherine Bateson, Alan Kay, Todd Siler, Robert Soto)

what science does best is create art, and what art does best is
Fred Alan Wolf, Ph.D., Author of ***Parallel Universes*** and ***Taking the Quantum Leap***

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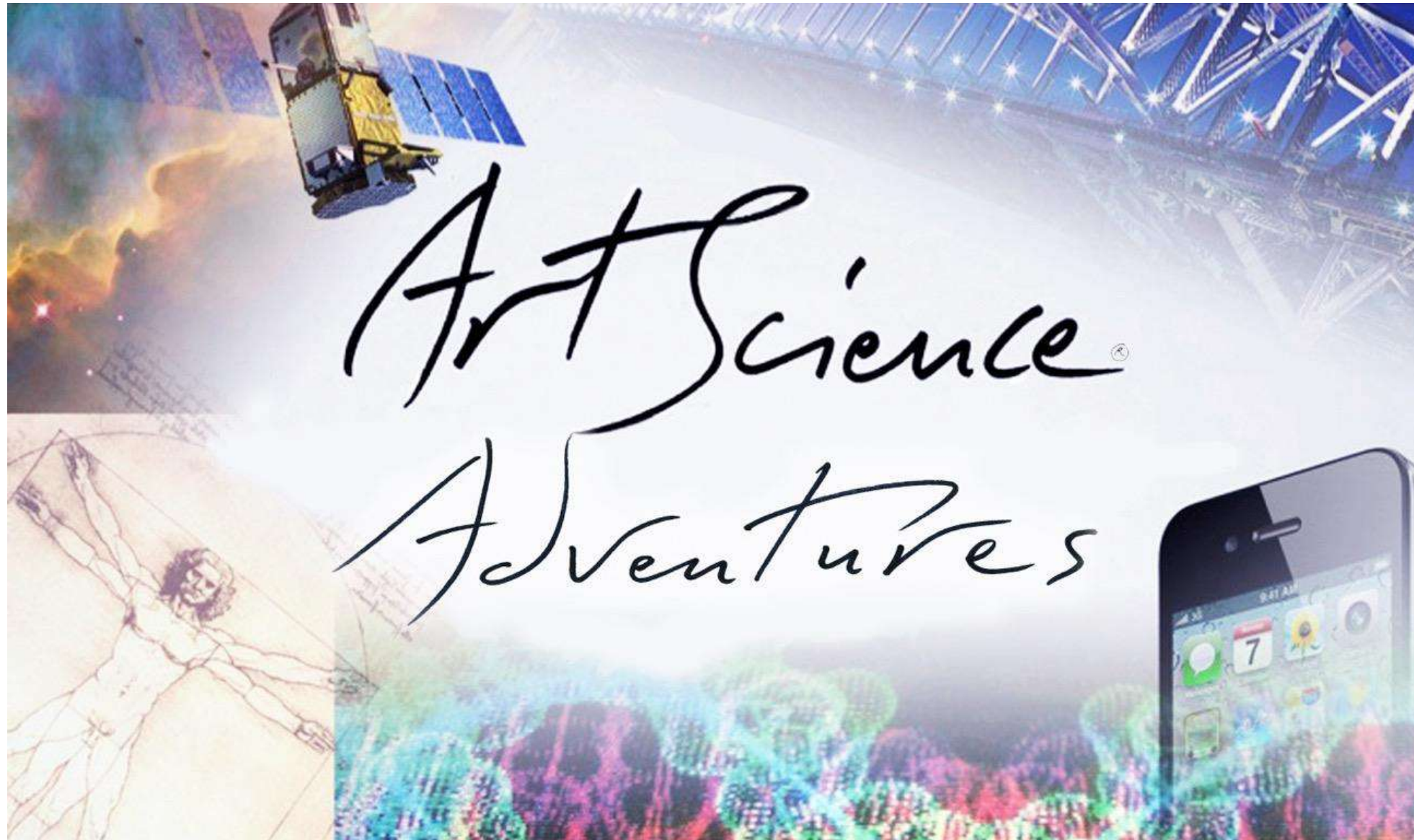
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Thank you!



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