

ALCOR LIFE EXTENSION FOUNDATION

A Non-Profit Organization

CRYONICS

JANUARY-FEBRUARY 2016 · VOLUME 37:1

CRYONICS UNDER FIRE: MEETING THE CHALLENGES OF HOSTILE SCIENTISTS THEN AND NOW

PAGE 8



THE SCIENCE SURROUNDING CRYONICS

PAGE 28

THE IMPORTANCE OF LOCAL STANDBY SUPPORT AND EMERGENCY RESPONSE TECHNOLOGIES

PAGE 32

ISSN 1054-4305



\$9.95

Improve Your Odds of a **Good Cryopreservation**

You have your cryonics funding and contracts in place but have you considered other steps you can take to prevent problems down the road?

- ✓ Keep Alcor up-to-date about personal and medical changes.
- ✓ Update your Alcor paperwork to reflect your current wishes.
- ✓ Execute a cryonics-friendly Living Will and Durable Power of Attorney for Health Care.
- ✓ Wear your bracelet and talk to your friends and family about your desire to be cryopreserved.
- ✓ Ask your relatives to sign Affidavits stating that they will not interfere with your cryopreservation.
- ✓ Attend local cryonics meetings or start a local group yourself.
- ✓ Contribute to Alcor's operations and research.



Contact Alcor (1-877-462-5267) and let us know how we can assist you.

Visit the ALCOR FORUMS www.alcor.org/forums/

Discuss Alcor and cryonics topics with other members and Alcor officials.

- The Alcor Foundation
- Cell Repair Technologies
- Cryobiology
- Events and Meetings
- Financial
- Rejuvenation
- Stabilization

Other features include pseudonyms (pending verification of membership status) and a private forum.

Visit the ALCOR BLOG www.alcor.org/blog/

Your source for news about:

- Cryonics technology
- Cryopreservation cases
- Television programs about cryonics
- Speaking events and meetings
- Employment opportunities



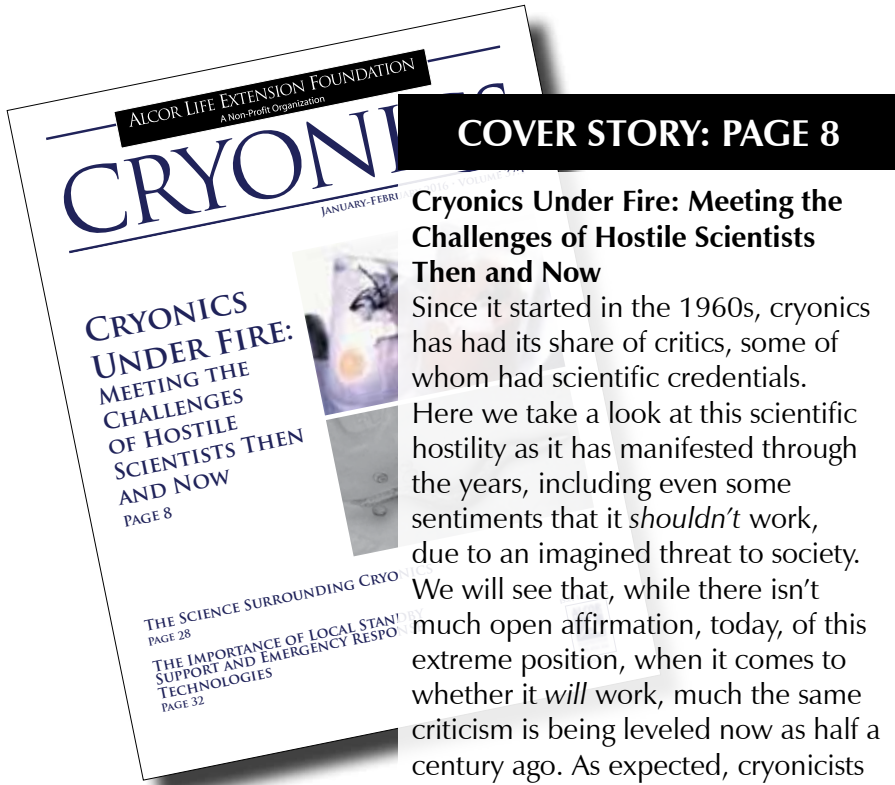
Alcor is on Facebook

Connect with Alcor members and supporters on our official Facebook page:

www.facebook.com/alcor.life.extension.foundation

Become a fan and encourage interested friends, family members, and colleagues to support us too.

CRYONICS



On the cover:

- a) *Vitrified kidney vs frozen kidney*
 b) *A roundworm hatches larvae after being cryopreserved*

COVER STORY: PAGE 8

Cryonics Under Fire: Meeting the Challenges of Hostile Scientists Then and Now

Since it started in the 1960s, cryonics has had its share of critics, some of whom had scientific credentials. Here we take a look at this scientific hostility as it has manifested through the years, including even some sentiments that it *shouldn't* work, due to an imagined threat to society. We will see that, while there isn't much open affirmation, today, of this extreme position, when it comes to whether it *will* work, much the same criticism is being leveled now as half a century ago. As expected, cryonicists continue to feel their practice is legitimate; arguments favoring its continuation will be interspersed. (One source for the latter is "The Science Surrounding Cryonics," also reprinted in this issue—see below.)

28 The Science Surrounding Cryonics

On September 15, 2015 the MIT Technology Review published an online article named "The False Science of Cryonics" that revealed a poor understanding of the state of cryobiology and conflated cryonics with connectomics and mind uploading. David W. Crippen, Robert J. Shmookler Reis, Ramon Risco, and Natasha Vita-More set the record straight with a fact-based response.

32 The Importance of Local Standby Support and Emergency Response Technologies

As much as Alcor endeavours to employ a standby team to the bedside in a timely manner, this is not always possible, especially in cases of sudden death or remote locations outside of the US. Carrie Wong offers an overview of basic local standby needs and current technologies and smartphone apps that can alert others in case of serious events or sudden death.

CONTENTS

- 5 QUOD INCEPIMUS CONFICIEMUS
Cryonics Without Cerebral Dehydration?**
 Perfusion of a healthy brain with high concentrations of cryoprotectant produces severe dehydration in humans. While this brain shrinking may not erase identity-critical information, we do know that it compromises viability and produces ultrastructural alterations. An important research priority in the next couple of years is to further understand this phenomenon and design protocols to prevent it.
- 31 Impressions from a Cryonics Training in the Netherlands**
 In Autumn 2015, Cryonics UK took its standby equipment and ambulance on the road for a cryonics training in Utrecht, the Netherlands. This successful meeting was attended by cryonicists from the Netherlands, the UK, Germany, and Switzerland and is a further step toward a coordinated European cryonics network.
- 36 Membership Statistics**
 How many members, associate members, and patients does Alcor have and where do they live?
- 38 Resuscitation Update**
 Mike Perry surveys the news and research to report on new developments that bring us closer to the resuscitation of cryonics patients.

CRYONICS

Editorial Board

Saul Kent
Ralph C. Merkle, Ph.D.
R. Michael Perry, Ph.D.

Editor

Aschwin de Wolf

Contributing Writers

David W. Crippen
Aschwin de Wolf
Gregory Jordan
Torsten Nahm
R. Michael Perry, Ph.D.
Robert J. Shmookler Reis
Ramon Risco
Natasha Vita-More
Carrie Wong

Copyright 2016

by Alcor Life Extension Foundation
All rights reserved.

Reproduction, in whole or part, without
permission is prohibited.

Cryonics magazine is published bi-monthly.

To subscribe to the printed edition
and/or change your address, please call
480.905.1906 x101 or visit the magazine
website:

www.alcor.org/magazine

Please note: If you change your address less than
a month before the magazine is mailed, it may
be sent to your old address.

Address correspondence to:

Cryonics Magazine
7895 East Acoma Drive, Suite 110
Scottsdale, Arizona 85260
Phone: 480.905.1906
Toll free: 877.462.5267
Fax: 480.922.9027

Letters to the Editor welcome:

aschwin@alcor.org

Advertising inquiries:

480.905.1906 x113
advertise@alcor.org
ISSN: 1054-4305

Visit us on the web at www.alcor.org

Alcor News Blog
<http://www.alcor.org/blog/>

2016 Annual Giving Program

Alcor provides a wide array of services for you the member, and the general public. We inform and educate, we protect and preserve, and we strive to remain at the forefront of cryonics technology.

Since its founding, Alcor has relied on member support to maintain its mission and attract new members. Your support, regardless of size, can provide a better future for all cryonicists. **Please act now.**

SUGGESTED GIVING LEVELS

\$20	FRIEND
\$60	JUNIOR SUPPORTER
\$120	SUSTAINING SUPPORTER
\$500	ADVOCATE SUPPORTER
\$1,000	LEADING SUPPORTER
\$2,500	VISIONARY SUPPORTER
\$5,000	SILVER SUPPORTER
\$10,000	GOLD SUPPORTER
\$25,000	TITANIUM SUPPORTER
\$50,000	VANGUARD SUPPORTER

We encourage every member to donate. Even if you can only afford \$5 right now, you will make a significant contribution to Alcor's future.

Donations may be made via the Donations button on the Alcor website or by contacting Alcor's Finance Director, Bonnie Magee, at bonnie@alcor.org. Your donation may be made as a lump sum or divided into easy monthly payments. ■

The James Bedford Society



Gifts have played a fundamental role in the cryonics movement since its earliest days. Dr. James Bedford, a man whose extraordinary vision led him to become the first person to be cryopreserved, and the first to make a bequest to a cryonics organization, exemplified the determination of the early pioneers of cryonics. We invite you to follow in his footsteps, and join the James Bedford Society.

The James Bedford Society recognizes those who make a bequest of any size to the Alcor Life Extension Foundation. If you have already provided a gift for Alcor in your estate, please send a copy of your relevant documents to Alcor's Finance Director, Bonnie Magee.

If you'd like to learn more about setting up a bequest, send an email to bonnie@alcor.org or call 480-905-1906 x114 to discuss your gift. ■



QUOD INCEPIMUS CONFICIEMUS



Photo: Cryo-Care Equipment Corporation at 2340 E. Washington St., Phoenix, AZ.
Dr. Bedford's "home" in 1970 or 1971.



CRYONICS WITHOUT CEREBRAL DEHYDRATION? By Aschwin de Wolf

One of the interesting things about technological progress in cryonics is that awareness of technological problems, and the desire to solve them, is often dependent on other problems being solved first. For example, cryoprotectant toxicity became a more serious concern after it was possible to eliminate ice formation. After all, it is more important to eliminate severe (mechanical) damage caused by ice crystals than to prevent (minor) alterations of biomolecules. One problem that is increasingly rising to the top of technological issues to be solved is the extreme dehydration caused by the perfusion of cryoprotectants.

The fact that perfusion of the brain with cryoprotectants causes substantial dehydration has been known in cryonics for a long time. While no rigorous public studies are available about this topic, it is usually assumed that the cause of this dehydration is that most (but not all) cryoprotectants have poor blood brain barrier (BBB) permeability. Another line of evidence is that prolonged warm and cold ischemia eliminate this dehydration, presumably because ischemia compromises the BBB in a time-dependent manner. One ironic consequence of this is that in cryonics severe dehydration is often an indicator of good patient care (i.e.

minimization or mitigation of ischemia). Maybe because of this there has been relatively little interest in eliminating CPA-induced cerebral dehydration. Another reason is that dehydration actually assists in removing water from the brain to facilitate vitrification, perhaps even permitting lower concentrations of cryoprotectant than are necessary for the vitrification of other organs (preliminary evidence for this exists).

“Electron micrographs of brains cryopreserved with M22 and other cryoprotectants show ultrastructural alterations that are primarily presumed to be due to CPA-induced dehydration.”

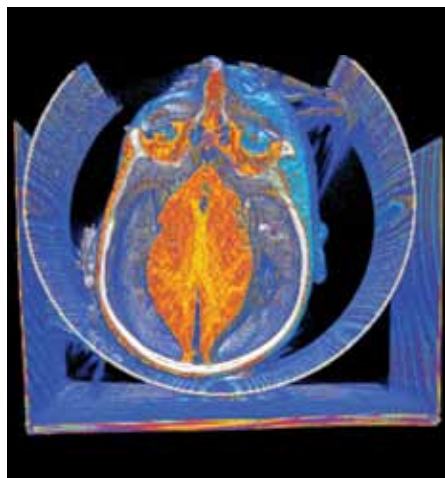
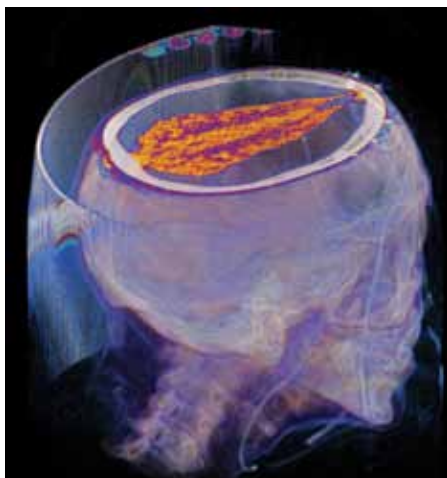
Cerebral dehydration was identified as a potential form of injury in a case report for patient A-1097 (2006) but until recently the “advantages” of dehydration seemed to outweigh its potential disadvantages. More serious concerns started to emerge in the last couple of years. Electron micrographs of brains cryopreserved

with M22 and other cryoprotectants show ultrastructural alterations that are primarily presumed to be due to CPA-induced dehydration. The significance of this issue was further reinforced in 2015 when a researcher from 21st Century Medicine showed electron micrographs of aldehyde-stabilized vitrified brains (vitrification *after* chemical fixation) that look considerably better than traditionally vitrified brains. In addition, while employed for the Cryonics Institute, Yuri Pichugin demonstrated that the extreme dehydration associated with modern vitrification solutions is not compatible with good brain slice viability.

Since most researchers in cryonics would like to see a biopreservation protocol that does an excellent job of preserving both viability and ultrastructure, eliminating this kind of injury is likely to be a rather important research goal in the next couple of years.

It is not desirable to deliberately induce ischemia to improve BBB permeability of cryoprotectants. This leaves a number of strategies to improve delivery vitrification agents to the brain:

1. Osmotic opening of the BBB. Molecules such as mannitol have a transient effect on BBB permeability but are probably not potent enough



CT scans of Alcor patients with cerebral dehydration

to permit brain cryoprotection without dehydration.

2. Yuri Pichugin has discovered that detergents such as sodium dodecyl sulfate (SDS) permit cryopreservation of the brain without dehydration.
3. Not all cryoprotectants are impermeable to the brain. Can these cryoprotectants be used in low toxicity vitrification solutions?

Fortunately, the tools to screen the efficacy of BBB modifying technologies for brain cryopreservation are already known in the literature. Brains can be inspected for post-perfusion morphology

and weight loss/gain. BBB modifiers can be tested for viability in brain slices or even whole animals. We can compare whether the use of BBB modifying strategies raises or lowers the concentration of cryoprotectant necessary to vitrify the brain. How do BBB modifiers affect overall ultrastructure in electron micrographs? What do BBB modifiers do to other cells and the vasculature? Do BBB modifiers produce more edema in the rest of the body? Will the use of BBB modifiers allow “extracellular” cryoprotectants and ice blockers to cross the BBB or even cells?

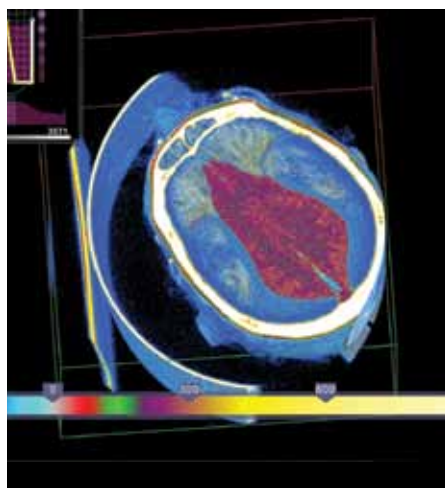
One challenge is how to validate and authorize the use of BBB modifying strategies in human cryonics cases. We know from burr hole and CT scans of neuro patients at Alcor that severe cerebral

dehydration is frequently seen in good cases with little ischemia (shrinking the brain down to almost 50% of its natural size). Switching to a cryoprotectant that has similar or even lower toxicity as M22 would be relatively straightforward but if potent agents are used to open the BBB it will be important to choose a dosage that does not produce serious side-effects such as fulminating edema or poor cell viability.

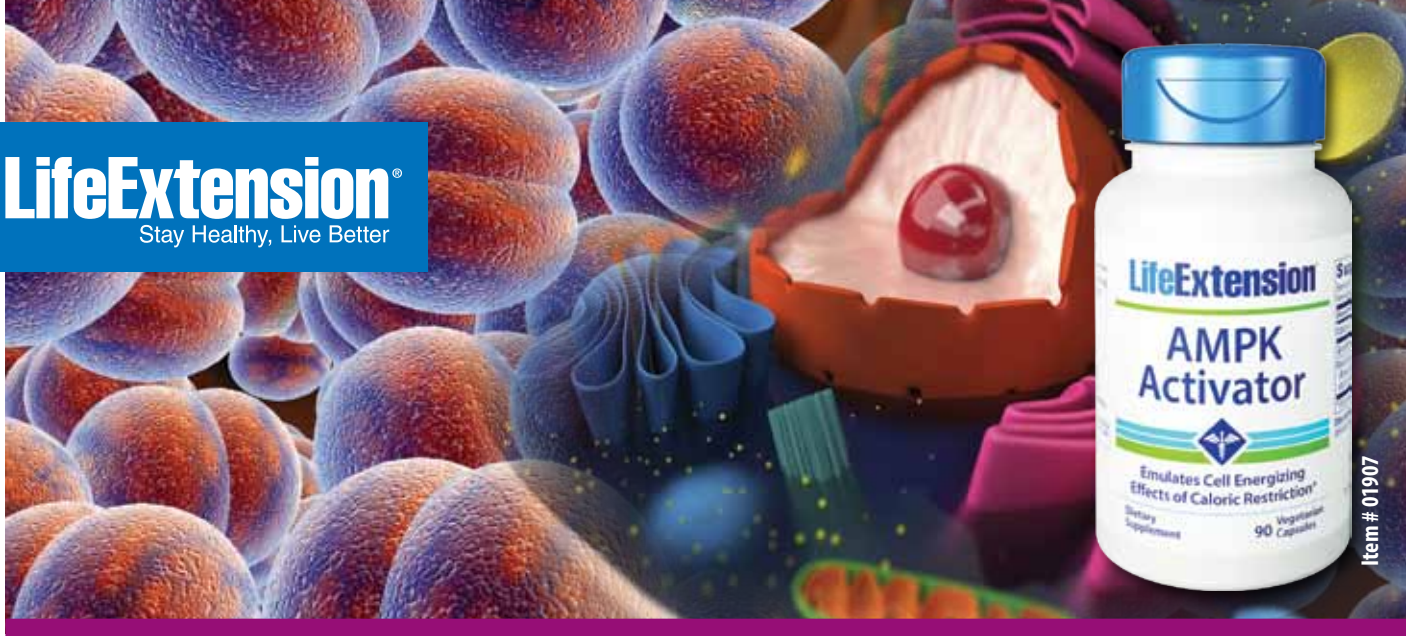
*For 2016, my lab
Advanced Neural Biosciences
has made identifying such a
brain-friendly cryoprotection
protocol a high priority.*

In a 2007 Alcor article (“Securing Viability of the Brain in Cryonics”) I speculated that we should assume that viability of the brain (or slices made from such a brain) is currently lost about halfway through cryoprotectant perfusion as consequence of cryoprotectant toxicity. As we understand it now, the need to use high concentrations of cryoprotectants also produces brain shrinking. If we want to move Alcor closer to its mandate of developing reversible human cryopreservation both problems will need to be resolved. This will most likely involve a minor re-formulation of M22 or a novel cryoprotectant that is more “friendly” to the brain.

For 2016, my lab Advanced Neural Biosciences has made identifying such a brain-friendly cryoprotection protocol a high priority. The good news is that we already know of strategies that work. Now we need to identify protocols that maximize high viability and excellent ultrastructure to make the next step in further closing the gap between cryonics and suspended animation. ■



CT scans of Alcor patients with cerebral dehydration



Item # 01907

AMPK Activator

A New Paradigm in Controlling Aging

AMPK is an enzyme that serves as the body's "master regulating switch." It inhibits multiple degenerative factors by *revitalizing* aging cells.¹

Found in every cell,^{2,3} **AMPK** promotes *longevity factors* that have been shown to extend life span in numerous organisms.^{1,4} Increasing AMPK signaling "turns off" many damaging effects of aging, thus enabling cells to return to their youthful vitality.⁵

Life Extension® scientists have compiled years of research to create **AMPK Activator**, a specialized *dual-extract formulation* that supports AMPK activation for health optimization. This natural formula supports AMPK enzymatic activities required to safely support a more youthful cellular environment.

Importance of AMPK

Greater **AMPK** (*adenosine monophosphate-activated protein kinase*) activation has been shown to help target damaging factors of aging.⁵ Studies show **increased** AMPK activity supports reduced fat storage,⁶ new mitochondria production,⁷ and the promotion of healthy blood glucose and lipids already within normal range.⁴

Gynostemma Pentaphyllum

An extract of the plant *Gynostemma pentaphyllum* was traditionally used in Asian medicine to promote longevity and scientists now know why — *G. pentaphyllum* promotes **AMPK** activation!⁸⁻¹⁰ In one of many studies showing a wide variety of benefits, researchers documented a one-inch reduction in **abdominal circumference** in overweight individuals who took **450 mg** daily of *G. pentaphyllum* extract for 12 weeks.¹¹

Trans-Tiliroside

Trans-tiliroside, extracted from plants such as **rose hips**, also boosts **AMPK** activation, but triggers different downstream metabolic benefits

References

1. *J Mol Med (Berl)*. 2011 Jul;89(7):667-76.
2. *J Proteome Res*. 2011 Apr 1;10(4):1690-7.
3. *Circ Res*. 2007 Feb 16;100(3):328-41.
4. *Physiol Rev*. 2009 Jul;89(3):1025-78.
5. *Age (Dordr)*. 2014 Apr;36(2):641-63.
6. *Clin Sci (Lond)*. 2013 Apr;124(8):491-507.
7. *Proc Natl Acad Sci USA*. 2002 Dec 10;99(25):15983-7.
8. *Bioorg Med Chem*. 2011 Nov 1;19(21):6254-60.
9. *Carbohydr Polym*. 2012 Jul 1;89(3):942-7.
10. *Biotechnol Lett*. 2012 Sep;34(9):1607-16.
11. *Obesity (Silver Spring)*. 2014 Jan;22(1):63-71.
12. *Diabetes Res Clin Pract*. 2011 May;92(2):e41-6.
13. *Prev Nutr Food Sci*. 2013 Jun;18(2):85-91.
14. *J Nutr Biochem*. 2012 Jul;23(7):768-76.
15. *Bioorg Med Chem Lett*. 2007 Jun 1;17(11):3059-64.

than *G. pentaphyllum*.¹²⁻¹⁴ Among its many benefits, a low human equivalent dose of **56 mg** daily *trans*-tiliroside has been shown by researchers in preclinical studies to promote healthy blood glucose levels and body weight already within normal range.¹⁵

The suggested daily dosage of **AMPK Activator** is to take two capsules with the first meal of the day and one capsule with the second meal. Three vegetarian capsules provide:

ActivAMP™ <i>Gynostemma pentaphyllum</i> extract (leaf)	450 mg
Rose hip extract	1,120 mg
Standardized to <i>trans</i> -tiliroside	56 mg

Anti-Aging Discovery That Cannot Be Overlooked

Scientists uncovered the cell-energizing effect of **AMPK** in the 1970s. Since then, an exponential volume of data (over 7,500 published studies) has documented the critical role that activated **AMPK** plays in maintaining life-sustaining cellular functions.

Those seeking to meaningfully extend their healthy life span should ensure they optimally activate their cellular **AMPK**. The reason this is so important is that in response to aging, excess calorie consumption, and/or low levels of physical activity, AMPK activity markedly declines.

A targeted way of **reversing** cellular depletion of this critical enzyme is to take the new **AMPK Activator** formula that comprises a dual-extract, plant-based formulation.

A bottle of 90 vegetarian capsules of **AMPK Activator** retails for \$48. If you purchase four bottles, the price is reduced to **\$33** per bottle.

ActivAMP™ is a trademark of Gencor.

ORDER NOW!

Toll-free 1-866-820-4967

www.LifeExtension.com

Be sure to use Code PIM601X to get these savings.

This supplement should be taken in conjunction with a healthy diet and regular exercise program. Results may vary.

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.

CRYONICS UNDER FIRE: MEETING THE CHALLENGES OF HOSTILE SCIENTISTS THEN AND NOW

By R. Michael Perry



INTRODUCTION

Since its inception in the 1960s cryonics has not lacked its share of critics, some of whom had scientific credentials. Many cryobiologists, for example, have been hostile to the practice, though not these alone among scientists. Cryonics, the critics say, is an “unproven” technique, diverts resources that should be being used for basic research, gives people false hope, and will alienate scientists from doing the very research that would be needed to make it worth pursuing in the first place. Some also emphasize that, as a corollary, cryonics services should not be offered to the public now or before such time as cryonics can gain scientific “respectability.” In addition some hostility has been based, not on the belief that cryonics won’t presently work, but that it might work, with unhappy consequences for society.

Here we take a look at this scientific hostility as it has manifested through the years, starting in the early days and continuing today. We will see that, while there isn’t much open affirmation, today, that cryonics *shouldn’t* work, when it comes to whether it *will* work, much the same criticism is being leveled now as half a century ago. As expected, cryonicists continue to feel their practice is legitimate; arguments favoring its continuation will be interspersed. Extensive portions of what follows are excerpted and adapted from various sources, most notably an article of mine on Robert Prehoda.



*Robert Prehoda, high school
graduating class, 1949.*

*PHOTO CREDIT: Sentinel (Harvard School,
N. Hollywood, Calif. yearbook) 1949, 41.*

ROBERT PREHODA, PIONEERING CRYONICS SKEPTIC¹

Robert Prehoda was a chemist, reduced metabolism expert, and futurist who promoted his ideas through a number of books.² Back when cryonics was in its infancy, he tried to interest the scientific community in suspended animation. For the long term he was optimistic: cryogenic preservation would prove reversible, thus qualify as suspended animation, meaning that people could be put “on hold” until their diseases could be cured, or might undertake long planetary voyages in a state of ametabolic coma. But this would

only happen if a massive research effort were undertaken to perfect the primitive techniques then available. For the short term he was a pessimist and strongly opposed the newly-introduced practice of cryonics, which he thought to be premature, futile, and fraudulent. Prehoda was both scientifically trained and articulate, and his well-stated opinions are worth considering today for much more than purely historical reasons, even if some of his reasoning is dated or otherwise flawed. (As one indicator of relevance, our techniques today are still unacceptably primitive, inasmuch as there is no demonstrated, reversible cryopreservation of large tissue masses or sizable organisms.)

Prehoda’s feud with cryonics started in 1963, when he received for evaluation a pre-publication version of Robert Ettinger’s *The Prospect of Immortality*, the book that largely started the cryonics movement. Though impressed with the colorful writing style, he took issue with the “freeze now” concept of preserving the recently (clinically) dead for eventual reanimation, and tried to persuade Ettinger to drop it. Ettinger refused, and, after the book was commercially published the following year, Prehoda became a leading voice of opposition. In its April 1966 issue *Pageant* published an article by Prehoda contending that perfusing and freezing a large organ such as the human brain would damage most of the cells “beyond any conceptual means of future repair and restoration to original function.” He was certain



Prehoda at the freezing of
Dr. James Bedford, 12 Jan. 1967,
Dr. Dante Brunol behind him.
Photo courtesy of Robert F. Nelson.

that “[t]he very process of attempting to repair billions of separate brain cells would necessitate separating them, and this would sever inter-cellular connections that would be almost impossible to rejoin.” The odds of completing such a repair task he estimated at “less than one chance in ten trillion.” Of the leading cryobiologists he said that “[n]ot one of them thinks there is even a remote chance of reanimating people frozen under present cryobiological techniques.”³

Prehoda’s article and other cryonics criticism was covered in the August-September, 1966 issue of *Freeze-Wait-Reanimate*, the newsletter of the pro-cryonics Life Extension Society, founded in 1963 by Evan Cooper. In his reply Cooper notes an experiment of Isamu Suda and colleagues at Kobe University in Japan. A cat brain perfused with a glycerol solution was chilled to -20°C for more than six months, then reanimated with recognizable brain waves.⁴ Cooper surmises that “it might be extravagant to claim that most of the cells would be damaged beyond any conceptual means of repair.”⁵ Ettinger in the same issue disputes Prehoda’s claim that the leading cryobiologists all discount any chance of reanimating persons frozen with current techniques. Instead, of the ones Ettinger had corresponded with, including some of the best known, “not one denied that there is some chance of eventual revival.” He also tellingly notes that “poll taking is an art, and the answer you get depends on the way you ask the

question.” Finally, Ettinger takes issue with the low probability estimates of Prehoda and others, arguing that they have not done any calculations but only given in to emotional blocks.⁶

Prehoda was not, of course, deterred by such rebuttals. Instead, he presents his case more definitively in “The Lunatic Fringe,” chapter 8 of his 1969 book, *Suspended Animation*, with some further elaboration in the chapter that follows, on the freezing of James Bedford in 1967. It is worth remarking that, despite its negativity, there is no indication of malicious intent. Prehoda, by appearance, was sincere and believed he was presenting issues fairly.

The opening sentence of “Lunatic Fringe” sets the tone for what follows: “For the past six years, serious scientists engaged in reduced metabolism research have been confronted by the unexpected emergence of a pseudo-scientific cult which is presenting a completely distorted picture of the prospects for suspended animation to the general public.”⁷ The “cult”—the newly-formed cryonics movement—had by then achieved a few human freezings, a dozen or so, with great difficulty. It is worth noting that at least the frozen were, by and large, still frozen at this point, though one or two little-publicized thawings had already occurred. But criticism would naturally focus on scientific and technical issues at this early stage, a fortunate circumstance in view of the later failures. Prehoda limits most of his attention to these issues, and to what he considers the unwarranted publicity of proponents, particularly that of the “revered prophet,” Ettinger.

What is glaringly overlooked is that the cells that do not survive might still be repairable, much as a car that will not start can often be made to run with the right mechanic’s attentions.

Prehoda defines a “pseudo-scientific proposal or idea” as “a hypothesis or combination of hypotheses which cannot be accepted by any of the leading specialists in the field.” For cryonics the “field” is cryobiology, and the “leading specialists” include such respected scientists as Dr.

Audrey Smith and her coworkers, Sir Alan Parkes and Dr. Christopher Polge, who pioneered the resuscitation of small mammals (hamsters) from partial freezing in the 1950s. No prominent cryobiologist had endorsed cryonics; Prehoda thus felt justified in labeling it pseudo-scientific. (Negative comments from other scientific authorities are also noted. Ettinger’s rebuttal above stops short of saying that cryobiologists endorsed cryonics, even if still allowing it some chance success.) Moreover, Prehoda’s objections do not stop with simple labeling, nor are they particularly dependent on specialists, beyond noting their lack of support. Instead Prehoda offers his own arguments, laying his groundwork with care.

He opens with a discussion of pseudoscientific movements in general, and considers why they flourish in the absence of confirming scientific evidence or even in the face of contrary evidence. The primary reasons will be familiar to students of religion. Basically, people gain an important sense of meaning and purpose from certain beliefs, which may then override objections that others find compelling. It is not necessary that the beliefs themselves be false, of course, just that they be especially gratifying or meaningful to adherents, and that there be evidence for these beliefs in some form that seems convincing enough to overrule any objections that others might raise.

In the case of UFO cults, believers may think that benign extraterrestrials are walking among us and about to usher in an era of world peace and brotherhood. Alleged alien encounters or sightings may be convincing, even if the world at large remains unpersuaded. Prehoda particularly notes the UFO cults as a modern counterpart to beliefs in angels or other spiritual beings. For some, claims of extraterrestrial encounters, while extraordinary, possess a scientific plausibility not found with angels and thus seem more credible. Because of the general skepticism of leading specialists such as astronomers, however, beliefs in alien encounters would qualify as pseudoscientific despite their grounding in presumed, non-supernatural effects.

Pseudoscientific movements may be annoying in a minor way but, it may be asked, why get upset? No one is forced to subscribe to their tenets; few generally do. But Prehoda notes that such groups

can impede legitimate science. UFO believers, for instance, may claim they have already achieved space travel through their extraterrestrial contacts. A gullible public could then become less enthusiastic about bearing the considerable expenses of human-engineered space flight. (Though this is a plausible argument, Prehoda offers no quantitative estimate of the putative effects.) In the case of suspended animation, Prehoda fears a burgeoning “freeze now” movement that could convince the public that more research is not an urgent priority, inasmuch as hopes are based on existing procedures. Discouraging such hopes, and opposing the practice that supports them, become priority items.

Prehoda then considers the specifics of cryonics, which were anticipated and delineated in *The Prospect of Immortality*. (The term *cryonics* itself did not appear until 1965, a year after *Prospect* was published; Prehoda in his book prefers “cryogenic interment.”) Prehoda defines “cryogenic suspended animation” as “the complete cessation of all metabolic activity for an indefinite period by means which allow future reanimation.” In general, of course, it may not be known if a particular method inducing this cessation of activity will prove reversible or not. Prehoda is only in favor of applying such a method when (if ever) there is general agreement, among scientists in the relevant specialties, that prospects are good for reanimation.

Near the beginning of *Prospect*, Ettinger sets the tone of the proposed program, in direct opposition to Prehoda (emphasis original): “It must be made very clear that our basic program is not one of ‘suspended animation,’ and does not depend on any special timetable of scientific progress, but can be instituted *immediately*.”²⁸ Cryopreservation might *not* be suspended animation—we don’t know yet if it will prove reversible. So far we can only label it “suspended death”—any metabolic processes, including decomposition, are put on indefinite hold, nothing more. This, then, is the best that could be hoped for with cryopreservation, and it is what Ettinger is promoting in his book.

Suspended death, however, is not simply the known end of life but a possible gateway to future life, based on the hope that future technology will be able to restore a healthy consciousness. Ettinger offers some thoughts on how resuscitation

of frozen patients might occur, envisioning robot surgeons capable of superhuman feats of dedication and fine control. “[I]t is not inconceivable that [such] huge surgeon-machines, working twenty-four hours a day for decades or even centuries, will tenderly restore the frozen brains, cell by cell, or even molecule by molecule in critical areas.” (We today, of course, are conditioned by the possibilities of nanotechnology and other advances and ask why the machines must be “huge.” A plausible alternative would be swarms of tiny, intelligently controlled, artificial microbes.)

Ettinger’s speculative thinking provides Prehoda a pathway for attacking cryonics, though also exposing weaknesses in his own position. He acknowledges that brain cells can survive cryogenic freezing (this was well-established at the time), but notes that such survival is rare, thereby concluding that the mind of a resuscitee “would be irretrievably lost.” What is glaringly overlooked is that the cells that do not survive might still be repairable, much as a car that will not start can often be made to run with the right mechanic’s attentions. As another possibility, information from damaged cells could be extracted and used in forming new, functionally equivalent cells. The brain might thus be rebuilt with its original memories intact, or largely so, even if few of its cells would “survive”—that is to say, be able to spontaneously resume function on simple thawing.

In assessing the validity of the cryonics premise, a critical issue is how memories are stored in the brain, an area where understanding is still inadequate and divergent views are held. Many feel, for instance, that the long-term memories which would be important for recovering the personality reside primarily in the synaptic connections between the neurons, but this is not the only view. An alternative that is favored by Prehoda in his book is to credit specially configured strands of RNA. According to this hypothesis, these memory molecules are present in large numbers in the brain’s neurons, and must accordingly be restored if a prospective resuscitee is to retain any sense of the original self. On this latter possibility Prehoda is characteristically doubtful. “The memory RNA within many of the brain’s neurons would be altered or damaged by present freezing techniques. The robot surgeons would have no way of knowing

the precise structure of these trillions of altered RNA memory molecules before they were frozen.” Ettinger notes, however, that memory is highly redundant, however it may be encoded, which should materially lessen the dependence on “precise structure,” much as a book might be reconstructed from a number of damaged copies.

Another issue involves the “six minute limit” beyond which, Prehoda tells us, a person experiencing oxygen deprivation generally loses his memory and intelligence, if he survives at all. The effect can be mitigated if body temperature drops quickly, as in cold water drownings, but such favorable conditions will often not be present when a person is cryopreserved. Prehoda assumes that the information loss is total and permanent; the brain, then, is quite a fragile organ and trying to preserve its fine structure after clinical death is, at best, highly problematic. Ettinger also considers this problem, but reaches more optimistic conclusions. Many human body cells, he notes, are shown to resume some function up to a day or two after death, suggesting that the injury to brain cells might not be so severe as to obliterate the encoded memories.⁹ On the other side of the coin, starting cryonics procedures immediately after pronouncement of death would be feasible in many cases, to minimize any deterioration.

OPPOSING CRYONICS BECAUSE IT MIGHT WORK¹⁰

We have seen how Prehoda’s stance was pro-suspended animation, thus really he hoped cryonics would work even if he thought it unlikely so that more research should be done before cryonics was publicly offered. We turn now to something entirely different: fearing the consequences if cryonics works *and hoping on that basis that it won’t work*. Incredibly, this was the stance taken by cryobiologists *in general*, according to Mike Darwin in a lengthy three-part serial on the conflict between cryonicists and cryobiologists (*Cryonics* Jun.-Aug. 1991):

“I have talked with many cryobiologists about cryonics over the years. Whether young or old it has been my experience that almost universally cryobiologists consider the goal of human suspended animation and/or vastly extended lifespans anathema.”²¹¹



Dr. Harold Meryman testing blood-freezing techniques at the Naval Medical Research Institute, Bethesda, Md., 1957.

PHOTO CREDIT: *Electronic watercolor by author, based on photo by Fritz Goro, LIFE Images; see, for example, http://www.militaryblood.dod.mil/viewcontent.aspx?con_id_pk=239, accessed 4 Nov. 2015.*

These sentiments were dramatically underscored in a letter from Harold T. Meryman to Charles Tandy in 1978. Meryman was an American Red Cross physician and for many years a leading cryobiologist. He is “credited with saving countless lives for his innovative work refining the process of freezing blood, allowing thousands of units of blood to be kept in long-term storage in banks around the world.”¹² Tandy was a young transhumanist philosopher and cryonics enthusiast,¹³ interested in the possibility of creating a National Institute of Low Temperature Biology which would focus on the goal of achieving suspended animation. Meryman responded:

“I am quite unsympathetic with the goal of preserving human beings through freezing. I find the proposition mischievous in the extreme and fear that, like some other scientific ‘breakthroughs’ one might mention, the end result would be impossible to control and far more damaging than beneficial to society.

“In short, I think that a national institute of low temperature biology is unjustified and the goal of freezing humans is deeply disturbing.”¹⁴

Ettinger had this to say in 2001:

“I have correspondence from Meryman, many years ago, showing that his antipathy to cryonics has religious or/and ideological roots—he doesn’t think human life should be extended beyond the “natural” span.

(Yes, pretty ironic for a cryobiologist, not to mention a physician!)”¹⁵

Darwin in his article documents how Meryman, who around this time was president of the Society for Cryobiology, used his influence with Minnesota Valley Engineering to halt their supplying of cryogenic containers to cryonics groups:

“Meryman reportedly approached Minnesota Valley Engineering (MVE), the cryogenic engineering company and manufacturer of the custom storage vessels for whole body patients, and threatened them with loss of their institutional membership and refusal of their advertising in the Society’s journal, as well as a boycott of purchase of their equipment unless they stopped supplying patient storage vessels to cryonicists. MVE complied, and for nearly a decade there was no reliable commercial source of whole body cryogenic equipment available to any cryonics organization anywhere (this information was supplied to the author in the late 1970s by an individual in MVE management who wishes to remain anonymous). Indeed, it was in part as a result of this storage unit embargo that Robert Ettinger and the Cryonics Institute launched their program to build patient dewars in-house so as to be protected from such manufacturer black-listing.”¹⁶

Matters culminated in September 1982 when a new version of the Society’s bylaws took effect. Section 2.04 provides that cryonicists are unwelcome and might be expelled:

“Upon a two-thirds vote of the Governors in office, the Board of Governors may refuse membership to applicants, or suspend or expel members (including both individual and institutional members), whose conduct is deemed detrimental to the Society, including applicants or members engaged in or who promote any practice or application which the Board of Governors deems incompatible with the ethical and scientific standards of the Society or as misrepresenting the science of cryobiology, including any practice or application of freezing deceased persons in the anticipation of their reanimation.”¹⁷

There is much else in Darwin’s article which documents the long hostility of cryobiologists to cryonics, which I will have to omit here. I note one more item however, relating to an appearance of Mike Darwin and Brenda Peters on the Larry King Live show which aired July 11, 1991.

Another guest on the show was Dr. James Southard, then vice president of the Society for Cryobiology. King asked Southard, “James, do you want this [cryonics] to work?” Southard answered, “No. I don’t see any reason why one isn’t satisfied with the one life that they have on earth. I mean from a personal standpoint.”¹⁸ (In fairness, Southard did make clear, later in the show that he was not opposed to others seeking cryopreservation if that is what they want, just that he was opposed to it personally.)

By this point the (pro-cryonics) reader may be wondering what particular strange obsessions, complexes, et cetera would motivate cryobiologists, of all people, to oppose the idea of human life extension which their very profession might especially be able to offer. I think it fair to say that, it’s not just cryobiologists but people more generally, including scientists outside of cryobiology, that have this pro-mortality mindset. As one case in point consider none other than Albert Einstein, probably the most respected scientist of the twentieth century. The preeminent physicist didn’t spend all his time in that cerebral field but on occasion would venture forth on art, philosophy, religion and other subjects:

“The fairest thing we can experience is the mysterious. It is the fundamental emotion which stands at the cradle of true art and true science. He who knows it not and can no longer wonder, no longer feel amazement, is as good as dead, a snuffed-out candle. It was the experience of mystery—even if mixed with fear—that engendered religion. A knowledge of the existence of something we cannot penetrate, of the manifestations of the profoundest reason and the most radiant beauty, which are only accessible to our reason in their most elementary forms—it is this knowledge and this emotion that constitute the truly religious attitude; in this sense, and in this alone, I am a deeply religious man. I cannot conceive of a God who rewards and punishes his creatures, or has a will of the type of which we are conscious in ourselves. An individual who should survive his physical death is also beyond my comprehension, nor do I wish it otherwise; such notions are for the fears or absurd egoism of feeble souls. Enough for me the mystery of the eternity of life, and the inkling of the marvelous structure of reality, together with the single-hearted endeavor to comprehend a portion, be it

ever so tiny, of the reason that manifests itself in nature.”¹⁹

Einstein in his thinking was far from alone but could be said to exemplify an attitude common to many thoughtful people who seek meaning and value in a life that, on the face of it, seems destined to end rather soon in eternal oblivion. Many find his resolution of the problem both comforting and inspirational. Death, however prevalent, cannot deprive life of meaning and purpose. But in discounting the idea of a life after death they, also like Einstein, disparage and distance themselves from the “feeble souls” who would misguidedly seek such a life by way of “fear or absurd egoism.”

Yet Einstein was not suicidal, and it seems likely he would have accepted rescue from the debilitating and eventually lethal effects of aging, had such deliverance been possible—as would most of the rest of the human species. His attitude, then, can be seen as a consequence of the principle that one’s values tend to conform to one’s expectations. Einstein found a way to value his lot as a mortal, which seemed inescapable based on his understanding, and to dismiss as undesirable any putative amelioration. It is the old principle of the fox thinking the grapes he wants but cannot reach must be sour, not worth having anyway. When the prize is the “grapes” of radical life extension, the frustration is exacerbated by fears and anxieties imposed by natural selection’s survival instinct, and is hardened and transmogrified into a mortalist bias. Paradoxically, one is repelled by and disparages what one really desires but is convinced is unobtainable.

Einstein died in 1955, a little before the cryonics movement got started, but it’s not hard to see why its advent did not have much effect on attitudes of scientists and others more generally. To most people cryopatiens are only frozen corpses, just as dead as if they had been buried or cremated. We make the case that they should not be treated as dead, there is still hope for getting them up and going again, but the rest of the world isn’t convinced. As Einstein was hostile to the idea of extending his life beyond nature’s limits, we should not be surprised that so many others, including mainstream cryobiologists, have this bias also, and that it persists today, given we are not close to resuscitating any of our cryopreserved.

SOME RECENT EXCHANGES

Some recent, strongly anticryonics sentiment from a scientific source started innocently enough, and positively too, with an article by Amy Harmon in the *New York Times*.²⁰ “A Dying Young Woman’s Hope in Cryonics and a Future” tells the gripping story of Kim Suozzi, who was a bright, college-level neuroscience student at Truman State University (Kirksville, Missouri) when stricken herself with brain cancer. Ailing but still alert and eloquent, she spoke briefly at Alcor’s conference in Scottsdale in October 2012. Though initially she had little funding, money had been raised by the Venturist organization and others to cover the \$80,000 fee for neuropreservation and she was cryopreserved by Alcor three months later. Several speakers at the conference with scientific credentials spoke well if cautiously about cryonics. This is recounted in Harmon’s article of September 12 and overall the tone is respectful, scientifically responsible, and positive.

The same cannot be said of a followup article which appeared within days in a respected scientific publication, the *MIT Technical Review*.²¹ “The False Science of Cryonics” by Michael Hendricks, who is a neuroscientist and assistant professor of biology at McGill University (Montreal, Quebec), offers a determined attack.

“I study a small roundworm, *Caenorhabditis elegans*, which is by far the best-described animal in all of biology. We know all of its genes and all of its cells (a little over 1,000). We know the identity and complete synaptic connectivity of its 302 neurons, and we have known it for 30 years.

“If we could ‘upload’ or roughly simulate any brain, it should be that of *C. elegans*. Yet even with the full connectome in hand, a static model of this network of connections lacks most of the information necessary to simulate the mind of the worm. In short, brain activity cannot be inferred from synaptic neuroanatomy.”

Cryonicists, however, never say the connectome would *necessarily* be enough. It is not all that is preserved, allowing for resuscitation by other paths. But Hendricks flatly dismisses any such possibility, and closes with nasty afterthoughts:

“No one who has experienced the disbelief of losing a loved one can help but sympathize with someone who pays \$80,000 to freeze their brain. But reanimation or

simulation is an abjectly false hope that is beyond the promise of technology and is certainly impossible with the frozen, dead tissue offered by the ‘cryonics’ industry. Those who profit from this hope deserve our anger and contempt.”

Responders soon noted considerable flaws in Hendricks’s arguments, such his tendency to wander off topic, conflating cryonics with uploading and obsessing, as he does, over whether a computer simulation of you, if it could be engineered someday, would be you. A firm if polite rebuttal article, “The Science Surrounding Cryonics” by David W. Crippen, Robert J. Shmookler Reis, Ramon Risco, and Natasha Vita-More,²² appeared a few weeks later in the same online journal, offering words of encouragement:

“We agree there is more to the mind than the synaptic connections between neurons. The exact molecular and electrochemical features of the brain that underlie the conscious mind remain far from completely explored. However, available evidence lends support to the possibility that brain features that encode memories and determine behavior can be preserved during and after cryopreservation.”

Some recent evidence actually was obtained by one of the authors:

“Direct evidence that memories can survive cryopreservation comes from the roundworm *Caenorhabditis elegans*, the very animal model discussed in Hendricks’s response. For decades *C. elegans* have commonly been cryopreserved at liquid nitrogen temperatures and later revived. This year, using an assay for memories of long-term odorant imprinting associations, one of us published findings that *C. elegans* retain learned behaviors acquired before cryopreservation. Similarly, it has been shown that long-term potentiation of neurons, a mechanism of memory, remains intact in rabbit brain tissue following cryopreservation.”

Further, older, supporting arguments for cryonics concern the likely survival of information-bearing structure. In “Cryonics, Cryptography, and Maximum Likelihood Estimation”²³ encryption expert Ralph Merkle likens the cryopreservation process to message encryption, inasmuch as “text”—the body’s original structure, is typically somewhat damaged or “scrambled” by existing protocols. The “plain text” (original, undamaged tissue)

thus turns to “ciphertext” and for the goal of resuscitation one must “decrypt” or “unscramble” the “ciphertext” to obtain the “plain text” or refurbished tissue similar to its original, undamaged form. That this should be feasible depends on such properties as that (1) preserved tissue tends to show fine structure down to the molecular level, and (2) as a physics principle, information is relatively hard to destroy, particularly by methods that rely, mainly, on greatly lowering the temperature.

KENNETH HAYWORTH, A NEW PREHODA?

Kenneth Hayworth is a Ph.D. neuroscientist and is president of the Brain Preservation Foundation (BPF) which he cofounded. He was a postdoctoral researcher at Harvard University and then became a senior scientist at the Howard Hughes Medical Institute’s Janelia Farm Research Campus (JFRC) in Ashburn, Virginia. There he is working on ways to extend focused ion beam scanning electron microscopy (FIBSEM) imaging of brain tissue to encompass much larger volumes than are currently possible. He is a coinventor of a tape-to-SEM process for rapid imaging of volumes of brain tissue by splitting the tissue into many very thin slices, and designed and built several automated machines to implement this process.²⁴ As he says: “The BPF has offered a challenge prize for the development of a medical procedure which can preserve a human brain so that people today can potentially take advantage of mind uploading technology [more than] 100 years in the future.”²⁵

Hayworth’s approach, then is not necessarily cryonics but still (equivalently) a form of biostasis—preserving the brain or its information after cardiac arrest—until future methods can be applied to, in some way, recover the functioning patient. (In this case uploading, simulating the mind in a computer, is explicitly referred to as a possible mechanism for this restoration. It might be used under the circumstance that only brain information not original material is preserved—or a duplicate brain with body might be made, as usual assuming advanced technology of the future is available. Some are comfortable with such prospects, but for those who aren’t, other possibilities exist through cryopreservation, since the original tissue is preserved.) It



*Dr. Kenneth Hayworth in 2011.
PHOTO CREDIT: Author’s
personal collection.*

might be thought that Hayworth would be a supporter of cryonics, and he does favor it in the sense of wishing it could work, and feeling that scientific research should be directed to making it work. His support, however, is highly qualified and appears to exclude current practices, which he feels are inadequate, as indicated in his own rebuttal to the article of Michael Hendricks:

“[P]lease do not conflate what a small, highly-suspect company like Alcor is offering with what is possible in principle if the scientific and medical community were to start research in earnest. I started the Brain Preservation Prize as a challenge to Alcor and other such companies to ‘put up or shut up,’ challenging them to show that their methods preserve the synaptic circuitry of the brain. After five years they have been unable to meet our prize requirements even when their methods were tested (by a third party) under ideal laboratory conditions. Out of respect for loved ones I will not comment on any particular case, but it is clear from online case reports that their actual results are often far worse than the laboratory prepared tissue we imaged. Speaking personally, I wish that all such companies would stop offering services until, at a minimum, they demonstrate in an animal model that their methods and procedures are effective at preserving ultrastructure across the entire brain. By offering unproven brain preservation methods for a

fee they are effectively making it impossible for mainstream scientists to engage in civil discussion on the topic.”²⁶

Earlier he said, in an interview:

“We can argue to a certain extent about what level of criteria should be used for when [a preservative method] is ready to apply to a human being but I think, if you look at the lessons from cryonics, it was applied to human beings way too early, and the scientific community, rightly, had to distance itself from that. And the overcompensation that the scientific community did, from those applications to humans, was detrimental to the entire human race. Because what it basically said is now we’re *not* going to do the mainstream scientific research that is required, to get this to work, to eventually be applied to human beings. We cannot let that happen on chemical brain preservation. And we need to undo it on cryonic preservation.”²⁷

So Hayworth is much more a Prehoda than he is either an Ettinger or a Meryman, favoring research that will lead to some form of suspended animation, while opposing the idea of putting people in “suspended death” for now. (In one way Hayworth differs from Prehoda. Prehoda was interested in preserving viability for suspended animation, whereas this does not appear to be a strong interest of Hayworth. Both, however, and other scientific critics through the years can be accused of “repair denialism”—discounting of the possibility that future technology may be able to repair damage inflicted by current methods of preservation and bring about resuscitation.) To his credit Hayworth does not, like Meryman and other cryobiologists, feel that cryonics ought not to work. But he thinks that present and past cryonics practices have repelled the scientific community from doing the research that would be needed to develop a method that would demonstrably work and this has been “detrimental to the entire human race.” He may be convinced that prospects for resuscitating existing cryonics patients are negligible, as underscored by his comment that the methods used were “unable to meet our prize requirements.” Or if not, that saving a few lives by cryonics now will not compensate for the loss of life that must follow because the alienated scientists are not doing their work that would make cryonics attractive and widely adopted by the masses.

Either possibility seems highly speculative at best. In general, we know people are strongly affected by their own mortality, and don't like to be reminded of it. Because it is a fact of life, however, people are forced in one way or another to make peace with it, which leads to an attitude of acceptance, from which, it seems, it is but a few short steps to a kind of approval and even reverence. In the case of Einstein, we see how an eminent scientist expressed hostility to the idea of extending human life beyond the natural limits and disparaged those who would think otherwise. The same mortalist bias is apparently prevalent among cryobiologists and has been. It seems quite plausible that the presence or absence of a cryonics practice has little to do with this—there was no cryonics when Einstein was alive. So it is not clear that if cryonics had not developed, cryobiologists and other scientists would have felt *more* disposed to perfect a method of extending life.

SOME FINAL THOUGHTS

There is the issue of whether cryonics, as practiced now and up to now, is likely to work. Some of us, this author included, think its prospects are good, and base our assessment on informational grounds. Ralph Merkle, I think, has done the best job of explicating this point of view, seconded by Eric Drexler.²⁸ I don't have space to go again into the arguments (briefly addressed in an earlier paragraph) but suffice it to say that the confidence I think is warranted means that cryonics clearly should continue. The other kind of objection, that, if we grant that cryonics has a significant chance of saving lives, still, there is too much cost overall in alienating the scientists, is too speculative and shaky to take seriously—unless and until more corroborating evidence is found. So we can be grateful that we have a cryonics practice that is active today and not just promised for an unknown future that could only help those alive in that future.

As for the validation problem, it appears that up to now skeptics have mainly been saying (1) the current practice won't work or is unlikely to, based on tests that have been done, thus (2) some new, improved practice is essential. A better practice is, of course, always desirable and worth seeking, which means that research must continue. (This includes Dr. Hayworth's research and

other research encouraged by him.) I would also, however, take a hard look at (1), and ask if better tests of existing procedures might show more favorable results leading to a more positive assessment. The new tests could take different forms. One would be new testing methodologies applied to tissues preserved by the existing methods, another, new algorithms for processing data obtained and used in previous testing. In regard to the latter, we could ask if some, legitimate "unscrambling" of 3-D models of cryopreserved neural tissue might yield "corrected" tissue that could meet Dr. Hayworth's prize requirements.²⁹ I think this should be investigated; current computer capabilities should make it possible.

In any case we are surely on the right track. We are still here doing our thing, and our movement is stronger than ever. Time is on our side. A case could even be made for doing cryonics if it proves impossible to fully restore patients with no amnesia or memory distortions. The amnesia problem is the most serious one we are likely to face in any case, and having the preserved information alone—whatever its deficits—should be of interest to future historians.

Patients with amnesia but otherwise fully functional, on the other hand, could be helped through the use of records, including personal memorabilia. They should at minimum end up fully able to speak their native language, with basic knowledge and comprehension at former levels, and also know their name and other basic data which should be available from records. They should, in particular, know that they had been cryopreserved and resuscitated and when and where these events occurred. Personal memorabilia, photos, diaries and the like, could help to further fill out missing memories (and cryonicists are encouraged to maintain files of such memorabilia).

Our hope of defeating death through our practices is serious and an important source of meaning. But it also supplies a motive that otherwise would be lacking, one whose absence would, I think, greatly slow or halt our progress toward suspended animation, given the mortalist bias that seems to creep in when such hope is shackled. We must continue our work, *both* in doing research *and* in preserving our patients, in the latter case using the best available methods when the need arises. ■

REFERENCES

1. MP1 (entire section, except as noted).
2. MP2.
3. RP1; quoted in RP2, 113.
4. IS.
5. EC.
6. RE2.
7. Quotes by Prehoda and summarization of his views in the remainder of this section are from RP2, 100-107.
8. RE1, 2.
9. RE1, 34.
10. The main source for this section is MD.
11. MD, 148.
12. RS.
13. Author's personal knowledge.
14. MD, 148.
15. RE3.
16. MD, 119.
17. CB.
18. MD, 146.
19. AE, quoted in MP3, on which the remainder of this section is based.
20. AH.
21. MH, including Hendricks quotations.
22. DC, including quotations.
23. RM.
24. KH1.
25. KH3.
26. KH4.
27. KH2.
28. See ED for an easy introduction to ideas about nanotechnology, including possible application to the problem of cryonic resuscitation.
29. MM suggested using deep learning methods to electronically reverse the damaging effects of cryopreservation.

SOURCES (REFERRED TO IN REFERENCES ALSO INTERNALLY):

AE. Albert Einstein, *The World as I see It*, abridged ed., http://cdn.preterhuman.net/texts/science_and_technology/physics/Albert%20Einstein%20-%20The%20World%20as%20I%20See%20it.pdf, accessed 12 Sep. 2015, quote from p. 7.

AH. Amy Harmon, "A Dying Young Woman's Hope in Cryonics and a Future," *New York Times*, 12 Sep. 2015, http://www.nytimes.com/2015/09/13/us/cancer-immortality-cryogenics.html?_r=0, accessed 2 Nov. 2015.

CB. Bylaws, Society for Cryobiology, Incorporated, amended May 15, 1995, <https://mega.nz/#!1Qd0SBZL!amSUIgluRM7LwAHaj0S9VWnpsEvOwu5ugBayigss3f0>, accessed 2 Nov. 2015.

DC. David W. Crippen, Robert J. Shmookler Reis, Ramon Risco, and Natasha Vita-More, "The Science Surrounding Cryonics," *MIT Technology Review*, 19 Oct. 2015, <http://www.technologyreview.com/view/542601/the-science-surrounding-cryonics/>, accessed 1 Nov. 2015.

EC. Evan Cooper, "How Reanimation of the 'Presently' Frozen Might Be Possible in the Future," *Freeze-Wait-Reanimate* 3, no. 27 (August-September, 1966), 3-4.

ED. K. Eric Drexler, *Engines of Creation: Challenges and Choices of the Last Technological Revolution*, Garden City, New York, Anchor Press, 1986.

IS. Isamu Suda, K. Kito and C. Adachi, "Viability of long term frozen cat brain in vitro," *Nature* 212 268-70: 15 Oct 1966; Gregory Fahy, private communication 14 Aug. 2012. The remarkable work of Suda and colleagues nearly a half-century ago has not been repeated but prominent cryobiologist Fahy has carefully examined it, including extensive unpublished notes supplied by the late Dr. Suda, and judges it scientifically sound.

KH1. Kenneth Hayworth, Brain Preservation Foundation, undated, <http://www.brainpreservation.org/team/kenneth-hayworth/>, accessed 3 Nov. 2015.

KH2. Kenneth Hayworth, Singularity 1 on 1: Brain Preservation is the Logical Lifeboat, 25 Jan. 2013, <https://www.youtube.com/watch?v=w6-cs-T0U6g>, 35:35-36:35, accessed 2 Nov. 2015.

KH3. Kenneth Hayworth, "I Am Kenneth Hayworth," 21 Nov. 2013, <https://www.reddit.com/r/IAMa/comments/1r6exr/>, accessed 3 Nov. 2015.

KH4. Kenneth Hayworth, "Ken Hayworth's Personal Response to MIT Technology Review Article," 16 Sep. 2015, <http://www.brainpreservation.org/ken-hayworths-personal-response-to-mit-technology-review-article/>, accessed 2 Nov. 2015.

MD. Michael Darwin, "Cold War: the Conflict between Cryonicists and Cryobiologists," PM 109-53, originally appeared in *Cryonics*, June, July, August 1991.

MH. Michael Hendricks, "The False Science of Cryonics," *MIT Technology Review*, 15 Sep. 2015, <http://www.technologyreview.com/view/541311/the-false-science-of-cryonics/>, accessed 1 Nov. 2015.

MM. Michael Maire, private communication (email) 17 Jun. 2015.

MP1. R. Michael Perry "For the Record," *Cryonics* 28(3) 28-31, 33 (3rd Quarter 2002).

MP2. Mike Perry (R. Michael Perry), "Death of Robert Prehoda," *Cryonics* 36(2), 7 (2nd Quarter 2010), <http://www.alcor.org/Library/html/RobertPrehoda.html>, accessed 1 Nov. 2015.

MP3. R. Michael Perry, "Religion, Science, and Reductionist Prospects for an Afterlife: Amending the Thought of Einstein and Others," to appear in Charles Tandy, ed., *Death and Anti-Death 13*. Ann Arbor, MI: Ria University Press, 2015.

PM. *Preserving Minds, Saving Lives: The Best Cryonics Writing from the Alcor Life Extension Foundation*, Aschwin de Wolf, Stephen Bridge, eds., Ft. Lauderdale, Fla.: Commercial Printers, Inc., 2015.

RE1. Robert C. W. Ettinger, *The Prospect of Immortality*. Garden City, N.Y.: Doubleday, 1964. Reprint, London: Sidgwick and Jackson, 1965; Oak Park, Mich.: Immortalist Society, 1987.

RE2. Robert C. W. Ettinger, letter, *Freeze-Wait-Reanimate* 3, no. 27 (August-September, 1966), 5.

RE3. Robert C. W. Ettinger, Cryonet message #15333, 13 Jan. 2001, <http://www.cryonet.org/cgi-bin/dsp.cgi?msg=15333>, accessed 31 Oct. 2015.

RM. Ralph C. Merkle, "Cryonics, Cryptography, and Maximum Likelihood Estimation," PM 401-14, originally appeared in *Cryonics*, 2nd Quarter, 1995.

RP1. Robert W. Prehoda, "To Freeze the Dying or Dead at the Present Time Is Totally Unfeasible," *Freeze-Wait-Reanimate* 3, no. 27 (August-September, 1966), 1 (quoting material from an article by Prehoda in *Pageant*, April 1966), 1-2.

RP2. Robert W. Prehoda, *Suspended Animation: The Research Possibility That May Allow Man to Conquer the Limiting Chains of Time*. Philadelphia: Chilton, 1969, "The Lunatic Fringe," 100-110; "January 12, 1967," 111-120.

RS. T. Rees Shapiro, "Harold T. Meryman, 88, Dies; Found Method to Freeze Blood," *Washington Post*, 21 Jan. 2010, <http://www.washingtonpost.com/wp-dyn/content/article/2010/01/20/AR2010012004754.html>, accessed 2 Nov. 2015.



INTERVIEW WITH ROBERT W. PREHODA (1969)

Q & A

CRYONICS REPORTS: *What is your background?*

PREHODA: My degrees are in chemistry and my research experience has been focused primarily on propulsion chemistry (rockets, ramjets, etc.), although I have had considerable research experience in the biological sciences. I have participated in investigations of natural hibernation, partially successful attempts to induce hibernation in animals that do not hibernate, and unsuccessful experiments involving whole animal DMSO perfusion and freezing.

CRYONICS REPORTS: *When did you first become interested in the possibility of extending the human lifespan?*

PREHODA: I have been interested in life span extension since I was in my teens, and have been contacting scientists active in various phases of gerontology and reduced metabolism throughout the world since about 1950. Many of them are now close friends.

CRYONICS REPORTS: *How bright do you feel the prospect of immortality is?*

PREHODA: Immortality is statistically impossible because accidents would eventually eliminate all

individuals in any non-aging population. Extreme examples of unavoidable accidents include meteorite impact or a cosmic ray (heavy element ion) striking a suitable target atom nucleus in a vital portion of the brain. These and other extreme examples would rule out immortality. However, the human life span can be significantly extended via control of the aging process, human hibernation or a synergistic combination of both.

CRYONICS REPORTS: *What was your role in the freezing of Dr. Bedford?*

PREHODA: I was present at the request of Norman Bedford and served as his representative on that occasion. However, I am still opposed, as I was before Dr. Bedford's death, to freezing people at the present time because this money should be spent on research. Any human freezing is premature and without scientific basis until a mammal can be revived from the frozen state.

CRYONICS REPORTS: *What is the Bedford Foundation?*

PREHODA: It is an organization, set up by Prof. James H. Bedford before his death, whose only purpose is to engage in basic cryo-biological research.

CRYONICS REPORTS: *What activities is it engaged in? What are its plans?*

PREHODA: The Bedford Foundation started to undertake a program of research along the lines fully described in my new book on reduced metabolism, *SUSPENDED ANIMATION*. Unfortunately, litigation to break Dr. Bedford's will intervened, and the case has not been settled in the courts.

CRYONICS REPORTS: *What are the titles of your books and what are they about?*

PREHODA: *DESIGNING THE FUTURE, THE ROLE OF TECHNOLOGICAL FORECASTING* (Chilton Books, 1967) was the first American publication on technological forecasting and the importance of this new discipline to economic growth, education, military defense and the allocation of funds between contending R & D options. *EXTENDED YOUTH, THE PROMISE OF GERONTOLOGY* (G. P. Putnam's Sons, 1968) is the first popular book to be published since 1960 on the research areas that may allow senescence to be overcome. *SUSPENDED ANIMATION* (Chilton Books, 1968) is the first semi-popular book to deal with the research requirements and options that may allow human hibernation and cryogenic suspended animation to be achieved.

CRYONICS REPORTS: *What area of scientific research do you believe should receive first priority?*

PREHODA: Dr. John Bjorksten's molecular cross-linking aging research, which I believe will be recognized in the 1970's, as the most important and momentous scientific discovery of the 20th century.

CRYONICS REPORTS: *What are your immediate plans?*

PREHODA: My immediate plans include the continued refinement of technological forecasting methodology and the writing of a series of future-oriented books on emerging branches of applied biology and the

physical sciences. I will continue to do everything I can to promote responsible research in gerontology and reduced metabolism, with particular attention to my original conceptual research contributions to both of these vitally important branches of applied biomedicine. ■

FEARLESS IN THE FACE OF DEATH: BUDDHIST DETACHMENT, EPICUREAN EQUANIMITY, AND CONTEMPORARY IMMORTALISM

By Gregory Jordan

Buddhism and Epicureanism combat the fear of death by accommodating the emotions to the reasonable certainty of death. Contemporary immortalism (which includes projects such as life extension, cryonic suspension, and universal immortalism) argues that scientific and technological solutions to the problem of death can be found, thus questioning the inevitability of death. Buddhist, Epicurean, and contemporary immortalist approaches to death and the fear of death are explored, compared, and contrasted.

Death and the fear of death were prominent among the problems considered by many ancient religions. Buddhism and Epicureanism, in particular, proposed rational solutions to the fear of death, solutions which required counter-intuitive emotional assessments of the human condition and the nature of death. Buddhist and Epicurean solutions to the fear of death attempted to accommodate the emotions to the reasonable certainty of death. These solutions depended upon the assumption that death was inevitable.

In recent times, a kind of immortalism has arisen which challenges the assumption of death's inevitability. Expectations about future advances in science and technology have raised the prospect of combating death itself by rational methods. This contemporary immortalism does not assume the inevitability of death and sees the fear of death as both a logical warning and a problem to be solved. Questioning the inevitability of death disturbs the ancient rational solutions to the fear of death found in Buddhism and Epicureanism.

Buddhist Detachment

For one swept to old age / no shelters exist. / Perceiving this danger in death, / one should drop the world's bait and look for peace.

– Tripitaka. Sutta Pitaka, Samyutta Nikaya, Sagatha Vagga, Devaputtasamyutta, Uttara Sutta (2,19)

Early Buddhism was concerned with the problem of all types of suffering, especially the suffering caused by aging and death. The desire for immortality was recognized:

In beings subject to aging [and] death . . . the wish arises, "O, may we not be subject to aging [and] death." . . . But this is not to be achieved by wishing.

However, the inevitability of death was explicitly assumed:

It's impossible that one could forbid anything born, existent, fabricated, and subject to disintegration from disintegrating.

Even if people could extend their life spans significantly by rare techniques, they would still grieve over the deaths of their less-long-lived loved ones.

Even if a person lives a century / – or more – / he's parted / from his community of relatives, / he abandons his life / right here. . . . seeing the dead one whose time is done, / [thinks,] "I can't fetch him back."

For Buddhism, the root of all types of suffering, including grief and fear of death, was the desire for unchangeableness in a world in which all things were continually changing. Human beings themselves were seen as examples of constant change, part of a continuum of causes and effects which constituted the world.

People feared growing old and dying, according to this perspective, because they wished to stay the same. However, the very understanding of one's self as an unchanging entity, a single spirit or soul seems to be an error, since one continues to change throughout life, even from one life to another.

If self is defined as an entity that persists unchanged through time, and if there is no unchanging self that persists across time, then there is no self, and selflessness is the

genuine nature of the human condition. If this is so, then belief in an unchanging self is a delusion. If people cling to belief in an unchanging self, and if they desire such unchanging selves, then they will inevitably be frustrated by change, and this frustration will cause them to experience anguish.

For this suffering, Buddhism proposed the cure of detachment. Detachment embraced, as it were, the chaos and flux of change in the universe, finding joy in the very lack of desire for the universe to be otherwise. If people realized that they were not unchanging selves, and if they let go of their desire to be unchanging, then causes and effects could change around them, and change them, without causing them suffering. This detachment from one's self and all other objects of desire entailed letting go of the desire to have those things stay the same and letting go of the desire to have those things stay in the same, attached, relation to one's (nonexistent) self. According to Buddhism, this detachment eliminated the fear of death.

And who is the person who, subject to death, is not afraid or in terror of death? There is the case of the person who has abandoned passion, desire, fondness, thirst, fever, and craving . . . Then he comes down with a serious disease. As he comes down with a serious disease, the thought does not occur to him, "O, those beloved sensual pleasures will be taken from me, and I will be taken from them!" He does not grieve, is not tormented; does not weep, beat his breast, or grow delirious."

Buddhism accepted the prevalent traditional belief in reincarnation, but, perhaps surprisingly, reincarnation

did not solve the problem of fear of death. Reincarnation could not prevent the frustration of the desire for unchangeableness, since it led to separation from an old life, new suffering in a new life, and a new experience of aging, dying, and death. In fact, reincarnation *prevented* the release from suffering that even death as total annihilation might provide. Thus, for Buddhism, reincarnation was a problem not a solution.

According to Buddhist thought, perfect detachment from self eliminated intentional action, which depended upon the perception of selfhood and the valorization of selfhood. The elimination of intentional action in turn eliminated the causes of reincarnation — the regular consequence of intentional actions. Thus, detachment eliminated future birth (reincarnation), and by extension, future death.

With the arising of birth there is the arising of aging and death. With the cessation of birth there is the cessation of aging and death.

Therefore, the remedy Buddhism proposed for emotionally accepting the inevitability of physical death was detachment, and the remedy it proposed for endless future physical deaths (by reincarnation) was also detachment. Detachment was thus the price of overcoming fear of death in this life, and it was also the price of preventing any future deaths in future reincarnations.

Did Buddhist detachment depend upon a sleight of hand in denying the existence of the self? The criteria of eternity and identity (everlasting unchangeableness) were the grounds of being for many ancient ontologies. But it is possible to understand selfhood differently, as a dynamic, evolving, continuous pattern.

Buddhist scholars seem to have recognized this, because they saw reincarnation not as the preservation of an unchanging soul, but rather as the provisional transfer of some ever-changing elements. Later sects of Buddhism developed the concept of “mind-stream” to handle the continuity of patterns in the chain of causes and effects associated with a person. This allowed Buddhists to refer to the progression of an individual through many changes within one life and across many reincarnations. This mind-stream, then, was eternal and unchangeable as a *pattern*, but it was not eternal or unchangeable as manifested in a particular

self in a particular life. It was the particular self in a particular life which was subject to change, and it was this change which caused suffering.

Was Buddhism making a virtue of a necessity? Things do change, and people change over time. Accepting this fact of life would seem to be the reasonable course of action. A critical assumption in the framing of the problem here was that humans desire unchangeableness. Detachment as a solution depends on a presumed choice between two options, (1) chaotic change that destroys our attachments and frustrates our desires, and (2) an unattainable, pure, and eternal unchangeableness. Surely, however, many people do not desire pure unchangeableness, but rather reasonable control over the circumstances of their lives. They wish things to change, but only in certain ways. For example, we may want our friends to grow and mature, but we do not want them to sicken or die. We may want our bodily appearance to vary in beauty, but not to become ugly. It is possible to be happily attached to a continuity which changes in ways we like, by desirable variety, or by desirable progress and evolution—that is, changes which relate one instant of life to another, or one form of a self to another, in a positive and desired manner.

Detachment during suffering eliminates suffering, but detachment during enjoyment would seem to eliminate enjoyment. Is attachment necessary for enjoyment? If one enjoys something, one will reasonably wish it to continue so that one can continue enjoying it. It is not always the case that enjoyment will continue, but if it does, the desire to have the source of it continue is entailed. If one subtly separates enjoyment from the desire to continue enjoyment, provisional and temporary enjoyment is possible, but detachment means accepting an end to enjoyment, if the source of enjoyment must end. This subtle resignation confronts the emotion of frustration with the reasonableness of accepting the inevitable.

Buddhist detachment was a solution to the problem of death, grief, and fear of death which concluded that release from pleasure was necessary for release from suffering, and that an abandonment of pleasurable attachments is necessary to quell the suffering caused by the eventual, inevitable loss of all the sources of pleasure which constitute our lives.

Epicurean Equanimity

You have persuaded me to laugh at [death].

— Inscription of Diogenes of Oinoanda, fragment 73

For Epicureanism, fear was a central cause of human suffering, and fear of death was perhaps the strongest fear. In the *Tetrapharmakos*, a four-sentence distillation of Epicureanism, fear of death was explicitly repudiated: “Death is not to be feared.” (Warren 2002, 7).

Upon what basis did Epicurus repudiate fear of death? In a famous passage, Epicurus asserted,

Death is nothing to us, . . . because so long as we are existent death is not present and whenever it is present we are nonexistent. (Strodach 1963, Letter to Menoeceus 125)

That is, since conscious awareness ends with death, the state of death cannot be sensed or experienced by any person. From this statement, the implication is often drawn that the state of death cannot be considered a form of suffering or misfortune for a person who has died. But Epicurus’s point here may actually have been stronger than that.

By saying that life required real presence, he could conclude that life was the only possible state of existence for a human being. Life was the only possible field of concern for human thought and action, and death was impossible for sentient, aware persons to experience. By what at first seems a specious trick of definition, Epicurus conferred immortality on all humanity. This existential immortality combated the fear of death and thus in turn conferred equanimity upon the mind.

Is this equanimity reasonable? In everyday life, we must calculate how we are to preserve our lives and thus in some way we may take measures to avert death if we can. The Epicureans granted this much as preserving the good of life. The Epicurean was supposed to cultivate physical health in order to maintain life (Strodach 1963, Letter to Menoeceus 128).

[The wise Epicurean] . . . spares no effort in all those opportunities which can bring something better, in the expectation of living longer. And he takes particular care of his health and having considered illnesses and death he vigorously undergoes measures to ward them off.

Epicurean equanimity was supposed to combine with such efforts to make a long life possible to enjoy.

In what sense, however, can one preserve

life without regard for death? Presumably, any method to prevent death would work by preserving life. Combating death and perpetuating life seem to be two sides of the same coin. If Epicureans worked to preserve and prolong their lives, what would be gained by not fearing death, by adopting the attitude that “death is nothing to us”?

Epicurus’s definition of life put one’s own death beyond one’s notice and concern, because it involved one’s nonexistence. Even if one made plans for the future, these plans could never be frustrated because at the moment of death the plans would disappear at the same time as the one who made the plans.

Nevertheless, one would have no reason to try hard to preserve or safeguard one’s life if one did not attend to the phenomenon of death. The Epicurean who “considered illnesses and death” in order to “ward them off” perhaps had in mind an abstraction of death from the example of others who had sickened and died. But if “death is nothing to us” then one’s own death cannot be a possible concern. I may be aware that others sicken and die, and I may know how to prevent sickening and dying, but if “death is nothing” to me, then I am experientially immortal and so I will have no reason to take steps to ward off my own death. Although I can, practically, preserve my life without fearing death, I have no motive for doing so if I do not attend to the possibility of my death.

If Epicureanism was compatible with taking precautions to effectively prevent certain states that could cause death, how could the state that actually causes death be treated differently? What confers upon it a special status?

We fear things that we can avoid, and Epicureanism had a prominent concern with avoiding bad things that could be avoided. Still, the Epicurean language was careful—it is not the *possibility of death* that was not to be feared, but *death* that was not to be feared. The state of death must follow a failure to prevent possible death. What good, then, does it do us to believe that “death is not to be feared” if we already pursue the rather common-sense practice of attempting to avoid possible death?

The answer is that Epicureanism assumed the existence of a final failure to avoid possible death, resulting in a state of death. This death existed, for others

and also for ourselves: “Whenever [death] is present we are nonexistent.” Death is “nothing to us” in an emotional sense, that it is of no concern to us because we will not experience it. But it can have emotional meaning to us even if we do not experience it (by being dead or by avoiding being dead), if it is a possibility that we can avert. Our deaths can be important to us as states of affairs that we endeavor to avoid and prevent. But our deaths *should* be “something to us” only if we can effectively avoid and prevent them. Epicureanism seemed to grant that we *can* postpone certain possible deaths, and that we *should*. But those possible deaths are the exact possible deaths which we will not only be able to avoid, but that we will, in fact, avoid. The only reason for postulating a death that we should not fear would be the existence of a death that we will not be able to avoid, and that we will not avoid. If we could be certain that all deaths could be, and by our own efforts would be, avoided, then we would have no use for Epicurus’s remedy.

Epicureanism assumes mortality, the existence of an inevitable death, in order to assess it as a state of unconsciousness and nonexistence for the person who has died. It is this phenomenon, this unavowed death, which is evaluated emotionally as “nothing to us.” We may be aware of many possible deaths in our lives, and assess them as dangerous threats which we can avoid by our own efforts. These possible deaths are not “nothing” to us, and yet they are reasonable pretexts for fear.

Fear involves an emotional assessment of circumstances which may be dangerous. Fear is not useful to us if fear fails to enable us to avoid danger. However, fear is reasonable and useful if we are uncertain whether we are facing an avoidable or an unavoidable danger. Epicureanism then must assume that some possible death, at some point in one’s life, will result in an actual death, in order to assess that the fear of this actual death is unreasonable and useless.

The Epicurean remedy was thus an attempt to adapt the emotions, by reasoning, to the inevitability of death. If a death is avoidable, it is reasonable to fear it, and so be motivated to endeavor to avoid it. In such a case, it is the possibility of death which is the object of awareness and concern. A possible death that can be avoided is not

“nothing” to us. Epicureanism does not explain how we can distinguish between an avoidable and an unavoidable death, and so it cannot be clear to us which possible death will result in our actual death (which we have no reason to fear) and which possible death will be successfully averted by our own efforts (which we *should* fear so that we can be motivated to avert it). If we assume every possible death we encounter in our lives, that is, every deadly danger, is one we can resolve satisfactorily by our own effort, then we must reasonably fear every possibility of death. This is the most reasonable way we can best preserve our goods, including our lives.

However, Epicureanism assumed that there would certainly be an unavowed death, which we might not be able to identify in advance, which was what should be “nothing” to us, and which should not be feared. This implied that we would certainly fail to avert one possible death, and that we must someday lose all our goods, that is, our lives. Thus, for Epicureanism, freedom from fear of death was bought at the price of assuming the inevitability of death.

Contemporary Immortalism

Death is an imposition on the human race, and no longer acceptable. . . . Mobilize the scientists, spend the money, and hunt death down like an outlaw.

– Alan Harrington, *The Immortalist* (1969)

The rational approaches to death and fear of death in Buddhism and Epicureanism assumed the inevitability of death, but then suggested ways one could look upon this eventuality with detachment or equanimity. These approaches were not necessarily opposed to the possibility, or desirability, of prolonging life by ordinary care for one’s body, using existing medical practices, and avoiding unnecessary dangers. However, neither Buddhism nor Epicureanism took into consideration any possibility of indefinitely prolonging life.

The last hundred years or so, however, have seen many dramatic advances in medicine and biology. Scientists have begun exploring the causes of aging and methods for intervening in them to slow, stop, or even reverse aging (Panno 2005). It now seems plausible to wonder if extremely advanced medicine and biotechnology of the future might be able to prevent aging or all natural causes of death. Nanotechnology (Drexler 1986) and

new methods of freezing (Pichugin et al. 2006) may give new support for the idea of cryonics.

Developing and implementing scientific and technological strategies to prevent and reverse death may be considered the goals of a renewed, contemporary immortalism. Contemporary immortalism's novel approach is to try to combat the problem of death and fear of death in the most direct way possible—by eliminating it. Contemporary immortalism includes a diverse variety of specific projects, but among the most noteworthy are life extension, cryonic suspension, and universal immortalism.

LIFE EXTENSION

[In the future] all diseases may by sure means be prevented or cured, not excepting even that of old age, and our lives lengthened at pleasure even beyond the antediluvian standard.

– Benjamin Franklin, letter to the scientist Joseph Priestly in 1780

Life extension includes a wide variety of dietary and medical interventions to increase lifespan—for example, calorie restriction (Delaney and Walford 2005; Masoro 2002) or calorie-restriction mimetics such as resveratrol, antioxidants, phytochemicals, comprehensive nutritional supplementation, and scrupulous diagnostic and preventive health care—in addition to following the usual recommendations of weight control, exercising, healthy habits, and risk-avoidance.

These practices, in themselves, do not constitute immortalism if the aim is only to lengthen life or increase the quality of life. Contemporary immortalists, however, pursue life extension in order to live long enough to take advantage of the more effective medical technologies which they assume will exist in the future, thus allowing them to extend their lives even further, and so on until the time when lifespan can be extended indefinitely (Kurzweil and Grossman 2004, 14-32; De Grey 2005). Then, the only danger of death would be by accident, a danger which might also be avoided by additional future technology.

CRYONIC SUSPENSION

The fact: *At very low temperatures it is possible, right now, to preserve dead people with essentially no deterioration, indefinitely...*

The assumption: *If civilization endures, medical science should eventually be able to repair*

almost any damage to the human body, including freezing damage and senile debility or other cause of death.

Hence we need only arrange to have our bodies, after we die, stored in suitable freezers against the time when science may be able to help us.

– Robert Ettinger *The Prospect of Immortality*

It is possible, in some cases, for death not to be avoided, but also not to be permanent or irreversible. The notion of *temporary death* confounds traditional definitions of death, which associated it with a permanent condition. Since the invention of cardiopulmonary resuscitation (CPR), over two hundred and fifty years ago, the understanding of death as the cessation of certain vital functions such as breathing and heartbeat has had to accommodate the fact that these vital functions, once stopped, can be restarted under the right circumstances. Today many cases of “death” can be reversed by a variety of methods—mouth to mouth resuscitation, cardiac pulmonary resuscitation, vasopressin, defibrillators, and so on—and, as medical technology advances, more cases of death are being reversed all the time. Death is now even medically induced in some cases, because it can be so reliably reversed.

However, a particular death is usually considered reversible only if the technologies to reverse it already exist and only if they are employed in a short, controlled amount of time. Since it seems likely that new technologies for reversing death will be invented in the future, contemporary immortalists have argued that it would be best to preserve those patients whose deaths cannot be presently reversed, in case their deaths might be able to be reversed by future medical technologies. Such resuscitation would depend upon preserving a patient for an indefinite period of time, as well as developing more advanced medical technologies in the future. Cryonic suspension is the practice of preserving the “dead” by freezing (Ettinger 1964; Drexler 1986, 130-46; Immortality Institute 2004).

Universal Immortalism

Humans admit nature to be a blind force even when they regard themselves as part of it and accept death as a kind of law and not as a mere accident which permeated nature and became its organic vice. Yet death is merely the result or manifestation of our infantilism. Death can be called real only when all

means of restoring life, at least all those that exist in nature and have been discovered by the human race, have been tried and have failed... Mortality is an inductive conclusion. We know that we are the offspring of a multitude of deceased ancestors. But however great the number of the deceased, this cannot be the basis for incontrovertible acceptance of death because it would entail an abdication of our filial duty. Death is a property, a state conditioned by causes; it is not a quality which determines what a human being is and must be.

– Nikolai F. Fedorov, *What was man created for? The philosophy of the common task.*

If it is true that science and technology will continue to advance indefinitely, then it must follow that future technologies and the feats possible by them may at some point exceed even our wildest imaginations. As Arthur C. Clarke said, ‘any sufficiently advanced technology is indistinguishable from magic.’ It is unclear, then, for contemporary immortalists, where to draw the line of hope, and some have concluded that there is, in fact, no reason to draw a line at all. Science in the future might reveal ways by which people from the past could be brought back to life, even if their bodies were not preserved by means such as cryonic suspension.

Universal immortalism is the belief in the possibility and desirability of developing material technologies advanced enough to bring back to life all those who have ever lived. The technologies that would be required for such a feat, such as universe simulations, wormholes in space-time, parallel universes, or time travel, are certainly much more remote and hypothetical than those of either life extension or cryonic suspension.

Universal immortalism, however, is the form of contemporary immortalism that can address the problem of grief over loved ones who have died without being physically preserved. It can also suggest a way to act on the ethical concern for human beings in the more distant past whose lives, even if they have long since been forgotten by people today, were in their time just as important to them as our lives are to us. All those who have ever wished to live longer, who have had enough sense of the possibilities of their own lives extending into the future, may be considered to have suffered by being limited to finite life spans. In this train of thought, if it were possible to extend lifespan indefinitely, even beyond

the lifespan of this universe, it would be unethical not to try to share this lifespan with all people who have ever lived.

Problems

Although contemporary immortalism sets forth future scenarios, these still remain possibilities rather than certainties. Contemporary immortalism, then, combats a basic source of fear—the phenomenon of death itself as a physical and mechanical problem, while at the same time introducing reasons for at least two new fears: (1) the fear that immortalist technologies will fail to develop at all, even though they are theoretically possible, and (2) the fear that immortalist technologies will develop, but fail in particular instances (for example, one's own case).

For example, life extension might be theoretically possible, but the technologies to extend lifespan indefinitely might never develop because of lack of funding, lack of political support, and so on. Also, life extension practices might work, but not well enough for some individuals to live long enough to use medical technologies for indefinite life extension.

The Effort of Immortality

Life extension, cryonic suspension, and universal immortalism all propose methods of combating the fear of death by combating death, yet all of the contemporary immortalist proposals require incredible effort and dedication to research and development. Is life really worth this much effort?

From a Buddhist point of view, to live is to suffer. Longer life means longer suffering, since aging, grief, and death are only some of the examples of suffering we experience in life. Buddhist detachment is part of a larger strategy against suffering, not just death and fear of death. But surely in a calculation of value that includes the value of pleasure and happiness in life as well as suffering, eliminating the suffering caused by aging and death must be significant.

Buddhist detachment is not ascetic in the sense that it finds fault with concern for the health of one's body. But if one is not attached to one's life, there can be no reason to introduce suffering for the sake of extending that life forever. The Buddhist remedy for suffering caused by death is not to restore life, but to cultivate detachment from life.

And how, monks, does one not yearn for the future? He thinks: "I may have such form in the future" but brings no delight to bear on it. He thinks: "I may have such feeling... such perception... such formations... such consciousness in the future" but brings no delight to bear on it. That is how, monks, one does not yearn for the future.

However, the entire purpose of detaching one's self from one's life was to avoid the suffering that would be caused by losing it. If it were not certain that one would lose one's life, then the purpose of detachment would be put into question and it would become possible again to consider that it might be valuable to suffer in order to live.

Epicureans might also have questioned the value of suffering in order to extend one's life. Even if Epicurean equanimity grants preserving one's goods (in this case, one's life), still life extension invokes a notion that longer life is of greater value than shorter life, a notion which Epicureanism vigorously denied.

Infinite and finite time afford equal pleasure, if one measures its limits by reason.

Epicureans invoked a large set of arguments against the value of longer life so that the frustration of the desire for a longer life would not make fear of death reasonable. For example, it was argued that pleasure had natural limits; that once the maximum of pleasure had been attained, there was only variety of pleasures; and that indulging in insatiable desires was unreasonable.

It would be impossible within the space of this paper to fully treat these arguments, but in general it will be noted that the assumption about the inevitability of death was also key here.

Bodily pleasure seems unlimited, and to provide it would require unlimited time. But the mind, recognizing the limits of the body, and dismissing apprehensions about eternity, furnishes a complete and optimal life, so we no longer have any need of unlimited time... When the end of life approaches, [the mind] does not feel remorse, as if it fell short in any way from living the best life possible.

Epicurean equanimity depends upon the mind's recognition and acceptance of the "limits of the body," including the "end of life." A desire for infinite variety of pleasures and infinite duration of pleasures is insatiable only if its object is, in fact, unattainable. But contemporary scientists are not agreed that lifespan must be

limited. It is not even clear that the capacity for pleasure is strictly limited. Epicurean equanimity depends upon the notion of "the best life possible," and thus upon the entire theory of what is possible and what is impossible.

In addition, Epicureans typically denied that the future would contain any novelty.

Do you expect me to invent some new contrivance for your pleasure? I tell you, there is none. All things are always the same.

This argument seems fairly weak. Even by ancient standards, the variety of specific changes observable throughout a person's life must be reasonably considered as novelty, even if not very marked or significant novelty. If, as Epicureanism maintained, the universe was eternally old, all arrangements of atoms would endlessly recur. But this would not be apparent to any individual who was not eternally old, because that person would not have experienced all the arrangements of atoms.

Contemporary science holds that nature itself can produce novelty through emergence and evolution, and contemporary technology has advanced and produced many "new contrivances" indeed. Historically, along with the growing perception of significant progress in human affairs has come a concomitant frustration with limited lifespan, with the inability to live long enough to see a better, or at least very different, future. In the context of expectations of the future, the human lifespan has come to be seen as a limit on the ability to enjoy and understand the world.

Even though Epicureanism argued that there was no novelty in the world, it was still prepared to combat the notion that a life could be considered incomplete because of premature death. In order to feel as though one might die prematurely, or live an incomplete life, one would have to grant physical reality to a life not lived, to time not experienced, which is impossible by the Epicurean framing of the problem. Whatever experiences one *will not* experience are *not* one's experiences; they do not form part of one's life. Therefore, by definition, no one's life can actually be curtailed in any way. The length of a life is whatever length it is found to be by the limits of experience.

However, we do not form our emotions on the basis of experience only, but also on the basis of expectations about the

future. If we do not know for sure whether or not we will live or die, then a possible death could be imagined as cutting short a possible life. If this doubt cannot be resolved in any way, then any emotional assessment is useless.

It should be borne in mind, then, that the time to come is neither ours nor altogether not ours. In this way we shall neither expect the future outright as something destined to be nor despair of it as something absolutely not destined to be. (Strodach 1963, Letter to Menoeceus 127)

But to be perfectly in doubt about the resolution implies an inability to affect the outcome. If we are faced only with possible futures about what is destined to be and what is destined not to be, then our emotional assessment is irrelevant—we cannot affect the outcome and thus our emotions are useless to motivate us to effectively bring about a desired state of affairs. Epicurean equanimity rejects both expectation and despair as useless, but it also rejects *fear*, which is the emotion which could motivate us to do what we must do in order to stay alive.

The Need for Eternal Life

Epicureans might have argued that the desire for life extension is an “unnecessary” desire.

All desires which create no pain when unfulfilled are not necessary; such desires may easily be dispelled when they are seen as difficult to fulfill or likely to produce harm.

If we accepted this argument, we could conclude that the desire for indefinite lifespan is an unnecessary desire, since when it is unfulfilled (if a person dies), there is no pain. If extending lifespan indefinitely required the slightest pain, it would thus detract from the overall happiness in a person’s life. Thus Epicureans must argue against life extension even if life extension were merely “difficult to fulfill,” let alone impossible.

However, surely *necessity* must be judged from the vantage point of the living, since the dead have no vantage point—the dead are nonexistent, according to Epicureanism, and so they need nothing and desire nothing. It does not matter, then, to the dead if they experience no pain *when* they are dead; what is important to the living is the life they stand to keep *if* they do not die.

While we are still alive, and as long as we think we might be able to avert death, our

longer life and its greater happiness are still real possibilities. Once the *possible* loss of life becomes real in death, those who stand to lose something become nonexistent at the same moment that the thing which they stood to lose, the longer life, is also found to be nonexistent. However, while we are alive, if we do not know whether or not a particular danger will surely result in our deaths, then life and death are both real possibilities, and we are faced with choices.

Our emotions analyze circumstances with regard to our safety or danger. We do not only desire the things that we desire while we are alive; we also desire to be safe from deadly danger—that is, we desire to stay alive. It is this desire which leads us to try to avert deadly harm and loss of life, and to seek the pleasure and benefits available from a longer life. This desire could be considered an unnecessary desire only if death were inevitable, so that we could speak of conditions obtaining *when* the desire is not fulfilled.

If it is not certain whether or not the desire to stay alive will be fulfilled or unfulfilled, then in such a case the desire to stay alive cannot be judged necessary or unnecessary because of lack of information about the future. If we knew that this desire enabled future life, then it would have to be judged necessary because its fulfillment would be the precondition for the existence of a being about whom it could be predicated that there is happiness. What is central in the Epicurean argument against the necessity of desiring to live indefinitely is the pessimistic assumption that death is inevitable. This argument would be valid only if an actual end of life were approaching, and only if one were absolutely certain that this was the inevitable end.

The Need for Resurrection

Epicureans might also find it difficult to be concerned about those in the past who have died. If the dead are nonexistent, then they could not be an object of concern. Their desires and their ambitions to continue living died with them. Although the living can care to live, the dead are without cares; therefore, the dead cannot be raised to satisfy them or for their sake.

The ethical basis of universal immortality seems to be the common responsibility of human beings to each other, or concern for each other, regardless of how they are

separated in time or space. According to modern physics, the past, while practically inaccessible, is not “nonexistent” in the absolute sense. If time is a dimension, then the past exists in a timeless sense, just as much as the present. “So long as we are existent death is not present”—but if death merely interrupts part of our lives (as it would in both cryonic suspension and universal immortality), then discontinuity in life must be acknowledged even if death is not. If resurrected persons were to look back on their lives before the discontinuity of death, they would reasonably judge themselves to have been “existent” at that time.

Therefore, we cannot, in the terms of Epicureanism, judge the dead to be nonexistent unless such a resumed life will never take place. Everyone who *will* exist again in the future can be an object of our ethical concern. If we are not certain whether or not the dead will be resurrected, then we could not decisively dismiss the dead as nonexistent. The resurrected dead may experience the resumption of their lives as the absence of death, but the gap in their lives will be the consequence of death on their lives and their existences. Death will not be “nothing” to them, and the dead in that case would not be “nothing” to us. Epicurean equanimity depends upon rejection of the possibility of resurrection. If it were possible to be resurrected after death, then the possibility of missing this resurrection would be a reason for fear, and this fear would motivate one to do whatever is in one’s power to be resurrected.

Conclusion

Buddhism, Epicureanism, and contemporary immortality all confront the problem of death and the proper emotional reaction to death. Buddhism and Epicureanism assume the inevitability of death and thus work to adapt the emotions to that phenomenon, modulating the natural and spontaneous human tendency to fear death into a calm detachment or serene equanimity that extends throughout life. The inevitability of death is not only a fundamental assumption of these religions; in both cases, the inevitability of death is one of the main starting points for a train of logic which developed many of the distinctive beliefs of both religions. Given that death is inevitable, how should we handle our fear of death?

Contemporary immortalism uses the resources and methods of modern science and technology to approach the same question from a novel direction. In the traditions of empiricism and progress, it responds to the problem of death by hypothesizing, developing, and promoting rational, scientific, and applied technological methods to combat death as a natural phenomenon. Contemporary immortalism thus revisits one of the fundamental assumptions of both Buddhism and Epicureanism, namely, the inevitability of death.

For contemporary immortalism, the Buddhist and Epicurean approaches could be cast as forms of resignation and fatalism. If we do not lose our lives, then we will not suffer from being separated from them. If we will not suffer separation from our lives or the lives of our loved ones, then we do not need to be detached from them. If we have a future, we do not need to be detached from it, and yearning for the future will not be frustrated or result in suffering. Rather than equanimity, contemporary immortalism might suggest, what we need now is an urgent research program. The Epicurean approach that “neither begs off from living nor dreads not living” (Strodach 1963, Letter to Menoecus 126) would lack the confidence and vision necessary for the technical development of physical immortality.

For many religious traditions, beliefs about death and solutions to the problem of death and fear of death lie at or close to their cores, comprising some of their most valued beliefs. Contemporary immortalism’s goal of eradicating the physical phenomenon of death obviously has profound consequences for all the religious traditions which assume the inevitability of death. Until now, religions have arisen within, and defined themselves by, a human condition which has always included mortality. Contemporary immortalism challenges the very nature of that human condition. ■

REFERENCES

- Cetron, Marvin, and Owen Davies. *Cheating Death: The Promise and Future Impact of Trying to Live Forever*. New York: St. Martin’s Press, 1998.
- Clarke, Arthur C., and Stephen Baxter. *The Light of Other Days*. New York: Tor, 2000.
- De Grey, Aubrey. “A Strategy for Postponing Aging Indefinitely.” *Studies in Health Technology and Informatics* 118 (2005): 209-19.
- Delaney, Brian M., and Lisa Walford. *The Longevity Diet*. New York: Marlowe & Co., 2005.
- Deutsch, David. *The Fabric of Reality*. New York: Penguin Books, 1997.
- Drexler, K. Eric. *Engines of Creation*. Garden City, NY: Anchor Press/Doubleday, 1986.
- Fedorov, Nikolai Fedorovich. *What was man created for? The philosophy of the common task*. Selected works translated from the Russian and abridged by Elisabeth Koutaissoff and Marilyn Minto. N.p.: Honeyglan Publishing/L’Age d’Homme, 1990.
- Ettinger, R. C. W. *The Prospect of Immortality*. Garden City, NY: Doubleday, 1964.
- Gruman, Gerald J. “A History of Ideas about the Prolongation of Life: The Evolution of Prolongevity Hypotheses to 1800.” *Transactions of the American Philosophical Society* 56 (1966) pt. 9.
- Immortality Institute. *The Scientific Conquest of Death: Essays on Infinite Lifespans*. Buenos Aires: Libros en Red, 2004.
- Kurzweil, Ray. *The Singularity is Near: When Humans Transcend Biology*. New York: Viking, 2005.
- Kurzweil, Ray, and Terry Grossman. *Fantastic Voyage: Live Long Enough to Live Forever*. Rodale. 2004.
- Lobo, Francisco, S. N. “Phantom Energy Traversable Wormholes.” *Physical Review D* 71 (April 13, 2005) 084011.
- Masoro, Edward J. *Caloric Restriction: A Key to Understanding and Modulating Aging*. Boston: Elsevier, 2002.
- Merkle, Ralph C. “Molecular Repair of the Brain.” *Cryonics* (January 1994): 16-31, (April 1994): 20-32. Also available at <http://www.merkle.com/cryo/techFeas.html>.
- Panno, Joseph. *Aging: Theories and Potential Therapies*. New York: Facts on File, 2005.
- Pearce, David. *The Hedonistic Imperative*. <http://www.hedonistic-imperative.com>.
- Perry, R. Michael. *Forever for All*. U.S.A.: Universal Publishers, 2000.
- Pichugin, Yuri, Gregory M. Fahy, and Robert Morin. “Cryopreservation of Rat Hippocampal Slices by Vitrification.” *Cryobiology* 52 (2006): 228-240.
- Strodach, George K. *The Philosophy of Epicurus*. Northwestern University Press, 1963.
- Tandy, Charles, ed. *Death and Anti-Death, Volume 1: One Hundred Years After N. F. Fedorov (1829-1903)*. Palo Alto, California: Ria University Press, 2003.
- Tipitaka: The Pali Canon. <http://www.accesstoinight.org/canon>.
- Tipler, Frank J. *The Physics of Immortality: Modern Cosmology, God, and the Resurrection of the Dead*. New York: Anchor Books, 1995.
- Walford, Roy L. *Maximum Life Span*. New York: W. W. Norton & Company, 1983.
- Warren, James. *Epicurus and Democritean Ethics: An Archaeology of Ataraxia*. Cambridge: Cambridge University Press, 2002.

CRYONICS AS A MEASURE OF RATIONALITY?

By Aschwin de Wolf

Most cryonics advocates are often frustrated by the amount of irrationality, ignorance, and hostility when other people encounter the idea of human cryopreservation. It should not be surprising then that some of us have simply concluded that most people “just don’t get it.” Which raises an important question. Is making cryonics arrangements a strong measure of rationality? After all, a close examination of Alcor members indicates that most of them are highly educated, a disproportionate number of them have PhDs, and their backgrounds are often in fields where strong analytic skills are required; computer science, neuroscience, biochemistry, etc. Another indicator is that cryonics is relatively popular in communities with a high proportion of “nerds.” In fact, a number of “leaders” in the “rationality” community (Robin Hanson, Eliezer Yudkowsky) have cryonics arrangements and have made public arguments in favor of cryonics. In short, one could argue that someone who has made cryonics arrangements is not prone to short term gratification and minimizes cognitive biases, one could argue.

The problem with this characterization of cryonics as a measure of rationality is that it does not explain why the overwhelming number of people who can be considered highly analytical or rational have not made cryonics arrangements. Many cryonicists are smart but most smart people are not cryonicists. To explain this we will have to look elsewhere.

The 18th century skeptic and analytical philosopher David Hume once wrote that “reason is a slave to the passions.” In the case of cryonics, no matter how smart a person is, if the person does not have a passion for life (and an aversion to death and aging), that person will not be primed

for an enthusiastic personal endorsement of cryonics. Closely related to having a desire to live and to pursue life extension is an optimistic temperament. A cryonicist is not necessarily “wildly” optimistic, but (s)he should at least think that life is worth living and not be prone to thinking about the future in dystopian terms. I am also inclined to think that such a person is prone to think “like an economist” (to use Bryan Caplan’s phrase). By this I mean that a person can think in a probabilistic manner, does not see the world as a “zero-sum game,” and sees developments like automation, computerization and biotechnologies in a positive light.

Do these combined traits produce a favorable attitude towards cryonics? This still cannot be the complete story because the traits discussed so far are shared by many millions of people in the world and support for cryonics is extremely small. I want to single out two additional traits that are usually required to prime someone for cryonics. The person also needs to be a non-conformist of some kind. When cryonics is as small as it is, strongly endorsing cryonics makes someone stand out (to put it mildly). And this “standing out” is not comparable to just having a bizarre hobby or a strange sense of style. It can sometimes produce confusion or hostility in other people, which can turn even our most life-affirming friends and family into apologetic pro-mortalists.

The most important trait, in my opinion, and the one that really distinguishes the cryonicist from the non-cryonicist, is the ability to deal with vulnerability, uncertainty and the unknown — in some cases, to even welcome it. People who have been around in cryonics for awhile know that ultimately (that is, when you dig a little deeper) skeptics are really afraid to be resuscitated in a

distant and unknown future. This should not be easily dismissed. Personal identity is not identical to the brain or the body (as a simplistic version of cryonics would have it) but extends to all the things and people that have become part of a person’s life. To many people, the cryonics proposal means survival at the cost of losing everything that gives meaning to their lives.

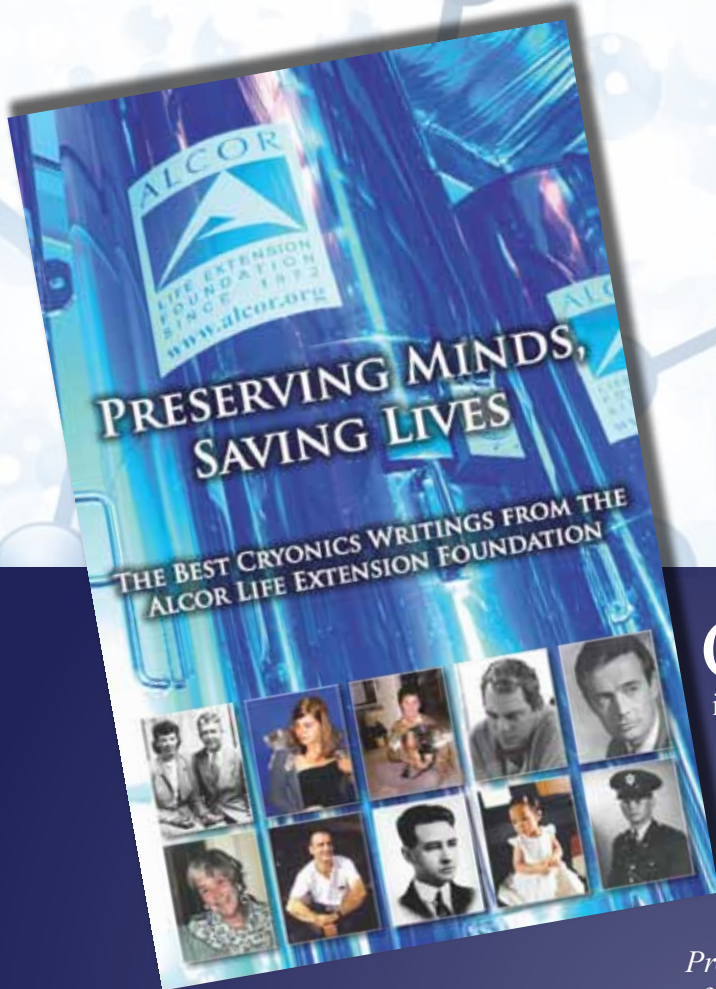
If we look at the limited acceptance of cryonics from this perspective, does this inspire optimism in persuading more people? An immediate response would be negative because fundamental character traits are hard to change. Another approach, however, is to change the conceptualization and delivery of cryonics so that these fears are not triggered. In particular, it might serve a cryonics organization well to transition from an organization that just “stores” a human body or brain without specific resuscitation and reintegration scenarios to an organization that offers more comprehensive means of identity preservation. Such an organization puts a strong emphasis on the cryopreservation of families and friends. It will offer means of preservation of assets and personal belongings. It develops specific resuscitation protocols which are updated and calibrated as our knowledge and technologies improve. And it makes serious efforts to provide a reintegration program which seeks to minimize adjustment to the time in which an individual is resuscitated.

Is endorsement of cryonics a measure of rationality? Yes, but without a desire to live, a reasonably optimistic attitude, an independent mindset, and, most of all, confidence in a cryonics organization to preserve all that is important to a person, being smart by itself is not going to do it. ■

**ORDER
NOW!**

PRESERVING MINDS, SAVING LIVES

THE BEST CRYONICS WRITINGS OF THE ALCOR LIFE EXTENSION FOUNDATION



“Cryonics magazine introduced me to Alcor and cryonics at its best back in 1983. The visions and technological breakthroughs that you will read about in this book continue to shape Alcor’s mission to preserve life through science.”

– Max More, Ph.D.
President and CEO of Alcor

Cryonics is an experimental medical procedure that uses ultra-low temperatures to put critically ill people into a state of metabolic arrest to give them access to medical advances of the future. Since its inception in the early 1960s, the practice of cryonics has moved from a theoretical concept to an evidence-based practice that uses emergency medical procedures and modern vitrification technologies to eliminate ice formation.

Preserving Minds, Saving Lives offers an ambitious collection of articles about cryonics and the Alcor Life Extension

Foundation. From its humble beginnings in 1972, and its first human cryonics patient in 1976, Alcor has grown to a professional organization with more than 1,000 members, more than 140 human patients, and more than 50 pets, all awaiting a chance to be restored to good health and continue their lives.

This book presents some of the best cryonics writings from *Cryonics* magazine from 1981 to 2012. There are clear expositions of the rationale behind cryonics, its scientific validation, and the evolution of Alcor procedures. Also covered are repair and resuscitation scenarios, philosophical issues associated with cryonics, and debates within the cryonics community itself.

Soft Cover Edition: \$20 – Hard Cover Edition: \$35

To order your copy, go to: www.alcor.org/book

or call 1-877-GO ALCOR (462-5267)

Table of Contents

Foreword: Cryonics and Hope • Introduction

WHAT IS CRYONICS?

Why We Are Cryonicists • Cryonics: Using Low Temperatures to Care for the Critically Ill • Medical Time Travel • The Bricks in the Wall

HISTORY OF CRYONICS

John Hunter, Cryonics Forerunner • The Society for the Recovery of Persons Apparently Dead • Riding the Jameson Satellite • The First Cryonicist • Robert Ettinger: Some Brief Historical and Personal Notes • Notes on the First Human Freezing • The Realities of Patient Storage • Suspension Failures: Lessons from the Early Years • Dear Dr. Bedford • Robert Nelson and the Bedford Freezing: A Comment • Cold War: The Conflict Between Cryonicists and Cryobiologists

HISTORY OF ALCOR

A Brief History of Alcor • Where did the name Alcor come from? • New Home, New Life: Alcor Moves to Arizona • The Alcor Patient Care Trust

RESEARCH IN CRYONICS

Evaluation of the Condition of Dr. James H. Bedford after 24 Years of Cryonic Suspension • A Brief History of Alcor Research • The 21st Century Medicine Seminar: Amazing Breakthroughs in Cryobiology and Resuscitation Systems for Intermediate Temperature Storage for Fracture Reduction and Avoidance

ALCOR PROCEDURES AND TECHNOLOGIES

How Cold is Cold Enough? • History of DMSO and Glycerol in Cryonics • Mathematical Analysis of Recirculating Perfusion Systems, with Application to Cryonic Suspension • Getting to 8M Glycerol and Other Perfusion Problems • How Cryoprotectants Work • Vitrification Arrives: New Technology Preserves Patients without Ice Damage • New Cryopreservation Technology • Cooling Down • Elements of a Transport • Cardiopulmonary Support in Cryonics: The Significance of Legal Death in Cryonics • Rapid Stabilization in Human Cryopreservation • Securing Viability of the Brain at Alcor • Case Reports in Cryonics

RESCUSCITATION OF CRYONICS PATIENTS

To Wake Refreshed • The Anabolocyte: A Biological Approach to Repairing Cryoinjury • Cell Repair Technology • Realistic Scenario for Nanotechnological Repair of the Frozen Human Brain • A Cryopreservation Revival Scenario Using MNT • Neural Archaeology • Cryonics, Cryptography, and Maximum Likelihood Estimation • Information Storage and Computational Aspects of Repair

PERSPECTIVES ON CRYONICS

A Message for Terminal Patients • The Death of Death in Cryonics • Why Suspension Members Need More Than Minimum Funding • Conservative Medicine • Binary Statutes, Analog World: Burke's Paradox and the Law • Why a Religious Person Can Choose Cryonics • Cryonics and Emergency Medicine • Ethics of Non-ideal Cryonics Cases • Let's Talk About Cryonics • How to Protect Your Cryonics Arrangements from Interference by Third Parties

DEBATES WITHIN CRYONICS

But What Will the Neighbors Think? A Discourse on the History and Rationale of Neurosuspension • The Neurocryopreservation Option: Head First Into the Future • The Case for Whole Body Cryopreservation • Responsibility, Probability, and Durability • The "I" Word • The Road Less Traveled: Alternatives to Cryonics • The Myth of the Golden Scalpel • Has Cryonics Taken the Wrong Path?

Afterword • Biographies of Contributors

"Society's failure to take cryonics seriously is a tragedy that is probably costing countless lives. Alcor, notably via its magazine, is leading the fight to change that."

– Aubrey de Grey, Ph.D.

Biomedical Gerontologist and Chief Science Officer
of the SENS Research Foundation

"Alcor appears to be the leading organization in the application of cryonics in medicine.

I'm proud to be a part of this effort."

– Michael D. West, Ph.D.

Stem Cell Scientist and Chief Executive
Officer of BioTime, Inc.

THE SCIENCE SURROUNDING CRYONICS

First published in MIT Technology Review, October 19, 2015

By David W. Crippen, Robert J. Shmookler Reis, Ramon Risco, and Natasha Vita-More

What the nervous system of the roundworm, frozen embryos, and extreme hypothermia tell us about preserving the mind.



A roundworm hatches larvae after being cryopreserved.

Last month, the New York Times published a front-page article about Kim Suozzi and her decision, at the age of 23, to have her brain cryopreserved after learning she had terminal cancer. Her hope was to be able to preserve biological information that could someday be used to restore her mind, a practice known as cryonics. Michael Hendricks subsequently published a critique of this concept in MIT Technology Review (see “The False Science of Cryonics”). While his article focuses primarily on hypothetical brain “uploading” to computers, he and others have raised an intriguing question: can any technology, even in principle, preserve the unique features of an individual’s mind?

We agree there is more to the mind than the synaptic connections between neurons. The exact molecular and electrochemical features of the brain that underlie the conscious mind remain far from completely explored. However, available evidence lends support to the possibility that brain features that encode memories and determine behavior can be preserved during and after cryopreservation.

Cryopreservation is already used in laboratories all over the world to maintain animal cells, human embryos, and some organized tissues for periods as long as three decades. When a biological sample is cryopreserved, cryoprotective chemicals such as DMSO or propylene glycol are added and the temperature of the tissue is lowered to below the glass transition temperature (typically about -120°C). At these temperatures, molecular activities are slowed by more than 13 orders of magnitude, effectively stopping biological time.



Researchers are attempting to preserve whole organs at ultra-low temperatures. The animal kidney at left is frozen at -140°C , while the kidney at right is preserved in a glass-like state called vitrification.

Although no one understands every detail of the physiology of any cell, cells of virtually every conceivable kind are successfully cryopreserved. Similarly, while the neurological basis for memory, behavior, and other features of a person’s identity may be staggeringly complex, understanding this complexity is a problem largely independent of being able to preserve it.

Direct evidence that memories can survive cryopreservation comes from the

roundworm *Caenorhabditis elegans*, the very animal model discussed in Hendricks’s response. For decades *C. elegans* have commonly been cryopreserved at liquid nitrogen temperature and later revived. This year, using an assay for memories of long-term odorant imprinting associations, one of us published findings that *C. elegans* retain learned behaviors acquired before cryopreservation. Similarly, it has been shown that long-term potentiation of neurons, a mechanism of memory, remains intact in rabbit brain tissue following cryopreservation.

Reversibly cryopreserving large human organs, such as hearts or kidneys, is more difficult than preserving cells but is an active area of research with important public health benefits, since it would greatly increase the supply of organs for transplant. Researchers have made progress in this area, successfully cryopreserving and later transplanting sheep ovaries and rat limbs, and routinely recovering rabbit kidneys after cooling to -45°C . Efforts to improve these technologies provide indirect support for the idea that the brain, like any other organ, may be adequately cryopreserved by current methods or methods under development.

For those who hope to preserve and restore the unique information-encoding features of the mind, a key question is when this information is actually lost following cardiac arrest. It is clear from examples of emergency resuscitation that information loss occurs not at the moment heart or brain activity stops, but when the chemistry or structure of life becomes irreversibly damaged—often significantly after clinical death has been established. For instance, although brain activity is suspended at

temperatures below 18°C, the medical literature contains many cases of people who have survived profound hypothermia without permanent brain damage. In one famous example, Swedish radiologist Anna Bågenholm was trapped under ice during a skiing accident and then resuscitated after being considered clinically dead for more than two hours.

Some surgical procedures also rely on intentionally arresting brain activity with the help of hypothermia. One of the authors' institutions is carrying out a Defense Department-funded clinical trial to induce profound hypothermia (body

temperatures of less than 10 °C) in critically injured trauma victims, effectively shutting the brain down and restarting it later to buy time to save the patient's life.

It is easy to dismiss controversial practices such as cryonics and gloss over the research surrounding them, but we should remember and even respect that prevailing views are often shown to be incorrect, and that what is impossible now may be possible in the future. For example, Ignaz Semmelweis, the father of germ theory, was widely ignored when he proposed in the 19th century that nurses and doctors should wash their hands before

treating patients. Even today, physicians are frequently incorrect when predicting outcomes in end-of-life situations.

Cryonics deserves open-minded discussion, as do mainstream efforts to understand the nature of consciousness, preserve human tissue and organs for life-saving transplants, and rescue critically injured patients by understanding the boundaries between biological life and death. ■

Credit: Images courtesy of Greg Faby and Natasha Vita-More

About The Authors

David W. Crippen is a professor in the Departments of Critical Care Medicine and Neurological Surgery, University of Pittsburgh.

Robert J. Shmookler Reis is a professor in the Departments of Geriatrics, Biochemistry & Molecular Biology, and Pharmacology/ Toxicology at the University of Arkansas for Medical Sciences.

Ramon Risco is a professor of engineering and director of the CryoBioTech Cryobiology Laboratory, University of Seville, and senior physicist at the National Accelerator Centre, Spain.

Natasha Vita-More is a professor and chair of graduate studies at the University of Advancing Technology.



LONGECITY

By Alvin Steinberg, Justin Loew, and Sebastian Sethe

Through the course of browsing the internet in search of life extension news and conversation, you might have come across a website www.longecity.org. Some readers might be quite familiar with the organization because many people are members of LongeCity as well as major cryonics organizations.

LongeCity is a web-based non-profit organisation (registered in the U.S as a "501-c-3" entity) whose mission is "to conquer the blight of involuntary death". It was originally founded as the "Immortality Institute" in 2002 and has since adopted the website moniker of LongeCity, which is a hybrid of the terms "longevity" and "city" – Think of it as a community, or online city, of longevity activists.

LongeCity's central feature is its open forum for the exchange of information

and discussion related to life extension. Though this, LongeCity provides a responsive infrastructure to develop and support community initiatives, including, over the years: the anthology "The scientific conquest of death"; the feature-length film "Exploring Life extension"; a regular podcast featuring interviews with people from the life extension field; the 'crowdsourcing' of a specialised multivitamin supplement; various 'citizen science' projects; local meetings and scientific conferences.

Through crowdfunding, the LongeCity community has raised funds to support scientific projects, including research into lipofuscin ablation, oxidative stress, mitochondrial rejuvenation, stem cell treatments, life extension supplementation, and cryoprotectant toxicity, and small

grants awarded to emerging students/researchers.

Many in the community could be considered original 'bio-hackers', experimenting on themselves with various supplements and sharing the results on the LongeCity forum. This has also led to a very active niche in cognitive enhancement.

Voting Membership rates are currently \$50 per year, with discounts and merit schemes available — but LongeCity forum is available for free to anyone. Due to the sprawling, community-based nature of content on the site, it can take a while to become familiar with LongeCity. Navigation buttons in the site-wide menu and search functions (such as the handy search box at the upper right of every page) help to locate topics and further information. ■

RAAD FESTIVAL

*The revolution against aging & death (RAAD)
starts with you*

JOIN US FOR THIS HISTORIC LIFE EXTENSION EVENT.

August 4-7, 2016, San Diego, CA
Town and Country, Resort & Convention Center

Information. Inspiration. Celebration.

- Learn the latest scientific advancements.
- Gain vital insights to extend your health and well-being.
- Connect with like-minded people and scientists.
- Enjoy live music and performances.

Numerous
presenters
include:



Aubrey
de Grey, Ph.D.



Ray
Kurzweil



Joe
Mercola, M.D.



Bill
Andrews, Ph.D.



Mark
Gordon, M.D.



William
Faloon

Take advantage of the early registration special until February 29th.

\$897 reduced to \$347* — when using Promo Code: CRYONICS

*includes: Healthy Lunch and Dinner, Friday and Saturday

Register now at: www.raadfest.com

If you'd like live personalized assistance in registering, call 1-866-595-6577 (24 hours).

LifeExtension®
Stay Healthy, Live Better



Cheese, clogs and ... liquid nitrogen?

Impressions from a cryonics training in the Netherlands

By Torsten Nahm

When Cryonics UK announced that they would do a road show and training session in 2015 in mainland Europe, we got very excited. Cryonics UK organizes sessions in UK four times a year, and members of our group, Cryonics Germany, had been going there every once in awhile for the last few years. But logistics are much easier when there is no air travel involved, so we not only looked forward to getting hands-on training from the experienced folks from Cryonics UK, but also brought along the full set of our equipment. This way, we could show what we had, and get instructions and feedback on our kit.

The training took place on the weekend of November 14 and 15 in the city of Utrecht in the Netherlands, and was graciously hosted by the Dutch Cryonics Organization (DCO). The Dutch guys did a fantastic job of organizing the meeting. We had a nice location, a spacious room where we could set up and train, and a great dinner on Saturday evening.

In all, 19 cryonicists from four different countries joined. There were 5 members from Cryonics UK (with Tim Gibson as always doing a fabulous job in leading the meeting and the training sessions), 7 members from DCO (with Jappie Hoekstra as the main organizer), and 5 members from Cryonics Germany. We were especially pleased that 2 members of CryoSuisse, the newly founded Swiss cryonics organization, were present as well, including its president Patrick Burgermeister.

The training sessions covered two full days, and included setting up the ice bath, the administration of medications, operating the thumper and setting up the perfusion circuit, as well as a summary / walk-through of a whole case, from preparation to shipping. Cryonics UK had brought along their fully equipped ambulance, which is always great to see (have a look at their website at

cryonics-uk.org), and their training dummies and materials.

It was the first time the ambulance had been across the channel, and so this was also a good testing case for a deployment to mainland Europe. If a case arises in Germany, we will operate in joint fashion: Cryonics UK will handle the case and come over in their ambulance, and our volunteers will act as local liaisons to the hospital and doctors, as well as helping with procedures and equipment. While we are equipped to handle a case by ourselves on a minimal basis, the UK team has much more equipment and experience. For this reason, their cooperation is vital to us, and we are very grateful for their continued support (for example, our equipment is in large part based on their inventory lists).

Apart from the training sessions, we also had detailed discussions of the last two cryonics cases in the UK (one in 2014 and one in 2015; members from Germany joined in for both cases), practical experiences and lessons learned. An important part of any case is securing the cooperation of hospital staff and doctors. Cryonics UK does a great job here, which has allowed them to initiate cooling quickly, often within minutes of cessation of heartbeat.

The training sessions were intense, and some of our newer members felt their heads spinning from all the information. But from my experience, with the second and third training, the equipment and steps become more familiar and things fall into place. And luckily, there was time to relax as well. When we weren't in session, we had lots of fun getting to know each other, and discussing cryonics, life and everything else.

As a nice bonus, we were also pleased to take into our possession two LUCAS-1 thumpers. Their story serves as a neat example for our well-functioning cooperation in Europe: We had gotten a hint from our friends at KryoFIN (the Finnish

cryonics group) that some used, inexpensive LUCAS devices were on sale on eBay. We procured two for a really good price (less than \$300 each), but the supplier could only ship to the UK. So Cryonics UK was kind enough to have them delivered to their place, and bring them to Utrecht for us. They are now at our main hub in Dresden.

Altogether, the weekend in Utrecht was fun and productive, and I really liked the spirit of openness, enthusiasm, and shared aspirations. It was great to see that cryonics is growing healthily in Europe. Where a decade ago there was (almost) only Cryonics UK, we now have strong organizations in many European countries. There was actually quite a bit of talk of forming a European Cryonics Organization to coordinate our efforts. I certainly feel the time for this is coming, and I am pleased and proud to see cryonics developing so well here on this side of the Atlantic.

Thanks again to Cryonics UK and the DCO for making this wonderful meeting happen. This was the first, but certainly not the last pan-European training weekend. Stay tuned!



Tim (left) giving instructions as Torsten (right) works on the meds tubing.

Contacts: Tim Gibson (Cryonics UK):
tim.gibson@cryonics-uk.org &
Torsten Nahm (Cryonics Germany):
tnahm@web.de

The Importance of Local Standby Support and Emergency Response Technologies

By Carrie Wong

INTRODUCTION

What would you do if a cryonicist passed away unexpectedly?

The lack of immediate standby response is one of the biggest problems facing cryonicists today. Cryonics providers are very well-equipped for deaths occurring to individuals that have terminal illness like cancer, where there is some idea of when someone could die. However, there is not much in terms of immediate local support for the majority of cryonicists who could face accidental and sudden death. This especially applies to cryonicists that live further away from cryonics facilities and providers. As a cryonicist living outside of the United States, within a province that has laws on the books against cryonics, I have spent some time with my local group brainstorming the best ways to deal with sudden death within our group.

Within five minutes of cardiac arrest, ischemia sets off a cascade of events that ultimately ends in cell death. When there is an unplanned death or accident, there needs to be some way of notifying local cryonicists for immediate attention and response. Alcor encourages its members to wear their medical bracelets or necklaces. Certainly the best response is to immediately notify the individual's cryonics service provider after someone has had a life-threatening event or is dead. However, cooling should start immediately after death and the quickest response would be from local cryonicists to show up as soon as possible to deal with the situation. Every cryonicist should make a special effort

to get to know other cryonicists nearby. They are in the best position to help in an emergency, including an unexpected arrest. This is especially true when a cryonicist's family members or friends do not understand cryonics or do not have any interest in doing what needs to be done. The lack of action from family members or friends may not always have to do with unwillingness; it might just be because they don't know what to do in a crisis. Furthermore, the shock of having a loved one pass may make cryonics preparations more difficult for someone who is a close family member or friend.

HOW TO CREATE MINIMAL LOCAL STANDBY

The first step in creating local standby is to get to know other cryonicists. Usually you can find a cryonics club at a state level and then contact them to see if there are any members in your city or town. If there are no other cryonicists around who are interested, then turn to friends and family. Let them know explicitly that if you pass away you want them to call Alcor or CI immediately. Let them know that you want to be cooled after death; and that if you were to pass away, these would be your last wishes.

The second step is to put together a list of people who are interested in helping with cryonics standby. Obtain their name, location and number. Print this information out on a single piece of paper, have each and every cryonicist hand it out to the people around them. The idea is to put this contact

information in the hands of someone close to the cryonicist; it could be their family or roommate. Basically anyone who would be the first to know if a cryonicist has passed away should have the contact information of local cryonicists or supporters. The instructions at the top of this page would be to simply go down the list and call each person until someone responds. Hopefully someone will respond and notify others of the situation. This is a very low-tech, low-cost way of increasing your chances of getting local support in a sudden-death scenario. This contact information could be placed in your wallet and on the fridge or anywhere easily accessible.

The third step is to put together a basic local standby kit which Cryonics Institute offers for \$400 which includes Heparin. One way to offset the cost of this is to reach out to other cryonicists to make a group-buy. The more people involved the better. There always needs to be someone present to advocate against autopsy or embalming. Someone else needs to rush off to get 100 pounds of ice. Someone else needs to do CPR and someone else needs to prepare and administer Heparin. Ice-water cool-down and CPR ideally need to occur for a full hour; this is not a single person task.

What I have just outlined are very basic, minimal standby requirements. Ideally, cryonics procedures should begin immediately after legal death (i.e., cardiopulmonary arrest) has been declared. Ideally, trained medical professionals from Suspended Animation or Alcor would be at

the scene, immediately after death, instead we have a volunteer force of amateurs who have to be the first responders. All cryonicists should plan for the worst and hope for the best. The reality of the situation is that even if Alcor were notified immediately, it would still take them hours to mobilize their standby teams to the location of arrest. If absolutely nothing is done at a local level, there will be ischemic damage that may make perfusion of cryoprotectant into the brain difficult or even worse, if enough time has passed (days), produce information-theoretic death. A cryonicist today cannot be complacent about local standby.

Every cryonicist should make a special effort to get to know other cryonicists nearby. They are in the best position to help in an emergency, including an unexpected arrest.

In the future, it would be fantastic if cryonics were integrated into our current medical system and infrastructure. Quick and immediate emergency response capabilities already exist for the majority of people in North America today. What if medical staff and professionals simply started cryonics procedures on people immediately after arrest? Almost everything that a cryonicist needs already exists, cheaply, in ambulances and hospitals. What if cryonics was a perfectly normal and acceptable mainstream practice? This is not the current reality. The current reality is that we cryonicists have to have our own infrastructure to deal with emergencies, spread out thinly and left in the hands of a few. If more cryonicists were advocating the practice, perhaps one day we could push this practice into the mainstream.

CURRENT STANDBY AND EMERGENCY RESPONSE TECHNOLOGY

Having contacts of local supporters on a single piece of paper costs nothing

and it is a good starting point for local standby. However, there are a number of (smartphone) apps and other devices that could also aid in notifying local cryonicists and supporters of sudden death or crisis.

In terms of apps specifically for cryonicists, there's only one at the moment. Cryonics Institute released their first app in November of 2015, available on Google Play. Alcor is also working on their own alert and standby system, but this technology hasn't been released yet. The Cryonics Institute's Check-In app is an alert system that allows the user's phone to send messages for help when the user is unable to. The app uses a simple alarm system that checks in on the user at selected times during the day. If the user fails to respond to one of the scheduled alarms, the app will automatically send a text message for help to up to five contacts. The app is ideal for older people who live alone or for times when someone is fishing, hiking or otherwise out of contact, adding an extra level of security in the event of an emergency. Some of the downsides include reliance on phone battery life, which is usually less than 20 hours and reliance on having a phone signal. Also there is a potential for too many false alarms. For example,

if the user accidentally leaves their phone around the house like many people do and the alarm goes off and nobody is around to turn it off.

There are many apps for people who want additional safety features, emergency response and assistance. Some features that are useful in emergency response are GPS tracking, unconscious emergency detection, escalating levels of alerting, multiple methods of checking sensory data, and long battery life. GPS tracking is useful for immediately locating the person in trouble; ideally an app could send the location of the user to their contact list when the alarm system goes off. Unconscious emergency detection could be in the form of a simple alarm system where the user has to periodically turn off alarms, as in the case of Cryonics Institute's Check-In app. Check-ins are a primitive method of unconscious emergency detection. There are also heart or glucose monitors and fall detectors. Escalating levels of alerting is useful to diffuse and diminish the chances of false alarms. It should be very easy to turn off a false alarm. First the alarm could call out to different levels of responders, from close family to professional emergency services. So far there is no app that has all



the features that could be useful but there are many with some combination of the features I listed above.

The Cryonics Institute's Check-In app is an alert system that allows the user's phone to send messages for help when the user is unable to.

There are a number of personal safety apps that send out messages to preset contacts that include a linked map and address of the user's current location. SOS One Click is one of these apps and it's available on iTunes. Help Me! is another example, available on Android. There are many other low cost apps like these. However, they only help when the user is conscious and experiencing some acute injury, or has time to respond to a threat. In addition, all these apps rely on some aptitude in technology and having a charged phone.

There is a flourishing market of emergency monitoring for old folks at subscription cost. These systems require monthly payments as opposed to one-time app purchases. The current products that dominate the market rely on a press of a button in case of emergency and a few products that can sense when a user falls down. Examples of this type of technology include Medical Guardian, Lifefone, Bay Alarm Medical and Alert1 Medical Alert Systems. Alert1 stands out because of its wireless sensor, worn around the neck and its ability to detect falls. Furthermore it has a 2-year battery life. Bay Alarm Medical only has 72 hours on one charge, but features GPS tracking and a connection to a mobile network. Depending on the age and circumstances of the user, using old-folks emergency monitoring systems for cryonics emergency response might work, but has the major downside of high subscription costs.

Another set of technologies to be considered for cryonics response are fitness

devices and apps. SenseGiz is one example of this type of technology. It tracks exercise and activity, has an emergency button and furthermore, has crash or fall detection. This handy, multi-purpose device is sort of like a Fitbit but has added emergency response features. If someone crashes their bike or falls, the device has the capability to send a GPS location and map to the programmed contacts. This device has three levels of sensitivity: for young people, middle-aged people and older people. The battery life of SenseGiz is a week, which is much better than a phone. Another upside of these types of devices is that there is no subscription cost and SenseGiz only costs a bit more than a Fitbit.

There always needs to be someone present to advocate against autopsy or embalming.

Last but not least, there are comprehensive biomonitors, emergency devices which can detect death or near-death conditions with high levels of accuracy. These new products detect cardiac arrest. I have not done an exhaustive search of available devices but Cardiac Guard is a very good example of this type of device. It has an optical heart rate sensor, 9-axis accelerometer, skin conductivity sensor and skin temperature sensor. All these biosensors are built into what looks to be a simple wristwatch. As most people know, any sort of life-threatening injury or accident will ultimately result in cardiac arrest. Cardiac Guard can detect two key phases of cardiac arrest, ventricular tachycardia and ventricular fibrillation. When a cardiac emergency occurs, a notification can be sent to saved contacts such as friends, family or local emergency services. Furthermore, Cardiac Guard has other useful features which focus on heart health by analyzing body movement, heart rate and body temperature for a more comprehensive view of current activity levels. Interestingly, Cardiac Guard can also detect when its user is stressed and can be programmed to send a notification telling

the user to try to calm down since stress can trigger cardiac arrest. Heart disease is the leading cause of death in the world, so really anyone over age 60 should seriously consider keeping an eye on their cardiac health.

In summary, there is an entire range of monitoring apps and alert systems for cryonicists to consider in standby, but it all starts at the local level. Fundamentally we all require some degree of social connectedness in making standby work for us. From a single sheet of paper to sophisticated heart monitors, the idea is the same, to create a quick method of communicating a crisis situation to all the local people for immediate response and help. ■

Carrie Wong is a young Canadian cryonicist. She graduated in 2011 with degree in geology from The University of British Columbia and worked in gold exploration for a few years. In addition to writing for Cryonics Magazine, she is also writing for geologyforinvestors.com and running a cartography business.





REDUCE YOUR ALCOR DUES WITH THE CMS WAIVER

Alcor members pay general dues to cover Alcor's operating expenses and also make annual contributions to the Comprehensive Member Standby fund pool to cover the costs of readiness and standby. Benefits of Comprehensive Member Standby include no out-of-pocket expense for standby services at the time of need, and up to \$10,000 for relocation assistance to the Scottsdale, Arizona area.

Instead of paying \$180 per year in CMS dues, Alcor also provides members the option to cover all CMS-associated costs through life insurance or pre-payment. Members who provide an additional \$20,000 in minimum funding will no longer have to pay the \$180 CMS (Comprehensive Member Standby fund) fee. This increase in minimums is permanent (for example, if in the future Alcor were to raise the cost of a neurocryopreservation to \$90,000, the new minimum for

neurocryopreservation members under this election would be \$110,000). Once this election is made, the member cannot change back to the original minimums in the future.

To have the CMS fee waived, these are the minimums:

- **\$220,000 Whole Body Cryopreservation** (\$115,000 to the Patient Care Trust, \$60,000 for cryopreservation, \$45,000 to the CMS Fund).
- **\$100,000 Neurocryopreservation** (\$25,000 to the Patient Care Trust, \$30,000 for cryopreservation, \$45,000 to the CMS Fund).

If you have adequate funding and would like to take advantage of the CMS waiver, contact **Diane Cremeens** at diane@alcor.org.

Become An Alcor Associate Member!

Supporters of Alcor who are not yet ready to make cryopreservation arrangements can become an Associate Member for \$5/month (or \$15/quarter or \$60 annually). Associate Members are members of the Alcor Life Extension Foundation who have not made cryonics arrangements but financially support the organization. Associate Members will receive:

- **Cryonics magazine by mail**
- **Discounts on Alcor conferences**
- **Access to post in the Alcor Member Forums**
- **A dollar-for-dollar credit toward full membership sign-up fees for any dues paid for Associate Membership**

To become an Associate Member send a check or money order (\$5/month or \$15/quarter or \$60 annually) to Alcor Life Extension Foundation, 7895 E. Acoma Dr., Suite 110, Scottsdale, Arizona 85260, or call Marji Klima at (480) 905-1906 ext. 101 with your credit card information.

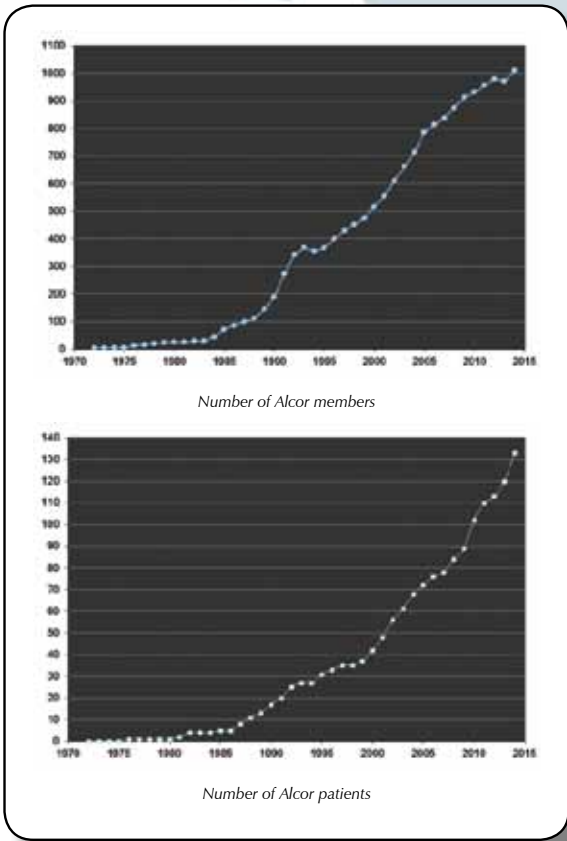
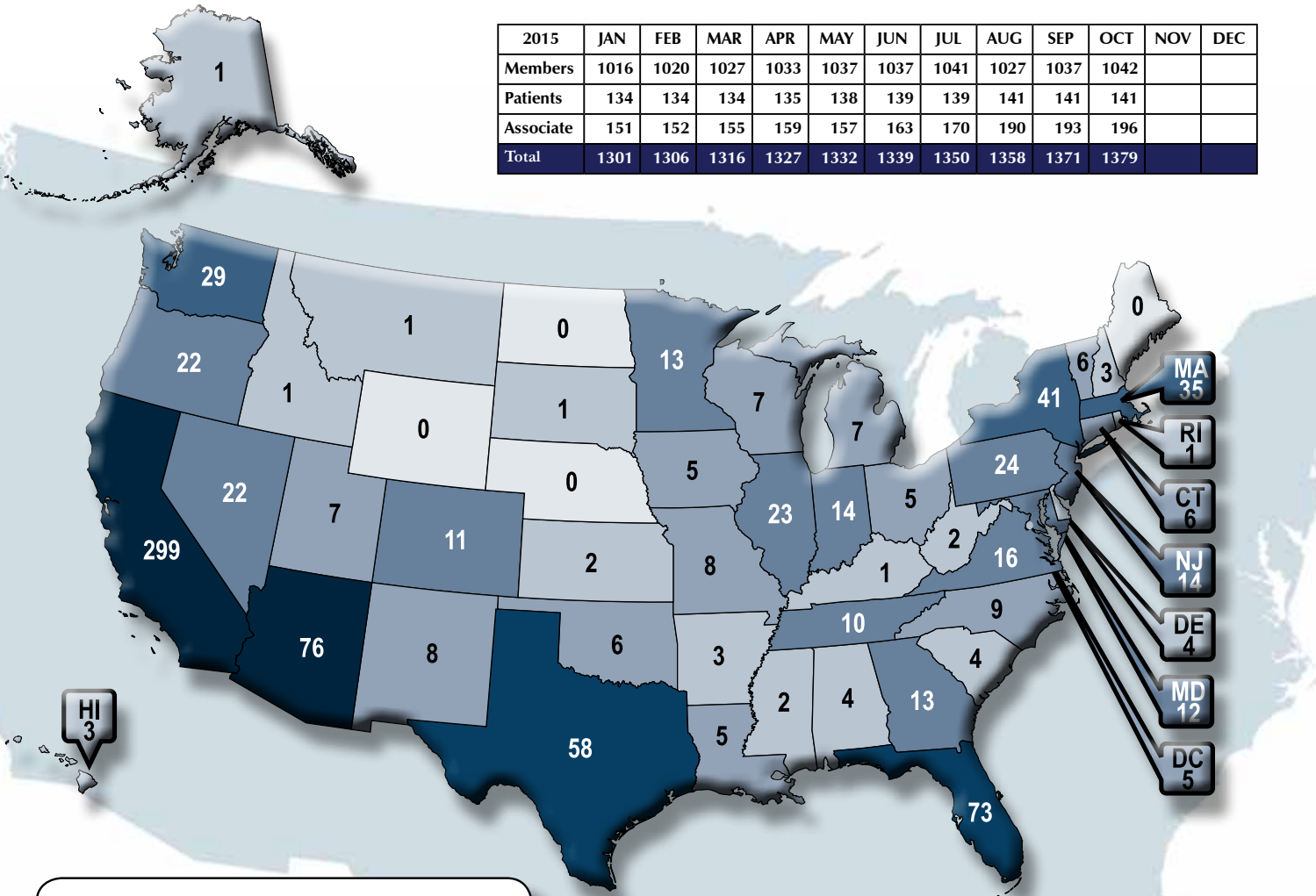
Or you can pay online via PayPal using the following link: <http://www.alcor.org/BecomeMember/associate.html> (quarterly option is not available this way).

Associate Members can improve their chances of being cryopreserved in an emergency if they complete and provide us with a Declaration of Intent to be Cryopreserved (<http://www.alcor.org/Library/html/declarationofintent.html>). Financial provisions would still have to be made by you or someone acting for you, but the combination of Associate Membership and Declaration of Intent meets the informed consent requirement and makes it much more likely that we could move ahead in a critical situation.



Membership Statistics

2015	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Members	1016	1020	1027	1033	1037	1037	1041	1027	1037	1042		
Patients	134	134	134	135	138	139	139	141	141	141		
Associate	151	152	155	159	157	163	170	190	193	196		
Total	1301	1306	1316	1327	1332	1339	1350	1358	1371	1379		



International

Country	Members	Patients
Australia	11	3
Canada	46	2
China	0	1
Finland	1	0
Germany	8	0
Hong Kong	1	0
Israel	1	1
Italy	3	0
Japan	4	0
Mexico	4	0
Monaco	1	0
Netherlands	1	0
New Zealand	1	0
Norway	1	0
Portugal	4	0
Singapore	1	0
Spain	3	1
Thailand	3	1
United Arab Emirates	1	0
United Kingdom	25	2
TOTAL	120	11



Advanced Resveratrol Formula

In 2003, the **Life Extension Foundation**[®] introduced a standardized **resveratrol** extract shown to favorably alter genes implicated in the aging process—many of the same genes that respond to **calorie restriction**.

Since then, we have identified additional compounds that simulate calorie restriction's ability to trigger youthful **gene expression**—the process by which genes transmit signals that slow certain aspects of aging.

Compelling evidence reveals that certain compounds found in berries, such as **pterostilbene** and **fisetin**, possess potent “longevity gene” activators that work in synergy with **resveratrol**. For example, **fisetin** (found in strawberries) has been shown to **stabilize** resveratrol in the body by shielding it from metabolic breakdown,¹⁻¹⁰ thus extending its beneficial effects.

CAUTION: If you are taking anti-coagulant or anti-platelet medications or have a bleeding disorder, consult your healthcare provider before taking this product.

References

1. *Cell*. 2006 Dec 15;127(6):1109-22.
2. *Endocrinology*. 2008 Jan;149(1):84-92.
3. *Crit Care Med*. 2004 Oct;32(10):2097-103.
4. *J Agric Food Chem*. 1999 Apr;47(4):1416-21.
5. *Arch Pharm Res*. 2002 Oct;25(5):561-71.
6. *Nutr Cancer*. 1999;35(1):80-6.
7. *Anticancer Agents Med Chem*. 2006 Sep;6(5):389-406.
8. *Nature*. 2006 Nov 16;444(7117):337-42.
9. *Nature*. 2004 Aug 5;430(7000):686-9.
10. *Xenobiotica*. 2000 Sep;30(9):857-66.

High-Potency Resveratrol

Life Extension[®] customers gain access to standardized **trans-resveratrol** combined with botanical extracts that favorably influence longevity gene expression. Unlike many commercial formulas, Life Extension standardizes to **trans-resveratrol**, which researchers contend is the most active constituent.

A bottle containing 60 vegetarian capsules of **Optimized Resveratrol** retails for \$46. If you purchase four bottles, the price is reduced to **\$31** per bottle. The suggested dose of one capsule a day provides:

The suggested dose of one capsule a day provides:

Trans-Resveratrol	250 mg
Red grape (fruit) and wild blueberry (fruit) blend	85 mg
Quercetin	150 mg
Trans-Pterostilbene	0.5 mg
Fisetin	10 mg

To order Optimized Resveratrol, call 1-866-820-4967 or visit www.LifeExtension.com
Be sure to mention code PIM601X.

\$1,000 Whole Genome Barrier Broken

Veritas Genetics announced September 29 that the company is making it possible for participants in the Personal Genome Project (PGP) to be among the first to get their whole genome sequenced and interpreted for less than \$1,000. Led by Veritas Genetics Co-Founder Dr. George Church, Professor of Genetics at Harvard Medical School and Director of the Personal Genome Project, PGP is a long-term effort to sequence thousands of complete genomes to enable research into personal genomics and personalized medicine. PGP has more than 16,000 participants worldwide. The “\$1,000 Genome” has long been considered the tipping point when sequencing and interpreting the human genome becomes commonplace and begins to rapidly increase what is known and to dramatically impact healthcare. The catchphrase underscores how far science has come since the actual cost of the Human Genome Project, estimated at \$2.7 billion spent over a decade.

PRNewswire
29 Sep. 2015

<http://www.prnewswire.com/news-releases/veritas-genetics-breaks-1000-whole-genome-barrier-300150585.html>

Near-Real-Time Videos of Nanoscale Processes

Engineers at MIT have designed an atomic force microscope that scans images 2,000 times faster than existing commercial models. With this new high-speed instrument, the team produced images of chemical processes taking place at the nanoscale, at a rate that is close to real-time video. In one demonstration of the instrument’s capabilities, the researchers scanned a 70-by-70-micron sample of calcite as it was first immersed in deionized

water and later exposed to sulfuric acid. The team observed the acid eating away at the calcite, expanding existing nanometer-sized pits in the material that quickly merged and led to a layer-by-layer removal of calcite along the material’s crystal pattern, over a period of several seconds. Kamal Youcef-Toumi, a professor of mechanical engineering at MIT, says the instrument’s sensitivity and speed will enable scientists to watch atomic-sized processes play out as high-resolution “movies.” The group’s design and images, which are based on the PhD work of Iman Soltani Bozchalooi, are published in the journal *Ultramicroscopy*.

Jennifer Chu, MIT News Office
14 Dec. 2015
<http://news.mit.edu/2015/new-microscope-real-time-videos-nanoscale-1214>

New Technology to Enable Us to ‘Chart’ All Cells in Brain

The human brain is made up of hundreds of billions of cells. Many of these cells and their functions are as yet unknown. This is about to change with a new technology that is being used for the first time at the Center for Brain Research at MedUni Vienna and Karolinska Institutet in Stockholm. By combining traditional methods of identifying cells under a microscope and so-called “single-cell RNA sequencing,” it is possible to identify every building block of any given excitable cell. “We are well on the way to being able to map many, if not all, neurons and their functions before too long,” explains lead investigator Tibor Harkany, Head of the Department of Molecular Neurosciences at MedUni Vienna. So far, we have only been able to study neurons based on a set of scientific premises and to determine or “search for” their function on the basis of a priori knowledge on their morphology (what does the cell look like?), biochemistry (what does it contain?) and what partners a cell might communicate with.

Medical University of Vienna /
ScienceDaily
21 Dec. 2015
www.sciencedaily.com/releases/2015/12/151221111440.htm

Intelligence ‘Networks’ Discovered in Brain for the First Time

Scientists from Imperial College London have identified for the first time two clusters of genes linked to human intelligence. Called M1 and M3, these so-called gene networks appear to influence cognitive function—which includes memory, attention, processing speed and reasoning. Crucially, the scientists have discovered that these two networks—which each contain hundreds of genes—are likely to be under the control of master regulator switches. The researchers are now keen to identify these switches and explore whether it might be feasible to manipulate them. The research is at a very early stage, but the scientists would ultimately like to investigate whether it is possible to use this knowledge of gene networks to boost cognitive function. Dr. Michael Johnson, lead author of the study from the Department of Medicine at Imperial College London, said: “What’s exciting about this is that the genes we have found are likely to share a common regulation, which means that potentially we can manipulate a whole set of genes whose activity is linked to human intelligence.”

Kate Wighton, Imperial College, London
22 Dec. 2015
http://www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/newssummary/news_22-12-2015-10-13-44

Cell-Free Protein Synthesis Is Potential Lifesaver

Lives of soldiers and others injured in remote locations could be saved with a cell-free protein synthesis system developed at the Department of Energy's Oak Ridge National Laboratory. The device, a creation of a team led by Andrea Timm and Scott Retterer of the lab's Biosciences Division, uses microfabricated bioreactors to facilitate the on-demand production of therapeutic proteins for medicines and biopharmaceuticals. Making these miniature factories cell-free, which eliminates the maintenance of a living system, simplifies the process and lowers cost. "With this approach, we can produce more protein faster, making our technology ideal for point-of-care use," Retterer said. "The fact it's cell-free reduces the infrastructure needed to produce the protein and opens the possibility of creating proteins when and where you need them, bypassing the challenge of keeping the proteins cold during shipment and storage." ORNL's bioreactor features elegance through a permeable nanoporous membrane and serpentine design.

Ron Walli, Communications, Oak Ridge National Laboratory
29 Dec. 2015

<https://www.ornl.gov/news/ornl-cell-free-protein-synthesis-potential-lifesaver>

Program Seeks to Assemble Atom-sized Pieces Into Practical Products

DARPA recently launched its Atoms to Product (A2P) program, with the goal of developing technologies and processes to assemble nanometer-scale pieces—whose dimensions are near the size of atoms—into systems, components, or materials that are at least millimeter-scale in size. At the heart of that goal was a frustrating reality: Many common materials, when fabricated at nanometer-scale, exhibit unique and attractive "atomic-scale" behaviors—but they tend to lose these

potentially beneficial traits when they are manufactured at larger "product-scale" dimensions, typically on the order of a few centimeters, for integration into devices and systems. DARPA recently selected 10 performers to tackle this challenge: Zyvex Labs, Richardson, TX; SRI, Menlo Park, CA; Boston University, Boston, MA; University of Notre Dame, South Bend, IN; HRL Laboratories, Malibu, CA; PARC, Palo Alto, CA; Embody, Norfolk, VA; Voxel, Beaverton, OR; Harvard University, Cambridge, MA; and Draper Laboratory, Cambridge, MA.

Outreach@Darpa.mil
29 Dec. 2015

<http://www.darpa.mil/news-events/2015-12-29>

Gene Editing Offers Hope for Treating Duchenne Muscular Dystrophy

After decades of disappointingly slow progress, researchers have taken a substantial step toward a possible treatment for Duchenne muscular dystrophy with the help of a powerful new gene-editing technique, Crispr-Cas9. Duchenne muscular dystrophy is a progressive muscle-wasting disease that affects boys, putting them in wheelchairs by age 10, followed by an early death from heart failure or breathing difficulties. The disease is caused by defects in a gene that encodes a protein called dystrophin, which is essential for proper muscle function. Because the disease is devastating and incurable, and common for a hereditary illness, it has long been a target for gene therapy, though without success. An alternative treatment, drugs based on chemicals known as antisense oligonucleotides, is in clinical trials. But gene therapy—the idea of curing a genetic disease by inserting the correct gene into damaged cells—is making a comeback. A new technique, Crispr-Cas9, lets researchers cut the DNA of chromosomes at selected sites to remove or insert segments.

Nicholas Wade, New York Times
31 Dec. 2015

http://www.nytimes.com/2016/01/01/science/gene-therapy-muscular-dystrophy.html?_r=0

Artificial Intelligence Outperforms Human Data Scientists

An MIT startup's computer software has proved capable of building better predictive models than the majority of human researchers it competed against in several recent data science contests. Until now, well-paid data scientists have relied on their human intuition to create and test computer models that can explain and predict patterns in data. But MIT's "Data Science Machine" software represents a fully automated process capable of building such predictive computer models by identifying relevant features in raw data. Such a tool could make human data scientists even more effective by allowing them to build and test such predictive models in far less time. But it might also help more individuals and companies harness the power of Big Data without the aid of trained data scientists. "I think the biggest potential is for increasing the pool of people who are capable of doing data science," Max Kanter, a data scientist at MIT's Computer Science and AI Lab and co-creator of the Data Science Machine software, told *IEEE Spectrum*.

20 Oct. 2015
IEEE Spectrum

<http://spectrum.ieee.org/tech-talk/computing/software/artificial-intelligence-outperforms-human-data-scientists>

Brain Waves May Be Spread by Weak Electrical Field

Researchers at Case Western Reserve University may have found a new way information is communicated throughout the brain. Their discovery could lead to identifying possible new targets to

investigate brain waves associated with memory and epilepsy and better understand healthy physiology. They recorded neural spikes traveling at a speed too slow for known mechanisms to circulate throughout the brain. The only explanation, the scientists say, is the wave is spread by a mild electrical field they could detect. Computer modeling and in-vitro testing support their theory. "Others have been working on such phenomena for decades, but no one has ever made these connections," said Steven J. Schiff, director of the Center for Neural Engineering at Penn State University, who was not involved in the study. "The implications are that such directed fields can be used to modulate both pathological activities, such as seizures, and to interact with cognitive rhythms that help regulate a variety of processes in the brain."

Case Western Reserve University /
Eurekalert!
14 Jan. 2016
[http://www.eurekalert.org/pub
releases/2016-01/cwru-bwm011416.php](http://www.eurekalert.org/pub/releases/2016-01/cwru-bwm011416.php)

Hope for Axonal Repair in the Brain

Lab-grown neural networks have the ability to replace lost axonal tracks in the brains of patients with severe head injuries, strokes or neurodegenerative diseases and can be safely delivered with minimal disruption to brain tissue, according to new research from Penn Medicine's department of Neurosurgical Research. Their work is published in the *Journal of Neural Engineering*. Complex brain function derives from the activity of populations of neurons –

discrete processing centers – connected by long fibrous projections known as axons. When these connections are damaged, by injury or diseases such as a Parkinson's or Alzheimer's, they, unlike many other cells in the body, have very limited capacity to regenerate, thus permanently disrupting the body's signal transmission and communication structure. Senior author D. Kacy Cullen, PhD and his team have been working to grow replacement connections, referred to as micro-tissue engineered neural networks (micro-TENNS), in the lab and test their ability to "wire-in" to replace broken axon pathways.

Penn Medicine
19 Jan. 2016
[http://www.uphs.upenn.edu/news/
News_Releases/2016/01/cullen/](http://www.uphs.upenn.edu/news/News_Releases/2016/01/cullen/)

A Roadmap to Resuscitation

Successful rejuvenation of cryonics patients will require three distinct technologies: (1) A cure for the disease that put the patient in a critical condition prior to cryopreservation; (2) biological or mechanical cell repair technologies that can reverse any injury associated with the cryopreservation process and long-term care at low temperatures; (3) rejuvenation biotechnologies that restore the patient to good health prior to resuscitation. OR it will require some entirely new approach such as (1) mapping the ultrastructure of cryopreserved brain tissue using nanotechnology, and (2) using this information to deduce the original structure and repairing, replicating or simulating tissue or structure in some viable form so the person "comes back."

The following list is a list of landmark papers and books that reflect ongoing progress towards the resuscitation of cryonics patients:

Jerome B. White, "Viral-Induced Repair of Damaged Neurons with Preservation of Long-Term Information Content," Second Annual Conference of the Cryonics Societies of America, University of Michigan at Ann Arbor, April 11-12, 1969, by J. B. White reprinted in *Cryonics* 35:10 (October 2014), 8-17.

Michael G. Darwin, "The Anabolocyte: A Biological Approach to Repairing Cryoinjury," *Life Extension*

Magazine (July-August 1977):80-83. Reprinted in *Cryonics* 29:4 (4th Quarter 2008),14-17.

Gregory M. Fahy, "A 'Realistic' Scenario for Nanotechnological Repair of the Frozen Human Brain," in Brian Wowk, Michael Darwin, eds., *Cryonics: Reaching for Tomorrow*, Alcor Life Extension Foundation, 1991.

Ralph C. Merkle, "The Molecular Repair of the Brain," *Cryonics* 15(January 1994):16-31 (Part I) & *Cryonics* 15(April 1994):20-32 (Part II).

Ralph C. Merkle, "Cryonics, Cryptography, and Maximum Likelihood Estimation," First Extropy Institute Conference, Sunnyvale CA, 1994.

Aubrey de Grey & Michael Rae, "Ending Aging: The Rejuvenation Breakthroughs That Could Reverse Human Aging in Our Lifetime." St. Martin's Press, 2007

Robert A. Freitas Jr., "Comprehensive Nanorobotic Control of Human Morbidity and Aging," in Gregory M. Fahy, Michael D. West, L. Stephen Coles, and Steven B. Harris, eds, *The Future of Aging: Pathways to Human Life Extension*, Springer, New York, 2010, pp. 685-805.

Chana Phaendra, "Reconstructive Connectomics," *Cryonics* 34(7) (July 2013): 26-28.

Options for Safe, Secure and Legal Asset Preservation for Post-Resuscitation Access

The Seventh Annual Young Cryonicists Gathering
Teens & Twenties 7 2016: Getting to Know You -
You Getting to Know Each Other

Fri-Sun; April 8-10, '16 Ontario CA Host: Life Extension Foundation SCHOLARSHIPS AVAILABLE

★★

Greetings to *Young Cryonicists*,

You are receiving this invitation because you are among the future leaders in cryonics.

All attention will be focused on:

our getting to know you and

you getting to know each other.

PLUS: an update on the latest emergency response technologies and revival strategies.

Who is Eligible?

Fully signed up young cryonicists from all cryonics organizations in their late teens through age thirty (18-30 as of April 10, 2016) - may apply to attend.

Younger Cryonicists With Parent(s):

Thirteen through seventeen year olds may attend when accompanied by their parent(s) or guardian(s).

Parents/guardians of attendees aged 18-19 are also encouraged to accompany their child. All attending parents will be put in touch with each other should they choose to have their own "get together" during the "young cryonicists" gathering.

Program

Some individuals are social butterflies. This is not so for everyone. And we want everyone to meet everyone. Therefore, I have designed a diverse range of "getting to know you" activities. IF you would enjoy participating in these various getting acquainted activities, THEN this is for you.

Enjoy this exciting & fulfilling weekend.

SCHOLARSHIPS:

Life Extension Foundation, through a generous education grant, is offering 40 scholarships that pay for ALL of the following:

- ◆ U.S. airfare to/from South Florida (or up to \$1000 for origin outside the U.S.)
- ◆ Hotel accommodations for Friday & Saturday nights - plus Thursday & Sunday nights for scholarship attendees who room together.
- ◆ Meals and beverages on Friday night, all day Saturday, & Sunday breakfast & lunch
- ◆ Registration fee - \$350 - also covered

Please click on this website for a full packet with all details and application forms.

http://www.alcor.org/T2_7_2016_details.pdf

Forever,

Cairn Erfreuliche Idun

Founder/Director: T2

PS Come Early. Stay Late.

Some attendees to T2 enjoy spending extra time in California - especially since their flight is already paid for via their scholarship.

This is at their own expense for additional lodging and food.

I look forward to getting to know you.

MEETINGS

ABOUT THE ALCOR FOUNDATION

The Alcor Life Extension Foundation is a nonprofit tax-exempt scientific and educational organization dedicated to advancing the science of cryopreservation and promoting cryonics as a rational option. Being an Alcor member means knowing that—should the worst happen—Alcor's Emergency Response Team is ready to respond for you, 24 hours a day, 365 days a year.

Alcor's Emergency Response capability includes specially trained technicians and customized equipment in Arizona, northern California, southern California, and south Florida, as well as many additional certified technicians on-call around the United States. Alcor's Arizona facility includes a full-time staff, and the Patient Care Bay is personally monitored 24 hours a day.

ARIZONA

FLAGSTAFF:

Arizona without the inferno. Cryonics group in beautiful, high-altitude Flagstaff. Two-hour drive to Alcor. Contact eric@flagstaffcryo.com for more information.

PHOENIX

VALLEY OF THE SUN:

This group meets monthly, usually in the third week of the month. Dates are determined by the activity or event planned. For more information or to RSVP, visit <http://cryonics.meetup.com/45/> or email Lisa Shock at lisa@alcor.org.

AT ALCOR:

Alcor Board of Directors Meetings and Facility Tours—Alcor business meetings are generally held on the first Saturday of every month starting at 11:00 AM MST. Guests are welcome to attend the fully-public board meetings. Facility tours are held every Tuesday at 10:00 AM and Friday at 2:00 PM. For more information or to schedule a tour, call Marji Klima at (877) 462-5267 x101 or email marji@alcor.org.

CALIFORNIA

LOS ANGELES:

Alcor Southern California Meetings—For information, call Peter Voss at (310) 822-4533 or e-mail him at peter@optimal.org. Although monthly meetings are not held regularly, you can meet Los Angeles Alcor members by contacting Peter.

SAN FRANCISCO BAY:

Alcor Northern California Meetings are held quarterly in January, April, July, and October. A CryoFeast is held once a year. For information on Northern California meetings, call Mark Galeck at (650) 772-1251 or email Mark_galeck@pacbell.net.

FLORIDA

Central Florida Life Extension group meets once a month in the Tampa Bay area (Tampa and St. Petersburg) for discussion and socializing. The group has been active since 2007. Email arcturus12453@yahoo.com for more information.

NEW ENGLAND

CAMBRIDGE:

The New England regional group strives to meet monthly in Cambridge, MA—for information or to be added to the Alcor NE mailing list, please contact Bret Kulakovich at 617-824-8982, alcor@bonfireproductions.com, or on FACEBOOK via the Cryonics Special Interest Group.

PACIFIC NORTHWEST

A Yahoo mailing list is also maintained for cryonicists in the Pacific Northwest at <http://tech.groups.yahoo.com/group/CryonicsNW/>.

BRITISH COLUMBIA (CANADA):

The contact person for meetings in the Vancouver area is Keegan Macintosh: keegan.macintosh@me.com.

OREGON:

The contact person for meetings in the Portland area is Aschwin de Wolf: aschwin@alcor.org. See also: <https://www.facebook.com/portland.life.extension>

ALCOR PORTUGAL

Alcor Portugal is working to have good stabilization and transport capabilities. The group meets every Saturday for two hours. For information about meetings, contact Nuno Martins at n-martins@n-martins.com. The Alcor Portugal website is: www.alcorportugal.com.

TEXAS

DALLAS:

North Texas Cryonauts, please sign up for our announcements list for meetings (<http://groups.yahoo.com/group/cryonauts-announce>) or contact David Wallace Croft at (214) 636-3790 for details of upcoming meetings.

AUSTIN/CENTRAL TEXAS:

A new group for the Austin area has been started for those interested in discussion and understanding of the relevant technologies and issues for cryopreservation, genomics, epigenetics and medical research for increased life/health span. Contact Tom Miller, 760-803-4107 or tom@blackmagicmissileworks.com.

JAPAN

Cryonics meetings are held monthly in Tokyo. Send queries to [grand88\(at\)yahoo.com](mailto:grand88(at)yahoo.com).

UNITED KINGDOM

Alcor members in the UK can contact Garret Smyth at Alcor-UK@alcor.org for information about local meetings.

If you are interested in hosting regular meetings in your area, contact Alcor at 877-462-5267, ext. 113. Meetings are a great way to learn about cryonics, meet others with similar interests, and introduce your friends and family to Alcor members!

WHAT IS CRYONICS?

Cryonics is an attempt to preserve and protect human life, not reverse death. It is the practice of using extreme cold to attempt to preserve the life of a person who can no longer be supported by today's medicine. Will future medicine, including mature nanotechnology, have the ability to heal at the cellular and molecular levels? Can cryonics successfully carry the cryopreserved person forward through time, for however many decades or centuries might be necessary, until the cryopreservation process can be reversed and the person restored to full health? While cryonics may sound like science fiction, there is a basis for it in real science. The complete scientific story of cryonics is seldom told in media reports, leaving cryonics widely misunderstood. We invite you to reach your own conclusions.

HOW DO I FIND OUT MORE?

The Alcor Life Extension Foundation is the world leader in cryonics research and technology. Alcor is a non-profit organization located in Scottsdale, Arizona, founded in 1972. Our website is one of the best sources of detailed introductory information about Alcor and cryopreservation (www.alcor.org). We also invite you to request our FREE information package on the "Free Information" section of our website. It includes:

- A fully illustrated color brochure
- A sample of our magazine
- An application for membership and brochure explaining how to join
- And more!

Your free package should arrive in 1-2 weeks. (The complete package will be sent free in the U.S., Canada, and the United Kingdom.)

HOW DO I ENROLL?

Signing up for a cryopreservation is easy!

- Step 1:** Fill out an application and submit it with your \$90 application fee.
- Step 2:** You will then be sent a set of contracts to review and sign.
- Step 3:** Fund your cryopreservation. While most people use life insurance to fund their cryopreservation, other forms of prepayment are also accepted. Alcor's Membership Coordinator can provide you with a list of insurance agents familiar with satisfying Alcor's current funding requirements.
- Finally:** After enrolling, you will wear emergency alert tags or carry a special card in your wallet. This is your confirmation that Alcor will respond immediately to an emergency call on your behalf.

Not ready to make full arrangements for cryopreservation? Then **become an Associate Member** for \$5/month (or \$15/quarter or \$60 annually). Associate Members will receive:

- *Cryonics* magazine by mail
- Discounts on Alcor conferences
- Access to post in the Alcor Member Forums
- A dollar-for-dollar credit toward full membership sign-up fees for any dues paid for Associate Membership

To become an Associate Member send a check or money order (\$5/month or \$15/quarter or \$60 annually) to Alcor Life Extension Foundation, 7895 E. Acoma Dr., Suite 110, Scottsdale, Arizona 85260, or call Marji Klima at (480) 905-1906 ext. 101 with your credit card information. You can also pay using PayPal (and get the Declaration of Intent to Be Cryopreserved) here: <http://www.alcor.org/BecomeMember/associate.html>



Call toll-free TODAY to start your application:

877-462-5267 ext. 132 • info@alcor.org • www.alcor.org

Get the world's premier publication on prolonging youth and longevity for only \$1.00 an issue.



MIKAQAV160101

Packed with the latest medical findings, research results, and innovative treatment protocols, *Life Extension Magazine*® is the ultimate resource on staying healthy and living longer. Call now and get 12 issues for only \$1.00 each ... that's a whopping \$47.88 off the newsstand price! And it's brought to you by the global leader in the field of preventing age-related disease for over 35 years.

Stay healthy with the highest-quality supplements money can buy.

Life Extension® is the only supplement brand solely dedicated to helping you live a longer, healthier life. Our premium-quality products are based on the latest clinical studies — made with pure, potent ingredients at the same clinically validated dosages used in those studies. Your body deserves the best. Insist on Life Extension.



Don't just guess what your body needs.

Our expert team of Health Advisors can answer your health-related questions every day of the year. And they'll gladly create a regimen of nutritional supplements, diet, and exercise that's customized for your needs.

Get more with Your Healthy Rewards.

With our new FREE rewards program you earn valuable LE Dollars back on every purchase you make.* No membership required. For details visit www.LifeExtension.com/Rewards.

Subscribe to *Life Extension Magazine*® now for only \$12.00.

Call toll-free 1-866-820-4967 to speak to a live operator (24 hours) or visit www.LifeExtension.com/sub12

You must mention **Discount Code PIM601X** to get these savings. • Offer expires 12/31/16



LifeExtension®



*You earn LE Dollars on all your Life Extension purchases (except shipping fees, CHOICE and Premier program fees, Life Extension Magazine® subscriptions, or any purchases made with LE Dollars or gift card). Redeem LE Dollars for any purchase such as products, labs, sale items, and shipping fees at the rate of 1 LE Dollar being equal to \$1 U.S. dollar at checkout. LE Dollars may not be redeemed for Premier program fees, CHOICE program fees, Life Extension Magazine® subscriptions, or to purchase gift cards. LE Dollars have no cash value and are not redeemable for cash, transferable, or assignable for any reason. Please allow 4-6 weeks for delivery of your first issue.