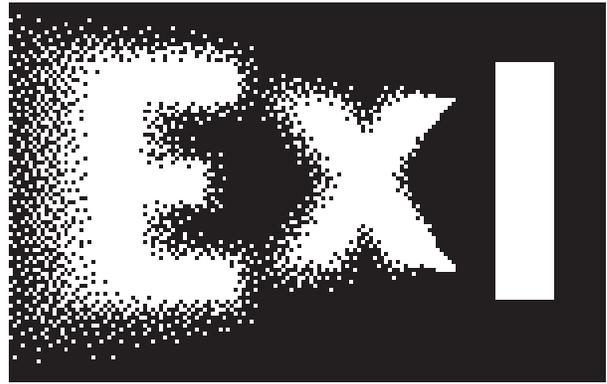


EXTROPY: The Journal of Transhumanist Thought is a journal of ideas, dedicated to discussing and developing themes in the following areas:

- Transhumanism and futurist philosophy
- Life extension, immortalism and cryonics
- Smart drugs (nootropics) and intelligence increase technologies
- Machine intelligence, personality uploading, and Artificial life
- Nanocomputers and nanotechnology
- Memetics (ideas as viruses)
- Experimental free communities in space, on the oceans, and within computer networks
- Effective thinking and information filtering
- Self-transformative psychology
- Spontaneous orders (free markets, neural networks, evolutionary processes, etc)
- Digital economy (privacy technologies, digital money and electronic markets)
- Rational, market-based environmentalism
- Probing the ultimate limits of physics

EDITORIAL TEAM

EDITOR:	Max More, MA, Extropy Institute
ART DIRECTOR:	Nancie Clark, Eonian Productions
Communications:	Russell E. Whitaker, Webmaster, Silicon Graphics
Computing, Linguistics:	Simon D. Levy, MA, Univ. of Tennessee
Cosmology:	Michael C. Price, M.Sc.
Cryonics & Immortalism:	Michael R. Perry, Ph.D; Director, Society for Venturism
Fuzzy Logic & Neurocomputing:	Bart Kosko, Ph.D; University of Southern California
Law, Politics:	Tom Morrow, MA, J.D., Extropy Institute
Memetics:	Keith Henson, Founder, L-5 Society
Nanotechnology:	J. Storrs Hall, Ph.D. Rutgers University, Laboratory for Computer Science Research
Philosophy, Politics:	Max More, MA, Extropy Institute
Physics:	Prof. Gregory Benford, Ph.D., Physics Dept., University of California, Irvine
Science:	David Krieger, MLS, Agorics, Inc.
Biotechnology:	Ray Sahelian, M.D.
Transhumanities:	Mark Plus, MS



Extropy Institute

EXTROPY (ISSN 1057-1035) is published approx. quarterly by Extropy Institute (ExI), an educational tax-exempt corporation, 13428 Maxella Avenue, #273, Marina Del Rey, CA 90292. Phone: (310)398-0375.

E-mail to: more@extropy.org
or: exi-info@extropy.org

Copyright ©1995 by Extropy Institute and the respective writers.

Distributed by Desert Moon Periodicals, Sante Fe, NM; Fine Print, Austin, TX; IPD, Solana Beach, CA; Small Changes, Seattle, WA; Ubiquity, Brooklyn, NY; & Tower Magazines, W. Sacramento, CA; and in the UK by Counter Productions, London, UK.

Writers: Contact the editor for submission details.

SUBSCRIPTIONS (4 issues):

USA:	\$18
Canada and Mexico*:	\$22
Overseas*:	\$32 (air); \$24 (surface)
Institutions:	USA: \$40, Canada, Mexico: \$44 Overseas: \$60/\$44 (air/surface)

BACK ISSUES: See p.45 for contents

#s 1,2,3,4,5,6,7,8, 9,10,11,12,13, 14: \$5 each

EXTROPY INSTITUTE (See p.31 for details)

Membership (Includes one year subscription to *Extropy* and to eight issues of the ExI newsletter *Exponent*), plus discounts on electronic fora, conferences, tapes, T-shirts, software, and books, and invitations to festivals, and local meetings, and other gatherings:

USA:	\$45
Canada/Mexico*:	\$50
Overseas*:	\$55/\$67 (<i>Extropy</i> by surface/air)
Sustaining:	\$100 (receive <i>Extropy</i> first class)
Benefactor:	\$300
Sponsor:	\$1000

Make checks payable to "Extropy Institute."

***We can now accept payment in your own currency, converted from the amount in dollars.**

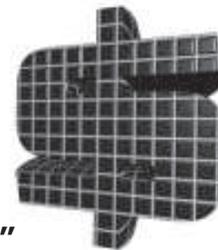
CONTENTS

10 Future Forecasts

Gregory Benford, Stephen Bridge, Eric Drexler, FM-2030,
Mark Miller, Max More, Nick Szabo

14 Introduction to Digital Cash

Mark Grant



16 Thoughts on the Economics of "Digital Money"

Lawrence H. White

19 Hayek's *Denationalisation of Money*

Max More

28 PROFILE: FM-2030 — Pioneering Futurist

38 Consciousness: Spontaneous Orders and Selectional Systems

Reilly Jones

D E P A R T M E N T S

07 Letters

34 Biotech Enhancement:

Melatonin

Dr. Ray Sahelian

46 ENIGMA: Squared Deal M.J.P. Wolf

47 Mindsurfing:

The Internet Adapter Yow

Cover by Nancie Clark

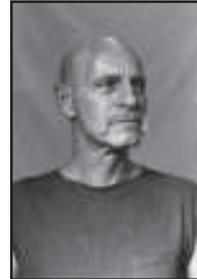
Biosphere 2

21

Ecological Experiments, Space Habitats, & Long Life

An Interview with
Roy Walford, M.D.
(Part Two)

by David Krieger
with Max More



THE TRANSHUMAN TASTE (reviews)

The World of 2044

Reviewed by Phil Goetz

48

The Theory of Free Banking (George A. Selgin)

Reviewed by Eric Watt Forste

51

The Millennial Project (Marshall T. Savage)

Reviews by Phil Fraering and Phil Goetz

54

Extropy Institute	31
Extro ² Conference	32
Back Issues	45
Contributors	59

EXTROPY #15
2nd-3rd Quarter 1995 (vol.7, no.2)

EDITORIAL

A different kind of future:

~~World government~~ polycentric law

~~Monetary supranationalism~~ competing private currencies



Photo by Nancie Clark

Many readers of this publication prefer to refer to themselves as *transhumanists* or *Extropians* rather than as *futurists*. One reason for this is most persons claiming to be futurists have social and economic views at odds with the principle of spontaneous order. Ever since H.G. Wells, many futurists have proclaimed the wisdom of world government and central control or central planning by a “scientific elite”. Today, these views still appear in futurist writings, though fortunately some of the best known writers such as Toffler and Naisbitt do see the virtues of free markets and decentralization to a fair degree.

In this issue of *Extropy*, we continue to explore a different kind of future, a future without centralized political institutions. In past issues we have looked at how the very legal system itself could work — and work better — if separated from government. This time we focus on economic issues and see how the monetary system could be run privately.

Electronic money has been discussed for years, with a recent surge of interest. Here, we combine an examination of electronic money and free banking or competing currencies. Anonymous digital money is expected to sharply reduce the state’s power to tax and control many economic activities. Competing currencies would curtail the state’s ability to control international money flows and to engage in harmful monetary policy. The two topics of electronic money and competing currencies therefore share a feature in common. The articles on pages 14, 16, and 19 are complemented by an extensive book review on free banking on p.51.

When might a sizeable proportion of the population use anonymous digital money? Several prognosticators give their estimates of this and other breakthroughs in “Future Forecasts”. Though the forecasters share many ideas about technology and society, you will find a wide range of dates for the forecasts events. Compare where you stand, and let us know where you think our forecasters went wrong. If the response justifies it, next issue we will publish a critical discussion of the feasibility and value of trying to forecast the future (a topic of recent discussion on the Extropians e-mail List).

New features: In addition to Dr. Ray Sahelian’s Bioenhancement Update, *Extropy* now features two new columns: An Internet feature by “Yow” — the online name of attorney/hacker Steve Arbuss. We also welcome Mark Wolf’s puzzle series, Enigma. The Letters section, though not really new, appears again after several issues absence, in response to reader demand. In this record-size issue, we continue to diversify our content in terms of its level of technical challenge. Start with the interview and work your way into Reilly Jones’ essay!

I look forward to meeting some of you at our June conference, EXTRO².

Upward and Outward!

Max More



EXTROPY—a measure of intelligence, information, energy, life, experience, diversity, opportunity and growth. Extropians are those who consciously seek to increase extropy. The Extropian Principles are: (1) Boundless Expansion; (2) Self-Transformation; (3) Dynamic Optimism; (4) Intelligent Technology; (5) Spontaneous Order. [See *Extropy* #11 for Extropian Principles v.2.5]

TRANSHUMANISM—Philosophies of life (such as Extropianism) that seek the continuation and acceleration of the evolution of intelligent life beyond its currently human form and human limitations by means of science and technology, guided by life-promoting principles and values, while avoiding dogma and mysticism. [See *Extropy* #6]

Dear *Extropy*,

Issue Number 13 was excellent.
Keep up the good work.

Re: the debate between Charles Platt and Max More over the proper libertarian ethic toward free speech, I must add a third perspective, that of Libertarian Pragmatism.

This point of view says *all* obsessive, overly intellectualized generalizations about human beings have proven wrong in the past, and will prove wrong in the future. While Libertarian dogma sounds much nearer to human nature than Karl Marx's fantasies about us, it makes little sense to defend Freedom of Speech on purely intellectual grounds.

We call it sacred and fundamental, yet *no* other human civilization agreed with this rather pushy statement. Instead, history shows strong evidence for a very basic and compelling human drive not to hear things we disagree with, and to suppress dissent by others. Far from inalienable, it is all-too easily taken away.

Moreover, history shows that when a society's fear level rises, intolerance and suppression do also. Supposed sacredness will not protect freedom when the mob is frightened.

To the Pragmatic Libertarian, there is one truly effective rationale for defending Freedom of Speech. A rationale that is both necessary and entirely sufficient. It is this — Those societies which practice it have prospered to a degree that vastly exceeds the success of any civilization that suppressed free speech.

Instead of idealizing human nature, this argument works *with* that nature's many paradoxes. Take one of the greatest ironies of life, which I call the Allegory of the Peacock.

While pea-birds might be better served in general to be small quick and camouflaged, their physical traits have been dominated by what is good for *individual* pea-cocks. The reproductive success engendered by bright flashy tails has overwhelmed what might be thought of as good for the group as a whole.

Likewise, in all of human history, there has been discovered only one effective antidote to *error*. That antidote (more of an anodyne, actually) is

LETTERS

Send comments to more@extropy.org or to:

The Editor, *Extropy*, 13428 Maxella Avenue, #273, Marina Del Rey, CA 90292

criticism. Mutual, adversarial, open, cantankerous. Criticism allows mistakes to be exposed before they are set in motion. Anyone who thinks today's society is especially error prone has no sense of perspective re: how incredibly successful we've been at mistake-avoidance, or how complex are the incredible tasks we've set ourselves which no prior civilization ever tried — (e.g. universal justice & quixotic, high-tech battles to counteract every ill effect of bad luck.) The media is filled with mistakes we *almost* made, but which are more often than not caught in time, or modified, as a result of criticism.

Alas, criticism is the one non-physical thing which human beings find almost as painful to receive as torture. It is human nature to avoid it, suppress it. Leaders hate it, even when they claim otherwise. Kings have always crushed it.

Look at all the mistakes that fill human history, you can see that what was good for the individual king — suppression — nearly always overwhelmed what was good for society — encouragement of adversarial debate. Only recently has the latter become so institutionalized that it has become the norm. Coincidentally, only recently has libertarianism flowered.

Now here's the point. No one can tell in advance *which* criticism is right. There is only one way to ensure we will always get the maximum of useful criticism, and that is to treat freedom of speech AS IF it were sacred, fundamental, holy, inalienable! Only when there is clearly too much of it can we ever be sure we're getting enough. Only when imbeciles, politically-correct doofuses and Limbaughs get podiums are we able to say that our anti-error immune system is up and running.

(Indeed, there is evidence that it has lately metastasized into a modern fetish of distrust that exceeds any error-

correcting need in today's society. But that's another topic.)

Some insist on purist definitions such as "anything goes, so long as you do no harm". To these folks I respond by asking where such a rule is founded anywhere in biology or in the long history of human interactions on this planet? It sounds elegant, and I'm willing to include it in discussions of what kind of creatures we would *like* to become. But in the near term I'd rather base my libertarianism on the way the world works. It's less self-righteous and far more convincing, while leading to the same conclusion — freedom must be preserved.

With best regards, David Brin
brin@alumni.caltech.edu

> [...] it makes little sense to defend
> Freedom of Speech on
> purely intellectual grounds.

I'm not sure to what I extent I agree with you. Certainly I hold to a pragmatic form of libertarianism in that I believe the principles can ultimately be justified only by their results. However, I don't see that this means we shouldn't make generalizations and principles. If, by "intellectual grounds" you mean views such as Murray Rothbard's natural rights position, then I concur. I prefer to ground libertarian rights in a kind of principled pragmatism. Much better than the natural rights view is the contractarian/rational choice approach (such as used by Jan Narveson in The Libertarian Idea and by David Gauthier in Morals By Agreement — reviewed last issue). When done properly, such an approach is grounded in what works, i.e., by looking at actual human behavior.

> We call it sacred and fundamental,
> yet *no* other human
> civilization agreed with this rather

pushy statement.

Most libertarians don't seem to regard free speech as a fundamental right. As I suggested in my reply to Platt, such rights are derived from and defined in terms of more general property rights.

- > Likewise, in all of human history,
- > there has been discovered only one
- > effective *antidote to error*. That
- > antidote (more of an anodyne,
- > actually) is *criticism*.

I thoroughly agree. People have a hard time accepting criticism, even though it's vital to growth and improvement. I find this such an important issue that I presented a paper dealing with it at EXTRO¹ ("Pancritical Rationalism: An Extropic Metacontext for Memetic Progress.") As our resources and capabilities grow, I anticipate Extropy Institute focusing heavily on finding ways to increase our ability to be critical and to accept criticism.

- > (Indeed, there is evidence that it has
- > lately metastasized into a
- > modern fetish of distrust that exceeds
- > any error-correcting need in today's
- > society. But that's another topic.)

*The problem is that few people are any good at appropriate criticism. They are over-ready to distrust in some ways while far too resistant to criticizing and questioning in other areas. Someone who distrusts big corporations or the government may blindly believe in a religious dogma or other forms of propaganda. We all need to become better at understanding our own complex motivations in order to see where we need to become more, less, or more intelligently critical. Thank you for your thoughts. — Max More
more@usc.edu more@extropy.org*

Physics of Immortality by Frank Tipler

Date: 21 Jan 95 21:28:01 EST
From: Dave Lindbergh
<70310.267@compuserve.com>

Re Michael Price's review of Frank Tipler's *Physics of Immortality*, I too

read the book as well as Tipler & Barrow's earlier *The Anthropic Cosmological Principle*.

I agree with almost all of Price's comments on the book, good and bad, but I disagree about its ultimate worth. Tipler's vision of the Omega Point is far from proven, yet it is a vision of what we, residents of the universe, might ultimately achieve.

We can take it as our project to realize Tipler's dream, to colonize the universe with intelligent life, to make the universe an ever-better place to live. We can choose, ultimately, to build "angels", resurrect all intelligent creatures, and to offer them a free and challenging existence, rather than an infinity of hells "tortured forever by sadistic virtual demons".

Tipler's logic may well be circular, his dream of heaven wishful. But it may be within our power to make it real, eventually. Perhaps we can take his vision a goal, rather than as prophecy.

I'm less interested in speculating about the future than in making it happen. We, the people alive today, make the future happen. We choose the future by our actions. Tipler's vision is a possible one, worth pursuing. We may not succeed, but we might, and we can try.

—Dave Lindbergh
<david.lindbergh@itu.ch>

From: Hal
<hfinney@shell.portal.com>
Date: Thu, 12 Jan 1995 23:03:08 -0800

--BEGIN PGP SIGNED MESSAGE--

This book was reviewed pretty unfavorably in the recent *Extropy* by Mike Price. I agree with many of Mike's specific points, but I think the book has more to offer than he suggests.

Specifically, I think the picture Tipler paints of the future of life in the universe is very ambitious. He has life engulfing the universe and taking charge of virtually every aspect of energy and matter. The very shape of the universe itself is controlled. Apparently, left to itself, the universe would collapse wrong, starving life of energy. However, living beings should be able

to use the "butterfly effect" to get massive results from tiny changes. In this way the universe can be made to collapse just right to ensure continual energy availability.

This vision is highly Extropian in terms of its optimism, expansion, and the transformation which living things will have to undergo. I also think, although Tipler does not emphasize this, that during the collapse phase life will be faced with ongoing challenges as we move to higher and higher energy regimes, without limit. This would suggest a future of unlimited challenge and change rather than eventual success and stasis.

Some aspects of his picture can be criticized from the extropian perspective. The actions needed to control the shape of the universe would require considerable cooperation between the actions of living things at widely separated parts of the universe. This might suggest a non-extropian uniformity and enforced order. However, my understanding of the physics is that centralized control would be difficult or impossible due to speed of light considerations. Rather, the various living beings must be essentially autonomous, cooperating out of rational self-interest in a true spontaneous order.

Mike points out that Tipler's ideas, like other resurrection models, do not promote individual action. This is legitimate but I still feel that the book will introduce many people to the idea that life may become so powerful that we will be like gods. This will come as a revelation to most readers.

The book does provide some interesting information about religions beyond the simple Christianity we are mostly exposed to in the West. Tipler goes to some lengths to compare conditions in the far future when life is virtually omnipotent to various religions' views of the powers of God. It is not too surprising to me that he finds many similarities; religions are largely based on wish fulfillment, and in the future we will have the power to make our wishes come true directly. In the process, though, Tipler does say a lot about religions that I had not known.

In sum, although the religious aspects of the book may irritate many Extropians, I think it will be a good

introduction to many ambitious and Extropian ideas for less experienced readers.

Hal Finney

—BEGIN PGP SIGNATURE— Version: 2.6

```
iQBVAwUBLxYljxnMLJtOy9MBAQEQRrAH
+Jd0ub5JNiwOhyCqu5YGGkDbNHrhQQGA
LunHFe9ippxpXk0uQW+zR8AuH88GbgGW
EkhhbbNg8gQs1UqOY+DmA== =uM1A
—END PGP SIGNATURE—
```

From: Hal <hfinney@shell.portal.com>
Date: Sat, 14 Jan 1995 17:14:13 -0800

Robin Hanson:

- > Tipler is optimistic, but I'm not sure
- > he's ambitious. In his view, the
- > reason the future holds so much
- > promise is because the laws of
- > physics almost directly require us to
- > succeed. No need to work toward
- > expansion, transformation, or even
- > long personal life – physics
- > requires unbounded expansion which
- > will resurrect us all in simulations.
- > "God" (embodied in the laws of
- > physics) will make sure all our wishes
- > are fulfilled.

I did not read Tipler's logic in quite this way, although I didn't find it completely satisfactory either. Tipler seemed to say, assume that life will exist and grow forever. On its face this is a moderately optimistic and slightly extropian view, but it does not appear too extravagant. However, Tipler then shows that the challenges facing this assumption are very great: heat death if the universe is open, which he does not think can be overcome, or collapse to singularity if the universe is closed, which has its own problems. It turns out that in order for life to survive at all, it must become nearly omnipotent, with all the tremendous powers that he describes.

The problem that I had with this was not so much the resurrection aspect, where I agree with most of what Mike and Robin have said, but rather I felt that Tipler had put one over on me. The original assumption that life would last forever sounded reasonable enough. But I didn't realize at the time just what I was being asked to buy into. If he had started off saying, let's assume that life

will become omnipotent, that is something most people would be a lot slower to agree to. But the thrust of his book is to show that these two points are equivalent. If life is to succeed at all, it must become God.

You can argue with Tipler's physics, as Mike does in his review, but to the extent that Tipler is right then this does tell us something interesting and perhaps unexpected about the universe.

It is interesting, BTW, that Tipler has tried to create testable predictions from his theories. He says some things about the Higgs boson or some such particle and something about the Hubble constant. There was recently some surprising measurement of the Hubble value (recall that it showed that the universe was younger than thought, possibly younger than globular clusters). I tried to figure out whether this value was consistent with Tipler's theory, and as best as I could tell, it was not. Tipler needs to have the universe older than these recent observations would show, as I read it. However my physics is pretty rusty and I could be mistaken.

Hal

From: price@price.demon.co.uk
(Michael Clive Price)
Date: Sun, 15 Jan 1995 09:35:01 GMT

Hal writes:

- > It is interesting, BTW, that Tipler has
- > tried to create testable predictions
- > from his theories. He says some
- > things about [...] the Hubble constant.
- > There was recently some surprising
- > measurement of the Hubble value

Yes, some recent observations by the appropriately named Hubble space telescope (and some land-based observatories) indicate that the universe is expanding faster than had been thought. (Observations of the Virgo cluster of galaxies – which is a crucial yardstick for other, greater distances – place it nearer than previously suspected. We know their recession velocity from the red-shift, so by shrinking the scale of our extra-local-cluster neighbours we get a higher Hubble constant, since the Hubble value

is a measure of recession speed/distance.)

This new value for Hubble (of approx. 80 km/(sec*megaparsec)), if confirmed, would cause a bit of a minor upset for some astronomers since if we project the expansion backwards, with the new value, we find that the big-bang is too recent. As Hal says:

- > (recall that it showed that the
- > universe was younger than thought,
- > possibly younger than globular
- > clusters).

And the globular cluster ages are fairly well established. There is a way out of this – the only way I'm aware of, which I also (luckily) quite like – which is to revive an early idea of Einstein's, after a fashion, and introduce an extra, quite natural, term into his equations. This term is called the cosmological constant (I won't go into the details) which accounts for the higher expansion rate which is driven by both matter and the intrinsic energy of the vacuum (the cosmological constant) and automatically pushes the big-bang further back in time. It also accounts for some other long-standing astro-puzzles, like missing mass. There is no missing mass, just the cosmological constant acting as if the universe was pervaded by extra mass-energy. (Missing mass is distinct from dark matter, which is matter we know to exist from the rotational dynamics of galaxies, but which is non-luminous.)

- > I tried to figure out whether this value
- > was consistent with Tipler's theory,
- > and as best as I could tell, it was not.

That's right. Tipler predicts $H \leq 45$ (in above units), whilst the latest observations give $H = 80 \pm 17$. Even worse, for Tipler's "theory" which requires re-collapse, is that this high H says that the universe will expand forever, whether or not it is open or spatially closed. As the universe expands the expansion is increasingly driven by the cosmological constant which is not diluted away by the expansion, unlike ordinary matter.

Michael Price
price@price.demon.co.uk

FUTURE

EVENT	Benford	Bridge	Drexler
Frozen Organ Transplant Is Routine	2020	2010	never
Two Century Biological Lifespans	2150	2050/2140	never
Indefinite Biological Lifespans	2300	2080	1967
Reanimation for Last Cryonics Suspendee	2100	2060	2006-2021
Reanimation for Current Cryonics Suspendees	2200	2090	2006-2021
Biotech Cures for Most Heart Disease, Cancer & Aging	2030	2030	never
Fine-Tuned Mood/Motivation Transformation Drugs	2010	2020	?-2021
Genius Drugs (>20 pts permanent IQ increase for most people)	2030	2020	?-2021
Human Germ-Line Gene Therapy	2040	2007/2025	
Human Child Gestated Completely in Artificial Womb	2020	2050	
Cloning of a Human Being	2050	2020	
Completely Genetically Composed Children	2060	2050	
Extinct Species Reanimation (from preserved DNA)	2100	2025	?-2021
Cryonics Industry Revenues \$1 billion/year	2035	2015	
Nanotech Factories	2100	2030/2050	2006-2021
Atomically Detailed Design for Self-Reproducing Drexler-style Assembler	2070	2015	1998-2010
High-Degree of Freedom Cell Repair Nanomachines	2075	2040/2060	2006/2021
Reproducing Nanotech Assemblers	2080	2025	2004-2019
Really Cheap Fusion Power	2100	2040	
Nukes as Cheap as Tanks	2105	2015	
Nukes as Cheap as Handguns	never	never	
Most Publications are Electronic	2015	2015	
Most Intellectual Publications are on Web	2001	2008	
Information Storage \$0.01 per Megabyte	2010	2020	
Computer Implanted in Brain	2015	2045	
Human-Brain Equivalent Computers on a Desk	2030	2030	2004-2019
Human-Level A.I.	2030	2050	2004-2019

FORECASTS

FM-2030	Miller	More	Szabo
1990s+	N+20 if (S>N+30)	1999-2008	2020-2030
2010-2020	never	2015-2040	2040/2100
	S-50	2020-2045	2090/2150
	S+6*DAF	2025-2055	2050/2200
2020	S+10*DAF	2030-2100	2400/2410
1990s+	S+10*DAF	2015-2040	2090/2130
1990s+	N+10	1998-2010	2040/2050
	S-10 to S+10*DAF	2020-2060	2010/2050
1990s	N+20	2010	now/2020
2010-2020	S-5 to S-2*DAF	2015-2035	2100/2120
2010	S-5 to S+4*DAF	2010	now/2010
		2015-2020	2060/2100
	N+5 to S+1		2010/2020
2010-2020	N+30 (if S>N+30)	2015-2020	now/2020
2010-2020	S-3 to S+1	2015-2030	2070/2080
	N+7	2000-2015	2100/2100
2010	S+2*DAF		2160/2180
	S-3 to S+1	2020-2030	2120/2140
2010-2020		2010-2020	2200/2210
		2040-2050	2100/2150
			2200/2250
1990s+	N+10 to N+30	1999	2000/2005
late 1990s	N+5 to N+30	1999-2002	2000/2005
	N+1 to N+10	2015	2010/2010
2010	N+1 to N+10	2020-2050	2010/2020
2010	S-3*DAF	2030	2040/2050
2010		2040-2150	2150/2200

C O M M E N T S

NICK SZABO

The first number is when something might be possible under ideal engineering, economic, and political conditions. "now" means we could have done it already. The second number is the practical prediction, based primarily on the viewpoint of starting a business with engineering and political issues secondary. Big gaps between the two numbers usually indicate major economic or cultural barriers to adaptation of the technology. Many of the political developments (law choice, etc.) will be available much sooner for those who sacrifice other aspects of their lifestyle to pioneer these new jurisdictions.

STEVE BRIDGE

My answers are based on when something will "actually happen" rather than on when it will be *possible*. Some of the reasons why something could be possible at a particular time but not actually accomplished are economic, some are related to social objections, and some are simply because the top minds in these fields can't pursue all avenues of research at once. What we are trying to do here is not only to predict technological development, but to predict what people will choose to work on first.

I am equally convinced that the time line for "actually happens" is not well connected to the time line for "most people do it." Computers have existed for 50 years or so; home computers have been easily available for at least 15 years. Yet we are still not to a point where "most" people even own a home computer, much less use one for anything more than games. Most people own a television because it is passive. Most people are not interested in actually "doing" things. We tend to forget that, because we spend almost all of our work and social time with the people who are steeped in thinking and doing. The average American and the average human are not like those around us.

ERIC DREXLER

The rate of technological advance depends on the quality of tools, both material and computational. Both are getting better faster as better tools are used to build better tools. The result of this cannot be a singularity in the strict mathematical sense, but Vernor's term still seems remarkably appropriate. For advances that we can already describe, a steady trickle of progress over the coming decades and centuries seems most unlikely.

Actual developments will depend not only on what is possible (a matter of physics) but on races between different technologies (a matter of complex competitive processes in an unfolding history). The

EVENT	Benford	Bridge	Drexler
Uploaded Minds	2060	2125	2006-2021
Uploads Running 1000x Faster than Humans	2080	2125	2006-2021
Big Fraction of Economy Off Earth	2200	2100	2006-2021
Big Fraction of Economy out of Solar System	2800	3000	2011-2026
Comet Mining, Javelins, Drugs, etc. (robotic space industry)	2080	2075	2006-2021
First Person on Mars	2050	2025	2006-2021
First Person in Another Solar System	2400	2085	2011-2026
Reproducing Comet Eaters		2070	
Reproducing Asteroid Eaters	2150	2045	2006-2021
Reproducing Starships	2300	2200	2006-2021
1,000,000+ People Using Anon. Electronic Cash	2010	2020	
30%+ of Labor Telecommutes	2015	2030	
Untaxable Economy Using Electronic Cash \$100b/year	2020		
Ocean Colonization	2020	2020/2045	
Most Education Privatized	2005	2050	
Most Law Enforcement Privatized	2010	2095	
Most Law Choice Privatized	2020	never on Earth	
National Defense Privatized	never	never on Earth	
Betting Markets a Big Policy Influence	never	never	



dates that follow represent a single set of basically similar scenarios, in which advances in computation and molecular machinery support one another strongly and win certain technology races. The key assumption is that molecular manufacturing is not *vastly* more difficult to develop than it now seems to the handful of people doing atomically-detailed design and simulation of molecular machines.

A reliable schedule for technological advance is impossible to produce, but these dates wouldn't greatly surprise me.

MARK MILLER

The time of onset of many of these events are related to each other. Phrasing the predictions in terms of absolute time makes predicting even more hazardous than it need be. If I think that A will happen between 10 and 40 years from now, but that B will follow A by between one and two years, I communicate much more to the reader by saying that than to predict that B will happen between 11 and 42 years from now. Think of AB as a fairly rigid structure hanging at the end of a long stretchy rope. The relative positions of the elements of the structure carries information. However, phrasing all predictions in terms of offset probability distributions from all the other predictions would drive both reader and writer crazy. Accordingly, I will use the

following variables:
 N = Now, 1995 S = Singularity DAF = Design Ahead Factor

I could define what event constitutes Singularity, such as general molecular assembly capability. However, in this exercise such a definition is unnecessary. By predicting other events as clustered in time around Singularity, Singularity effectively becomes defined as a kind of center of gravity of the onset of these other events. I consider the distance between here and Singularity to be the most uncertain distance in the mix. I predict Singularity as occurring between N+10 and N+40.

Finally, how sudden Singularity is, i.e., how closely clustered the various events are, depends on how much design ahead has occurred in anticipation of Singularity. The sooner Singularity occurs, the less design ahead will have anticipated it, and the more spread out it will be. To account for this, I introduce a Design Ahead Factor which I define as 10/(S-N). If Singularity occurs in 10 years, DAF is 1. If Singularity occurs in 40 years, DAF is 1/4.

One can always make yet more complex models, but I fear that, as Karl Popper would put it, my precision already vastly exceeds my accuracy. Well, you're better off if you try than if you don't.

FM-2030	Miller	More	Szabo
	S+7*DAF	2040-2100	2300/2400
	S-3*DAF	2045-2100	2450/2450
	S+20*DAF+20	2100-2200	2150/2200
	S+20*DAF+(50-200)	3000	2400/2500
		2050	2040/2060
2010-2020	N+15 to S+2*DAF	2025	2040/2060
2030-2050	S+10*DAF+20	2150-2400	2200/2400
		2050-2070	2140/2180
	S+2*DAF		2350/2400
1990s	N+10 to N+30 to never	1999-2006	1997/1999
1990s	never	never	2000/2050
		2010-2115	1997/2005
	N+20 to never	2010-2050	now/2040
	never		now/2040
	N+10 to S+50		now/2150
	S+50 to never		now/2150
	S+20*DAF+20 to never		now/2200
	never		2000/2100
	S+20*DAF+20		

THE FORECASTERS

Gregory Benford: Benford is a physics professor at University of California, Irvine, where he conducts research in plasma turbulence and in astrophysics. He is a Woodrow Wilson Fellow and a Visiting Fellow at Cambridge University, and has served as an advisor to the Department of Energy, NASA, and the White House Council on Space Policy. Benford is author of over a dozen novels, including *Jupiter Project*, *Against Infinity*, and *Timescape*. A two-time winner of the Nebula Award, Benford has also won the John W. Campbell Award, the Australian Ditmar Award, and the United Nations Medal in Literature. gbenford@uci.edu

Stephen Bridge is the President of the Alcor Life Extension Foundation, the world's largest cryonics organization. He is 46 years old. Steve graduated from DePauw University in 1970 with a B.A. in Theater and from Indiana University in 1974 with a Master's Degree in Library Science. Steve was a public librarian from 1974-1992 and has been involved in cryonics since 1977. He co-founded *Cryonics Magazine* in 1981. He has long had an interest in science, science fiction, life extension, and the future. As a former librarian, he knows a little bit about everything. steve@alcor.org

Eric Drexler: Eric Drexler extracted a Ph.D. in Molecular Nanotechnology from MIT. He wrote *Engines of Creation* (Doubleday), co-authored *Unbounding the Future* (Morrow), and *Nanosystems: Molecular Machinery, Manufacturing, and Computation* (Wiley Interscience) — named the outstanding computer science book of 1992 by the Association of American Publishers. He began studies of molecular nanotechnology in 1977. drexler@netcom.com

FM-2030: See Profile in this issue.

Mark Miller: At Datapoint Mark built the first commercial distributed windows system. He was co-architect of the Xanadu distributed hypermedia server. At Xerox PARC, Mark co-authored (with Eric Drexler) the agoric open-systems papers on market-based computation and market-oriented programming. Currently he is co-director of the Agorics Project at GMU, Chief Technical Officer of Agoric Enterprises, inc. in Fairfax, VA, and a founder of Agorics, Inc. in Los Altos, CA. mmiller@netcom.com

Max More: See Contributors on p.59.

Nick Szabo has worked at JPL scheduling communications on the Deep Space Network, and at IBM and Sequent on operating systems software. He currently resides in the Netherlands, working at Digicash bv on privacy technologies. szabo@netcom.com

I assume "Human-level AI" means without uploading. This may not in practice be a clean distinction at the time, just as there is no longer a clean distinction between synthesized images and texture mapped sampled images. The practical way really impressive "synthesized" images are usually created is to also mix in (via texture mapping) lots of images sampled from the world. Similarly, by the time we are synthesizing human-level AI for practical purposes, we will probably be mixing in uploaded components of evolved intelligence.

"Uploaded Minds" and "Uploads Running 1000x Faster than Humans" will happen about the same time: The hard part will be getting a good upload. At the level of technology at which that will be achieved, the extra factor of 1000 will not be a computer power issue. There will, however, be user-interface issues in both directions. How does a sped up upload interact with a world working 1000 times slower (subjectively) than he's used to, and how do non-uploads interact with a 1000 times faster person?

For the first problem, part of the answer is what I call "bodies as user-interface metaphor". Our cognition is the result of long evolving to control a body which in turn effects the world. Computer mice work by keying into notions of pointing, grasping, and carrying. Uploads will have no need for physical bodies, but to make good use of their evolved minds to affect the world, they will largely bring about these effects by controlling a simulated and somewhat abstracted body, in a somewhat more symbolic world.

Cash provides many advantages. It allows anonymous transactions, you can hoard it secretly, you don't need to use a central clearing system to pass it on to others, and some of it even looks good. In comparison, transactions using credit cards and checks are all logged, can take days or weeks to complete, and typically require you to keep your 'money' in a bank account.

Next time you find your mailbox filled with junk mail, or you receive an unsolicited marketing call, there's a good chance that it happened because someone matched your recorded spending patterns with the profile of their customers. Worse still, given the propensity of twentieth century governments to ban possession of an incredible variety of objects (even data), the police could use your perfectly legal spending patterns today to justify an armed dawn raid in the future because you match *their* profiles of criminals.

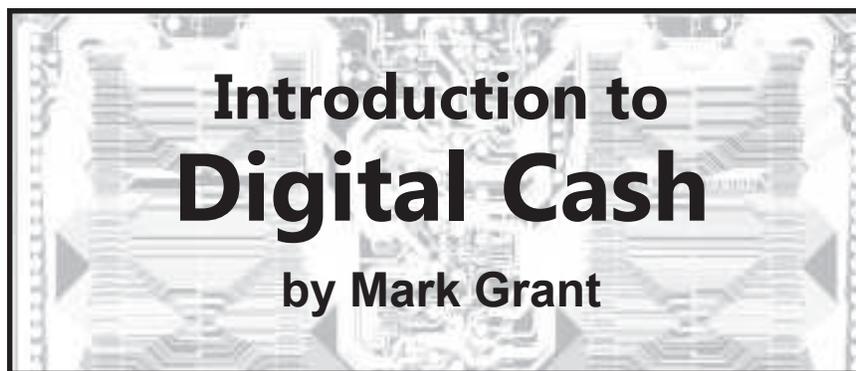
Recently we have heard much discussion of how the "Information Superhighway" will radically change the economy of the world as more and more transactions take place on the Net. However, many of the payment systems suggested for these transactions have more in common with checks and credit cards than cash. While this is good for marketers and governments, it's bad for those of us who prefer to avoid junk mail and maintain our privacy. What we really need is digital cash.

Digital Cash

Hal Finney has already covered the technical details of digital cash in *Extropy*, so I will only give a brief explanation here. In essence, physical cash (e.g., dollar bills) is an object of a specific form that is difficult to forge, typically with a unique serial number. Similarly, digital cash is a *number* of a specific form containing an embedded serial number. The numbers are chosen in such a fashion that the bank can easily create the numbers, and the recipient will find it easy to verify that the numbers are valid, but a forger will find it very difficult to create numbers from scratch without knowing the secret parameters of the formula that the bank uses to create them.

There are two ways in which this basic digital payment system differs from physi-

cal cash, the first is the ability to double spend, and the second is the lack of anonymity. Double spending is very difficult, if not impossible, with physical cash because few people can copy a bank note or coin. Unfortunately, since digital cash is just a number, while it is very difficult for a forger to create *new* valid cash, it is extremely easy for someone to keep a copy of the cash they used to pay for goods and then to spend it again buying something else.



To prevent double spending the majority of proposed digital cash systems require that after each transaction the cash is returned to the bank to verify that no one has spent it before. This requirement creates the anonymity problem. Physical cash transactions are anonymous because it would be very time-consuming for a bank to record the serial numbers of all cash issued and deposited in order to link buyer and seller. In any case the cash will probably have changed hands several times before it returns for deposit. With our simple payment system, however, it is trivial for the issuing computer to store the serial numbers. If the cash must be returned to the bank after a single transaction, the bank can easily use the serial numbers to link buyers and sellers.

True digital cash therefore must explicitly provide anonymity. The most widely known anonymous implementation is "Chaumian" digital cash, invented by David Chaum of DigiCash BV in the Netherlands. Chaum's system allows the person (or computer) withdrawing the cash to choose a random serial number; the size of this number can be set large enough to make the probability of two people picking the same number as close to zero as desired. They then pick a second random number, and multiply the two together before sending the result to the bank. The bank "signs" this product to create valid digital cash, and then returns it to the customer, who by using some clever mathematics can then "divide out" the random

multiplier. As such, when the cash returns to the bank it will be impossible to link the serial number to the original withdrawal.

Current Implementations

Currently there is no true anonymous digital cash implementation that can be used to buy and sell goods on the Net. There are however two experimental implementations of Chaum's system. The first is Ecash, a full implementation with GUI, from

DigiCash BV, and the second is "Magic Money", free code written by the pseudonymous "Pr0duct Cypher".

Ecash is currently in beta-test, and provides a GUI allowing the user to withdraw cash from their bank account. When they attempt to buy information that requires pay-

ment the seller's machine will automatically connect to the Ecash client, which will request payment from the user. If they agree to pay, then the cash is removed from their local storage and passed on to the seller, who verifies with the bank that it is valid.

Magic Money comes as C source, and wrappers allow a "bank" server to be set up on an Internet-connected machine so that it can automatically deal with encrypted client messages as they arrive. Apart from the lack of a full interface, the current software differs from Ecash in that it relies on the users storing their cash locally rather than in a centralised account on the server. This is perfectly safe as long as the cash is encrypted with a secure algorithm.

There are other electronic payment systems available on the Net that can be used for real transactions, such as NetCash and First Virtual, however at this time they do not provide full anonymity in transactions. The Mondex system currently being tested in the UK (a joint venture between British Telecom, National Westminster Bank, and Midland Bank) reportedly provides anonymous transactions. However it appears to rely for security on the use of tamper-resistant smartcards, which could allow significant potential for fraud if the hardware is reverse-engineered.

The Future

Unfortunately neither anonymous digital cash implementation is currently backed with anything (though there was an attempt at one stage to create a Magic Money server whose cash was backed with a cache of Diet Coke). Hence today you cannot go out and buy goods on the Net with digital cash.

In my opinion, there are two main reasons for this. The first is due to banking regulations that make it difficult to set up digital cash systems backed with physical cash. The second is technical, in terms of ease-of-use (which the Ecash software is addressing), security (the algorithms are secure in theory, but if there are errors in the theory then early adopters could lose much money), and the complexity of a large-scale clearing system.

It seems likely that many governments will be reluctant to relax their banking regulations to allow the use of anonymous digital cash rather than credit cards and checks or fully tracked electronic payment systems. The primary reason for this is the supposed value of digital cash to the "Four Horsemen Of The Infocalypse": drug dealers, terrorists, money launderers and child pornographers. While it is true that there is some value to them, will banning the use of digital cash harm them more than legitimate users?

It seems clear that the answer is no. As with other failed attempts to enforce laws against victimless crimes (e.g., gun ownership, self-medication), any attempt to prevent criminals from acquiring and using the technology will merely ensure that *only* the criminals will have access to it. Just as the personal computer and laser printer have made it possible for anyone to become a publisher, digital cash makes it possible for anyone to become a bank, whether they are a major corporation or a street-corner drug dealer with a laptop and cellular telephone. The only requirement is that they have a good Net link and will pay up when requested. Indeed, as national debts continue to increase, many people might see an advantage in using cash backed with, say, cocaine instead of cash backed solely by a government's ability to collect taxes.

The next question is: will digital cash make life easier for criminals? Some people have predicted that with a combination of anonymous digital cash, anonymous remailers, and pseudonyms, we will see the appearance of assassination markets, untraceable kidnappings, and worse.

In practice, while digital cash will not make life harder for the professional criminal, there are many pitfalls that will still trip up the unwary amateur. For example, one

of the limitations of Chaum's Ecash system is that it only protects the identity of the buyer, not the seller. While the bank and seller cannot collude together to identify the buyer, the buyer and bank can (though slight modifications to the protocol can prevent this).

As a result, anyone who naively threatened to blow up the World Trade Center and demanded a million dollar digital cash ransom would have the cops breaking down their door within hours of depositing it. They would also have to demonstrate an ability to carry out their threat, which would allow the use of traditional investigative methods to trace them. Similarly, kidnapers would have to kidnap someone, and assassins would have to assassinate some-

Some form of digital payment system is essential if the Net is to achieve its potential as a global marketplace.

one. The use of remailers and pseudonyms would also make entrapment much easier for the police: They could pseudonymously put up a contract, accept offers from potential assassins, then wait for the assassins to show up to do the job.

A further problem that would reduce any advantage of digital cash for criminals would be the potential for fraud. This would also be a potential problem for legitimate users, but someone who is buying supposed stealth bomber plans from a pseudonym through remailers would find it difficult to seek recompense if the seller merely took the money and ran.

There are a number of ways to reduce this risk, the most likely being a combination of reputation and the use of escrow agents. For example, sellers can request satisfied customers send them a signed document stating that they received what they paid for, or automated servers could be set up to accept positive or negative votes on a seller's reliability. Customers can then use this reputation to decide with whom they wish to do business. Escrow agents would accept a payment from the buyer, and wait until they had received the goods from the seller before passing on the money.

So, it seems clear that digital cash is extremely useful, and that its potential for criminal misuse is overrated. Given that governments are still not likely to relax their regulations without a very good rea-

son, the final question is how would we expect digital cash to appear?

One possible avenue would be offshore banks in countries with fewer regulations than the US or most of Europe. They could potentially link into one of the credit card networks to allow users to withdraw physical cash from standard ATM machines, and they would deposit or withdraw digital cash over the Net. It would be possible for governments to restrict dealings with offshore banks, but that would create significant economic effects as multinationals and foreign investors took their money out of the country.

At the other end of the scale, small groups might decide to set up local digital cash systems (e.g., using Magic Money),

backed with something other than physical cash. For example, a BBS might allow users to buy access time with digital cash denominated in "access hours", users would then be free to pay each other with this for, say, writing software. Other possibilities might include the increasingly common barter or labor-trading schemes around the world, which could create their own digital currencies. Once these came into existence it would seem almost inevitable that soon a system would be set up to allow exchange of currencies.

Some form of digital payment system is essential if the Net is to meet its potential as a global marketplace. It seems likely that there will be numerous specialised systems and a few widely accepted systems, and the provision, or lack, of anonymity will have significant economic effects. Fortunately we will fulfil the Net's full potential only with an anonymous system such as digital cash. However governments who benefit from tracking transactions may feel that the law enforcement benefits are worth the economic loss, and so may restrain the growth of digital cash systems.

[See bottom of next page for Notes]

NOTES

1. Hal Finney, "Protecting Privacy With Electronic Cash", *Extropy* #10 (4:2), Winter/Spring 1993.
2. Though this is changing as the quality of color photocopies improve.

Some interesting ideas have been floated recently about what the electronic payments system of the future might look like, particularly by Hal Finney and by Steven Levy.¹ To their discussions of the technical problems of cryptographically securing electronic payments methods against counterfeiting and theft, and of the prospects for preserving the privacy of transactions, I want to add some thoughts on the economics of possible future payments systems.

Most of the electronic payment methods under discussion involve transferring balances from one bank account to another.² The practice of making payments by account transfer has been around since at least 1200 AD, and correspondingly so has intangible or “digital” money. A bank account transferable by any method can serve as money (i.e. as a widely accepted as a medium of exchange), and any account balance is an intangible claim represented by digits on the bank’s balance sheet. Whether those digits are displayed by means of pixels or ink hardly matters. Electronic funds transfer is just the newest method (going to the bank in person was the first, writing a check came later) for authorizing a bank (or pair of banks) to shift balances from one account to another.

At the financial wholesale level, the practice of wiring money has been around for decades. Point-of-sale electronic funds transfer, initiated by swiping a “debit card” through a retailer’s card-reader and keying in a PIN (personal identification number), brings wire transfer to the retail level. Debit cards have now arrived at U. S. supermarkets and service stations. (Credit cards, with transaction approvals obtained electronically in seconds, are also now accepted at many supermarkets.) Soon just about every point of sale that has a cash register will take both credit cards and debit cards. Home banking — including

Thoughts on the Economics of “Digital Currency”

by Lawrence H. White

account transfer authorization by home computer — has been around for a decade, and has begun to grow in popularity.³ A decade from now, it may be common to shop on-line and pay on-line by mouse-clicking an on-screen “buy” button to authorize a transfer to the seller’s account. The authorization method will have changed from the days of writing a check, but not the event (transfer of account balances) taking place behind the scenes.

An alternative to the deposit-transfer and credit-card models of payments has appeared on the horizon. Developments in cryptography are said to make “digital currency” possible, that is, payment by means of a “smart card” that carries a spendable balance written to and from its implanted microchip, or by means of a personal computer that has the same kind of balance written to its hard drive or RAM. If we are to understand smart-card and PC payment systems clearly, such terms as “digital currency” and “electronic cash” should not be used loosely. “Currency,” strictly speaking, is the subset of money (the set of widely accepted media of exchange) that circulates from transactor to transactor.⁴ (“Cash” is either synonymous with currency or means a specific kind of currency, issued outside the banking system, for which bank liabilities are redeemable.) Some have suggested that the currently available type of plastic prepaid

card, which carries a balance written to a magnetic strip on its back, offers a prototype of smart-card currency. The balance on a typical prepaid card, however, is neither currency (the spent balance is not re-spent by the recipient, but simply disappears) nor money of any other sort (the balance is not widely accepted, but can only be spent at vending machines owned by the card issuer, such as the photocopy machines in a university library).

Smart card balances are *money* when the same card is widely accepted by vending machines and cash registers. The truly smart card can also have its balance “topped up” at an ATM (or even at a home computer) by downloading funds from the cardholder’s bank account. But is the smart-card balance more like *currency* than like an account balance? The fact that the card balance would be a claim on a private commercial bank (or other financial firm), rather than the nominal liability of a government central bank, does not disqualify it from currency status. Private banknotes have been the predominant form of currency when and where (everywhere in the nineteenth century; Scotland, Northern Ireland, and Hong Kong today) governments do not arrogate a monopoly of paper currency issue to themselves.

A smart-card- or PC-carried balance is like banknote currency, and unlike a deposit claim, if the balance is not “in” a particular account, being continuously tracked by the bank, but is instead held “on the card” (or “on the hard drive”), by whom ever owns the card (or the PC). A smart-card balance deserves to be called “digital currency” if and only if it *circulates*, i.e.



Continued from p. 15

3. See, for example, Stefan Brands, “An Efficient Off-Line Electronic Cash System Based On The Representation Problem”, or Niels Ferguson, “Single Term Off-Line Coins” for examples of systems using off-line verification. Both papers are available on the Internet by ftp from ftp.cwi.nl.

4. David Chaum, “Achieving Electronic Privacy”, *Scientific American*, August 1992. Also available by WWW on the DigiCash site at <http://www.digicash.com/>

5. See *Wired*, Dec 1994, for a demonstration of the Ecash user interface.

6. Those who would like to experiment with digital cash will find the Magic Money software by ftp on the Internet at ftp.dsi.unimi.it in Italy as [/pub/security/crypt/code/MagicMoney.tar.gz](ftp://pub/security/crypt/code/MagicMoney.tar.gz), or on [ftp.csn.net](ftp://ftp.csn.net) in the US. Note that US ITAR regulations make exporting this software from the US a serious crime, so if outside the US get it from a non-US site.

7. See <http://www.fv.com/> on the WWW for details of their credit-card based payment system.

Alice can transfer it to Bob, and Bob can transfer it to someone else, in transactions that are untracked by any financial institution. A currency smart card could thus have its balance augmented by a transfer from another card, perhaps via a pocket device for reading and writing to smart cards (a “digital wallet”), unmediated by the banking system.

I do not know whether the encryption technology exists to allow smart cards to carry such truly circulating balances, secure from counterfeiting. But then there may not be much demand for currency smart cards. The anonymity of currency would seem to be equally available through encrypted deposit transfer (see below). One major use of the circulability feature of paper currency — making change — is never needed with smart card payments.

The type of smart cards Finney and Levy describe do *not* follow the currency model. They are better be characterized as “digital cashier’s checks” than as digital currency, because the balances do not circulate party-to-party. Instead, like cashier’s checks today, Alice would always obtain her card balances directly from her bank (probably by transferring funds out of her regular bank account). Bob, receiving Alice’s payment, would always immediately redeem it by electronically depositing the payment into Bob’s account. With that kind of transactions technology, unlike with banknote currency, the bank is tracking *which card* has what outstanding balance at every moment. (The identity of the card-holder might be unknown to the bank, if anonymity is desired, but this does not make the card balance currency: a numbered Swiss bank account provides the same kind of anonymity.) Thus the card balance is functionally equivalent to a bank deposit, and smart-card payments are just another form of deposit transfer. Furthermore, every payment recipient must be wired to the payment network (to immediately confirm and covert the claim into the recipient’s deposit balances).

It seems to me that digital cashier’s checks, acceptable only to wired sellers, lack an obvious niche in the payment system. Immediate confirmation, which eliminates the risk of a payment bouncing, is already available on deposit transfers via debit card. If every recipient of smart-card payments needs to be wired to the payment network, there is no apparent reason for any set of sellers to accept payments via

smart card but not via debit card. Why then bother with the smart card? A conceivable way to make smart cards acceptable to non-wired sellers would be the development of a “digital safe”, a device allowing a seller to receive and to store smart-card payments until the end of the business day, when the payments would be electronically deposited. It is not clear that having a digital safe would ever be cheaper for the seller than being wired.

When debit- and smart-card readers become near-universal, paying by debit card or smart card will usually be more convenient than paying with paper currency or coins. A debit card is better than cash or a dumb prepaid card in at least two more respects: using a debit card keeps

If an offshore bank were linked to the clearing system and to an onshore ATM network, more of us could begin enjoying the advantages of offshore banking that big-money players and large firms have enjoyed for years.

your money in your bank account, where it is both more secure from theft *and* earns interest, right up to the moment it is spent. A smart card could be made as secure as a debit card by requiring a PIN (known only to the rightful owner) to be entered before the card balance can be spent. I imagine that a smart card could also be made to pay interest, namely by programming the card’s microchip to augment the unspent card balance automatically over time. If such programming can be developed and cheaply copied to smart cards, competition will force the banks that issue smart cards to pay interest on card balances.⁵

A potential privacy problem arises with electronic payments because a credit-card transaction or an electronic funds transfer (whether initiated in person or via computer), like writing a check (but unlike a paper-money or prepaid-card transaction), generates a trail. Your bank’s or card company’s computer ends up with a list of how much you’ve spent and where. The same list could be constructed by a third party that purchased and collated the information held by all the vendors from whom you bought. This list is potentially available to the IRS or to other government agencies who may want to commandeer it, and (if you don’t have a contract

with your bank and vendors expressly forbidding it) to credit bureaus or junk-mail firms. Cryptography, as I understand it, offers a solution to this problem by making *anonymous* electronic payments possible.

One set of methods for anonymous payment uses the “smart card” model (the funds to be transferred have already been downloaded onto a smart card or personal computer); an alternative set uses electronic deposit transfer either by debit card or by personal computer. I imagine that a privacy-preserving deposit transfer could work the following way. Suppose Alice wishes to pay Bob \$100. Alice might be standing at Bob’s cash register, or she might be home at her computer looking at Bob’s invoice or advertisement on her

screen. By merely typing in her PIN, or clicking on a “pay” button on my computer screen (after logging on with an ID code known only to her), Alice sends a cryptographically “signed” (or PIN-authorized) and numbered (Bob has assigned the number) message to Alice’s bank that instructs the bank to transfer \$100 to an account (whose name is encoded) at Bob’s bank. Alice’s bank reads the “signature”, and knows the message is genuine. Alice’s bank can’t read the recipient account name, so it doesn’t know to whom the money’s going (only to which bank). Bob’s bank can’t read Alice’s signature (which Alice’s bank may have removed), so it doesn’t know from whom the money came (only from which bank, and in favor of which account). Bob reads the transaction number to know the payment came from Alice (though Bob might not know Alice’s real name).⁶ Bob then hands Alice the goods, or ships them to Alice’s private post office box.

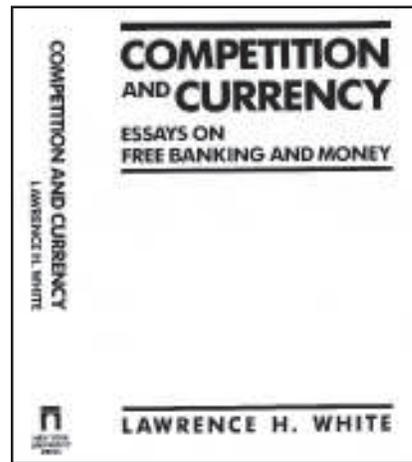
Are bank customers actually eager to pay cost-covering prices for privacy features of this sort? Encryption entrepreneur David Chaum of DigiCash thinks so. I don’t know. The market profit-or-loss test will tell us, assuming that the government does not interfere.⁷

Assuming that security and privacy can be assured, what implications do the new payment methods have for individual liberty? I have read a transcript of postings to the Extropians e-mail list discussing many of the relevant issues. Let me add my comments here.

One major potential advantage of electronic funds transfer via personal computer is that it may give ordinary consumers affordable access to off-shore banking. With direct deposit of paychecks, and with old-fashioned cash available at ATMs whenever we want it, many of us already no longer need to visit a bank office in person. Why not keep your account at a reputable foreign bank (perhaps a branch of a major Swiss bank) in the Bahamas or

ing. An exodus of retail banking business from the regulated onshore sector to an untaxed and unregulated offshore sector will shrink the domain of federal banking authorities. It is probably unlikely that the authorities will gracefully allow this to happen, though it should be noted that the Federal Reserve has since 1981 allowed U. S. banks and licensed foreign banks to do some "offshore" banking (no reserve requirements, no deposit insurance) with foreign customers onshore in the U. S., through separate balance sheets known as International Banking Facilities.⁸

Would currency smart cards, bearing a new privately issued form of money, undermine the Federal Reserve's control over the quantity of money in the economy? If



174ff. (surveys electronic payment methods and privacy issues), and Hal Finney, "Protecting Privacy with Electronic Cash," *Extropy* #10 (Winter/Spring 1993), pp. 8-14 (explains the encryption methods that enable anonymous electronic payment). See also "So Much for the Cashless Society," *The Economist*, 26 November 1994, pp. 21-23 (speculates about payments over the Internet).

2. In what follows I will use the terms "bank" and "deposit" to cover any sort of financial institution issuing any sort of claim with a transferable account balance, including a money-market mutual fund account (which strictly speaking is not a bank deposit).

3. See David C. Churback, "Let Your Fingers do the Banking," *Forbes* (19 August 1991), pp. 122-24;

4. A "medium of exchange" is an asset acquired in one trade in order to be spent (or converted into another asset to be spent) in a later trade.

5. Paper currency has traditionally not paid interest, even when issued by competing banks, because small amounts of interest are at stake (a week's interest on a \$20 bill amounts to less than 2 cents when the annual interest rate is 5 percent), and collecting it is cumbersome (one would have to stop to ascertain in each transaction the current value of a note whose value is rising over time). Interest on paper currency (or token coins) is thus not worth the trouble. A currency smart card that updates its own balance would make the cost of collecting interest on currency negligible for the first time in history.

6. This method preserves privacy by using the two banks as semi-anonymous "remailers" of different parts of the payment message. Privacy could be increased even further by having a clearinghouse relay the messages so that neither bank knows the identity of the other bank.

7. Some federal authorities have suggested that they would object to a completely untraceable version of smart-card or debit-card payment, because it might be used to hide transactions they want to tax or prohibit. To be consistent, such authorities should also object to the availability of untraceable \$100 bills, which can be carried in opaque suitcases. Chillingly, some do.

Continued on p. 19

Lawrence White's *Free Banking in Britain* will come back into print in a paperback second edition to be published by the Institute of Economic Affairs, late this year or early 1996. His *Competition and Currency* is available from Laissez Faire Books in paperback for \$14.95. LFB also offers a *The Crisis in American Banking* (NYU Press), edited by Prof. White, in hardcover for \$27.95.

the Cayman Islands? Such an offshore account is perfectly legal today (though a U. S. bank's offshore branch is prohibited from directly doing business with American citizens or firms), but is simply not worth the trouble (the expense of wiring money back and forth) for most individuals or small businesses. If an offshore bank were linked to the clearing system and to an onshore ATM network (the ATM link would be unnecessary if all cash-like payments could be made by debit card or smart card), more of us could begin enjoying the advantages of offshore banking that big-money players and large firms have enjoyed for years. Offshore banks pay higher interest on deposits because they are free from the taxes on deposit balances that the U. S. government levies in the form of reserve requirements, deposit insurance "premiums," and taxes on bank earnings. Desktop electronic funds transfer, in other words, may bring offshore banking to the small player. Individuals who are concerned about privacy should also find an offshore foreign bank attractive for its lesser propensity to surrender its records to domestic authorities.

When Prodigy, CompuServe, and commercial Internet sites begin offering offshore banking services, the retail banking market should become very interest-

the authorities thought so, it would be very easy for the Fed to impose the same reserve requirements against the total of a bank's outstanding smart-card balances that the Fed currently imposes against deposit balances. Even without Fed-imposed reserve requirements, however, a bank's obligation to convert card-balance dollars to scarce reserve dollars (physical currency or account balances at the clearinghouse) on demand naturally limits the number of card-balance dollars a bank will find it prudent to create given the size of its reserves.⁹

Finally, will desktop electronic funds transfer and smart cards promote the use of some monetary unit better than the currently predominant government fiat unit (the Federal Reserve dollar, in the United States)? Unfortunately, no. The fiat dollar has a great deal of inertia behind it because of a network effect: each individual normally wants to be paid in the units that he or she can most easily spend, which means the standard type of units that everyone else wants to be paid in. New methods of transferring payment do not change any seller's rational preference for being paid in units of the currently dominant money.

Notes

1. See especially Steven Levy, "E-Money (That's What I Want)," *Wired* 2.12 (December 1994), pp.

E-Cash & Private Money

Along with the explosion in press coverage of the internet has come increasing attention to the possibility of digital money or electronic cash. *Wired* recently featured a major article on the topic by Steven Levy, and the current special cyberspace issue of *TIME* surprised us with a story on the subject by Neal (*Snow Crash*) Stephenson. In thinking about the further evolution of money, its digitalization forms only part of the picture. Extropian thinkers seem to excel in synthesizing ideas from multiple disciplines to form a sophisticated view of the possible future. As usual, we can take the lead by moving beyond the present state of these discussions. An aspect of future money that you'll seldom find elsewhere is the denationalisation of money, or the separation of money and government.

Electronic cash and the competing currencies that would result from the denationalisation of money should be considered together. Both can reduce the power of government to tax and regulate, thereby freeing markets and increasing liberty and productivity. Serious modern thinking about competing currencies was pioneered by Friedrich Hayek, 1974 Nobel Laureate in Economics. His groundbreaking *Denationalisation of Money* he developed out of a critical scrutiny of proposals for monetary union in Europe. This attempt at creating a single European currency continues to flounder, though backed by ill-informed futurists who think in terms of world government and supranational governmental units. Few thinkers, especially policy-makers, have discussed Hayek's alternative of competing currencies, perhaps because it threatens the interests of centralized government institutions and state control. Most relevant writing focuses on historical experiences with free banking (the absence of a central bank). In place of most futurists' ideals of world government, technocracy, and monetary supranationalism, we can

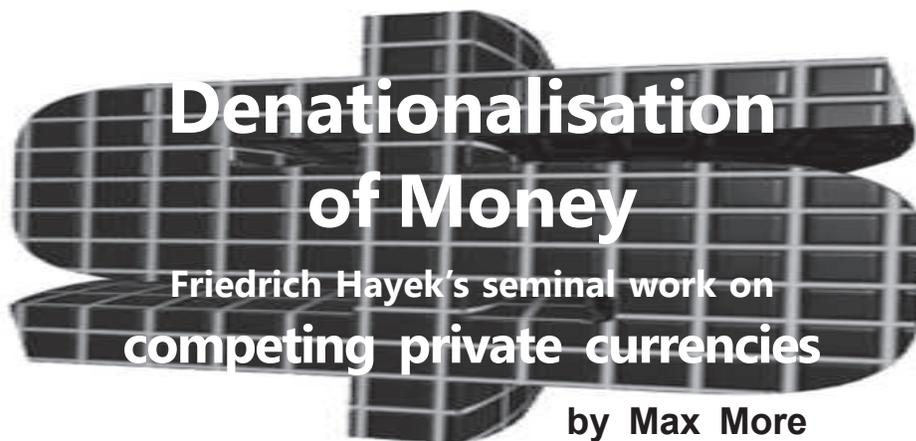
Published 1976, 1978, 1990, by the UK's Institute for Economic Affairs, 2 Lord North St., Westminster, London, SW1P 3LB, UK. 071-799-3745. ISBN 0-255-36239-0

examine the alternatives of polycentric/privately-produced law and competing digital private currencies.

What is the point of removing the government monopoly on money? Is it simply an ideological dream of radical free market enthusiasts? It may be a dream, but it's a dream with substance. The desirability of competing currencies comes from practical considerations. We can expect competing currencies to provide remedies to four economic ills: inflation, instability,

rise in the "average price level". The influx of new money, to the extent that it artificially lowers the interest rate, stimulates investment, especially in producer goods. Once the inflation is brought to an end, or once the interest rate is no longer too low, the uneconomic nature of the investments becomes apparent. The temporary boom ends up as a recession.

Economic instability — the series of recessions or depressions and recoveries — results directly from government ma-



undisciplined state expenditure, and economic nationalism.

Inflation and Instability

Inflation results from an increase in the quantity of money in excess of any increase in demand for cash balances. It is not caused by increases in wages or other factors of production (so-called "cost-push" inflation). Increases in wages in excess of productivity gains will result only in unemployment. Inflation can only result if governments expand the money supply in an attempt to prevent the rise in unemployment. Hayek and the "Austrian School" economists have long argued that much of the harm of inflation arises from the distortions in relative prices, and not just from the

manipulation of the money supply. Governments have found monetary policy addictive. The politically-caused cycle is especially clear in countries like Britain, where the executive branch has undivided control. Economic indicators usually strengthen just before an election, as the government throws money at the economy (borrowing and spending), then take a dive soon after as the economy pays the price of the unsustainable stimulus. It would be unrealistic to expect politicians to refrain from this kind of manipulation. So long as they have the power, they will exercise it to their advantage and the economy's long-term disadvantage.

The same self-interested incentives, in the radically different framework of competing private currencies, would have

Continued from p. 18

8. The most important legal restrictions on IBFs are that they are not allowed to transact with U.S. customers, and they are not allowed to offer overnight deposits. Consequently U.S. and foreign banks eligible to operate IBFs continue to operate Caribbean branches.

9. The theory of the economic limit to banknote and deposit volume under "free banking" applies equally to smart-card balances. See George A. Selgin and Lawrence H. White, "How Would the Invisible Hand Handle Money?," *Journal of Economic Literature*, vol. 32, no. 4 (December 1994), pp. 1718-49, and references cited there.



a thoroughly different effect: Private issuers, to preserve public confidence in their currency, will limit the quantity of the money they issue in order to maintain its value. I will not go into the details needed to justify this view of the incentives (though Hayek does); the presumption of stability of a private system should be clear from the realization that it will be in people's self-interest to switch from an unstable currency to a stable one. Marxists, Keynesians, and other statist, have long claimed that the Great Depression and other instabilities are inherent in the market economy. As Hayek notes, the truth is the "past instability of the market economy is the consequence of the exclusion of the most important regulator of the market mechanism, money, from itself being regulated by the market process". [102] (See Milton Friedman's and Murray Rothbard's extensive analyses of the Great Depression for further information.)

State Power & Nationalism

The state expands its power largely through taking more of the wealth of productive individuals. Taxation provides a means for funding new agencies, programs, and powers. Raising taxes generates little enthusiasm, so governments often turn to another means of finance: Borrowing and expanding the money supply. Only a legally-enforced monopoly on currency has allowed governments to cover deficits by issuing money. Taxation and deficits are related: If tax rate categories are not adjusted for inflation, inflation pushes people into higher tax brackets: their nominal but not real income rises, giving the government a way of increasing tax revenues seemingly without raising tax rates. Unexpected inflation also reduces the real value of the government's debt.

Most readers of this publication regard national boundaries as antiquated and irrational. Despite the efforts of governments, the advance of technology and the evolution of business practice contribute to the irrelevance of nations as economic units. Yet states continue to wield enormous nationalistic powers by means of their currency monopoly. Government is able to restrict the international movement of persons, money, and capital. This makes it extremely difficult for dissidents to escape oppressive governments. It's hard to leave a country if you can only take

pocket change with you. Abolishing exchange controls helps, but controls can always be reimposed so long as the state retains its monetary monopoly.

Doing away with the government monopoly in money would do away with economic and political problems tied to national concerns. One of supposed problems concerns the balance-of-payments: the balance between imports and inflows and exports and outflows measured within the boundaries of a *nation*. As Hayek says, "With the disappearance of distinct territorial currencies there would of course also disappear the so-called 'balance-of-payments problems' believed to cause intense difficulties to present-day monetary policy... it would be discovered that 'balance-of-payments problems' are a quite unnecessary effect of the existence of distinct na-

In place of most futurists' ideals of world government, technocracy, and monetary supranationalism, we can examine the alternatives of polycentric/privately-produced law and competing digital private currencies.

tional currencies, which is the cause of the wholly undesirable closer coherence of national prices than of international prices." [103-4]

The option of competing currencies can help us see that monetary policy is unnecessary; under the new competitive arrangement it would be impossible. Much of the instability governments cause with fiscal and monetary policy would be prevented. Interest rates would cease to be an instrument of policy, instead being determined by the demand for and supply of loans. Recently we've witnessed the absurd spectacle of the Federal Reserve Board (led by former member of Ayn Rand's inner circle, Alan Greenspan) continually raising interest rates to pour water on the economic fires before it reaches supposedly inflationary rates.

Instead of politically-influenced control by government, competitive pressures would determine the stability and value of competing private currencies. Hayek analyses the incentives faced by the private issuers of irredeemable currencies, showing that they would have an interest in maintaining a stable value. Currency users would abandon an unstable, inflat-

ing, or deflating currency, for better alternatives. Hayek looks at the ways in which an issuing bank could control the value of its currency in order to keep its value constant in relation to the aggregate price of a bundle of widely used commodities. You will find much more in *Denationalisation of Money*, including analyses of the relation between issuing and non-issuing banks, and how new currencies may be introduced.

Denationalisation of Money reveals the shape of a rational future for the monetary system. Competing currencies will trump the present system by controlling inflation, maximizing the stability of dynamic market economies, restraining the size of government, and by recognizing the absurdity of the nation-state. Pairing this reform with the introduction of anony-

mous digital money would provide a potent one-two punch to the existing order—digital cash making it harder for governments to control and tax transactions.

I deeply regret Hayek's recent death. A polymath and iconoclast, in his ninth decade of life Hayek continued to make major contributions to economics, history, psychology, and legal and constitutional theory. He was the key figure opposing Maynard Keynes in the '40s and '50s, finally gaining some real influence in the '70s and '80s. Not having been placed into biostasis, Hayek will never return to see the days of electronic cash and competing private currencies that his thinking may help bring about. If we are to remain the vanguard of the future, let's see what we can do to hasten these crucial developments. Perhaps we will yet see a private currency bearing Hayek's name.

My thanks for helpful comments to last-minute readers, especially Ralph Whelan and Lawrence White.



Ecological Experiments, Space Habitats, & Long Life An Interview with Roy Walford, M.D. (Part Two)

by David Krieger
with Max More

At 69, Roy Walford, M.D., is the author of two prior best-selling books, *Maximum Life Span (1983)* and *The 120-Year Diet (1988)*. He received his M.D. degree from the University of Chicago in 1948 and has been professor of pathology at the UCLA School of Medicine since 1966. Author of over 250 scientific articles, Walford was a delegate to the last White House Conference on Aging, is a member of the National Academy of Sciences Committee on Aging, and is considered to be one of our leading gerontology experts.

For more than 20 years, Walford's life work has been studying the effect of low-calorie, nutrient-rich diets in animals at his UCLA lab. In 1993 he completed two straight years of studying the effects of diet on aging in humans in *Biosphere 2*, a sealed environmental laboratory for the study of micro- and artificial ecologies, located in the Arizona desert. The goal of *Biosphere 2*, funded by controversial Texas billionaire Ed Bass, is to improve humanity's knowledge of managing ecosystems in preparation for the habitation of space. The results of Dr. Walford's *Biosphere* studies have been published in *Proceedings of the National Academy of Sciences*.

In *The Anti-Aging Plan*, Walford and his daughter, chef Lisa Walford, present an easier, more convenient cookbook and menu guide for humans who want to prolong their enjoyment of food. Max More and I interviewed Dr. Walford in his Venice, California, residence. In Part One of this interview, we discussed Dr. Walford's longevity research and hopes for the future; in Part Two, we talk about the *Biosphere 2* experience:

Let's talk a bit more about the Biosphere. I had a chance to visit the facility recently; it's very impressive. What do you think has been the major change in your life as a result of having been involved in that?

I guess I've gotten more involved in human values than I was; I'm not interested in being on such a merry-go-round. Although at the moment, I'm back on the merry-go-round, I'm getting off in 1995; I'm really tired of it.

What do you mean by "merry-go-round"?

Giving talks all over; being keynote speakers and banquet speakers and grants and that whole trip, and not having enough time to do some of the video and art and other technology that I'm trying to get into but haven't; I can't do it because I've got myself tied up. So I'm getting off of that. 1995 is the year of saying no.

How do you feel about the science that's come out of Biosphere?

Well, I don't think much has come out except for what I've done, in the *Proceedings of the National Academy of Sciences*¹—so far, but I think it will come out. Virtually nothing has come out; there are a number of papers that have been written, and there's one in *Bioscience*, that are all descriptions of potentiality. I think more will be coming out, because now that the cult people have been kicked out by the financial backer, Ed Bass, they have good management—and the scientific community, which had drifted away in disgust at the hierarchical, authoritarian, arrogant nature of the previous management, is now coming back. The Smithsonian is back, working with them; the Yale School of Forestry is back; the Lamont Geological Laboratory is back—all of those people said, "To hell with it; we can't work with you," and left. And other people are coming back; so I think it'll be back on track and regain its credibility.

What qualities of the prior management gave it the characteristic of being cultish?

Well, it was a typical cultish characteristic, if you just look at a book on cults. For example: a charismatic guru whose word was law. In "thought reform" programs you do a number of

things, and this is very typical of all the cults. One: Keep everybody so *busy* that they can't think for themselves—either busy working or busy engaged in what are ostensibly recreational programs, like putting on theatre plays and things like that, but really, the purpose of which is to keep everybody busy, doing something constantly. Every night, we had something going on after dinner, whatever, so it was a full-time occupation.

Separating people from their families or friends, children—breaking up all those ties—they've got everything centered around the group. Those are some of them.

After the change in management, there was an incident with a couple of your fellow Biospherians who broke the seal on the second group as a protest. Have you been in communication with them; do you know what their motivation was, and what they hoped to accomplish by that?

I haven't been in communication with them, but I know, or surmise, the motivation for everything. This is just a guess. First of all, among the eight Biospherians there were four who were loyal to the old cult management, or, basically, part of what has been called a cult. I don't think I quite want to say that, because I don't want to get sued.



Anyway, four were brainwashed, loyal to the old management, and then four of us, some had never been in it. I was never in it, although I was around it and could see it. Another person, Linda [Leigh],



was not really in it, and then Jane [Poynter] and Taber [MacCallum] had deprogrammed themselves about a year before going in, so there were four in and four not in [the cult]. The only thing that held everybody together was that everybody was very determined to make it work.

The funny side—not funny, but the side that illustrates that, is that I could never get a psychological evaluation done, which should have been done, because the psychology of isolated, confined environments is a big area—Antarctica, NASA, and space—it's a big area in the study of psychology, and obviously, the Biospherians should have been analyzed by good psychometric testing. But I couldn't get this done, because obviously management didn't want psychologists meddling with their cult system.

They didn't want it to be a "Sociosphere," just a Biosphere.

Yeah. So, two or three months before the end, I did manage to prevail, and got a good guy from the University of Arizona to do some evaluations and interviews and run the MMPI² and stuff like that. We were writing a paper together on biospheric medicine, but what he found—I thought that maybe he'd find that half the people were nuts and the rest of us were sane, something like that, but that isn't actually what he found. That didn't show up so much.

What showed up was that everybody was *so* achievement-

oriented, that was unheard of. He said he couldn't find a control group. He tried airline pilots, and they were completely wiped out, so he's looking for astronaut figures now. The fact is, we're so bulldog determined to make it work, in some high achievement stuff, that we would have overrun any kind of psychological problems, and that's basically what we did. Or physical problems—I really fucked up my back inside, overworking—two or three hours a day of heavy duty agriculture and field labor, for six days a week, for two years, was kind of like having had back surgery.

Anyway, that's why it worked. But the four were still in the cult afterwards, and when Ed Bass marched in and kicked everybody out—that is, the prior management—two of them came back from where they were in Japan, and sneaked in up the back road, and opened the doors and stuff like that, and did some moderate damage inside.

I can only guess the reason for that, because it didn't really do that much damage and it was kind of a pointless gesture; it didn't invalidate anything. The amount of air exchanged was not very much. But I think the reason was, they thought that some of the present people inside would come out if they were told to come

out, because they had also, to some extent, at one time, been under the influence of the cult guru, John Allen. And if they had walked, it would have been like the Biospherians voting with their feet against the new manage-



ment.

But in the end, they wouldn't come out; so the people who opened the door were left holding the bag. It didn't work that way. The woman is up for a felony trial, and the man was up for it, but he got off.

That was Abigail [Alling], and who was the man?

Mark van Thillo.

Kevin Kelly wrote an article in Whole Earth Review after the first year of the first Biosphere experiment and pointed out that there have been a lot of public misconceptions about the purpose and the achievement, the fact that there had to be oxygen supplementation and some additional supplies brought in and so forth. Could you comment on the real goals of the experiment?

I think the experiment was quite successful in terms of staying more or less closed for the two years and being almost totally self-sustaining, so that, if you're trying to make the Mars base—or something that will eventually become a Mars base, much modified—it was very successful. We did stay in for two years. There wasn't any extra food brought in. As far as the oxygen was concerned, there was some oxygen brought in, but that didn't make that much difference; it was just liquid oxygen that was brought in and allowed to fill up the oxygen that disappeared.

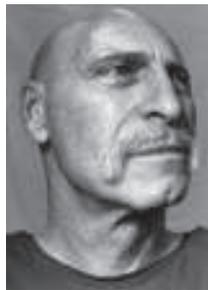
The falling oxygen was due to a management blunder. They had been told by the agricultural consultants to put in soil that was six to eight percent rich in organic matter; and, in their naive way, management thought, "Well, we want things to grow, so the richer soil the better." So they brought in soil that was about 30%—I'm not sure of the exact figure—in organic matter.

What happened then was that soil bacteria, in this super-rich soil, produced more carbon dioxide than the plants could deal with. Then, cement, which is calcium hydroxide, will take up carbon dioxide to form calcium carbonate. This is a mild problem in the cement industry, but in the Biosphere, because the carbon dioxide went up to 3500 or so instead of the normal 300 parts per million in our environment, that drove that reaction forward, and the cement sucked up a lot of the carbon dioxide, and the oxygen it contained, into the cement, acting as a sink. The oxygen went down. Finally, when it got down to 14 percent, as opposed to the outside 20 percent, we were having considerable breathing problems, and as the medical officer, I had to tell them to bring in oxygen, which they did.

But I don't think that invalidated anything; it illustrated the stupidity of management for setting that up against good scientific advice in the beginning.



You mentioned that the Biosphere is preparation for living in space. Do you think that more people should consider migration into space more seriously than it's being con-



sidered today? How important do you think that is to the future of humanity?

I think it's important to the eventual future. I don't know when—Now is a good time to do it. I don't have any firm opinion. I think it's a serious mistake to wait till all the problems on Earth are solved before we go into space, because in that case we'll never get there. So I think we should, the sooner the better.

Max: If you're around 30 years from now, do you want to go into space?

I'd like to go up now. If I can ever get in the shuttle, I'll give it a whirl. I think I'll try to get on, after I finish giving all these speeches and everything else, and doing some writing—

Jane and Taber are into, at the moment, making small closed ecosystems. The first ecosystems were made by Clara Folsom at University of Hawaii; they're basically glass, about ten inches in diameter, and he put pond water from different places around Hawaii in there and then sealed them up. And as long as they got the right amount of sunlight, they stayed alive, and they'd circulate in a sustainable system. The longest one has been going like that since 1968. There are a whole number of those—Folsom died, then, but his flasks were still living at the Biosphere. You may have seen them if you were over there; they're often included in the tour.

So Jane and Taber and Linda and others are now working on getting somewhat larger ecospheres; they're studying smaller closed ecological spaces like that. If they can get some, I suggested it would be fun to put some up in the shuttle and just stick them out in space—having given due thought to what they'd have to sustain in terms of too much sunlight and cosmic radiation and incorporate those thoughts into how to build them. So I've said, if they make them, I'll try to get up and put them into space. So, yes, the answer is yes.

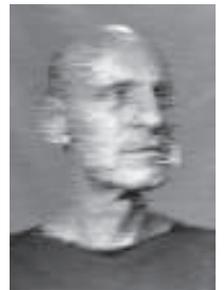
Max: Do you think that when there are a large number of people living in space, a space civilization—Do you think that will change the way we live, the way we organize our societies?

Yeah, I think it would, substantially. Our experience was that it changed everything, in the Biosphere. In a sense, you become disconnected from the outside world. While we were in, we had TV and radio and telephone and fax, but what was going on outside, in a sense lost its importance. The Russian empire fell, one day, and the same day the goats had kids. They were sort of comparable. So I think it'll change...

The other thing that will change a lot is, there'll be a lot of interconnection between space colonies



and Earth, in a sense, in terms of art interaction, I think, because it isn't very much fun to do art projects if you're only doing them for six people. I don't want to write a poem that's only going to be read by six people; I don't



want to even do it. So you need to have a two-way communication like that.

I was doing an art project with Barbara Smith, a performance artist, called *A 21st-Century Odyssey*, in which she was a female Odysseus, traveling around the world doing ecological performance art in different localities, such as Kathmandu, Australia, and Norway, and I was a male Penelope inside the Biosphere. So we were communicating by videophone. So I was doing some art things inside, but I think if I couldn't have shown them outside it wouldn't have made much sense; it wouldn't have been satisfying.

So if people are living in space, I think they'll need intercultural interaction with a larger population. So that's a different culture, that's the Internet culture, but expanded through multimedia—electronic culture.

How much do you use Internet communications? Are you a "nethead"?

No, not very much. I haven't had time since I've been out. I do some via CompuServe; I'm on the Well, but I don't use it very much. What I am getting into is multimedia and video technology, because I've got about 80 hours of inside High-8 video and 4000 photographs. I'm working that into some art pieces; so I have a lot of technology left to learn. That's what I plan to do in '95.

What kinds of projects do you have in mind for those? CD-ROMs?

Well, we've been talking about doing a CD-ROM about the Biosphere. I want to do a nine-channel video installation using a bunch of photographs and the video that I took inside.

[Dr. Walford showed us part of his video diary of his two years in Biosphere 2.]

Do you know the people at the Electronic Café in Santa Monica?

Oh, sure. They were the connecting link for all of this stuff that Barbara Smith and I were doing; it went through the Electronic Café—from her to the Electronic

kinds of things really don't travel well over the wire?

Well, I think people are freer in their speech, with electronic communication—less shy, or something like that—so that kind of verbal interaction travels well. I don't know what doesn't travel well—touching people; physical communication, which I think is quite different.

What kinds of changes do you hope for in society, with the chance to start new societies in space? What kinds of changes would you like to see?

Well, it's hard to say, but, as the Biosphere experience was so fractured—I thought that, hopefully, the eight people

liked it so much in there, they overgrew everything—they overgrew the whole rainforest; the space frame was covered with them; they hung from all the trees, and they grew across the rainforest floor. So we had to get in there and spend endless hours cutting them out; they just went crazy. A few other things did, too, like the Australian cockroaches. They decided they liked it.

You have a very wide range of interests. What fields in which you're currently not doing work do you find most interesting? What have you been reading and following lately?

I'm not doing work in theater now; I think that's interesting. I used to hang around with the Living Theatre; I've traveled with them and lived with them a little bit. And I wrote theatre criticism for the Los Angeles Free Press, but I'm not doing anything in that now, but I'm still trying to keep up on it.

Other fields... I'm not doing any work in molecular genetics, because I'm trying to get into another career, basically; to get out of this heavy scientific career. I've written in all my books that you should change careers two or three times, but I haven't been a very good example; I really haven't disengaged from the heavy-duty science career, but I want to do that. Therefore, I'm not really up on the cutting edge of, say, molecular genetics.

Max: Do you see any possible problems with the emergence of very long-lived people? Do you think there could be, for instance, people who are a couple hundred years old in control of things and younger people not having much of a chance to catch up, or do think there'll be ways around that, by restructuring the way we organize?

I think there's a danger of that, but I don't think it's any more dangerous than what's going on. Hitler was not very old when he got control of everything, so, no, I don't think that's more dangerous than it is at present. Maybe less, if people are living long enough; as I say, I think their sense of values increases, finally.

You also mentioned the ecological attitudes of people that expect long life; to what extent do you consider yourself an environmentalist, and what do you think is the best course for maintaining the sustainability of Biosphere 1?

Well, the best course for maintaining the

I think [space migration] is important to the eventual future. I don't know when—Now is a good time to do it. I think it's a serious mistake to wait till all the problems on Earth are solved before we go into space, because in that case we'll never get there. So I think we should, the sooner the better.

Café to me, and from me to the Electronic Café to her, and anybody else who wanted to sit in the Electronic Café and watch the interaction.

Max: I was there one day when you were sending pictures of the butt paintings. [These artworks, made inside the Biosphere, were based on the same principle as finger paintings—but effected with blunter utensils.]

Yeah, they're right up there [points high on the wall], some of them, up above.

During the sequence in one of the lungs [constant-pressure air reservoirs of Biosphere], you used the terms "Prisoners of Mars" to describe the extra-terrestrial look of the scene. Was there much claustrophobia going on during that time?

No, there was no claustrophobia. It's big enough you can see above and below ground, and it's not... [that's] one thing that nobody had problems with.

What qualitative difference do you think there is between electronic communication and face-to-face communication? You mentioned the isolation of space colonies and things like the Biosphere. To what extent can electronic communication really address that kind isolation, and what

would go in and form their own society, which was disconnected from outside—but in the event, the outside management kind of reached in, since they had thought control over four of the people, so we didn't really get to have the kind of experience that I thought might be happening.

A greater development of intimacy, and things like that, I think will come about in smaller societies, if you start out with the right people; but the whole thing is also like a chaos dynamics situation. You can change one person and the whole thing will be quite different. That means a real careful selection, if one knows how to select.

The Biosphere was very chaos-dynamic—not only like that, in terms of the social situation. There were other people that were supposed to go in and didn't go in, so the choice of the Biospherians changed a number of times as to who was going in. I know that with some of the people that were supposed to go in but then didn't get in, the whole scene would have been totally different, instead of this four-and-four fiasco.

The other thing that went on, in terms of chaos situations—before closure, we put in two tiny morning-glory vines, about as big as my thumb, on the cliff wall. They

sustainability is to have fewer children, or to reduce the birth rate, which is exponential now. I think that's really the main problem. Beyond that, people are becoming increasingly aware of the environmental crisis. Mankind has a big block about looking ahead for twenty years or 25 years, which is why people don't stop smoking; at 20 or 30 years old, people are still smoking because they can't imagine that they're going to get cancer when they're 55 or 60; and the same thing is true with the environmental problem. I think that's kind of an innate human problem that has to be faced and counteracted, I guess by education. Yes, I think the environment is a critical situation. It's kind of

So, they've tried to do that at each of their installations, and that's good. I certainly agree with that, and everybody does. The problem with the cult is that, on top of this ecologically worthy goal, they put this cult mentality, so that kind of destroyed everything.

What do you think is the best future direction for Biosphere-like research? You mentioned some of the microenvironments that Taber and Linda have been working with; what are some of the other interesting areas that you would like to see more research done in future, following on to this area of research?

Well, they need more well-controlled

In a sense, you become disconnected from the outside world. While we were in [the Biosphere], we had TV and radio and telephone and fax, but what was going on outside, in a sense lost its importance. The Russian empire fell, one day, and the same day the goats had kids. They were sort of comparable. So I think it'll change...

a race between science and madness at the moment, as far as the environment is concerned.

Do you think that the role of governments is helping or hindering the present drive for taking better care of the environment?

Well, it depends on the government—certainly the Soviet government didn't help at all, because they were interested in production. It's a toss-up. I think the government is interested in helping the ecology, but there are countervailing forces that deal with full employment, exploitation and money-making that are also in play, so there's a balance between those which is now not very good, actually.

The only positive thing about the [Biosphere] cult was that they were honestly interested in a sound ecology and had the conviction that you can't save the Earth by putting everything off-limits, by making vast stretches of the place where nobody can go, or putting Oregon off-limits, but by developing sustained agriculture that's not damaging. To that purpose, they have, for example, a 300,000-acre ranch in Western Australia which had been overgrazed by sheep; they've now made it into a working cattle ranch and they're bringing back the environment.

closed ecological spaces that are probably smaller than the Biosphere, where the different spaces are exactly the same but vary in small ways, so you can isolate what's going on. That's not what's happening in the Biosphere. Ecology in the Biosphere is like ecology on the Earth; it's not very well isolated. It's just more isolated than it is on the Earth. The top is this big glass bubble, and underneath there's a stainless-steel plate, so everything is inside. Other things like the Biosphere will be, for a while, smaller, but duplicated enclosed spaces where the variation is more limited so they can study that. I think that's going on in one other place that I know of, I think by NASA. So I think that's part of the package. And, of course, it's much too big to shoot up to Mars, so...

The capability to build O'Neil-style colonies isn't quite realistic yet, either.

Yeah.

NOTES

¹in the December 1992 issue.

²Minnesota Multiphasic Personality Inventory, a standard psychometric examination.

"Life Piled Upon Life"

From Dr. Walford's introduction to *The Anti-Aging Plan*:

The science of gerontology has been jokingly referred to as of interest primarily to biologists approaching retirement. This was not true in my case. In 1941 I published an article in my high school magazine, *The Literary Parade*, in which I deplored the brevity of life. To me, even a fairly long life seemed far too short to explore the world's outward wonders and humankind's inner realms, to walk all the strange pathways of society's subcultures, to read all the books, hear all the music, climb the mountains and dive the seas, to be present at least at the early stages of the age of space.

Does this sound sophomoric? Maybe so. But I still feel that way. "Life piled on life were all too little," to quote "Ulysses," a poem by Tennyson. And curiously enough, as my daughter and I finished writing this book, fifty-three years after the dreams and fantasies of high school days, I was engaged at all levels in a sort of "Anti-Aging Odyssey." Sealed inside Biosphere 2 in the Arizona desert along with seven others, I saw how "Life piled on life" makes living a greatly extended healthy life an attractive option.

I confess that at first gerontology seemed just a means to an end. I simply wanted to live longer, to have it all and do it all. As an honors student entering the California Institute of Technology (CalTech), I was more into mathematics and philosophy. But Descartes, who was pre-eminent in both of these fields, died at fifty-two. That would be awful, I figured. And so I set out *not* to die at fifty-two, or even twice that. And I was determined to have a great, productive, zestful time of it, for *all* of that time.

But a deep interest in biology began to push itself forward, until ... but here I must tell you a story.

I was a 19-year-old student at

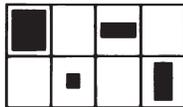
“A diet packed full of sound advice and useful information for those of us who plan to be around for a long, long time.”

—SEN ALAN CRANSTON



At your local bookstore, or order directly by calling 1-800-626-4848

FOUR WALLS EIGHT WINDOWS



CalTech. One weekend I was at a field station laboratory. We were taking a tea break on the first-floor balcony, which the wild woodland marched right up to. And here he was: Nobel Laureate Sir Thomas Hunt Morgan, the great founder of the genetic edifice of the fruit fly (*Drosophila melanogaster*). As I stood there, wide-eyed, regarding him with deep respect, this illustrious old man leaned over the balcony railing, intensely watching a salamander on a twig. The salamander was laying eggs one by one into a gel matrix, which she was also secreting, to form a translucent amber egg sac stuck fast to the twig.

Now, salamanders and egg-laying had nothing to do with why Sir Thomas was there that afternoon, but after a time I saw him straighten up, and I heard him mutter to himself as though he had waited all his life for that moment, “Ah ha! So that’s how she does it!”

And that’s how life does it, life piled on life or simply sitting on a twig.

Old Sir Thomas had impressed me deeply. It was one of those moments when you seem to step through a curtain and a transformation starts that—on the surface—has nothing to do with you, but of which you are the center. And then Sir Thomas winked. One eye remained fixed on the salamander, the other eye twitched and seemed to wink marvelously at me. His enthusiasm, for the secrets of life’s complex processes, had become mine. It was a great gift, and I like to think that it was done on purpose by a kind, great mind.

So biology came alive for me—for more than simply exploiting it to extend my own life and stay vigorous and healthy.

I graduated from medical school at the University of Chicago in 1948 and headed, along with my lifelong friend, NASA’s Dr. Albert Hibbs, for ... the gambling casinos of Nevada. Remember my convic-

tion that long life, to be well lived, must be punctuated with adventure, with varieties of experience. (I was captain of the wrestling team at the University of Chicago for two years, missing Olympic tryouts because of an injured shoulder—and always regretted missing the Olympic experience, since I had come reasonably close.) Al and I wanted to sail the Caribbean before going on with our scientific careers. To buy a sailboat we needed money. In Reno and Las Vegas we parlayed a roulette system we devised into fairly big bucks. This brought us a surprising amount of publicity—a full page in *Life Magazine* and all that, and when I did receive my M.D. degree, the Chicago paper carried the caption “Gambling Ace Wins M.D.”

So we bought out boat and sailed the Caribbean, but that’s another story. There followed an internship at the famous Gorgas Hospital in Panama, then residency training, then two years as an Air Force physician during the Korean War. In 1954 I joined the faculty at UCLA School of Medicine. It was time to get serious about gerontology as a biologic discipline, about health enhancement, about extending the vitality of youth and middle age to over the hundred-year mark.

In the course of my long stay at UCLA—during which, by means of a good wife (now divorced) and some confused help from me, three fine children were raised—I’ve spent year-long periods (sabbatical years) elsewhere, often as a sort of scientist-adventurer. A year in Freiburg, Germany, by the Black Forest, which in 1960 was still pristine and beautiful, not blasted by industrial pollution as it is now. Paris in 1968, at the laboratory of Nobelist Jean Dausset, during which time I covered the student revolution for the Los Angeles Free Press, and associated intimately with and wrote about the Living Theater (they have been a major influence in my life: another story). A year wandering around India looking for ancient wisdom, or even modern wisdom—and finding some of both. In 1983, trekking and hitchhiking across central Africa. And finally the grand living experiment of Biosphere 2, which combined science and adventure as never before.

But mainly, time was spent at UCLA, focused upon my developing research laboratory. During my watch, gerontology has moved from the fringes of science to its present position, center stage with its own institute at the National Institutes of Health. With its promise of a major extension in human life span, an event so far-reaching in its effect on society that it will rank with mankind’s change from a hunter-gatherer to an agricultural, industrial, and now an information-based society. Many of those now alive will be participating in this vast change.





FM-2030

Pioneering Futurist with a "Nostalgia for the Future"

By Max More

Extropians share many values and ideas with other transhumanists. We all recognize the acceleration of technological and social development, are dissatisfied with human limits, and appreciate ideas embodied in humanism, rationalism, and meliorism. Extropians affirm much in common with other transhumanists also because we have learned from them.

Although I first read the works of pioneering futurist FM-2030 as late as 1989, some of my own extropian thoughts were influenced by his work indirectly through reading Robert Anton Wilson. Wilson clearly had read FM's works and been ignited by them, both explicitly and through his advocacy of physical immortality, space migration, intelligence increase, anti-authoritarianism, and anti-nationalism. (Timothy Leary, while imprisoned, also was boosted by FM's ideas, thanks to Barbara Marx Hubbard who sent him *Up-Wingers*.)

FM's work deserves attention both because of its pioneering nature, and for the ways in which his ideas converge and diverge from most Extropians. While the Extropian perspective, in its explicit form, dates back only to the late 1980s, FM-2030 started developing and disseminating core transhumanist ideas two decades earlier. I have great respect for a thinker of FM's proclivities who can create and expound ideas so radically divergent from the thinking of the average human at a time when such thoughts were practically unheard of. My respect for his courage and innovation exists despite areas of disagreement:

Unlike FM, I expect many things to still have a price 35 years from now. Economic principles will still apply; our wants will continue to exceed our means, leading to scarcity and prices. If we have nanotech factories by then, many goods may be so cheap that they are given away just as matchbooks are now. However, produc-

tion requiring scarce skills and information will continue to carry a price.

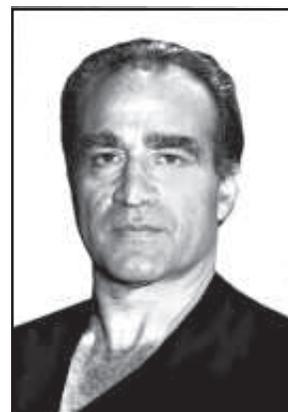
If we want to our economic system to work well, I don't think we can move "beyond" Capitalism—if that refers to a free market system rather than our current mixed economy.

Also, although I appreciate the sentiments behind them, I do not go along with sayings (see p.30) such as "So long as there is death all social freedoms are meaningless" or "so long as there are families no one grows up secure". I believe that social freedoms have been and remain vital independently of death, and that families made up of healthy individuals *can* raise secure children.

Having noted some differences, I wish to put them aside and with this Profile emphasize the vast area of shared values between FM-2030's transhumanism, and Extropian transhumanism.

Given the range and startling nature of FM-2030's ideas, it may be surprising to know that he has never been a reader of science fiction. I cannot properly convey FM's ideas in this space, nor his highly individual style. Here is a brief and partial list of some important themes of his work: Optimism is realistic and practical; the world and people's lives have been getting better throughout history and will continue to do so at an accelerating rate. We can overcome the biological and cultural limits that have previously been taken for granted: we can abolish aging and involuntary death; we can "de-animalize" ourselves, gradually replacing our bodies with superior synthetic replacements. Old family structures, exclusive relationships, and age-old methods of procreating and parenting will be replaced with more fluid alternatives. Nationalism will wither and representative democracy will be replaced by direct cybernetic decision-making. All

forms of exclusivity and ownership will be superseded and capitalism and socialism will give way to 21st Century abundance. The trend toward non-violence will continue, and competition will eventually fade away. Religion and faith-based thinking will become a thing of the past. Technology is a key to our evolution and nature is *not* an all-benevolent force to be submissively accepted. What were the circumstances leading to these ideas?



FM-2030

FM's early history helps explain how he developed some of his ideas. His father, a diplomat, took him traveling all over the world, so that FM grew up in Europe, Asia, Africa, and America. Living in many parts of the planet enabled him to witness humanity's diversity, and its situation at different levels of evolution. His global life helped him question the *status quo*—at any stage in history. While some might respond to such an upbringing by wanting to find a fixed home, FM found the mobility and fluidity enlivening. He developed attachments to many places, but not to any single country. He came to feel that he belonged everywhere and couldn't take nationalism seriously.

As a young adult in Paris in the early 1960s, FM-2030 started to develop a new way of looking at things. An interviewer at the time asked him about humanity's "tragic situation". FM, amused, asked "What tragic situation?" and explained he foresaw hu-

manity overcoming all limits, including death. Even thinkers generally optimistic about the prospects for humanity couldn't see a way around death, but FM saw that optimism need not be blunted by this entropic fate. FM spent considerable time thinking about the challenge of defeating death at the same time that others were breaking spatial limits with the Apollo moon adventures. If we can develop technology to break out of the confines of Earth's gravity, why not also break free of the body's limits? FM's ideas about the possibility and desirability of physical immortality developed in the early '60s, partly stimulated by discussions with friends in Paris.

The name 2030 reflects my conviction that the years leading to 2030 will be a magical time. The solar system will be alive with people linking in and out of planets and moons and orbital communities. In 2030 we will be ageless and everyone will have an excellent chance to live forever. 2030 is a dream and a goal.

He didn't yet know how death could be overcome, but was convinced that this was both possible and desirable.

In the mid-60's, FM-2030 returned to the United States. His book *Identity Card* was published by Grove Press — the publishers of radical, revolutionary writers of the time. *Identity Card* dramatized the irrelevance of national boundaries and identities. His Marxist editor at Grove Press, Harry Braverman, would talk with FM in New York, telling him his ideas were crazy but provocative. Certainly he had a hard time dealing with FM's declaration that both the political right and left were part of an old context. Nevertheless, Braverman encouraged FM to teach, helping him by contacting the New School for Social Research — an avant-garde university in New York, a hot-bed of revolutionaries. The philosophy department didn't know what to do with him. Lester Singer, who decided what courses would be offered, liked FM's revolutionary optimism and made a niche for him. Aside, perhaps from Buckminster Fuller's lectures, this was the first course on futurism. Teaching these classes to bright adult students, from 1965 to 1980, helped FM's ideas take form and develop

depth. His first course was "New Concepts of the Human". The course examined the evolutionary transformations of humanity.

From the mid-1970s, FM became bi-coastal, continuing to teach in New York, but now conducting classes at UCLA as well. The appeal of California to futurist-minded people soon became evident: While his New School classes never grew larger than 30 or 40 people, the UCLA classes grew to 200. His classes were demanding and intellectually stretching, and soon attracted many pioneering people from places like JPL and NASA. He has also taught at the Anderson Graduate School of Management at UCLA, and does

many seminars for companies and other groups such as designers, business executives, and psychiatrists.

Intriguingly, he says over the last 10-12 years he has done more seminars for architects than for any other group. The kind of people who have shown interest in FM's ideas can be surprising: One of his UCLA classes was attended by police executive Diane Harbor. She related some of what she had heard to C. L. Cronkite, former L.A. Deputy Chief of Police. He phoned FM, wanting to help police executives get more tuned in to the trends taking us into the future. FM told the five top cops who came to talk with him at an oceanside cafe that they needed "a more humanized police force". These officers started L.A. 2000, which invited speakers, including Gene Roddenberry. A few years later they called and asked FM to give a series of seminars to California decision-making officers.

Over the last 30 years, FM has been spreading his ideas about our transhuman future not only through his classes but also through several books and numerous articles. FM-2030 first used the term "transhuman" in print in his essay "Transhuman

2000" which appeared in the 1972 anthology, *Woman: Year 2000*. He had used this term earlier, in courses in the mid-'60s.

The first of his books dealing with his vision of the transhuman future was *Optimism One*, published in 1970, followed by *Up-Wingers* in 1972. *Telespheres*, finished in 1974, was published in 1977. These three books, now out of print but found in many libraries, he wrote under the name FM Esfandiary. His most recent book, *Are You A Transhuman*, was published in 1989, and regrettably recently went out of print. He has finished a new book, *Countdown to Immortality*, and is working on another that develops and updates the ideas in *Up-Wingers* and *Telespheres*.

Biographical note from FM-2030's last book, *Are You a Transhuman?*:

Born with a conventional name, FM-2030 (twenty-thirty) changed both his first and last names to reflect his confidence in the future. As he explains, "conventional names define a person's past: ancestry, ethnicity, nationality, religion. Long ago I outgrew such territorialities. I am not who I was ten years ago and certainly not who I will be in twenty years. I would rather be defined by my future — my hopes and dreams. The name 2030 reflects my conviction that the years leading to 2030 will be a magical time. The solar system will be alive with people linking in and out of planets and moons and orbital communities. In 2030 we will be ageless and everyone will have an excellent chance to live forever. 2030 is a dream and a goal.

I am a 21st Century person who was accidentally launched in the 20th. I have a deep nostalgia for the future."
FM-2030

EXCERPTS FROM FM-2030'S WRITINGS

"Something new is unfolding in the human condition—something unprecedented—something beyond historical knowledge—something potentially full of hope... Suddenly humankind's situation is not circumscribed or limited... we are no longer confined to this tiny planet. Soon we will no longer be confined to our fragile mortal bodies. We are on our way to becoming universal and immortal... This is precisely the distinction between the new optimism and the optimism of the past... These evolu-

tionary breakthroughs mark ours as the First Age of Optimism—WE ARE AT OPTIMISM ONE.”

Up-Wingers

“The 21st Century will look back with revulsion on many of our institutions: family—marriage—school—prison—hospital—city—money—government—nation.

Oppression is still all around us—although less brutal than in the past:

The child who has one set of parents is unprotected and unfree.

The person who possesses or needs to be possessed is enslaved.

The child who spends twelve years festering in classrooms suffers from child abuse.

The person who works eight hours a day five days a week is trapped in modern serfdom.

So long as there are families no one grows up secure.

So long as there are schools no one is well informed.

So long as there are hospitals no one is safe.

So long as there are prisons no one is free.

So long as there are leaders there is no democracy.

So long as there is death all social freedoms are meaningless.”

Telespheres

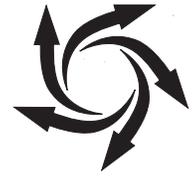
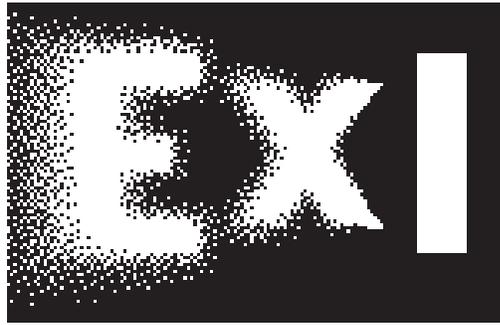
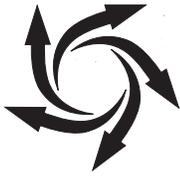
“The day will come soon when the death of a single human being will be so rare and tragic that the news flashed across the planet will stun humanity.”

Optimism One

“Transhumans (Trans) are a new kind of being crystallizing from the monumental breakthroughs of the late 20th Century... Trans can no longer be considered specifically human because the premises of biological terrestrial life that have always defined the human no longer fully apply... Trans are transitional beings—forerunners of the posthumans who will surely evolve later in the 21st Century.”

Are You a Transhuman?





Extropy Institute

"This is a philosophy of boundless expansion, of upward-and-outwardness, of fantastic superabundance. It's a doctrine of self-transformation, of extremely advanced technology, and of dedicated, immovable optimism. Most of all, it's a philosophy of freedom from limitations of any kind."

Ed Regis, "Meet the Extropians", *Wired*, October 1994.

"Extropians remain die-hard rationalists, resistant to revealed truth of any kind, even if it's the truth of their own predictions... The Extropians' is a libertarianism of rare sophistication... [their] vision could turned out to be our best guide through the strange eons to follow."

Village Voice, December 1994.

EXTROPY INSTITUTE

Extropy Institute (ExI) was incorporated in 1992 as an educational, tax-exempt organization. Like the Extropians e-mail list, ExI was an outgrowth of *Extropy* (founded in 1988 by Max More and Tom Morrow). We created ExI in order to provide a structure and network that would facilitate the spread and evolution of extropic ideas, values, and culture.

This organizational mission encompasses two aspects which together explain all our activities: (a) Within our existing Extropian culture refining and developing our ideas, working together to transform ourselves into "posthumans" and to evolve a radically new culture free of the irrationalities and limitations of the past. (b) To clearly and persuasively communicate our philosophy of life even to those who are not already attuned to the same ideas and attitudes, in order to influence the broader culture in more extropic directions.

In pursuit of these *transhumanist* goals Extropy Institute continually seeks new outlets for its members' energy, ability, and creativity. Complementing our primary publication, *Extropy: The Journal of Transhumanist Thought*, is our members' newsletter, *Exponent*. *Exponent* carries shorter articles, membership information such as forthcoming meetings, reports on progress of projects and new media attention, and reviews of relevant books, software, and other media.

We hold a variety of meetings, including special events like the *Extropy* 5th birthday party, monthly Idea Forum discussion meetings and dinner gatherings in the Los Angeles area, weekly lunch meetings in the N. California Bay Area, and impromptu celebrations and outings with extropic themes. As membership grows, local events across the country and abroad are taking place. Spring '94 saw an important new development: EXTRO¹ heralded the start of a series of annual conferences where ideas can be explored in depth, and bounced off persons of many different specialties and perspectives. (The main talks from each session can be found in

the Proceedings volume.)

As befits a transhumanist, high-tech subculture, supplementing printed publications and physical meetings is the online Extropian virtual community. The Extropian cyber-community continues to expand, encompassing the main

Extropians e-mail list (now in its 4th year), the ExI Essay list, five local e-mail lists for arranging meetings, parties, and other joint activities, a newsgroup, and now an Extropian presence on the World Wide Web (thanks primarily to Eric Watt Forste and Dave Krieger). Our FTP site makes available past postings to the Essay List, among other items. (See p.58 for information.)

If this issue is your first real contact with extropian ideas, the short version of The Extropian Principles (p.36) will help clarify our shared values and goals. (The full text appeared in *Extropy* #11) The Principles is intended not as a detailed statement or final word on any topic, but as a codification of some of our shared values and attitudes.

The highpoint of 1994 for ExI was our EXTRO¹ conference. Eighty thinkers turned up hear keynote speaker roboticist Hans Moravec and seven other sessions. Soon after this issue of *Extropy* goes to press, EXTRO² will draw over a hundred participants to Southern California. The EXTRO conferences bring together extropically-oriented persons from around the world to meet, listen, talk with and enjoy one another. The book of the conference Proceedings publishes in-depth papers by the speakers, providing a forum for more extensive discussion than our other publications.

Keynote speaker this year will be Prof. Marvin Minsky of MIT, author of *The Society of Mind*, long a leading figure in machine intelligence research. Prof. Minsky will present ideas from his new book in progress. Twelve other sessions will cover diverse ground, stretching minds and maintaining the freshness and vigor of extropian thinking. See the center pages for more information. If you can't make this year's conference but wish you could attend the largest and most intense extropian annual gathering, be sure to plan ahead for EXTRO³.



Continued on page 36

ExI Directors

Max More, President, Editor of *Extropy*. more@extropy.org
Tom Morrow, Vice President. tmorrow@aol.com
Simon D. Levy. levy@haskins.yale.edu
Tanya Jones, Treasurer. tanya@alcor.org
Ralph Whelan, Secretary. ralph@alcor.org
David Krieger. dkrieger@netcom.com
Russell E. Whitaker. russw@netcom.com

Council of Advisors

Jamie Dinkelacker, Ph.D.
Prof. Bart Kosko, USC
Prof. Marvin Minsky, MIT
Sharon Presley, Ph.D., Resources for Independent Thinking

Extropy Institute

13428 Maxella Avenue, #273

Marina Del Rey, CA 90292

310-398-0375 exi-info@extropy.org

For details of membership rates, see p.2, lower right.

EXTR 2

June 17-18 1995, Santa Monica, California

Registration begins at 8.0am on Saturday June 17, with the first session beginning at 9.0am. The Banquet begins at 7.30pm on Saturday night. (Note that this is changed since last issue, when it was scheduled for Sunday night.) Sessions on Sunday June 18 run from 9.0am to around 7.0pm.



Keynote Speaker:

Prof. Marvin Minsky

"The father of artificial intelligence" Toshiba Professor of Media Arts and Sciences, MIT author of *The Society of Mind*.

"Why Freud was the First Good AI Theorist."

Michael Rothschild, author of *Bionomics*.

Chris Heward, Ph.D.: Human Life Extension in 1995 — The State of the Art.

Sharon Presley, Ph.D., Critical Thinking about Authority: Resisting Social Influence and Unjust Authority.

Bart Kosko, Ph.D., author of *Fuzzy Thinking* and textbooks on neural nets & fuzzy systems.

Reilly Jones: A History of Extropic Thought: Parallel Conceptual Development of Technicism and Humanism

FM-2030, author of *Up-Wingers*, *Optimism One*, and *Are You a Transhuman?*

Extropian Virtual Community & the Future of the Net: Harry S. Hawk, with Steve Arbuss et al.

Ray Sahelian, M.D.: Deprenyl and Melatonin: The Latest Research.

Tom Morrow, J.D., Trade Dress Protection of Virtual Environments.

Ken Kittlitz, Duane Hewitt, et. al.: A World Wide Web Implementation of Ideas Futures.

Recreating Reality — Redefining Art: Nancie Clark, Dr. Fiorella Terenzi, and others.

Markus Krummenacker: Are Intellectual Property Rights Justified?

We expect to show one or more trailers for documentaries-in-production on extropic themes. A number of organizations and vendors will be displaying their wares.

The 2nd Extropy Institute Conference on Transhumanist Thought

California at The Miramar Sheraton

LOCATION: Our second conference will be held at the elegant and superbly-located Miramar Sheraton in Santa Monica, California. The tower rooms offer an excellent view, though less expensive accommodation is available nearby. The Miramar Sheraton has recently been renovated, and will have a new cafeteria and large outdoor hot tub. Conference attendees will receive about 30% off regular room rates. The beach is a minute's walk away, as is the 3rd Street Promenade and its large number of restaurants and cafes.

Miramar Sheraton reservations: 310-576-7777
101 Wilshire Blvd., Santa Monica, CA 90401



Comments on EXTRO¹:

"Congratulations on an immensely successful Extro 1!!"

"Great job! Wonderful conference!"

"Excellent overall. See you next year!"

"Fine conference — look forward to next time."

"I was very pleased to have been surprised by hearing some ideas which were entirely new to me. I like that."

"I loved all of the sessions!"

"The greatest *critical* mass of thinkers that I've ever encountered."



REGISTRATION: Fee includes a copy of the EXTRO² Proceedings volume, which will be available a few weeks after the conference..

REGISTRATION FEES:	Before Apr 1	After Apr 1	At the door
ExI MEMBERS:	\$135	\$155	\$165
Students/non-profit	\$90	\$110	\$115
NON-MEMBERS:	\$160	\$180	\$190
Students/non-profit:	\$95	\$120	\$125

- **You may subtract \$30 if you will not be attending the Saturday evening banquet.**
- **Documentation for special student/non-profit rate is required; thank you.**

Please send me information on hotels in the area and accommodation provided by local ExI members.

Reserve me a vegetarian meal for the banquet.

I want to reserve a copy of the conference Proceedings.

Mail to: Extro², Extropy Institute, 13428 Maxella Avenue, #273, Marina Del Rey, CA 90292

Bio-Enhancement Update

Ray Sahelian, M.D.



Photo by Nancie Clark

“I’ve heard of it,” said a friend of mine. “That’s skin pigment isn’t it?”

She was thinking of melanin, the dark color in skin and hair. Since that conversation I’ve encountered many people who confuse the two words. Melatonin is a natural molecule made by the pineal gland, which is located in the brain. Since 1993,

in shift workers, and a great supplement for those who have insomnia. Melatonin also may have roles to play in the treatment of prostate enlargement, as an addition to cancer treatment, in lowering cholesterol levels, in influencing reproduction, and more. A delightful bonus is that melatonin can influence lifespan.

M E L A T O N I N

The Anti-Aging Sleep Hormone

M e l a t o n i n supplementation could trick our DNA into thinking “Maybe I miscalculated. I must be younger than I thought.”

melatonin supplements have been available in many health food and drug stores, and through mail order catalogs.

Melatonin is made from an amino acid called tryptophan. Tryptophan is an essential amino acid, that is, the body cannot make it; we need to get it through the foods we eat. Tryptophan is found in a wide variety of foods. As we consume tryptophan during the day, the body converts it into serotonin, an important brain chemical involved with mood. Serotonin, in turn, is converted into melatonin. This conversion occurs most efficiently at night.

Melatonin helps to set and control the internal clock that governs the natural rhythms of the body. Each night the pineal gland produces melatonin which helps us fall asleep. Research about this molecule has been going on since it was discovered in 1958, but it has only been in the last few years that there has been such attention paid to melatonin. Close to a thousand articles about melatonin were published worldwide in 1994. One reason for this growing interest is that we are realizing that deep sleep is not the only byproduct of melatonin. We are learning that it has a significant influence on our hormonal, immune, and nervous systems. Research is accumulating about melatonin’s role as a powerful antioxidant, its possible anti-aging benefits, and its dream-enhancing properties. It is an effective tool to prevent or cure jet lag, an ideal substance to reset the biological clock

Melatonin and Longevity

A few years ago researchers in Switzerland gave male mice melatonin in their drinking water (Maestroni, 1988). Another group of mice received plain water. At the start of the study all the mice were 19 months old (equivalent to about 60 years in humans) and healthy.

The researchers were surprised when the mice on melatonin showed such a striking improvement in their health, and most remarkably, lived so much longer! And after 5 months on melatonin, astonishing differences in the fur quality and vigor of the two groups became evident. The mean survival time of the untreated group was 25 months (78 years in humans) versus 31 months (98 years) in the melatonin-treated mice!

A similar experiment was repeated in 1991 by Pierpaoli and colleagues. The results confirmed the earlier study. Melatonin, when given regularly to middle-aged mice, increased their life span by 20%.

How would melatonin administration do in the young? To find out, Pierpaoli and colleagues gave melatonin every night to young, female mice (strain C3H/He) starting at age 12 months until death. (There are various strains of laboratory mice and the effect of a particular substance may be different on each strain. That’s why it’s important to mention which one.) These mice had not yet reached menopause. The average lifespan in this strain of mice is about 24 months. The age of 12 months (pre-menopause) would correspond roughly to age 35

in humans. To the surprise of everyone, melatonin shortened survival by 6%. A common reason was the high rate of ovarian cancer in these young mice. Apparently there are cells in the ovaries in this strain that overgrow when stimulated by melatonin, causing tumors. Another strain of young, female mice (NZB) was also given melatonin nightly starting at age 12 months. They lived longer. Another group of NZB strain female mice was given melatonin at 5 months of age (Pierpaoli, 1994). They also lived longer. Therefore, there is a difference in response to melatonin by different mouse strains.

How did melatonin effect mice who had already reached menopause? In an additional study, when 18 month old post-menopausal female mice (strain C57BL/6) were given melatonin nightly, ovarian cancer was not detected and they lived 20% longer than mice of the same age who were not given melatonin.

How can we interpret these studies in order to make practical recommendations for us humans? First we have to realize that rodents and humans may respond differently to the same medicine. We have seen that different strains of mice respond differently. However, we know by experience in countless other studies and with various other medicines that there is often a similarity between the effects of a substance on rodents and that on humans. It is also possible that if the younger, female mice had been given a lower dose of melatonin, they may have fared better. Based purely on a weight ratio, the amount of melatonin given the mice was many times the dose a human would normally use at night for sleep.

In order for us to know for certain what melatonin will do in humans when given for a lifetime, we will need to follow at least a few hundred or thousand people receiving melatonin for a few decades. Multiple groups would be needed to try different dosages. The volunteers would be advised not to take any other supplements or medicines. Such a comprehensive study is not under way at this time. And the results of such a study would not be available until well into the 21st century. What are we to do in the meantime?

We have to make an intelligent decision based on the available information. There is no right or wrong answer at this time as to whether middle-aged and older people should or should not take melatonin regularly to increase their lifespan. *Chronic and high dose melatonin use in the young is strongly discouraged at this*

time.

Different scientists familiar with these studies may endorse different courses of action. One scientist may caution, "Let's wait a few more years before making any recommendations." Another scientist may advocate, "If we wait, we'll have to wait a few decades. I personally do not want to risk waiting that long; I may be 6 feet under by then. I'm 65 now and I'm having trouble sleeping at night. Melatonin provides me with great sleep. In addition to the obvious advantages of restful sleep, there's the added bonus that it could extend my life span." Who will eventually be proved right? No one can predict for sure at this time.

There are additional studies that support the role of melatonin and the pineal gland in life extension. It has been known for a few decades that when rodents had their pineal gland removed, they died sooner. When the pineal glands of young mice were transplanted into older mice,

meate into tissues and enter practically every cell of the body. (Most cell membranes are surrounded by a layer of fatty acids.) When melatonin enters the cells, it has the further ability to go directly to the DNA. Researchers speculate that the amount of melatonin reaching the DNA of every cell informs it as to which proteins to make. In November of 1994, the *Journal of Biological Chemistry* published a fascinating article where researchers Becker-Andre and colleagues found a specific receptor for melatonin right in the nucleus of cells. They conclude, "A nuclear signaling pathway for melatonin may contribute to some of the diverse and profound effects of this hormone."

During infancy and childhood there is a high peak of melatonin reaching every cell. The high peak lets the cells know that the organism is young. The amount of melatonin released each night is less in middle age and even less still in old age. Therefore, as we advance in years, a

Some researchers think the pineal gland functions as the "aging clock."

the older mice lived longer and aging symptoms were postponed (Lesnikov, 1994). When young mice received the pineal gland from older mice, they died sooner.

The pineal gland releases substances other than just melatonin. These other substances, one such example is epithalamin, have a role to play in longevity; in fact, epithalamin and other pineal gland extracts have similarly produced life extension in mice (Anisimov, 1994).

How can melatonin extend life span?

The pineal gland has the means of communicating with every cell of the body through its primary hormone, melatonin. Most hormones need a receptor on the cell membrane before they can enter the cell. Not so for melatonin. As the pineal gland releases melatonin, it quickly goes into the local bloodstream and then to the rest of the body's blood circulation. From there, melatonin finds its way to every body fluid and tissue. Because it is readily soluble in fat, melatonin has the unusual capacity to per-

lessor melatonin peak reaches the DNA in our cells. Some researchers think the pineal gland functions as the "aging clock." The reasons for the decline in melatonin levels was discussed in chapter two. One possibility is the failure of the pineal cells. They may get overworked through the years and not function as efficiently. Perhaps supplementation with melatonin may allow the pineal gland to work less hard and preserve its optimal functions for many more years.

The decline of melatonin peak levels provides a signal to inform all cells in the body of their age—i.e. it's time to call it quits, call a lawyer to write a living will, and make the down payment for a plot at the cemetery (or cryonics arrangements for futurists). Melatonin supplementation could trick the DNA into thinking, "Maybe I miscalculated. I must be younger than I thought."

We should not think of melatonin as the only influence on aging. In a complex organism such as the human body there are innumerable factors that are involved in the aging process. The pineal gland is only one of these factors, albeit an important one.

Some of the ways melatonin could prolong life span include it's ability to be an antioxidant, enhance the immune system, provide deep sleep, and regulate hormonal levels. Another interesting correlation is between diet and melatonin. It is known that food restriction in rodents causes an increase in melatonin production (Stokkan, 1991). Food restriction also leads to life extension. It is too early to tell whether the increase in melatonin due to food restriction is one of the factors that leads to this longevity.

To take, or not to take: that is the question

I know a number of individuals who have started to take melatonin nightly at doses ranging from 1 mg to 10 mg. They do not take melatonin necessarily for sleep, but primarily for its potential health and longevity benefits. Four of these individuals have been taking it for over two years, without apparent side effects. Some organizations involved in seeking ways for life extension are recommending to their members to use melatonin regularly.

A few pineal gland researchers have started to take melatonin for its potential health benefits. Russel Reiter, a neuroendocrinologist and foremost pineal gland researcher, is quoted in *Vogue* magazine, February 1995, "I've been taking it for years for jet lag. When we made the discovery about its antioxidant potential, I started taking it regularly." (He takes about 1 mg nightly.)

We don't know for certain the long-term, positive or negative, effects of melatonin use in humans—then again we hardly know for certain the long-term effects of many common medicines or supplements, including aspirin and vitamins.

More on Melatonin next issue, including its vivid effects on dreaming.

Excerpted from *Melatonin: Nature's Sleeping Pill* ©1995. Dr. Sahelian is interested in collecting information from melatonin users. Email your personal experience with melatonin, positive and/or negative, to dr.ray@ix.netcom.com. Or write to Be Happier Press, PO Box 12619, Marina Del Rey, CA 90295.

Anisimov V, et al. *Twenty years of study on effects of pineal peptide preparation: Epithalamin in experimental gerontology and oncology.* Annals NY Acad Sciences 719:483-493, 1994.

Becker-Andre M, et al. *Pineal gland hormone melatonin binds and activates an orphan of the nuclear receptor superfamily.* J of Biological Chemistry 269:28531-28534, 1994.

Lesnikov V, Pierpaoli W. *Pineal cross-transplantation (old-to-young and vice versa) as evidence for an endogenous "aging clock."* Annals of the New York Acad of Sciences 719:456- 460, 1994.

Pierpaoli W, et al. *The pineal control of aging: The effects of melatonin and pineal grafting on the survival of older mice.* Annals N Y Acad Sciences 621:291-313, 1991.

Pierpaoli W, et al. *Pineal control of aging: effect of melatonin and pineal grafting on aging mice.* Proceedings of the National Academy of Sciences of USA 91:787-91, 1994. Fifteen month old BALB/c strain female mice given melatonin lived up to 28 months compared to 24 for controls.

Stokkan K, et al. *Food restriction retards aging of the pineal gland.* Brain Research 545:66-72, 1991.



Continued from page 31

THE FUTURE

We will be fostering the growth of more local discussion groups and international chapters of ExI, and we will continue to develop our network of communication, discussion, and action. We look forward to the continued development of the Extropians cyberculture, especially on the World Wide Web. As finances allow, ExI will expand the range of tapes, books, and other items for sale; we will continue to build cooperation with other organization for shared goals and make contact with more scientists, technologists, philosophers, and artists to strengthen our network.

As we grow larger we will offer seminars and classes (starting towards the end of 1995), publish and publicize public policy papers on aspects of technology, start discussion groups in more areas, and supplement the general conferences with special-purpose conferences and seminars.

We will seek other ways of disseminating extropic ideas including producing extropic teaching materials for schools (e.g., critical thinking, thinking about the wise use of technology), the production of truly extropic TV documentaries, science fiction shows, and perhaps big-screen movies portraying the positive possibilities of the future.

We hope you will join us as an active participant in the Extropian movement. (See p.2 for membership information.) Help shape the future!

Upward and Outward!

Max More
President



EXTROPIAN PRINCIPLES v.2.5

(Full version in *Extropy* #11)

1. Boundless Expansion

Seeking more intelligence, wisdom, and effectiveness, an unlimited lifespan, and the removal of political, cultural, biological, and psychological limits to self-actualization and self-realization. Perpetually overcoming constraints on our progress and possibilities. Expanding into the universe and advancing without end.

2. Self-Transformation

Affirming continual moral, intellectual, and physical self-improvement, through reason and critical thinking, personal responsibility, and experimentation. Seeking biological and neurological augmentation.

3. Dynamic Optimism

Fueling dynamic action with positive expectations. Adopting a rational, action-based optimism, shunning both blind faith and stagnant pessimism.

4. Intelligent Technology

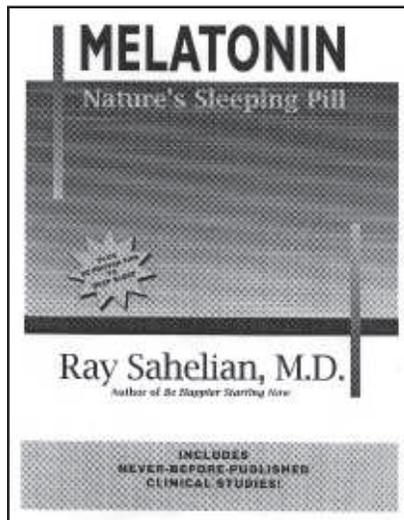
Applying science and technology creatively to transcend "natural" limits imposed by our biological heritage, culture, and environment.

5. Spontaneous Order

Supporting decentralized, voluntaristic social coordination processes. Fostering tolerance, diversity, long-term thinking, personal responsibility, and individual liberty.

B.E.S.T. D.O. I.T. S.O.

- Sleep like a baby
- Improve your mood
- Have more energy
- See vivid dreams
- Prevent jet lag
- And possibly live longer.



What on earth can do all this?

Melatonin, a natural hormone made by our pineal gland each night to help us sleep, is now available in health food stores, drug stores, and where supplements are sold—without a prescription. Is melatonin this miracle medicine?

"Are you interested in the possibility of a significantly longer, healthier life? Or just in sleeping more easily and soundly at night? In Melatonin: Nature's Sleeping Pill Dr. Ray Sahelian shows us that both may very well be possible, now. The evidence is presented in a clear way for the general reader, and includes extensive references to the scientific literature for the technically inclined. Melatonin: Nature's Sleeping Pill is 'must' reading for all of us interested in better health and greater longevity."

Jonathan V. Wright, M.D., best-selling author of *Healing with Nutrition*.

140 pages, \$13.95 ISBN: 0-9639755-7-9

For your autographed copy of *Melatonin: Nature's Sleeping Pill*, send a \$15.95 check or money order (includes shipping; California residents add \$1.15 tax, for a total of \$17.10) to the above address.

To order both books, send a \$29.95 check or money order (includes shipping; California residents add \$2.47 tax, for a total of \$32.42). Be sure to include your name and mailing address. Orders are shipped promptly. Residents outside of U.S. add \$6 postage for one book, or \$8 for two books.

For a non-autographed copy, have your credit card ready and call 1-800-507-2665 to order either or both books now. Orders are shipped the same day. Books can also be ordered from any bookstore.

Topics discussed and answered in *Be Happier Starting Now* include:

How to start feeling better immediately. Train your neurons just as you train your muscles and be a 'happy athlete.' How to become smarter and more creative. The role of diet in relation to mood. How to find meaning in life. The secrets to music appreciation. How do the mind and body communicate with each other? Is happiness basically due to having the right amount of brain chemicals? How to set and achieve goals. Learning to forgive yourself and everyone else. Can romance give you lasting happiness?

Do you know how happy you are? Take Dr. Sahelian's happiness quiz and score yourself. You'll get new insights about yourself in less than one minute.

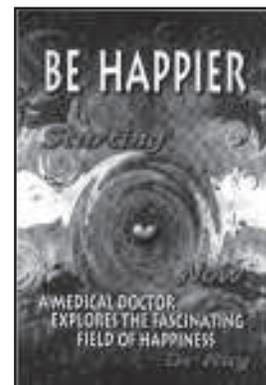
"Our lives can be filled to overflowing with joyful, peaceful, vigorous happiness, if only we act with self-control informed by wisdom. Dr. Ray Sahelian's delightful, well-rounded book lyrically delves into that wisdom — wisdom that we often forget in the rush of daily life. This book is gentle and soothing; we sense the author's strong sense of benevolence. Be Happier flows remarkably smoothly, informs broadly, and encourages us to renew our appreciation of the preciousness and glory of our lives."

Max More, President, Extropy Institute.

Price \$12.00 ISBN 0-9639755-6-0

For your autographed copy of *Be Happier*, send a \$14.00 check or money order (includes shipping; California residents add 99 cents tax for a total of \$14.99) to:

Be Happier Press
PO Box 12619
Marina Del Rey, CA 90295



Consciousness: Spontaneous Order and Selectional Systems

Part II

Introduction

The technological enhancements of consciousness that will follow in the wake of the coming neuroscientific revolution will be unequally distributed in the world population. This divergence will produce pressure in the political arena to move away from the current self-organizational forces of big money, towards the selectional forces of conflict. With enhanced consciousness and increased longevity, diverse life purposes will be created faster than tradition and social custom can assimilate their consequences. This rate of change will challenge world civilization on many fronts. The unlimited potential for historical change unleashed by the creation of new life purposes is captured by Walt Whitman in *A Thought of Columbus*. He describes the first time a thought entered Columbus's brain to sail the Atlantic, "... a mortal impulse thrilling its brain cell. . . only a silent thought, yet toppling down of more than walls of brass or stone." The quality of imagination in enhanced consciousness, when brought to actualization, will determine the success of leaders' responses to this challenge. It is the dual function of high culture to simultaneously foster enhanced consciousness and virtuous actions. High culture, above all, must be protected from the world dominance of statism, autocracy and organized crime.

This essay will cover potential pathways to enhanced consciousness and increased longevity, then project the resulting changes to secular morality and political forms as we progress into a transhuman future. To do this, I will recap some of the ideas covered in Part I of the essay, and provide some definitional groundwork that will aid the analysis. The discussion of these topics draws strongly on the evolutionary role that self-organization and selection plays in life processes from Stuart Kauffman's *Origins of Order* (see review in *Extropy* #13), 1 and in thought processes from Gerald Edelman's *Bright Air, Brilliant Fire* (see Part I in *Extropy* #14). 2 I have essentially extended some of these concepts from biophysics and neuroscience into the realm of political processes. Once this groundwork is presented, I will highlight a hierarchy of essential concepts we have about reality, life, formation of self, stability of identity and need for science, prior to discussing some intractable conflicts within the domain of politics. This will provide the framework for projecting future effects on morality and politics of our own self-directed evolution.

Internal Teleology and Conceptual Homeorhesis

A brief description of the concepts of attractors, evolution, fitness landscapes, and purpose (teleology) will aid

in the understanding of my analytical framework. 'Attractors' describes characteristics of nonlinear mathematical solutions of dynamical equations, small changes in parameters can lead to successive dramatic changes. In Kauffman's words: "Dynamical systems ranging from genomic cybernetic systems to immune systems, neural networks, organs systems, communities, and ecosystems all exhibit attractors. . . To some great extent, evolution is a complex combinatorial optimization process in each of the coevolving species in a linked ecosystem, where the landscape of each actor deforms as the other actors move. Within each organism, conflicting constraints yield a rugged fitness landscape graced with many peaks, ridges, and valleys."

Teleology refers to the existence of purpose. I am not referring to an external teleology in a theistic sense or as the Final Cause of all, rather to internal teleology. Purpose never enters into the universe, it imbues it. Niels Hansen describes 'internal teleology' as, "... self-organization—the tendency or striving of concrete processes towards the highest possible degree of organization in turning the multiplicity of their universes into coherent expressions." 3 At a simple level, particles moving towards each other in coherence is extropic purpose, and moving away from each other in decoherence, is entropic purpose. Attractors are analogous to fitness peaks, they are extropic spontaneously ordered purpose, coherent on varying scales. Attractors drain basins of attraction, analogous to entropic decoherence or fitness valleys. The stronger the attractors, the larger the basins drained around them. Extropy rises to spontaneously ordered peaks by clearing out valleys of entropy around it. The Second Law of Thermodynamics can be derived from the concept of internal teleology; it is dependent on the constraints or boundary conditions within dynamical systems.

Internal teleology means evolution is on-going between inorganic and organic systems, non-living and living systems, biological and cultural (or memetic) systems. Homeostatic attractors are complex dynamical systems that settle down to constrained behaviors stable to perturbations. Homeostatic attractors emerge in scaled coherent systems (molecular, biological, cultural) from evolutionary selection of forms and a mechanism for amplification of purpose. A description of this mechanism follows: "Another special aspect of self-organization in living cells is the abundance of energy contained in thermal fluctuations. These strong thermal fluctuations can be employed by far-from-equilibrium subsystems inside the cells. The laws of thermodynamics prevent the directed use of thermal fluctuations. However, as shown by Feynman in his analysis of the **thermal ratchet** (a process allowing motion in one direction only), this does not generally apply to systems with

some components that are far from thermal equilibrium (and thus, 'Maxwell's demon' may operate if it receives and dissipates energy from external sources)." 4 This directed use of energy is the essence of the organizing principle of life. A homeostatic attractor of evolution itself may exist, which determines possible creation of new selectional systems such as the brain, the immune system and unknown others. Kauffman expresses this possibility, "The thought that selection achieves systems able to adapt leads ultimately to the question of whether there may be attractors of that selective dynamics."

Kauffman's major hypothesis arising out of his synthetic biological models of *chaotic* and *ordered* attractors, is that ecosystems coevolve to a poised state at the edge of chaos, what he terms, the *complex* or *liquid* realm. This poised state has been named: "Lynn Margulis calls this fluxing, dynamically persistent state '**homeorhesis**'—the honing in on a moving point. It is the same forever almost-falling that poises the chemical pathways of the Earth's biosphere in purposeful disequilibrium." 5 I have used internal teleology, homeorhesis and the analogy of concepts as attractors, to construct a table of hierarchical concepts that describe reality, life, thought, and politics for us (see [Table I](#)). Concepts in the chaotic realm *always* precede the ordered realm. Homeorhesis is the word '*and*' between them, the liquid realm. Chaotic attractors 'learn' to be ordered attractors.

Learning, in Edelman's Theory of Neuronal Group Selection, is the conjunction of perceptual categorization and memory. Learning is how we come to discern true from false, right from wrong, good from bad. The liquid realm at the edge of chaos is an apt metaphor, it is the realm of tears. Aeschylus could not have known that neuroscience would one day discover that the hard lessons of each day's search are consolidated in our brain at night through emotional affect-linking. Yet he wrote in *Agamemnon*: "Zeus, whose law it is that he who learns must suffer. And even in our sleep pain that cannot forget, falls drop by drop upon the heart, and in our own despite, against our will, comes wisdom to us by the awful grace of Zeus."

Every concept in the liquid realm forms a linked, integral part of civilization and progress. An open-ended arrow representing extropy can be drawn through all the concepts in the liquid realm (see [Figure 1](#)). The entropic fall off on either side of the extropic arrow is analogous to what Kauffman termed "complexity catastrophes" in fitness landscapes that prevent species from becoming more complex. If individuals drift towards nihilism, civilization falls from fitness peaks into valleys. If they relax into unquestioning dogma, it becomes trapped in a region of lesser peaks, unable to

progress. It's a narrow upward path, precariously poised over the abyss of barbarism and the stagnant sink of dogma. John Milton in *Paradise Lost*, expressed our need to progress, "That in our proper motion we ascend up to our native seat; descent and fall to us is adverse."

Liquid Realm Conceptual Hierarchy

The advance of civilization requires that the concepts of eternity, infinity, existence, future, meaning, and design, have validity in the belief systems of its leaders. Theories resulting in the invalidation of these concepts lead to nihilism or dogma: post-modernist idealism, multicultural relativism, radical reductionist materialism, big bang, big crunch, heat death, eternal recurrence, omegapoint, and far too many more. These theories eliminate at least one or more of the concepts in the ordered or chaotic realm required in order to make the valid conjunction in the liquid realm. We sense that if no memory of us remains eternally, if our impact doesn't extend infinitely, if existence is no more than a blip between two voids, if there is no indefinite future towards which our actions are directed, if life is meaningless, or if we are simply background noise without design, then why not live for the day and embrace entropy? Why not beat the rush and try to transcend existence now? All things are permitted, why care about the consequences of our actions? Why care about tomorrow at all? The reason such profoundly destructive theories are put forth was stated clearly by David Hume in *An Enquiry Concerning the Principles of Morals*, "Thus skeptics in one age, dogmatists in another; whichever system best suits the purpose of these reverend gentlemen, in giving them an ascendent over mankind, they are sure to make it their favorite principle and established tenet."

Essential attributes of life are: catalysis, metabolism, recognition, perspective, information, vitality, judgment, motivation, communication, and adaptability. The material substrate of life is self-constructing, or self-extending, in the direction of increasing energy flows through exploration of new spaces, or increasing the energy recycling efficiency within existing spaces. Life is at war with time, with matter, with necessity, and with equality. Friedrich Nietzsche wrote in *The Will To Power*, "That which we call our 'consciousness' is innocent of any of the essential processes of our preservation and our growth; and no head is so subtle that it could construe more than a machine—to which every organic process is far superior." We think mechanistically, we can only map the true complexity involved and attempt an interpretation.

Emotions, adventure, context, and prediction help form a core of selfhood during early growth; centering and certainty help maintain stable identity over time. Edelman comments on adventure and emotions: "When, in society, linguistic and semantic capabilities arise and sentences involving metaphor are linked to thought, the capability to create new models of the world grows at an explosive rate. But one must remember that, because of its linkage to value and to the concept of self, this system of meaning is almost never free of affect; it is charged with emotions." Thinking may be most proficient in context generation. Memory mappings are kept fresh by reflections on past experience, a constant recontextualization occurs merging past into present;

this diachronicity expands the core of selfhood. Memories help establish basic prediction skills which continuously reinforce rationality.

The brain and body, which work together to produce the system property of consciousness, establish conceptual and molecular boundaries between the self and the nonself. These boundaries persist, giving us temporal integrity of identity. William Blake in *A Vision of the Last Judgment*, referring to his corporeal eye, illustrated the conjunction of self and nonself with this gem, "I look thro' it & not

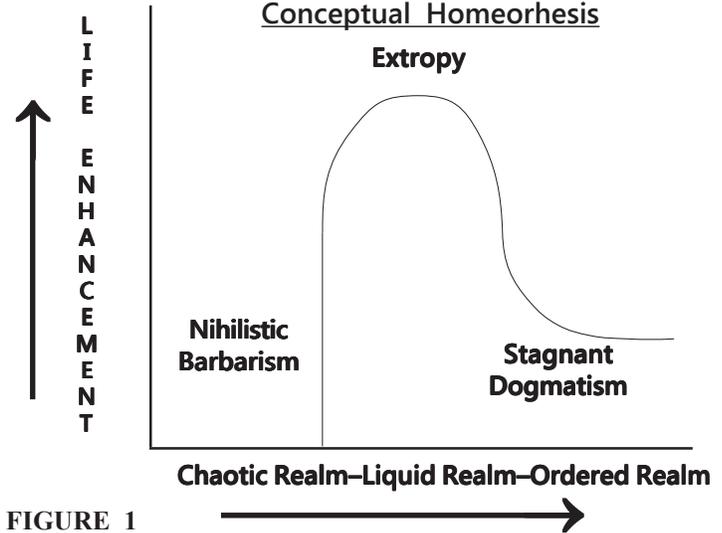


FIGURE 1

Kauffman's major hypothesis arising out of his synthetic biological models of chaotic and ordered attractors, is that ecosystems coevolve to a poised state at the edge of chaos, what he terms, the complex or liquid realm. This poised state has been named: "Lynn Margulis calls this fluxing, dynamically persistent state 'homeorhesis' — the honing in on a moving point."

with it." It is one of the most penetrating expressions of any liquid realm concepts I am aware of, the concept of centering. Centering makes the self into a point called "I" and places this point at the center of the universe. From this point, the self quests outward in all directions without the sensation of crossing any boundary between the self and the nonself. We achieve internal certainty through awareness that our subjective thoughts are objective truth to others. We embody truth, we alone can be certain of our purposes because we can decide them instant by instant. We cast aside doubt of existence, we know we cannot doubt doubt itself. Doubt exists, it is a thought, thought exists. Thoughts are about things, things from outside ourselves, these things exist.

We need science in order to extend our certainty externally. The development of science relies on understanding, experiment, and knowledge. One of the key conclusions drawn from biological epistemology (described in Part I), is that radical separation of value from fact in scientific endeavors is pure charade. Edelman explains that, "Any assignment of boundaries made by an animal is relative, not absolute, and depends on its adaptive or intended needs." The subjective mind cannot be placed outside of science, there are no objective scientists, no objective peer reviews and no objective funding requests. The aim of science is at objective

truth, but the actual content cannot comprise more than consensual agreements (which often pass as 'objective'). We do not know if, as a species, we all bring the same subjective presuppositions to bear on the objec-

tive truth. Science, above all, is utterly dependent on politics and the support of a civilized populace because it is a vocation. To paraphrase José Ortega y Gasset, the whole of science is only a chapter in certain biographies, it's what scientists do in the portion of their lives open to biography.

Ordered Realm Conceptual Conflicts in the Political Domain

Throughout **Table I**, no beginning-state concepts in the chaotic realm are ever in conflict with each other because they are formless and open-ended. Up until now—that is, through the conceptual groups of reality, life, and thought—none of the end-state concepts in the ordered realm have been in significant conflict. However, in the political domain, there are several pairs of end-state concepts that sharply conflict. Since the corresponding chaotic realm concepts do not conflict, this means the liquid realm concepts mesh uneasily with other, usually in a state of tension, but subject to unpredictable bursts of conflict.

The sharpest conflict is between the concepts of preservation and destruction. A high degree of permanent political tension is present between their corre-

Table I

Concepts in the Chaotic (Gaseous) Realm Always Precede
 Concepts in the Ordered (Solid) Realm.
 The Extropic Transformation is the Complex (Liquid) Realm

CONCEPTS OF CHAOTIC REALM-Conjunction-ORDERED REALM OF LIQUID REALM

Reality

Infinitely Divisible-and-Indivisible
 Beginning-and-End
 Space-and-Time
 Energy-and-Matter
 Past-and-Present
 Purpose-and-Truth
 Function-and-Form

Undecidability⁶
 Eternity
 Infinity
 Existence
 Future
 Meaning
 Design

Life

Competition-and-Cooperation
 Search-and-Consolidate
 Novelty-and-Ordinary
 Subject-and-Object
 Knower-and-Known
 Freedom-and-Necessity
 Interpretation-and-Map
 Fear-and-Greed
 Individual-and-Species
 Evolvability-and-Sustained Fitness
 Prometheus-and-Zeus

Catalysis
 Metabolism
 Recognition
 Perspective
 Information
 Vitality
 Judgment
 Motivation
 Communication
 Adaptability
 Bergson's *Élan*

Thought

Imagination-and-Abstraction
 Exploration-and-Discovery
 Coherence-and-Correspondence
 Cause-and-Effect
 Self-and-Nonself
 Consciousness-and-Being
 Holism-and-Reductionism
 Theory-and-Evidence
 Value-and-Fact
 Synthetic-and-Analytic
 Nihilism-and-Dogmatism
 Idealism-and-Materialism
 Evaluation-and-Breadth of Description
 Universal-and-Particular
 Caesar-and-Christ

Emotions
 Adventure
 Context
 Prediction
 Centering
 Certainty
 Understanding
 Experiment
 Knowledge
 Intellect
 Strength
 Extropianism
 Wisdom
 Sublimity
 Nietzsche's *Übermensch*

Politics

Mutability-and-Preservation
 Morality-and-Rationality
 Challenge-and-Response
 Command-and-Obey
 Self-Determination-and-Coerced Consent
 Private-and-Public
 Direction-and-Actions
 Familiarity-and-Contempt
 Excellence-and-Equality
 Spontaneous Contract-and-Inherited Custom
 Anarchism-and-Totalitarianism
 Rights-and-Responsibilities
 Creation-and-Destruction
 Individualism-and-Pluralistic Statism

Aesthetics
 Politics
 Leadership
 Self-Control
 Power
 Education
 Vocation
 Civility
 Respect
 Law
 Liberty
 Citizenship
 Capitalism

Cybernexus

sponding concepts of aesthetics and capitalism. We are presently in the midst of political leadership turmoil dealing with aesthetic issues of decaying ecosystem integrity and vanishing cultural traditions. Here, capitalism's destructive effects are tragically felt inter-generationally, but desired preservation will choke off the creation of economic vigor. The challenge to political leadership is always to focus on the search for new cultural forms while mourning the passage of the old forms. Aesthetics, politics and economic markets are all pushed by this inescapable tension to the ground of homeorhesis. The conflict between preservation and destruction is a major source of the undecidability problems in Kauffman's bionomic models. The models show that markets don't clear, discontinuities in the form of cascading bankruptcies or institutional instability are unavoidable. Cultural aesthetic values often aren't quantifiable. When they are quantified through arbitrary property boundaries backed by temporary force, markets do not protect them over time.

Next is the conflict between the concept of equality and the ability to obey (i.e., follow with dignity). Accepting direction is unambiguously hierarchical, *not* egalitarian. The corresponding concepts of respect and self-control mutually influence each other because the chaotic realm concept of excellence and the ability to command (i.e., lead while leaving those who follow with dignity) are so closely linked. Respect, being the conjunction of excellence and equality, is *earned* amongst true equals in top condition. Individuals, considered to be equal as an abstract ideal, incur *unearned* respect, a weakened form. Self-control, being the conjunction of commanding and obeying, is weakened when individuals stop accepting direction from their, in theory, 'equals'. Weakened self-control, coupled with weakened respect for others, eventually leads individuals to *refuse* to follow *any* direction or meet *any* standard. A self-organized hierarchy in society arises out of the necessity for leadership, higher abilities rise to the top where self-control and earned respect are reinforced through pursuit of common goals. The erosion of these occurs below this highest level in society, when those of less ability and lower levels of effort, believe themselves to be the equal of those above, without earning the distinction. José Ortega y Gasset in *The Revolt of the Masses* follows this process to its conclusion, "The mass crushes beneath it everything that is different, everything that is excellent, individual, qualified and select."

Religion solves this conflict between equality and obedience by positing equality before, and obedience to, higher authority than human leaders. This allows self-control in the followers as well as the leaders to be developed. Respect between followers and leaders then is founded on the dignity of humanity because all are obedient to higher authority. Political leadership in the past has been bonded to higher authority to forge a continuous chain of command linked by dig-

nity. Examples are the Egyptian Pharaohs, Divine Emperors of Rome and Japan, the Chinese Mandate of Heaven, and the European Divine Right of Kings. When the Enlightenment destroyed higher authority, all notion of authority went with it. The social bond of dignity between leaders and followers went also. The followers have been in continuous revolt against the notion of excellence, standards of behavior, high culture, and leadership authority since then. Statism is the end result, a mass of 'equals' expressing themselves as 'public opinion' swaying to and fro to the tune of the media piper, demanding direct action to meet their needs. Government responds by imposing the burden of meeting these needs on the backs of those individuals too weak to resist. In the absence of higher authority, the way out of this is to produce individuals with the strength to resist government.

The final conflict is between the concepts of coerced consent and inherited custom. Coercing consent involves a disruption of cultural tradition, or coercion would not be needed. The corresponding concepts of power and law are so interrelated that I must necessarily expand on all the concepts above, in addition to the chaotic realm concepts of self-determination and spontaneous contract. Oswald Spengler in *The Decline of the West* forcefully expresses how much these concepts permeate our lives: "From the feeling of power come conquest and politics and law; from that of spoil, trade and economy and money... **One may aim at booty for the sake of power, or at power for the sake of booty.**"

Irreducible first-person subjectivity, with its private inner life and moral autonomy, is central to the concept of an individual. This individual uniqueness, what Max Stirner referred to as the "unique I," carries with it an epistemological indeterminacy; namely, that the consequences of even tiny changes to immunological, genomic, or neuronal systems are uncertain. This is the primary argument for self-determination, we must 'own' ourselves. Our actual thoughts are too richly textured and unique to fully share with anyone else. This leaves us *isolated in full view*, with a sense of loneliness that can only be assuaged by reaching out to others. Reaching out to others, in ever expanding groups, leads to coerced consent as leaders within the groups vie through the *political technology* of world-view warfare ('*Weltanschauungskrieg*'), to steer the group's purpose in their direction. This is the origin of power politics (see Figure 2). The dominance of power politics in human affairs is due to the tremendous increase in a strong-willed individual's self-determination that comes with increases in abilities on the social scale. Dante in *De Monarchia* connects the maximum self-determination with the maximum consensual purpose in a civilization: "The human race when best disposed is a concord. For as a single man when best disposed both as to mind and body is a concord, and so also a house, a city, and a kingdom, so likewise is the whole human race. Therefore the human race when best disposed depends upon a unity in wills."

Power politics is personal, the determinant is strength of individual will. Nietzsche reminded us, "To expect that strength will not manifest itself as strength, as the desire to overcome, to appropriate, to have enemies, obstacles, and triumphs, is every bit as absurd as to expect that weakness will manifest itself as strength."

When language is used as a weapon to destroy or isolate context, understanding between individuals breaks down. This is why battles over changing language age so furiously; the image of the old world view must be tarnished and de-legitimized by breaking the old meanings, to make room for the new world view. The language that political elites use is shaped, then the new world view is filtered downward through imposition of educational standards. Politics are played as zero-sum games when there is *no* consensual purpose, deception and treachery are the rule. Politics are played as non-zero sum games when there *is* consensual purpose, maximum payoff occurs when strategies are revealed openly and honestly. The classical scam of the left is to hold out equality of opportunity to individuals (the promise of social ascent), while gutting their willpower to do so through nihilism (teach them to 'be proud, selfish, and dull'). The classical scam of the right is to hold out the potential of developing the greatest willpower to indi-

The classical scam of the left is to hold out equality of opportunity to individuals (the promise of social ascent), while gutting their willpower to do so through nihilism. The classical scam of the right is to hold out the potential of developing the greatest willpower to individuals, while gutting their ability to utilize it through dogma (social rigidity).

viduals, while gutting their ability to utilize it through dogma (social rigidity).

Context creation between individuals diverges due to differences in perspective and underlying private purposes. This limits the utility of the concepts of consent and contract. Hume said it this way in *Morals*, "These words too, inheritance and contract, stand for ideas infinitely complicated; and to define them exactly, a hundred volumes of laws, and a thousand volumes of commentators, have not been found sufficient." Contracts rely on inherited tradition and common moral language to fill in the incomplete contractual descriptions. The determination of which entities are qualified to be included in the human community, which are entitled to the benefits of citizenship and which are capable of giving consent; in fact, law itself, is always made *by* stronger individuals *for* weaker individuals. *Any form of consent is an expression of power politics and nothing else.* All rights are granted through power politics; a right not enforced, is not a right. All responsibilities are assigned through power politics; a responsibility not enforced (primarily through social pressure), is not a responsibility.

Rule by law may be an abstract ideal, but rule by individuals is the actuality. Laws are ambiguous, rights are not mutually exclusive, juries have divergent conceptions of justice, judges pursue legislative agendas, and enforcement of laws and regulations is at the caprice of funding levels and the shifting priorities of individuals. James Harrington in *The Commonwealth of Oceana* advised that, "You will be told, that where the laws be few, they leave much to arbitrary power; but

where they be many, they leave more, the laws in this case, according to Justinian and the best lawyers, being as litigious as the suitors." New life purposes form within existing law, they are either accepted within society and law is wrapped around them, or rejected and criminalized. Since life purposes conflict, laws will conflict, becoming too numerous and complex for consistent enforcement. The juridical system's legitimacy will decline after protracted periods of arbitrary and capricious use of laws by political factions. The creation of new purposes of life is facilitated by removing obstacles in the form of regulations and laws that cannot be enforced without significant exceptions. Substantial enforcement of all enacted laws is the meaning of the abstract ideal 'equity in law.'

Enhancements of

Consciousness

Coherency of purposes and values coupled with certainty is the desired condition prior to action. This is the biggest enhancement of consciousness we can achieve immediately. We must develop and maintain an understanding of our dynamic world civilization. The accelerating rate of changes forces us to design and invent the future; this maximizes our vitality. Our perspective must be broadened in order to find simplified contexts, by placing the tangled particulars of life against a universal background. This is aided by the development of, and participation in, high culture. Its exceedingly fine discrimination and standards of rectitude increase the fine structure of neuronal ensembles.⁷ This enriches consciousness. High culture fine-tunes emotional acuity through the practice of evaluating diverse individual moral decisions that had great historical consequences. William Wordsworth in *Preface to Lyrical Ballads* lauds this sensitization, "For the human mind is capable of being excited without the application of gross and violent stimulants; and he must have a very faint perception of its beauty and dignity who does not know this, and who does not further know, that one being is elevated above another, in proportion as he possesses this capability."

Within biological evolution, a perceptual bootstrap led to concept formation in primary consciousness. Then, a semantic bootstrap led to the cultural evolution of higher-order consciousness. These bootstraps increase the sophistication of pattern formation within our mind. Edelman emphasizes that "Thinking occurs in terms of

synthesized patterns, not logic, and for this reason, it may always exceed in its reach syntactical, or mechanical, relationships." Now, within cultural evolution, a technological bootstrap is developing. Our increasingly intimate connection to the communications and information capabilities, of the computer networks being embedded into social structures and the environment, coupled with advancing genetic engineering capabilities, will enable us to think in terms of kinetic living patterns. Such patterns have been inaccessible to us previously; they reveal the evolution of structure on varying spatio-temporal scales. They are nonlinear and counterintuitive to us now, they lead to organic logic as opposed to systematic logic. This bootstrap presents us with the breadth of description and the immensity of particulars that will facilitate wisdom and sublimity in individuals on a massive scale, leading to unknown emergent phenomenon.

Secular Morality as Longevity Increases Indefinitely

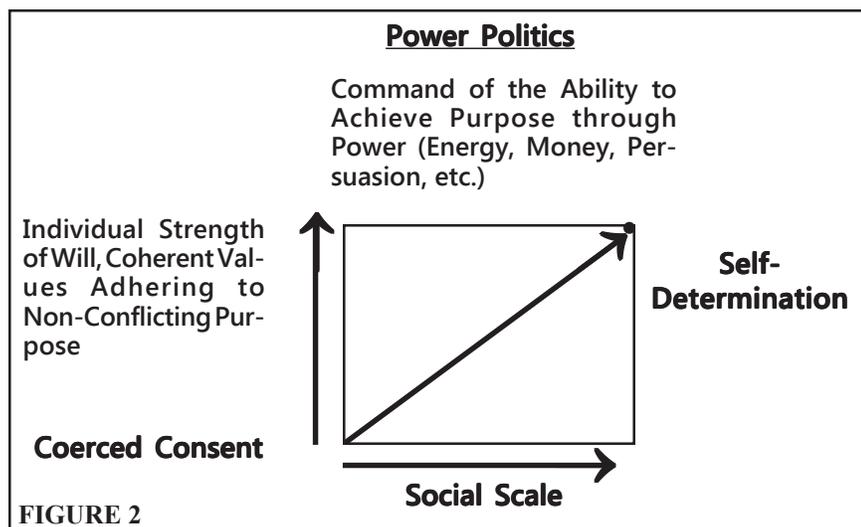
Enhancing consciousness cannot be accomplished by reducing the self to nothing, as the radical reductionist materialists are attempting to do, but by making the self more complex, and more long-lived, in a boundless expansion. Homeorhesis, where progress occurs amidst civilizing forces, is the infinite frontier, a flowing realm of potentially limitless life. Frontiers are never safe, easy, or tidy; but their wildness is exhilarating in the eternal quest for opportunity. The tip of the arrow of extropy is the preservation and enhancement of life, or as Nietzsche referred to it, "Life at it's highest potency." When we attempt to conceive of this tip, by plunging into it, seeking the wellsprings of extropy, we see that it is the

deadly to civilization. When practiced widely, courage appears as stupidity, temperance as needless denial of desire, justice as avoidance of hurt feelings, the sense that high aims are worthwhile seems incomprehensible, and the will to live in common is weakened, devolving to tribalism. The relativist's mantra of 'Don't judge,' and 'Accept people as they are,' are axioms of barbarism. The salient feature of a relativist is intellectual slackness, the rational will to construct or accept a construction, of an absolute worldview is absent. A relativist cannot say that a person who is a genius, inquisitive, literate, tough-minded, conscientious, exquisite, decisive, and resolute; is better than a person who is envious, hateful, malevolent, traitorous, craven, cowardly, violent, and jealous. One cannot be better than the other because the existence of the concept 'good' would be acknowledged. 'Good' is a moral absolute, it leads inexorably to a concept of the highest or greatest good. Thus, the relativist must either be conceptually incoherent, or else hold relativistic positions dogmatically.

There are four distinct worldviews possible, depending on whether we adopt an extropic or entropic purpose in life, and whether we believe in the immortality of the soul in a spiritual sense or as longevity increases indefinitely (see Figure 3). Adopting an entropic purpose draws our attention to the pain and incomprehensibility of existence. Life appears to be a mere spark between two voids if believed to be mortal, and extended suffering if believed to be immortal. Both conditions encourage a retreat to irrationality and mysticism. The mortal condition leads to a Sordid life of reanimalized mediocrity, where the immortal condition leads to an Ascetic life of patient suffering, or attempts to transcend existence. Adopting an extropic purpose places us in a vital drama of ascending life of cosmic proportions. Humanity is seen to be excellent and dignified. The mortal condition produces a Tragic view, because we experience the waste of invaluable human thought unguided or misdirected, with unbearable pain. We are acutely sensitive to how unequal, alone and subject to Fate we are. The immortal condition produces a Joyous view, there is time to achieve the visions of our ever-fruitful imagination.

Political Considerations Under Conditions of Divergent Enhancement of Consciousness

Individuals achieving enhanced consciousness stretch the distribution of the consciousness bell curve, because the bottom end is fixed at death. This stretching is fundamental to progress yet for those at the high end, the injunction of Byron in *Childe Harold* must not be forgotten, "He who surpasses or subdues mankind, must look down on the hate of those below." They will need protection that emotive statism will not provide. Edmund Burke in *Thoughts on the Cause of the Present Discontent* offered this sage advice, "When bad men combine, the good must associate, else they will fall, one by one, an unpitied sacrifice in a contemptible struggle." Protection is needed because high culture, associated with enhanced consciousness, is invaluable to all; to those at the high end so they can achieve excellence and to those below to have aspiration to the high. There is no escape



Edelman elucidates the main biological paths to enhanced consciousness, "Increasing the size of the primary repertoires or the reentrant connectivity between repertoires, or enhancing the means of synaptic change by adding new chemical mechanisms during evolution, increases the number of categorical responses that may enhance learning." With the caution that the adaptive consequences of polygenic design alterations are speculative at best, two areas of technological enhancement appear promising: emotions and aging processes. Emotional breadth and control might be improved by expanding the neuronal pathways between primary and higher-order consciousness as Arthur Koestler recommended in *Janus*.⁸ We may boost volitional power over our spectrum of focus (from high-focus analytical reasoning down through low-focus associative creativity) and our inborn temperament, if the genomic system governing attention is discovered. To increase longevity, we could pursue expanding neural connections and/or mechanical systems, in two directions: First, to our internal organs for improved control over homeostatic processes, internal levels of hormonal systems and responses to stress; and second, between the immune system and brain for more robust recognition of nonself molecules, better control of disease and more flexibility regarding acceptance of biological or mechanical introductions to the self.

The Transformation of

conjunction of the infinitely divisible and the indivisible. What is this concept? It is here that life is directed towards, an eternal search with consolidations along the way conserving all previous levels of complexity.

We are free to turn from this strenuously vital liquid realm of tears, but our destination will be the abyss of nihilism, or the stagnant domain of dogma. Following Augustine in *The City of God* and Nietzsche in *Beyond Good and Evil*, extropy is not intrinsically good nor is the chaos of the abyss and the order of necessity evil. For us, it is our volitional turning towards extropy that constitutes absolute good; just as it is the turning away itself, the "tension of the bow" of the soul being relaxed, that constitutes evil. The arch-defender of rationality and objectivity Ayn Rand, pronounced in *The Virtue of Selfishness*; "There is no escape from the fact that men have to make choices; so long as men have to make choices, there is no escape from moral values; so long as moral values are at stake, no moral neutrality is possible." The aesthetic standard of civilized life is the suffering of the tragic failure to preserve beauty, and the sustenance of the joyous promotion of artistic mutability; the promise of the surprising new is partial recompense for the cherished old passing away. The political standard of civilized life is the rational promotion of good and the moral confrontation with evil.

Relativism, the moral philosophy that no absolutes exist, no purpose, no truth, and no meaning, is

from the charge of elitism that will be brought by political opponents. Spengler defended high culture from this charge: "Every high creator in Western history has in reality aimed, from first to last, at something which only the few could comprehend. . . . To look at the world, no longer from the heights as Æschylus, Plato, Dante and Goethe did, but from the standpoint of oppressive actualities is to exchange the bird's perspective for the frog's." Political structures designed around a secular morality that attempt to span both extropic and entropic metaphysical, aesthetic and religious systems are unworkable. Entropic worldviews, where tolerated, tend to prevail over time because they are easier.

In the near future, these protective associations will evolve in an intermediate stage, less than a nation but more than an institution. Polycentric consensual purpose, standards of civilized behavior, law and markets are the shape of this intermediate stage. The view is of a web, a flux of connecting pockets of consensus with contractual bonds inside each core, and power politics between cores. This polycentric complex adaptive system is described by Kauffman: "At the boundary between order and chaos, the frozen regime is melting and the functionally isolated unfrozen islands are in tenuous shifting contact with one another. It seems plausible that the most complex, most integrated, and most evolvable behavior might occur in this boundary region." Arnold Toynbee labels this the "diasporas" model, what we envision as cybernexus and autonomous regions with limited sovereignty.⁹ Cybernexus is a synthesis of virtual communities on computer networks and the physical social connections individuals make to support these. Emphasis is placed on privacy and independence through techniques such as encrypted communication, digital cash and privately produced law (PPL). Cybernexus is *de facto* secession from existing states and institutions, if not *de jure*. The surrounding environment must support the technological structure though, these connections and alliances are permanent.

Divergence of life purposes leads to divergence of meaning. Literate society becomes fragmented into more or less coherent spheres of politically sympathetic writings to the exclusion of other, often considered illegitimate, spheres. This fragmentation becomes stronger as technology, through communication customizability, permits individuals more choice of association. How can overarching commonalities be discussed if there is no crossover meaning left? At the ridges of the interconnecting web there is a tremendous richness of complex meaning where commonalities between cores touch the underlying objective truth. Iris Murdoch points to how we can pull together disparate pockets, "We must indeed *preserve* and *cherish* a strong truth-bearing everyday language, not marred or corrupted by technical discourse or scientific codes; and thereby promote the clarified objective knowledge of man and society of which we are in need as citizens, and as moral agents."¹⁰

Notes

1. Kauffman, S. *The Origins of Order: Self-Organization and Selection in Evolution*. New York: Oxford Univ. Press, 1993.
2. Edelman, G. *Bright Air, Brilliant Fire: On the Matter of the Mind*. New York: Basic Books,

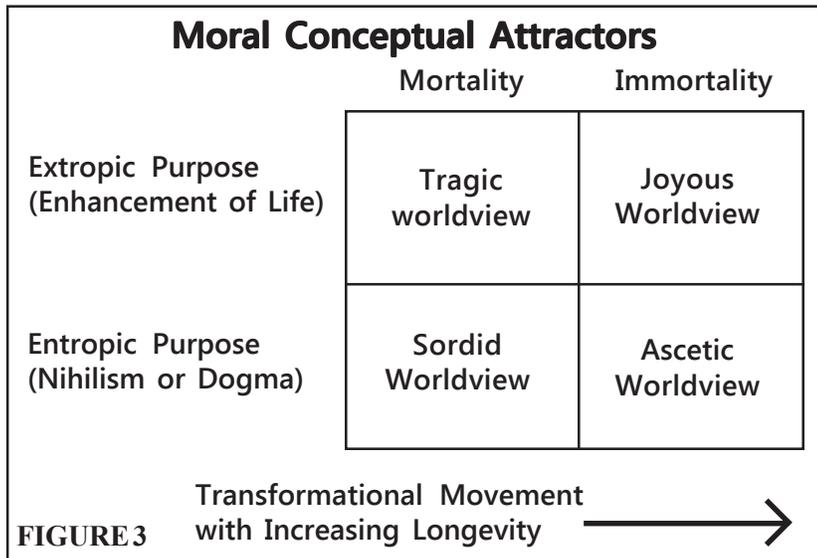
1992.

3. Hansen, Niels V. *Process Thought, Teleology and Thermodynamics: A Reinterpretation of the Second Law of Thermodynamics*. I found this paper in Feb. 1995 from an anonymous ftp, Phil-Preprints.L.Chiba-U.ac.jp/pub/preprints / Phil_of_Science. It is a well-reasoned derivation of the second law, emphasizing the role of constraints and boundary conditions between extropic and entropic processes, beginning from A.N. Whitehead's essentially Extropian metaphysics within his process philosophy.
4. Hess, B. & Mikhailov, A. "Self-Organization in Living Cells." *Science* 8 April 1994: 223.
5. Kelly, K. *Out of Control: The Rise of Neo-Biological Civilization*. Addison-Wesley Publishing Co., 1994. 'Homeorhesis' was previously used by the biologist C.H. Waddington in another context.
6. Undecidability because I haven't decided

Homeorhesis, where progress occurs amidst civilizing forces, is the infinite frontier, a flowing realm of potentially limitless life. Frontiers are never safe, easy, or tidy; but their wildness is exhilarating in the eternal quest for opportunity. The tip of the arrow of extropy is the preservation and enhancement of life, or as Nietzsche referred to it, "Life at it's highest potency."

what to name it yet; a wide range of concepts have been proposed for this, the current concept is 'Deterministic Chaos,' but this is not a conjunction, it is merely a restatement that no more facilitates comprehension than earlier attempts; Sartre conceived of it as 'Nothingness,' Newton as the 'Sensorium of God,' Leibniz as 'God,' Anselm as 'Perfection,' Lucretius as the 'Void,' Plato as the 'Receptacle,' Empedocles as the 'Vortex,' Heraclitus as 'Strife,' and Lao Tzu as the 'Tao.'

7. Zohary, E., Celebrini, S., Britten, K. & Newsome, W. "Neuronal Plasticity That Underlies Improvement in Perceptual Performance." *Science* 4 March 1994: 1289-92.
8. Koestler, A. *Janus: A Summing Up*. New York: Vintage Books, 1978.
9. On autonomous regionalism and limited sovereignty, see: Kennan, G. *Around the Cragged Hill: A Personal and Political Philosophy*. New York: W.W. Norton & Co., 1993.
10. Murdoch, I. *Metaphysics as a Guide to Morals*. New York: Allen Lane, The Penguin Press, 1992.



February 17-18 1996
Scottsdale, Arizona

Symposia Coordinators:

Linda Chamberlain
Fred Chamberlain
P.O. Box 189
Payson, AZ 85547
(602) 474-0428 Ext.888
(602) 472-7496 FAX
CompuServe:
72624,3554

Sponsored annually by
Alcor Life Extension Foundation
7895 Acoma Dr. Suite 110
Scottsdale, AZ 85260
1-800-367-2228

CALL FOR PAPERS

Cryo-1

**A Research Symposium
on Advances in Biostasis,
Life Extension,
and Re-Entry Technologies**

The purpose of the annual Cryo symposia is to benefit all members of the life extension community by promoting and encouraging more research by individuals and cryonics organizations, and to help raise the standing of cryonics within the general cryobiological and general scientific communities.

SQUARED DEAL

by M.J.P. Wolf

The United Square Republics have been together so long that the boundaries between the individual republics have vanished from most maps. As the USSR's cartographer, you have been commissioned to reconstruct a map of the 21 individual republics that make up the USSR, in order to settle the dispute as to which republic the capital, Quadra, resides in. The USSR covers an area of land, square in shape and 112 miles to a side, with Quadra in the exact center of the square. Each of the 21 republics is also square in shape, and each have whole numbers of miles to a side; but no two republics are the same size. Though it may hard to believe at first, the 21 square republics completely tile the entire area of the USSR. From the ten pieces of information gathered below, determine the size and position of each of the republics within the USSR, and which republic Quadra lies in.



A. The largest republic is exactly 625 times the land area of the smallest one, and the combined area of the six smallest republics is equal to exactly one tenth the land area of the largest republic.

B. The land area of the second largest republic is 49 times the area of the third smallest republic, and 36 times the area of the fourth smallest republic.

C. *Voth* has exactly as much land area as the combined areas of *Dorra*, *Froll*, *Gom*, and *Bolta*.

D. *Merm* is exactly one-fourth the land area of *Curro*, one-ninth the land area of *Phydra*, and over 20 times the land area of *Zevo*.

E. *Bolta* is larger than *Nurin*, which is 1000 square miles larger than *Gom*. There are also four republics which are each larger than *Gom* by less than 150 square miles.

F. *Alto* is four times the land area of *Telka*, and *Telka* has as much land area as *Dorra* and *Slome* combined.

G. *Hort* is 16 times the land area of *Elga*, and *Elga* is smaller than *Froll* but is larger than *Zevo*.

H. *Jarp* lies in one of the corners of the USSR, and shares a border with *Wintz*, and they both border *Elga*.

I. *Koid* borders *Okell* to the east, and neither borders *Rudra*. *Rudra* does share borders with *Lenif*, *Phydra*, and *Nurin*.

J. *Hort* borders *Dorra* to the south and *Okell* borders *Dorra* to the north

The solution will be revealed in next issue.

MINDSURFING

The tia Transformation

By now most of you should know that an IP (Internet Protocol) account using SLIP (Serial Line Internet Protocol) or PPP (Point to Point Protocol) is necessary to run the GUI (rhymes with groovy) applications that make the Internet nicer to look at and in some cases easier to use than command line UNIX. Netscape, for example (or Mosaic, for those of you living in 1993) requires IP access, as does the superb Anarchie and (except for those with true know-how) Eudora. With an IP account, one can run all this groovy GUI software simultaneously, so one can browse the Web at the same time one is pulling in e-mail and downloading bondage GIFs via ftp.

A dial-up IP account, unfortunately, tends to be terribly expensive. Is this a function of the extra equipment and software needed to provide IP service at the host end, or is this merely opportunism on the part of greedy providers taking advantage of a Netscape hungry public? Regardless, in most areas a SLIP or PPP connection is usually far more expensive than a plain old UNIX dial-up. In Los Angeles, for example, the going rate for a plain vanilla UNIX shell runs between \$15 and \$20 per month for unlimited usage, whereas an IP account at a major provider typically costs \$2 *per hour*. At those rates a typical net.geek might get billed a hundred bucks or more each month. Can the "Cool Site of the Day" possibly be worth that much money?

There are other differences between shell (i.e., UNIX) and IP accounts. An unlimited usage shell account often includes amenities such as on-line storage space (5 or 10 megs being typical) and publicly-accessible ftp and Web subdirectories (a must for the self-publisher). In addition, there are also a number of interesting UNIX facilities that have no counterpart on the Mac or PC.

If your objective is the most Net for the buck, you'd want to pay the low rates for (and get the other advantages of) a UNIX shell account, but still be able to run Netscape and the other groovy GUI stuff. Some clever hackers at a place called Cyberspace Development, Inc. (CDI) figured out how to do just that. Their glorious creation is called tia (acronym expansion: The Internet Adapter). tia runs on the host machine and emulates a SLIP connection—it uses the IP address of the host machine to send and receive TCP/IP packets on

behalf of your humble shell account. In other words, tia fools your shell account into thinking it is an IP account.

Those of you forking over big bucks for a SLIP or PPP account are probably wasting money
by Steve Arbuss

tia works. According to CDI's propaganda, a shell account running tia is as fast as an actual SLIP account, sometimes even faster. Mr. Yow's experience backs this up. You log in to your shell, like always, type "tia" at the prompt, and — shazam! Netscape! Eudora! Whee! When you get sick of downloading 5 meg ambient tracks at IUMA, you can quit out of your IP applications, go back to your term software, type control-C a bunch of times, and tia turns off. You are back at the UNIX prompt to wreak havoc in the old ways.

The disadvantages to using tia are slight. Since a plain vanilla shell account is not actually connected to the Internet with its own IP address, as is a machine with a true SLIP or PPP connection, you can't use tia to, for example, maintain your own ftp site on your PC. (But would you even want to on a dial-up?) Some people report freezing of certain client applications, but I have experienced no such problem in three months of heavy use. Lastly, tia presently supports only SLIP, not PPP, so you can't do some of the obscure fancy-dancing that a PPP link allows.

Installation is not trivial. You can get tia via ftp from CDI or a mirror site (tip: on some systems, tia is already set up somewhere, and all you have to do is create a link to the existing file), then you buy a tia license code for \$25 using an unusual and fun e-mail form, and, finally, you obtain and configure all the TCP/IP utilities and software on your PC or Mac. This is not a big deal for the seasoned user and takes well under an hour. Neophytes and non-DIYers can use a easy-install package from another clever little company, Software; this product, called "Cheap Sunglasses", includes (for \$65) tia and a tia license correctly installed on your shell account, a bunch of PC software, and the best-selling Adam Engst net book.

Since you'd otherwise be paying \$2 per hour for SLIP access, the modest license and installation fees pay for themselves within a month. A free 14-day evaluation license is available if you're nervous about whether tia will work on your machine.

tia is not the only SLIP emulator. There is a freeware (GNU license) program for Windows called TwinSock, for example, that does more or less the same thing as tia.

For obvious economic reasons—tia will probably cause dramatic reductions in IP account pricing over time—many Internet service providers are not wild about SLIP emulation. But since it causes no performance problems at the host end, the major providers are reluctantly permitting users to run tia, although most providers refuse to support it.

Wasting money needlessly is entropic. Do the right thing—dump that retro SLIP account in favor of an emulator.

Info about tia and Software's installation packages:

<http://marketplace.com/0/tia/tiahome.html>

or send e-mail to

tia-info@marketplace.com

Info about TwinSock:

<http://ugsparc31.eecg.utoronto.ca:8001/luk/tsfaq.html>

Usenet discussion about IP emulators:

alt.dcom.slip.emulators

MindSurfing is a series of articles about the cutting edge of the Internet for the dial-up user. Capitalized terms may be trademarks or service marks of the companies described above. Confused readers are welcome to send questions to the author at: mryow@aol.com.

The Transhuman Taste Reviews of Extropian Interest

The World of 2044

eds. Charles Sheffield, Marcelo Alonso, Morton A. Kaplan

Reviewed by Phil Goetz

Published by Professors World Peace Academy, 2700 University Ave. West, St. Paul, MN 55114 Distributed by Paragon House, 370 Lexington Ave., New York, NY 10017

September 1994, 381 pages

ISBN 0-943852-49-8 (hardcover): \$29.95

ISBN 0-943852-57-9 (paperback): \$19.95



The PWPA is an international association of professors and scholars from diverse backgrounds, devoted to issues concerning world peace. PWPA sustains a program of conferences and publications on topics in peace studies, area and cultural studies, national and international development, education, economics, and international relations.

Table of contents:

TECHNOLOGICAL FORECASTS p.3-96 Materials and Energy: Alexander Zucker. Robotics and AI: Hans Moravec. Biological Technologies: Claude Villee. Biomedical Technologies: Ernest Cravalho. Transportation & Communication: S. Fred Singer. Inhabiting the Oceans: Athelstan Spilhaus. Living in Space: Gerard K. O'Neill.

FROM TECHNOLOGY TO SCENARIO p.99-137 The Biological Century: Gregory Benford. Prenatal Genetic Testing & Euthanasia: Stephen Post. O Brave New (Virtual) World: Ben Bova.

INITIAL SCENARIOS (fiction) p.141-202 Report on Planet Earth: Charles Sheffield. An Address to the Council: Ben Bova. A Nightmare: Morton Kaplan. A Land of Empty Abundance: Jerry Pournelle. A Visit to Belindia: Frederik Pohl. A Utopian World: Morton Kaplan.

REGIONAL SCENARIOS p.205-375 The View from Outside America: Christie Davies. The Evolution of the World in the Next Fifty Years: Jan Knappert. The United States in 2044: Gordon Anderson. 2044: A View from Guatemala: Armando De la Torre et. al. Thai Society in the 21st Century: Weerayudh Wichiarajote. Opportunities for Africa: Ernest Emenyonu and V. Uchendu. Australia in 2044: Ivor Vivian,

Alan Barcan, and Patrick O'Flaherty. The Case for Jordan: Subhi Qasem. Polish Brainstorming: Maria Golaszewska and Tadeusz Golaszewski. The Philippines Fifty Years Hence: Andrew Gonzalez.

This book comes in two parts. The first two sections predict likely technological developments. The last two sections (over two-thirds of the book) try to envision future societies.

TECHNOLOGY

Alexander Zucker predicts the continued dominance of steel, with competition from plastics, composites, and ceramics. Simulation and atomic-scale examination will aid design. Copper, lead, manganese, molybdenum, nickel, germanium, zinc, tin, and bismuth must be replaced, as they will become scarce. These shortages should be faced with products designed to be repaired, not discarded.

Hans Moravec predicts the next 5 stages of AI and robotics: The Volks-robot (circa 2000-2010) will clean, cook, do specific repair jobs, and more. Learning robots (2010-2020) will improve with practice. Robots using mental imagery (2020-2030) to simulate their surroundings will think before acting. (I don't know why Moravec gives this order. These abilities are subjects of current research, and none seems more difficult than the others.) In 2030-2040, bottom-up robots will blend with top-down AI, providing humanlike reasoning. By 2050, humans will be obsolete. (See his book *Mind Children* for more of his thoughts on this issue.)

Claude Villee's essay on biological technologies covers only short-term technical developments: the Human Genome projects, hybridomas (fused cells of two



types) used to make catalytic antibodies, genetic engineering, and retroviral cures. He worries that the increasing number of healthier old people will be a burden on society; he does not mention that people who are healthier longer work longer. He hopes that using different fuels and increasing the number of plants will reduce the greenhouse effect.

Ernest Cravalho begins his essay on biomedical technologies with the economic problem of paying for high-tech medicine, but does not pose the hard question: How much is too much to pay to save a human life? He predicts that the stethoscope will develop into a system that collects signals over a broad frequency spectrum. Active capsules will collect and transmit information from the patient's digestive system, deliver drugs, and eventually perform microsurgery. MRI will be real-time. Expert systems will help cope with all the data. Chromophores (chemicals that glow under a certain wavelength of light) coupled to antibodies will locate pathologies precisely. He closes with the ethical problems of cloning, transspecies transplantation, cyborgs, and mind control.

S. Singer predicts that the automobile will survive, but will pollute less. Safety, he says, will be a major consideration in all advances—but he argues this based on the high costs to society of traffic accidents, not on any costs to manufacturers. Dynamic braking will convert kinetic energy into some other form on braking, then use it to accelerate. Smart cars with navigational software will appear, but smart highways demand the appearance of publicly funded highways and privately purchased cars at the same time. He also mentions maglev trains, air transport, and a hybrid personal/mass-transit system in which you rent out electric cars at a terminal. Singer hopes for partnerships of the private sector and governments to develop transportation infrastructures.

Athelstan Spilhaus' brief piece on inhabiting the oceans does not mention many technical difficulties, nor the relative merits of colonizing the oceans versus colonizing space. He argues that ocean cities would have the advantages that now make our shorelines overcrowded. Sea cities

will eventually seek independence. There is an Internet list planning for this eventuality; contact Eric Klien <oceania@terminus.intermind.net>. Also see *Extropy* #12 and The Millennial Foundation.

The late Gerald O'Neill, author of *The High Frontier*, writes that the need for solar power satellites will motivate travel into space. He hopes that cheap energy will bring high living standards to the entire world and save the environment from pollution, though to me it seems likely that cheap energy will make economical the exploitation of habitats such as marshes, tundra, and boreal forests. Most of what he

Stephen Post wants to restrict genetic testing, enhancement, and selective abortion. "It is incumbent on physicians to hold firmly against the quest for enhancement," he says, "in part by maintaining a disease-based definition of the human suffering for which medical therapy is responsible. To widen the definition of suffering so as to provide enhancement interventions is precisely the wrong response to the human condition..." Besides being circular, this argument implies that transhumanism is immoral... Study Post's arguments and attitude, for he represents one of our greatest enemies.

says about space colonies can be gleaned from the picture on the book's dustjacket. He tries to make them sound appealing, but does not explain why anyone but the desperate or overpaid would want to live in space, nor who would pay for non-essential personnel to move there.

The innovations Gregory Benford suggests in his essay, "The Biological Century", include bacteria that digest toxins, protein "pharms" producing insulin and milk containing anti-clotting proteins, a living "bath mat" that eats dirt, clothes that digest your sweat (and other wastes), ants designed to defend crops from pests, bacterial mining, trees grown in the shape of houses, and cocaine grown in Mom's bathtub from bacteria.

Stephen Post's politically correct essay will send Extropians into frenzy. He wants to restrict genetic testing, enhancement, and selective abortion. "It is incumbent on physicians to hold firmly against the quest for enhancement," he says, "in part by maintaining a disease-based definition of the human suffering for which medical therapy is responsible. To widen the

definition of suffering so as to provide enhancement interventions is precisely the wrong response to the human condition. Moreover, such interventions violate the purpose of the healing art, which is the restoration of physical and mental function when possible." Besides being circular, this argument implies that transhumanism is immoral. I believe that the majority of doctors today concur with his opinion. That is why researchers who find drugs that seem to improve memory advocate them as "a possible Alzheimer's remedy", but never suggest using them to enhance normal memory—and why the FDA would not allow it. Study Post's arguments and atti-

tude, for he represents one of our greatest enemies.

Ben Bova's article on virtual reality was obligatory, but contains no new ideas. It is largely a review of Howard Rheingold's *Virtual Reality*.

SOCIETY

In any similar book made between 1950 and 1990, the authors would have dwelt on the specter of nuclear holocaust. Only the Polish essay even mentions this. The concerns voiced most frequently are overpopulation, morality, education, damage to the environment, and uneven distribution of wealth.

Population

Villee, Spilhaus, O'Neill, Benford, Sheffield, Bova, Kaplan, Pohl, Davies, Knappert, Vivian, Qasem, and Gonzalez all mention overpopulation as a major problem. According to Knappert, women in the southern and eastern worlds have on average five children each, and in tropical Africa, seven. Knappert, Qasem, and Vivian et. al. say there is already not enough



fresh water.

Nations with low population growth are often besieged by immigrants: the US by Mexicans, western Europe by Muslims, and Australia by southeast Asians. Knappert predicts that either more nations will take the strict approach of Hong Kong, or the immigrants will soon outnumber the present inhabitants, particularly in Europe where the Islamic immigrants are urged to have as many children as God grants.

Sheffield envisions the use of artificial food, superplants that grow in soil unsuitable for other crops, and worldwide contraception as solutions to overpopulation. Villee mentions pest-resistant, high-yield crops and reduced beef consumption. Both believe that given the choice, women would rather have fewer children. But Gonzalez claims that contraception has been ineffective in curbing population growth in the Philippines for cultural and religious reasons.

Davies contends that “the only choices today for countries with runaway rates of population growth are either effective voluntary birth control and early abortion today or compulsory sterilization, late abortion and infanticide tomorrow.” Bova says that space will never serve as an outlet to reduce the Earth’s population, though he does not explain why. O’Neill, the advocate of space colonization, predicts only half a million people living in space by 2044. He does not present space as a vent for population on Earth. Rather, he says it will ease population pressures by providing the energy needed to bring affluence and low birth rates to the world. Benford fears a plague designed to reduce overpopulation.

Morality

The authors warn about the loss of morality, both because religion is weaker, and because multicultural societies have many conflicting sets of value systems. Pournelle gets to the heart of the matter: “No hint of religious origin of ‘values’ may be given in schools. Worse: most schools teach a kind of neutrality among cultures and value systems. We are, it seems, to produce a nation of ethical philosophers who will reason their way to civilized behavior — and do that in schools that cannot even teach the children to read. Any optimistic projection of the future must assume that the nation will undergo a revival of morality and find new wellsprings of moral be-

havior.” Vivian et. al. say that the American and French tradition of placing liberty above all else is not enough, and we need to reintroduce the idea of duty to society.

Most authors who admit the problem seem to think it is a simple matter of social engineering to construct some workable value system. Yet only Weerayudh Wichiarajote thinks he has a substitute for religious morality, and his article is the most frightening in the book. “Thai Society”, besides reading like an advertisement for foreign investors, exudes a bubbly enthusiasm for a Party-approved “democratic moral system”, based on balance between spiritual, social, and material well-being, that will be “successfully inculcated in the populace.” He is right in pointing out that chasing material gain without regard to psychological state leads to bad things, but one shudders to think of a government-run Ministry of the Science of Morality, or of a “democratic family system”.

Wichiarajote’s utopia could be Kaplan’s dystopia. Given the politically correct view that criminal behavior is a mental illness to be cured, Kaplan notes that “antisocial behavior, as interpreted by the received truth of the day, is sufficient to indicate the desirability of treatment.”

With the reductionist analysis of humans and the potential to build creatures midway between human and brute, the value of human life falls into question. Meanwhile, futurists argue trivial moral problems at the periphery of today’s ethics. Border skirmishes occupy them while the capital is under siege. Cravalho worries whether it is right to use a mouse’s islet cells to cure diabetes; a more relevant question would be whether it is right to use a cat’s brain to guide my lawnmower. Post indicates that adult onset polycystic kidney disease, which is treatable by dialysis or transplant, and Huntington’s, which has late onset, are not severe enough to justify abortion. By 2044 they may be judged severe enough to justify execution.

SUMMARY

Extropians hoping for a glimpse of a future shaped by technological breakthroughs will be disappointed. Only Moravec, Cravalho, Spilhaus, O’Neill, Benford, and Golaszewska predict any scientific advances other than the accomplishment of goals on which engineers are already working. Their insights are impressive, but each views one field. Only the Polish

essay attempts to put together the results. Most of the book is conservative. Zucker says that, in 2044, “With luck and the application of all the weight-saving materials, you may well expect 50 miles per gallon (gasoline equivalent) and good acceleration in an uncramped car”—performance I get from my Honda Civic VX today. Nanotechnology is mentioned only twice, dismissively. The Introduction mentions “intelligence amplification”, but it means only good user interfaces. Few authors provide references, so their statements (occasionally inaccurate or obsolete) must be accepted on trust.

This book is not primarily about technology. The fictional scenarios all concern themselves with the good or evil ways that present trends may affect society. The regional scenarios concern themselves with economics, politics, sociology, and ethics. The Preface states that the technological scenarios were distributed to PWPA chapters, which wrote regional scenarios based on them. But the regional scenarios do not show the influence of the technology papers. They assume that things will go on much the way they always have. Those in third-world nations worry too much about being left in the dirt economically and about how to acquire technologies that already exist to think about technologies to come. They remind me of an Indian friend with whom I once shared my Extropian dreams: he looked at me with something like shock, and said, “How can you work for such things when my people are still dying in poverty and ignorance?” Similarly, some authors hope their countries will become more like the West politically, but no one anticipates any new forms of government.

The *World of 2044* provides food for thought, but no new vision. It would be better titled *The World of 2014*. The authors try to be upbeat about the future, but the book’s pessimistic scenarios remain more convincing than its optimistic ones. Its greatest strength may be that the editors did not choose articles that reflected their beliefs, and so one can see the diversity of opinions about the future and about ourselves.





The Theory of Freebanking: Money Supply Under Competitive Note Issue

by George A. Selgin

Rowman and Littlefield, 1988
218 pages; ISBN 0-8476-7578-5



Reviewed by Eric Watt Forste

The advent of digital cash and secure private electronic transactions shows the way to an inevitably deregulated economic future. But again and again, proponents of the new technologies of private digital cash are confronted with the question “What will the new money be based on?” In a free marketplace, of course, the right answer to this question is “Whatever you want.” But the new technologies do raise more penetrating questions that get down to the root of monetary theory. What is money? How can we arrange for a marketplace that provides a stable money, free of either inflationary or deflationary instabilities?

Conventional answers to this question call either for the use of some centralized authority, with monopoly power over currency issue, or for the use of a commodity standard (and a one-to-one reserve ratio), the supply of which can only respond weakly to changes in the demand for money. Such weak response leads to price disequilibrium. The faults of centralized monopoly suppliers of currency are well-documented in history and theory. In the effort to sustain stable prices, a centralized authority can rely on either managerial discretion or adherence to a fixed rule. Managerial discretion allows constant temptations of overissue and inflation; fixed rules are incapable of responding to real changes in the demand for (or “velocity” of) money. Neither approach has led to a stable price structure free of crises. The monopoly in currency is also one more tool of the state in its efforts to control society and markets.

George Selgin’s book *The Theory of Free Banking: Money Supply Under Competitive Note Issue* is perhaps the first general overview of a serious competitor to central-banking theory.

Although unrestricted competitive fractional-reserve banking has been successfully practiced in the past, theoretical work in this area by economists, until now, has been specialized or isolated. Selgin combines a thorough survey of the economic literature with original work of his own to produce a sweeping account of the theory of free banking, and a solidly-based argument for its superiority to monopolized currency supply. Selgin’s case is that unrestricted competitive note issue on a fractional-reserve basis can provide a price structure more stable than can be provided by any monopolized system, and also (here’s the surprise for traditional libertarian monetary theorists) more stable than can be provided by a nonfiduciary commodity-money system such as that endorsed by Ludwig von Mises, or a fixed-supply fiat-currency system such as endorsed by Milton Friedman.

Why should extropians care about stable money? Unstable money leads to unstable prices, which hamper long-term planning by individuals and firms and provide a less nurturing environment for investment in blue-sky technologies. Instability and unpredictability in the structure of prices is certainly one factor hampering current investment in research into nanotechnology, space development, artificial intelligence, and other very-long-term-payoff domains. Unstable money is far from being the only such factor; unpredictability of future regulations is probably far more discouraging than the threat of inflation. Nonetheless, if we look toward private digital banking to protect us from some of the ravages of the state, we should do what we can to make sure our future extropian currencies do at least as good a job as the U.S. dollar had done, preferably better. Of course, this discussion is oversimplified; some price changes, such as lower prices brought about by increases in real productivity, are desirable and do not hamper good planning and investment decisions. But price changes due to monetary dis-

Unstable money leads to unstable prices, which hamper long-term planning by individuals and firms and provide a less nurturing environment for investment in blue-sky technologies. Instability and unpredictability in the structure of prices is certainly one factor hampering current investment in research into nanotechnology, space development, artificial intelligence, and other very-long-term-payoff domains.

equilibrium are another story altogether, a thing to be avoided.

Ludwig von Mises and Milton Friedman were both well aware of the failures of monopolies with discretionary power over currency issue. For these reasons, von Mises disapproved of fiduciary substitution (the practice of issuing unbacked notes) entirely, and endorsed free banking only because it was his opinion that free competition would do away with fractional-reserve banking. Milton Friedman, working in a more regulatory climate, acquiesced to the monopolization of currency, but endorsed the use of strict rules governing monetary growth to bar the way to discretion and inflation. However, as Selgin points out, although both von Mises’ and Friedman’s approach are preferable to traditional central banking, each has its own potential price instabilities. A system without fractional reserves cannot respond



to changes in the demand for currency balances. If people choose to hold more currency for longer periods of time (a “fall in the velocity” of money), then price deflation may ensue, and likewise if the “velocity” of money increases, price inflation may result from the decreased demand to hold money. Under a pure, full-reserve commodity money standard, these changes in demand fall directly upon the gold mines; banks can do nothing to alleviate them. Under a Chicago-school system of monetary growth at a fixed rate (possibly a zero rate), likewise, spontaneous changes in the demand for currency balances are unaccommodated by supply. Any change in demand that is unaccommodated by changes in supply must be accommodated by changes in the price structure; that means either inflation or deflation.

Selgin’s alternative is to allow individual banks to determine their own reserve requirements, issuing notes freely to meet their customers’ demand. His immediate task (to which he devotes most of the book) is to show that such note issue will respond to increases in demand without going beyond demand, and that such free note issue will likewise contract in response to decreased demand for holding currency balances. This is, of course, where things get complex. But it’s important to acknowledge that if the flexibility of free note issue on fractional reserves could be made to respond to demand (or “velocity”) and only to demand, it would lead to a more stable monetary equilibrium than any fixed rule for monetary growth.

Most of the objections to free banking have been based on the idea that there are no market forces to prevent concerted credit creation and resulting price inflation in a free banking system. Selgin’s counterargument is concise and elegant. He points out that demand for reserve currency (high-powered money, inside money, e.g. gold in the traditional commodity-based system) has two components. The first is the need for reserves to present for net clearings overall; this is already widely acknowledged in the literature, and is the reason why a free bank cannot overissue without the cooperation of its competitors overissuing at the same rate. But Selgin’s contribution is to point out that there is a component of reserve demand that is needed to meet daily clearings. If a bank in a stable market keeps its note supply constant, its positive clearings will over time cancel out its negative clearings.

Nevertheless, it needs reserves to cover those negative clearings when they happen. And if all banks expand in concert, the variance of those clearings will go up, which means that large daily negative clearings will happen more often than before the concerted expansion. Selgin explains how this component of reserve demand prevents a system of free banks from expanding as a whole beyond the limits of market demand. Of course, some expansion of this kind is possible; Selgin is discussing a fractional-reserve system, after all. But the expansion eventually meets market-imposed bounds, bounds which preserve monetary equilibrium and a beneficial environment for planning and investment.

One of the most entertaining parts of Selgin’s book is his Chapter Two, “The Evolution of a Free Banking System” in which he outlines the economic history of the fictitious country of Ruritania, to try and paint a picture of the sort of banking and monetary system we might have today had not governments intervened to secure themselves a source of cheap and easy

work).

Although Selgin’s focus is on filling a lacuna in recent economic literature by developing a solid *theory* of free banking, he acknowledges and draws upon the excellent recent work that has been done on the factual history of free and almost-free banking systems. In particular, he looks at the free banking systems in nineteenth-century Scotland, Canada, and Sweden, and the Suffolk Bank system of New England in the United States. In each case, he details the political processes that led to the transition from a system of plural, competitive note issue to a central-bank monopoly. Selgin is adept at using the historical records to test his theory. While “retrodiction” in economics has been widely abused, history remains the largest and readiest source of data for us to test our economic theories against, and Selgin’s many references into the economic and historical literature provide plenty of grist for the suspicious reader to further investigate.

And of course, while theory and history are enjoyable, the point of studying

While crypto mavens are busy explaining how these banks could function technologically, the theory of free banking explains how they could function economically. It provides an answer to the question “Under a digital cash system, what would the money be, exactly?”

loans (and hidden taxes) from the printing press. The interesting development of this chapter is a system of clearinghouses, which fill many of the functions currently served by our governments’ central banks, but which have no monopoly on note issue. (Under the systems Selgin envisions, clearinghouses hardly ever issue notes for circulation at all.) The principal function of clearinghouses is multilateral exchange of notes and checks issued by the various banks, on a daily basis, and the settling of any left-over clearing balances from this exchange. It is the rapid turnover engendered by this system that gives individual competing banks signals about the relative supply and demand of currency so much faster than a central bank (without the information-generating process of competition to inform it) can gather such information. Selgin’s Chapter Two is a beautiful exposition of spontaneous order (or of, as Adam Smith put it, “the invisible hand” at

these things is implementation: present and future practice. Given that we are currently running a dollar economy, how can we make a transition from the Federal Reserve system to a free-banking system without at the same time taking on the tremendous uproar of shifting to an entirely new unit of reserve currency? Selgin has a proposal here as well. There’s no particular reason why the bad old Federal Reserve Note cannot serve as the reserve currency for a free-banking system. First, we will need to remove the existing restrictions on branch banking and other liberal banking practices, and much of this deregulation is already underway. Second, we will need to remove the legal reserve minimums imposed on banks. This will need to be done carefully to avoid a large inflationary response. Most banks now, operating under a legal reserve minimum of, say, twenty percent, keep roughly twenty-five percent on hand. Only the extra five



percent does any useful work at the clearinghouse. Selgin describes some complex (to me, but then, I'm not an economist) schemes of swapping the legally-mandated reserves for Treasury bills or other forms of non-high-powered money. At this point we would be ready for the third step; freezing the base money supply and allowing banks to issue their own currency notes. Now freezing the supply of base money is the same reform Milton Friedman has proposed, and as we noted, it would result in price disequilibrium to the same extent that the demand for currency varied. By combining this reform with the additional step of allowing banks to issue currency (subject to the market discipline of the clearinghouse), we can allow for equilibrium-preserving responses to changes in demand. To promote public acceptance of the new currency, high-powered (and fixed-supply) Federal Reserve Notes could be issued in larger, inconvenient sizes, printed in red ink, and in large denominations (with perhaps only odd small denominations: we could see a return of the two-dollar bill, or even a three-dollar bill). Banks would of course be free to issue their currency in the size,

appearance, and denominations desired by their customers, who would still continue to use standard change machines, ATMs, and cash drawers.

Once such reforms were in place, banks would then be free (with a little further deregulation) to offer interest-bearing accounts based on other currencies, on mutual-fund shares, or on commodities such as gold. The gold and silver notes of old could then stage their return, for those who were interested in using them. Another pleasant feature of free banking is that not only does it allow currency supply to vary with market demand, it also provides base currencies according to market demand. There would be no need for a sweeping, politically-unpopular "return to the gold standard" or adoption of a complex (and frightening, to some) stock-market based currency; instead, we could simply set the market free to determine its own most salable good.

Contemporaneous with these hoped-for regulatory reforms, we can expect to see the technology of digital cash and cryptographic banking developing apace. While crypto mavens are busy explaining how these banks could function techno-

logically, the theory of free banking explains how they could function economically. It provides an answer to the question "Under a digital cash system, what would the money *be*, exactly?" What the money would be, if we deregulate banking at the same rate as we develop the new technologies, is cryptographically-secure bearer claims on deposited goods. Whether those deposited goods are Federal Reserve Notes, troy ounces of gold, or shares in an index stock fund, would depend purely on what you wanted to deposit with a bank in exchange for bearer claims. Since I myself am a big fan of Harry Browne, I'd love to be able to bring some gold in for deposit at my local cryptobank, and accept my digicash in exchange just for the beauty of the thing. Those who prefer to deal in cash based on silver, or dollars, or pounds, or Swiss francs, or shares in the S&P 500, or whatever, would be free to do so. Which is just what we ought to expect from a market system.



Bringing the Future Into Focus

BREAKTHROUGHS — A TRANSCENTURY UPDATE

Turn On — Tune In — Transform

PART 1 Transhumanist Philosophy

Max More, Robin Hanson, William Wiser

PART 2 Extropy Institute, MI, Uploads

Max More, Robin Hanson, Abe Heward

PART 3 Indefinite Lifespan, Uploads

Max More, Robin Hanson, Chris Heward, Tim Freeman

PART 4 Alcor Foundation and Cryonics

Max More, Regina Pancake, Dan Spitzer, Tim Freeman

PART 5 Mood Modification and Identity Choice

Dr. Ray Sahelian, Max More

PART 6 The WWW and Virtual Communities

Jeannine Parker, Coco Conn

\$18.50 each donation. Dept. S, Extropy Institute, 13428 Maxella Avenue, #273, Marina Del Rey, CA 90292

Host/Producer: Nancie Clark



The Millennial Project

Colonizing the Galaxy in Eight Easy Steps

by Marshall T. Savage

Reviews by Phil Fraering & Phil Goetz



ISBN 0-316-77165-1 (hardcover), 0-316-77163-5 (paperback);
Little, Brown, and Co. 1994; 508pp long and \$16.95 (Pb)

Review by Phil Fraering

In *The Millennial Project: Colonizing The Galaxy in Eight Easy Steps*, Marshall Savage outlines a bold plan for spreading life throughout the cosmos. Savage is erudite, convincing, and knowledgeable, but the book's (and the associated plan's) greatest strength is possibly its greatest weakness: the fact that it is a bold plan. One man's foregone conclusion is another's unwarranted assertion, and it is probably a good idea to work out ventures where not everyone need be in agreement to begin with.

The Basic Steps

Savage has outlined "Eight Easy Steps" towards conquering the galaxy, consisting of ocean colonization, drastic reduction of launch costs, the establishment of space colonies (or "ecospheres", described in great technical detail) first in free space and later on the surfaces of airless bodies like the moon, the terraforming of Mars, the transformation of the solar system into something like the original conception of a Dyson Sphere, and a program of galactic colonization.

Ocean colonization has been proposed on and off by many groups, and is especially popular in libertarian circles despite the unfortunate ending of the lamented Minervan Republic. Savage proposes as a first step towards learning about closed ecologies and volume-efficient architectures the construction of structures that are part arcology, part ocean-thermal power plant, and part oceanic aquaculture facility.

He believes that this ocean arcology will be necessary for people to learn to live in space, to get them used to trading personalized possessions for a mutable personal volume (since it seems that in his future, personal spaces will be defined not by possessions but by volume and information; I'm doubtful this can really be done.) Since I don't know enough about architecture and city design to criticize his vision here in depth, I am going to try to analyze Aquarius in a slightly easier way, by analyzing his market.

Like other ventures, he believes the best location for such a facility is near the Seychelles, in the Indian Ocean, but not only for the reasons others have given, which involve the geographic circumstances of the area: his location is close to his market.

The proposed primary exports of Aquarius, as the project is called, are foodstuffs and power for Africa; he is probably at least half right, since there is no large-scale power infrastructure in

Review by Phil Goetz, goetz@cs.buffalo.edu,

I was lured into buying this book by the praises on the jacket of the entire surviving hard-SF old guard: Clarke, Niven, Pournelle, and Poul Anderson. If you want to attract stares and convince the mundanes that you're wacko, leave this book on your coffee table. ("See my book on how to colonize the galaxy in eight easy steps? I think I'll start tomorrow.")

The book provides a step-by-step plan for colonizing the galaxy. Each of the first 5 chapters is an impressive achievement by itself. It looks like Savage has been gathering this information since the 1970s.

The Eight Easy Steps:

2. Aquarius (2015 AD): Floating cities. Motivation: Provide engineering and social experience necessary for space colonies.

Functions: 1. Produce electricity, seafood, algae, and communications relay stations. 2. Provide room for growing population. Problems: food, building materials.

Solutions: algae, seafood, calcium carbonate and magnesium electrodeposition

Savage plans to use algae to provide the bulk of food for sea and space colonies. But the algae he likes are dangerously high in vitamins for anyone living on them exclusively. Savage proposes 600g (dry weight) of algae a day. Since he bases this on a 2500 cal/day figure which actually only counts resting metabolism, I shall up it to 840g. This would give you 1.4g = 528K IU/day of vitamin A (50K IU/day is considered toxic), 3g/day of potassium (.3-.5 mg is normal, 18g/day can cause heart and kidney problems), 21mg/day of zinc (25mg/day impairs copper absorption), 150mg/day may impair the immune system), and 361mg of iron (RDA is 10-15mg/day). The vitamin A is not dangerous if it is actually beta carotene, but the book doesn't specify.

3. Bifrost: Build a magnetic mass-driver to move things into space cheaply. I consider this the most important step. This electromagnetic launcher will be in an evacuated tunnel at least 125 km long (for hardy human passengers willing to tolerate 225 g's for 2 seconds on entering the atmosphere), whose tail end runs up a big volcanic mountain near the equator: Mt. Kilimanjaro (Tanzania), Mt. Kenya (Kenya), or Margherita Peak (Uganda and Zaire). The launched mass will have a block of ice on its lower end, which six 250MW lasers will vaporize to provide further thrust. Savage proposes that the capsules be designed as sonic



most of Africa at present. Savage proposes that dirigibles filled with hydrogen be used to deliver the energy, which solves part of the infrastructure problem. If Africa manages to grow out of its current economic and political problems, then early entrants into the market there will profit greatly in spite of the current situation. As Bernard Baruch said, roughly paraphrased, “The best time to buy is when blood is flowing in the streets — even if it’s your own.” The success of the Aquarius Project may be self-limiting if food is to be a major export item over the long term due to the peculiar problems faced in Africa in its current state of agricultural development.

Everyone has seen the pictures of starving children, broadcast worldwide, whenever the Horn of Africa has a significant drought; given such images, and the Malthusian mindset which permeates much social thought today, it is easy to conclude that these problems are all due mainly to either overpopulation or environmental catastrophe. This is not entirely true. Agricultural development in Africa is hindered by several unique factors: it is heavily dependent on manual human labor; for a period of several centuries, the legal regime has favored herding over agriculture or horticulture; there have been several bloody wars; and continuing political corruption ensures that no change in this is likely soon.

All of these problems feed on each other; with a large amount of human labor needed in order to produce food, a famine tends to simply reduce the amount of available agricultural labor with which to feed the survivors. This is why no matter how many people died in the last famine, there will still be deaths in the next one. A loss in some economies of scale will probably tend to make the next famine worse. This will also happen due to the bloodshed of civil wars such as are going on there now. Combined with a bias in the legal community of many of the states, due to the Islamic law of the 15th and 16th centuries, towards goats and cattle as a more viable form of property than farmland, which encourages erosion and defoliation over large areas, the outlook looks bleak indeed. This situation will only change when there are real and stable regimes of law in place that respect private property and act to encourage agriculture and industrial development, or even allow such ventures to be possible without the loss of most profits (or even operating expenses!) as necessary bribes to petty officials or squad leaders.

While criticizing the market potential of Aquarius may initially seem off-target, it is the factor that determines whether it survives, and if it gains enough surplus capital to be able to move on to the project’s next steps. Since this isn’t a government project, it has to support itself. I think its goals are laudable, and that it probably has a chance of being profitable as well as worthwhile in its goals of attempting to feed the hungry. However, it has substantial competition, because a lot of the Malthusian roadblocks that dominate most of modern futurism are only in our head.

Only if political reforms were to come about would it be possible for Aquarius to operate in the market, but if that situation came about, within the decade there would be no need for food importation into Africa, and within two decades it would be impossible to find a cheap kitchen appliance not made there.

shock-wave riders so they can glide back down for reuse.

Savage mentions a space station, “Valhalla”, to serve as a staging area to develop Asgard.

4. Asgard: Ecospheres in space. Function: Communications. (He doesn’t mention solar power for export to Earth.)

Problems: radiation shielding, water, heat dissipation, meteorites, orbital junk, bone loss.

Solutions: 1. Use water for radiation shielding. 2. (He doesn’t say where the 6 million tons of water will come from.) 3. Circulate water through the radiation shielding to dissipate heat. 4. Use a recursive bubble structure to provide safety from meteorite punctures. 5. Use the Bifrost Bridge lasers to blast orbital junk. 6. He thinks we can prevent bone loss by electrical stimulation, although there is no good evidence that this is a safe or effective long-term treatment.

5. Avallon: Colonize the moon.

Problem: organic materials, esp. hydrogen, nitrogen, and carbon.

Solution: Mine the Apollo and Amor asteroids.

Savage envisions the doming-over of bubbles. This looks nice in pictures, but may not offer practical advantages. (Building is easier on flat ground.) He doesn’t say how impervious lunar rock is to oxygen. I wish he had dealt with the problems of construction materials and how to get them as well in this chapter

I doubt the Millennial Project in itself will succeed in being the main driver of a human presence in space. It suffers from a requirement of close agreement among its members. Savage hopes that new forms of electronic democracy will be able to forge a consensus and manage a society in ways that haven’t been seen before.

as he did for Aquarius.

6. Elysium (2125 AD): Terraform Mars.

Problems: oxygen, water, spacecraft power (chemical rockets aren’t enough).

Solutions: 1. CO₂ atmosphere from Martian ice. 2. Water from comets steered to collide with Mars. 3. Power from fusion.

7. Solaria (2250-2500 AD): Transmute the substance of our solar system.

Problems: water, energy.

Solutions: 1. Water from the moons of Jupiter. 2. Dyson sphere/cloud. Clever plan to surround Sun with a solar-power skin which does not orbit, but is held aloft by sunlight pressure.

Savage discusses the effects of a vast population (e.g., 5 billion billion). At any given moment there would be 500M “Einsteins” and “Michaelangelos”. Savage says people will naturally organize into meta-beings, based on a shaky analogy to cells forming animals and brain cells forming brains. He proposes territory be given to whoever gets there first. This is nicely self-organized, but I think it would create a terribly uneven distribution. Savage doesn’t ask whether the first settlers are entitled to as much territory as they can use. (With nanotechnology and the ability to create life, one person could use an entire planet).

8 (viewed sideways) (3000-1000000 AD). Galactia: Colonize the galaxy.

Problem: Fusion power won’t provide enough power for inter-



Industrial development, on the heels of the power distribution system Savage wants to build, would help supersede the current manual-labor agriculture system with something more efficient, which might or might not start to limit the market for Aquarius' foodstuffs.

I'm going to limit my criticisms of the other steps in Mr. Savage's plan to the next two immediate steps, partially due to my relative inexperience with the construction of Dyson spheres or the terraforming of Mars.

The next step after Aquarius is Bifrost, which is envisioned as a combination of mass driver and laser launch system to be able to launch massive amounts of things and people into space cheaply. I suspect that as currently conceived Bifrost is a bad idea. It requires the investment of tens of billions of dollars in a lump sum in order to be constructed, and its low costs are only realized if it captures a huge volume of traffic.

There are literally dozens of schemes or plans capable of achieving the same thing, given the same constraints of large amounts of capital and a large mass throughput. Proposals that come to mind include various large big dumb booster concepts, conventional laser-launch systems, mass drivers suspended from large aerostats, advanced airbreathing aircraft, reverse coilguns in orbit, and static and kinetic tether systems.

(A slight digression: an incomplete list of spacecraft propulsion technologies has been compiled by Dani Eder and is available on the internet at <ftp://explorer.arc.nasa.gov/pub/SPACE/FAQ/eder.transport.list>;

it is the most complete document of its kind that I know of. I recommend it as a good bibliography for anyone interested in the subject.) There are no current ways of telling which of them will actually be economical or even work, and I suspect that Bifrost goes about the whole approach the wrong way: it involves subjecting its payloads to enormous accelerations and aerodynamic stresses, which puts severe constraints on the shape of the vehicle, which may not make it efficient in all operating regimes.

I don't think any of these problems are impossible to solve. I do believe, however, that it would be better to do a lot of small-scale research first. Jordin Kare has proposed subscale laser-launch facilities capable of launching a payload to orbit that would cost somewhere around \$300 million dollars (I don't have figures for how much it would be in today's money, and the proposal is at least three years old and presupposed some infrastructure developed for the SDI program that may not exist). Test vehicles for some of the technologies in Dani Eder's list would not be expensive. The Air Force is going to be building a prototype vehicle for testing the technology and ideas behind Mitchell Clapp Burnside's "Black Horse" proposal. (Black Horse is a lifting-body rocket-propelled vehicle designed to refuel from a tanker aircraft after takeoff). There are a host of government and non-government proposals for SSTO vehicles.

With proposed communication satellite networks like Teledesic, there may be a market to develop some of these technologies immediately, and once the cost drops one or two orders of magnitude, the mechanics of the market changes.

stellar travel.

Solution: Antimatter.

This chapter explains why the galaxy on the front cover is green: Savage thinks light from Dysonized ("K2") stars will look green. We will live in the "Mossy Way". He doesn't waste our time with speculation about faster-than-light travel. There is an under-informed section on the odds of life evolving, which trails into an explanation of why we do exist that strikes me as a wacky New-Age argument with quantum mechanics waved over it.

1. Foundation (Now): Constitute the First Millennial Founda-

His plan's major flaw is that of Marxism: He assumes people are good. He requires mass behavior motivated by something other than self-interest. He argues that people can colonize space without losing huge sums of money, and that it will be profitable, but he does not claim that these colonies would be sound economic investments.

tion.

Contact: Marshall Savage, POB 347, Rifle CO 81650. Internet: mtsavage@pipeline.com CompuServe: 73163.3612@CompuServe.com World Wide Web: <http://www.csn.net/~mtsavage> BBS: (303) 625-3273, Voice: (303) 625-2815

Savage proposes to organize the Foundation as a true democracy, with no representatives. The book does not dwell on this point, but Savage clearly hopes that the Foundation will spread this anarchical self-organization across the galaxy.

The first step of the Foundation will be to publish a magazine, along the lines of *Omni* and *Discover*, to popularize ocean and space colonization. The second step is to move into books, TV, and other media. Third is a test sea colony in the Caribbean. (He doesn't mention Biosphere II at this point, which I think serves a similar purpose.) The rest of this chapter is more inspirational than informational. (Note: The First Millennial Foundation's 3rd annual Conclave will be August 4-6, 1995, in Denver.)

SUMMARY

Savage has vision and excitement, and communicates it. He has a knack for sig-file phrases, like "I am just a simple home-boy, and take no great interest in anything much beyond the Magellanic Clouds." He's gathered ideas from technical articles and presented them in a painless way, and added many of his own. The book does an outstanding job of generating ideas and excitement for expanding into space, and the plan is as detailed as one could expect within 418p.

His presentation has some problems. Savage speaks of every step in his plan with absolute certainty, so you seldom know whether a proposed solution is tried and tested or purely theoretical, or whether his knowledge is deep or shallow. His expertise is in space, and space travel and development. Outside that area, coverage varies. (In the two areas which I can judge, artificial intelligence and chaos theory, he speaks at the level of someone who's read an article in *Discover*. But they aren't important to his plan.) Some things are just wrong, such as the



It is not obvious to me that the ability exists to commit a massive amount of resources while entering the market later than everyone else, and hoping that the grand scheme being invested in is capable of competing with everyone else's second or third generation developments past today's technology in space access. The space launch market has faced a chicken-and-egg dilemma; the government was happy with high launch prices, and there wasn't a large enough non-government market to justify the commitment of research funds. Teledesic changes this: its projected budget (from what I can tell from the sketchy information available) is enough to launch roughly a thousand 2000 lb. satellites, leaving nothing left over to build them. It *requires* a massive breakthrough in order to succeed.

Given this set of problems, I doubt the Millennial Project in itself will succeed in being the main driver of a human presence in space. It suffers from a requirement of close agreement among its members. Savage hopes that new forms of electronic democracy will be able to forge a consensus and manage a society in ways that haven't been seen before.

I have my doubts about this. Even in a closely-focused group such as the Extropians, I find myself in disagreement with many others here on such basic topics as religion, the philosophy of science, and many economic issues. I don't think this group is ready to design a space station by consensus or democratic action. Thankfully that isn't the goal of this group, and the group can be structured so that I can cooperate with people I disagree with on common goals. Unlimited democracy isn't working at the national level, in this state, or the cities I live and work in. It used to be a limited democracy, but that changed pretty fast at all levels: at the local level, all it took was one Huey Long. I don't think an experiment where the Extropians tried to run each other's lives by direct democracy would end peacefully.

Former members of such focused groups as the L-5 Society will remember the infighting and bickering that took place there, as what was a common interest group had to concentrate on total consensus in order to achieve political lobbying goals and failed in many of them, or succeeded in achieving the political goals at the cost of their ultimate goals.

Ten or twenty years from now, when we have cheap space access, there will be people willing to follow the Millennial Foundation's vision. There will be competing visions: people unwilling to wait while all the myriad problems on Earth are solved before launching interstellar probes. I believe that the problem of the Fermi Paradox will be a driver of much space science in the next fifty years, and that within thirty years at least one robotic space probe will be launched towards another solar system to gain information relevant to solving the problem.

Is *The Millennial Project* a good book? If you want to read a book with a lot of good ideas relevant to space colonization, it is, and I enjoyed it in that context; I enjoyed the ideas without enlisting in the utopia. If you're looking for an all-encompassing plan for space colonization, you will probably enjoy this book much more, although I have my doubts about such plans. If you've somehow managed to avoid Freeman Dyson's books, which I recommend strongly, this is a good introduction to the concept of directed panspermia. If grand utopianism isn't your cup of tea, though, you will probably find the book lacking.



discussion on CaCO₃ deposition (which seems to be based on experiment, but you can't be sure), and his suggestion that we dilute antimatter with water. Although there are 727 footnotes, you usually can't tell whether an idea came from Savage or someone else.

Savage's mystic revels annoyed me. ("North Polar cap of Mars: Cosmic coincidence or thumb-print of the gods?") He believes that the galaxy has been prepared for us to colonize. If he would at least admit to belief in a God then I would not suspect him of committing grave teleological errors. But a first approximation of his teleology is that he thinks this universe was created for us, not by God, but by ourselves. (See Galactia above.)

His plan's major flaw is that of Marxism: He assumes people are good. He requires mass behavior motivated by something other than self-interest. He argues that people can colonize space without losing huge sums of money, and that it will be profitable, but he does not claim that these colonies would be sound economic investments. He thinks that people will telecommute from the colonies. I disagree; the only jobs in the ocean or in space will be ones that can't be performed as cheaply in regular Earth cities.

His presentation has some problems. Savage speaks of every step in his plan with absolute certainty, so you seldom know whether a proposed solution is tried and tested or purely theoretical, or whether his knowledge is deep or shallow. His expertise is in space, and space travel and development. Outside that area, coverage varies.

This problem affects the earlier stages (Aquarius and Asgard) more than the later stages. Savage doesn't consider developments in nanotechnology or genetic engineering.

He says we must spread life throughout the universe, and foresees vast nature reserves on Mars. He doesn't explain why anybody would build them other than for moral reasons, and indeed there is no other reason. Nor does he explain why humans would cherish other life forms in the future when most haven't in the past.

Still, we need Savage's vision. He has a long-term goal for humans and space — colonize the galaxy — rather than NASA's short-term, wasteful, and ineffective "put a few people in space now". To Savage, galactic colonization is not a fun way to spend money, but a moral imperative. So far as we know, all the rest of the vast universe is dead and empty. It is up to us to fill it with life. If we fail to do this before we are hit by the next series of asteroid strikes, or we do ourselves in, or our population grows until we are too poor ever to escape Earth, we condemn this great universe to be an empty graveyard for all eternity.



Excerpts from
Godling's Glossary

A Devilish Dictionary of
Travesties for Transhumans
by David Victor de Transend
© Copyright 1995 by David Krieger

Biosphere 2. Proof that one can do Big Science without involving Big Brother. A privately-funded boondoggle, for a change. The world's most expensive weight-loss clinic. The Emerald City of the Greens: "Pay no attention to those big tanks of oxygen behind the curtain!" An experiment successfully demonstrating that concrete soaks up oxygen: New Yorkers, take heed!

Clipper, n. A device for shearing sheep. Designed by those whose appetite for information is iNSAtiable.

Cryonic suspension. The second-worst thing that can happen to you. Cold comfort for cool characters. The penalty box in the war against entropy.

Earth. [From ME erthe, dirt.] The Third World. The planetary placenta of the universal uterus; the afterbirth of Homo celaestens (a cowering fetus that presently refuses to be born, despite growing labor pains).

Homeless, adj. Immune to the seizure of one's home by the DEA or IRS.

Key escrow. A system of law enforcement in which you provide copies of your house keys to the police, mayor, and dog catcher, allowing them unrestricted entry to your house "just in case." In return, each of these worthies promises never, never to use the keys without a solemn nod from one of the others. The corresponding verb is *escrow*, as in "Anyone depositing their private keys with the government is *escrowed*."

National Information Infrastructure. A desperately-needed government program to make the Internet as efficient, compassionate, and cost-effective as the Post Office, the Veteran's Administration, and the Department of Housing and Urban Development.

Population bomb. A dud. The Ehrlich worm deserves the Bird.

Prozac, n. A remedy for clinical depression. For mild depression, Amateurzac will do.

Transhuman, n. A human in a trance, mesmerized by a reflection in a magnifying glass. An ape with aspirations. One who feels that *being* meat is murder. Theme song: "Über the Rainbow".

classifieds

Now reduced print in The (Libertarian) Connection, open-forum magazine since 1968. Subscribers may insert two pages/issue free, unedited. Lots of stimulating conversation. Eight issues (year) \$20. 101 South Whiting #700X, Alexandria, VA 22304.

I need help in publishing conservative futurist tracts.
Call 516-938-3061

How to Join the ExI Virtual Community

Extropy Institute sponsors, through the endeavor of ExI Electronic Communications Officer Harry S. Hawk, a number of electronic fora for sharing libertarian, life-extensionist, pro-technology and other Extropian ideas with bright, like-minded individuals around the globe.

The most popular service is the Extropians e-mail list, which boils over with lively discussion and debate on numerous topics. To join, send a request to:

extropians-request@extropy.org

When sending your add request, indicate whether you want real time or digest mode. (If unsure, try the digest mode first!) The Extropians list is using the most advanced information-filtering software, allowing you to select which messages (topic, author, etc.) you receive and how you receive them.

There is a small charge to cover our expenses in providing these forums. After one month free on the List, you will be billed for the year at \$8 (ExI members), \$12 (*Extropy* subscribers), or \$14 (others).

Another service is the ExI Essay list, for posting longer, more carefully prepared electronic manuscripts. To get on this list, send a message to:

exi-essay-request@gnu.ai.mit.edu

Some ExI-Essay papers are available by anonymous FTP from:

<ftp://ftp.merak.com/pub/ExI-Essay>

Any questions should go to David McFadzean at dbm@merak.com.

Information of extropian interest is now available on the World-Wide Web at these two sites (among others):

http://www.acm.usl.edu/~dca6381/c2_mirror/extropy.html

This is David Arceneau's mirror of a site maintained by Eric Watt Forste, here you can find frequently-answered-questions (FAQ) lists for extropians, cryonics, and life-extension; pointers to information about space exploration and development, libertarian politics, AI/robotics research, and neuroscience; a hypertext version of the Extropian Principles 2.5; and more.

<ftp://ftp.netcom.com/pub/dkrieger/exi.html>

This expanding site, created by Dave Krieger, carries HTMLized back issues of *Extropy*, a hypertext version of The Extropian Principles, and more, including graphics of the magazine covers.

There are also five "local" lists for announcements and discussions around the San Francisco Bay Area, Boston, Los Angeles, New York, and the United Kingdom. To join these lists, send messages to:

exi-bay-request@gnu.ai.mit.edu

exi-bos-request@gnu.ai.mit.edu

CONTRIBUTORS

See p.13 for bios of Future Forecast contributors.

Nancie Clark: Artist, Performer, earned graduate honors from Academia Belli Arte (Italy); videos: "Two Women In B&W" (*Women In Video*) and "T – And Counting" (U.S. Film Festival). Nancie has been a futurist and activist in transhumanism for over a decade, the optimism of which is clearly exhibited throughout her work.
nancc@netcom.com

Eric Watt Forste is a Web engineer for Vivid Studios, a CD-ROM and online design firm in San Francisco, and formerly was Technical Support Manager for Neon Software, Inc. He edits the first of what is now many extropian World-Wide-Web sites, the extropians FAQ list, and (as assistant editor) the magazine *Slippery When Wet*. In what little spare time is left, he helps train volunteers for San Francisco Sex Information, and once was the Director of Operations for San Francisco Street Patrol.
arkuat@pobox.com

Phil Fraering: Phil builds oilfield inspection equipment in Lafayette, Louisiana while contemplating returning to college and studying something besides physics.
pgf@monet.siaa.com

Phil Goetz: Phil Goetz is writing a dissertation in artificial intelligence. Supposedly that makes him a computer scientist, but really, he is interested in the behavior and control of complex systems, including creatures, cultures, economies, and eco-systems.
goetz@cs.buffalo.edu

Mark Grant has a Master's Degree in Physics from Oxford, and is currently working as a software engineer, but is intending to become a technomad within five years. He is the author of Privtool, a free PGP-aware mail program for Sun workstations, and is working on a near-future SF RPG with extropian leanings. He owns far too many Italian cars, and maintains the (unofficial) Lancia WWW page.
mark@unicorn.com WWW: <http://www.c2.org/~mark/>

Reilly Jones: Reilly has had a successful engineering management career in the steel industry. He is currently devoting his time to a life-long interest in the philosophy of technology. As an independent Coherency Agent, he is working to provide context and judgment amidst rapid technological change.
70544.1227@compuserve.com

David Krieger: Dave Krieger is Director of Publications for Agorics, Inc., a platform software and consulting firm in Silicon Valley.

He is *Extropy's* Science Editor, an Extropy Institute director, and a former Technical Consultant to *Star Trek: The Next Generation*
dkrieger@netcom.com

Max More: President of Extropy Institute and co-founder of *Extropy*, Max is currently organizing the EXTRO² conference. While studying Philosophy, Politics, and Economics at Oxford University, Max founded the first British cryonics organization, MIZAR (now Alcor-UK). He is completing his Ph.D. dissertation in philosophy at the University of Southern California.
more@usc.edu more@extropy.org

Michael C. Price: BSc and MSc in Theoretical Physics from Imperial College, London. Specialist interests in cosmology and quantum field theory. Software engineer by profession. Director of Alcor UK by necessity. Short-term ambition: immortality. Long-term goal: win a chess championship.
price@demon.co.uk

Ray Sahelian, M.D. is a physician certified by the American Board of Family Practice. He obtained a Bachelor of Science degree in nutrition at Drexel University in Pennsylvania and completed his doctoral training at Thomas Jefferson Medical School. In addition to a medical practice, Dr. Sahelian is a frequent contributor to health magazines and has made numerous appearances on radio and television to discuss his personal experiences with melatonin and the current research now being conducted on this interesting health supplement. He is the author of *Be Happier Starting Now*.
dr.ray@ix.netcom.com

Lawrence H. White: Associate professor of economics at the University of Georgia. He is the author of *Free Banking in Britain* (Cambridge University Press) and *Competition and Currency* (New York University Press). His article "How Would the Invisible Hand Handle Money?" (co-authored with George Selgin) appeared in the December 1994 issue of the *Journal of Economic Literature*.
lwhite@rigel.econ.uga.edu

Mark Wolf: Mark J. P. Wolf is a Ph.D. Candidate who has recently finished a dissertation on digital technology's effect on art, communication, and cognition. He enjoys recreational mathematics, game design, and writing.
mwolf@scf.usc.edu

Production information

Extropy #15 was produced on a Gateway 486 DX2/50 with 8Mb of RAM, 630Mb hard disk, 17" NEC 5FG monitor powered by a #9GXE video accelerator with 2Mb of video memory, using Pagemaker 5.0 for Windows, Word for Windows 6.0, Pixar Typestry 1.0, and Aldus Freehand 4.0. Scanned images were input by a Microtek Scanmaker IISP, and processed with Photoshop 3.0. The proofs were printed at 600dpi on an HP Laserjet 4 with 6Mb of RAM, and final output at 2,400dpi on an Agfa typesetter. PageMaker files were sent to the printer on an 88Mb SyQuest cartridge. Complete chaos avoided with the help of Lotus Organizer 1.0. Layout by Max More with Nancie Clark.

This issue was printed by Ripon Community Printers, Ripon, WI. Print run: approx. 4,500

Audio Tapes, Books, T-Shirts

Choosing a Self in the Transhuman Era

by Max More.

In this talk delivered to the Redondo Beach Virtual Reality Group in March 1994, Max More examines the diverse technologies that increasingly will allow us to define ourselves — to design our bodies and personalities instead of leaving them at the mercy of outside forces. The talk focuses on the ways in which virtual reality and related technologies will encourage this historical trend.

\$11.95 (Members \$10.95) PH1 (90 minutes audio)

Everything is Getting Better and Better – I'll Bet On It!

by Julian Simon.

Economist Julian Simon uses hard data to counter prevailing gloomy beliefs about the current state of the world and its direction. Practically all measures of human well-being substantiate the Extropian's dynamically optimistic views: Life does tend to improve, though only through the efforts and applied intelligence of free persons. This tape makes an effective introduction to Simon's ideas, and, lent out to your pessimistic friends, will serve as a valuable intellectual catalyst.

\$11.95 (Members \$10.95) EC1 (1-hour audio)

Bionomics On Trial: A Discussion With Michael Rothschild

Rothschild outlines the main contentions of his book *Bionomics: Economy As Ecosystem*, and responds to audience questions. Topics discussed include electronic ecosystems; how bionomics effectively draws 'liberals' into support for free markets; the relation between Austrian/process economics and bionomics; the role of government; how far the economy as ecosystem analogy can be pushed.

\$13.95 (Members: \$12.50) EC2 (80 minutes audio)

Postage: Included in price for USA orders. Overseas orders: Surface mail – \$1.50 first tape, \$1.25 each additional tape. Contact ExI for airmail rates.

BOOKS AVAILABLE

(domestic postage included; members' price in parentheses):

Hans Moravec, <i>Mind Children</i>	\$13.50 (\$12.50)
K. Eric Drexler, <i>Nanosystems: Molecular Machinery, Manufacturing, and Computation</i>	\$27.95 (\$25.95)
Bart Kosko, <i>Fuzzy Thinking</i> (Hd)	\$23.95 (\$22)
Gelernter, <i>Mirror Worlds</i>	\$24.95 (\$23.95)
Vernor Vinge, <i>A Fire Upon the Deep</i>	\$7.49 (\$7.49)
John Varley, <i>Steel Beach</i>	\$14.99 (\$12)

Check or money order, payable to "Extropy Institute." Mail your order to: Extropy Institute, Dept. S, 13428 Maxella Avenue, #273, Marina Del Rey, CA 90292. Inquiries: 310-398-0375
