

ALCOR LIFE EXTENSION FOUNDATION

A Non-Profit Organization

CRYONICS

NOVEMBER - DECEMBER 2017 · VOLUME 38:6

Prospect of Human Age Reversal

Page 10

Member Profile: Christine Peterson

Page 16

Brain Preservation and Personal Survival

Page 20

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



COVER STORY: PAGE 10

Prospect of Human Age Reversal

Bill Faloon established the first cryopreservation facility in the southeastern United States. In 1977, he incorporated the Florida Cryonics Association, which is now named Life Extension Foundation, Inc. This article describes Bill's latest project, which is to identify and fund research aimed at reversing biological aging in people today!

16 Member Profile: Christine Peterson

Dive into nanotechnology and healthy living with cryonicist and Foresight Institute Co-Founder, Christine Peterson.

20 Brain Preservation and Personal Survival

The Brain Preservation Foundation's mission to validate structural preservation of the brain has been very successful but the link with mind uploading as a means of personal survival raises some important questions. Alexandre Erler makes the case for a distinct cryonics research program based on biological survival.

Editorial Board

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

Editor

Aschwin de Wolf

Contributing Writers

Aschwin de Wolf
Alexandre Erler
William Faloon
Max More, Ph.D.
R. Michael Perry, Ph.D.
Nicole Weinstock

Copyright 2017

by Alcor Life Extension Foundation

All rights reserved.

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

Cryonics magazine is published bi-monthly.

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/>

CONTENTS

5 **QUOD INCEPIMUS CONFICIEMUS** **The Case for Field Cryoprotection**

What is field cryoprotection? How does it differ from today's procedures? In this brief introduction to field cryoprotection you can read how aiming to deliver this procedure to all Alcor members will improve patient care and reduce costs, too!

6 **CEO Update**

An update about Alcor's efforts to bring underfunded members back in the black, the history of Alcor Presidents, and progress on case reports.

26 **Membership Statistics**

How many members, associate members, and patients does Alcor have and where do they live?

28 **FOR THE RECORD** **The Price of Life:**

Isaac Asimov, Cryonics, and Human Death Extension

Isaac Asimov was a well-known science fiction writer and science popularizer, who published many of his own writings through Doubleday, Inc., and was respected by them as a scientific consultant. In 1964 he played an important role in the fledgling cryonics movement by giving the nod of approval to Doubleday for publication of Robert Ettinger's book, *The Prospect of Immortality*. Yet Asimov shunned cryonics himself and was finally cremated. Here we take a look at why this happened.

36 **Revival Update**

Mike Perry surveys the news and research to report on new developments that bring us closer to the revival of cryonics patients.

QUOD INCEPIMUS CONFICIEMUS



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



THE CASE FOR FIELD CRYOPROTECTION By Aschwin de Wolf

The last major technological innovation at Alcor was vitrification (cryopreservation without ice formation). Viability assays of brain slices and electron micrographs of brains cryopreserved with these vitrification solutions show substantial improvements over the older cryopreservation protocols. But this was almost 20 years ago and it is time for another technological innovation that will improve patient care. I want to suggest that the strongest candidate for such an innovation is to introduce field cryoprotection for all Alcor members.

Field cryoprotection aims to close the gap in outcome between patients that are pronounced legally dead in the Scottsdale area and patients that are pronounced legally dead in other US states by conducting the cryoprotective portion of Alcor's procedure *prior* to transport to Alcor.

Currently the procedure would be to deploy a standby team to the patient's bedside, start rapid cooling and cardiopulmonary support, replace the blood with an organ preservation solution, and then ship the patient to Alcor for cryoprotection and long term care. Those organ preservation solutions have been designed to counter the adverse effects of cold ischemia but are from for perfect. After about 6 hours of cold ischemia, the brain is rendered non-viable (no EEG can be recovered). Electron micrographs of mammalian brains

show that the fine ultrastructure of the brain degrades in a time-dependent manner and blood vessels start leaking.

The good news is that preventing this outcome does not require novel scientific breakthroughs but a simple commitment to eliminate shipment of patients on water ice in favor of doing field cryoprotection and subzero cooling in the field instead. This procedure is named "field cryoprotection."

The reason why we call it "field cryoprotection" instead of "field cryopreservation" is because the patient is not cooled all the way down to liquid nitrogen temperature. While this is theoretically possible (and desirable), the logistics of this procedure are too demanding at this point. So instead of cooling the patient to liquid nitrogen temperature (-196° Celsius) the patient is shipped to Alcor on dry ice (-78.5° Celsius) where further cooldown begins. Research supports this is a safe temperature for shipping patients, provided stabilization and cryoprotection procedures are done timely and competently. From the patient's perspective the advantages include minimization of cold ischemia, preservation of integrity of the vessels and blood brain barrier, and, under good conditions, cryoprotection can start when the brain is still in a viable state.

One of the most remarkable aspects of making field cryoprotection the default

option for all eligible patients is that it does not just improve patient care but reduces cost as well. Right now, for non-local cases Alcor needs to deploy a team consisting of surgeons and technicians twice. Once at the patient's bedside and later again at Alcor for cryoprotective perfusion. Field cryoprotection would eliminate this double employment in favor of one single deployment at the patient's location. As a consequence, remote stabilization costs will go up but Alcor HQ costs will be basically eliminated except for a small cooling expense. This should allow for a non-trivial decrease in costs per case, which can be passed on to the member in the form of lower cryopreservation costs or can be used to eliminate or decrease future increases.

During the last couple of years Steve Graber and Hugh Hixon have collaborated to improve field cryoprotection technologies and the gap between conducting cryoprotection in Scottsdale or "on the road" has increasingly been closed. Eliminating water ice shipment for field cryoprotection will be need to be incremental and closely evaluated but the patient care and cost advantages are evident. Field cryoprotection constitutes the next big step in cryonics. Currently only overseas members can benefit from this procedure and the time has come to extend this to all members. ■

CEO Update

By Max More



Almost everyone is bad at financial planning.

Alcor members, on average, seem to be well above average in education and intelligence, as are Alcor directors and management. And yet, too many members seem to have assumed that inflation does not exist and that cryopreservation minimums would not rise from the level when they signed up. Perhaps some thought that Alcor membership would grow so strongly that early, poorly-funded members would be a minimal expense, easily grandfathered in. The world has disappointed us, so far, in not adopting cryonics far more widely. We *should* have grown much faster. Perhaps we will before too long. But we cannot make sustainable plans on hopeful assumptions.

Hugh has been full-time with Alcor for over 30 years, starting full-time without pay in early 1983. His first cryopreservation was in 1978.

Past Alcor boards have also contributed to the problem by putting off figuring out an (inevitably painful) solution. As cryopreservation minimums have risen over the years to reflect Alcor's real costs, the situation got worse. Finally, in 2013, the Alcor board and management settled

on the Underfunding Plan. No one really liked it much. Yet it was clearly better than the ten or so other options considered. Many members were able to solve their underfunding problem by switching from whole body to neurocryopreservation. Others increased their life insurance coverage. Still others provided other funding through the new Alternative Funding Methods mechanism.

Many of those who could not do these things were able to maintain their coverage by paying the Underfunding Dues. These began at 1% of the amount by which a member is underfunded (phased in gradually) and are currently (at the time of writing) at 2%. Because of the phenomenon of "adverse selection," this percentage is expected to rise over time. According to the International Risk Management Institute, adverse selection means: "An imbalance in an exposure group created when persons who perceive a high probability of loss for themselves seek to buy insurance to a much greater degree than those who perceive a low probability of loss." In our case: Those who can buy more insurance affordably or otherwise raise their funding will do so, leaving a smaller pool of increasingly underfunded members.

Given that there was no solution that would make everyone happy, the evidence is that the Underfunding Plan has been working well. Here are three historical data points illustrating the reduction in total underfunding, along with a growth in members funded above-minimum:

Start of the Underfunding Plan 4/12/2012

Number of members underfunded:
189 Neuro + 373 WB + 19 N/WB = 581

Total under minimum funding:
\$28,691,837

Number of members at or above
minimum funding:
230 + 113 + 17 = 360

Total amount over minimum funding:
\$16,533,511

Balance:
-\$12,158,326

1/31/2016

Number of members underfunded:
137 + 167 + 9 = 313

Total under minimum funding:
\$13,695,889

Number of members at or above
minimum funding:
395 + 342 + 11 = 748

Total amount over minimum funding:
\$30,665,112

Balance:
+\$16,692,223

9/1/2017

Number of members underfunded:
 $111 + 132 + 4 = 247$

Total under minimum funding:
\$10,720,606

Number of members at or above
minimum funding:
 $455 + 435 + 13 = 903$

Total amount over minimum funding:
\$33,837,527

Balance:
+\$23,116,921

To summarize the core points:

- From the start of the underfunding Plan over five years ago, the number of underfunded members has gone down from 581 to 247.
- The total amount of under-minimum funding has gone down from \$28,691,837 to \$10,720,606. That's a huge improvement.
- In addition, the number of members with funding at or above the *current* minimums has gone up from 360 to 903.
- The total amount of over-minimum funding (based on current minimums) has gone up from \$16,533,511 to \$33,837,527. That's shift from red to black of over \$35,000,000. So, all is good, right?

Not so fast.

Two factors should stop us from relaxing and keep us working on the issue. First, as minimums go up over time, there could be a shift toward the red if members don't plan ahead. Members need to do better at planning for future nominal price increases, and Alcor needs to do better at helping them (without falling afoul of financial regulations). Second, it's likely that the underfunded members are older and so will be cryopreserved sooner, leading to a loss for years to come. In other words, the overall balance currently looks to be well in the black, but that doesn't mean we won't have a large number of badly underfunded cases over the next decade or so.

Alcor's underfunding challenge has improved mightily over the last six years. At the same time, we need to acknowledge in our attitudes and policies going forward that realistic pricing and future planning are critical to long-term survival and success. In a future article, I plan to explore some ways in which Alcor members can put those principles into practice.

Alcor members, on average, seem to be well above average in education and intelligence, as are Alcor directors and management. And yet, too many members seem to have assumed that inflation does not exist and that cryopreservation minimums would not rise from the level when they signed up.

Friday September 1, 2017

Alcor staff took a little time off at noon to mark two occasions. The first was Hugh Hixon's 75th birthday. Hugh has been full-time with Alcor for over 30 years, starting full-time without pay in early 1983. His first cryopreservation was in 1978.

The other occasion was that on that day I became the longest-serving Alcor president in its 45+ year history. Fred Chamberlain held that title for a long time, having served as president twice, for 2 years and 6 months starting in February 1973 and then again for over four years starting in 1997. By the time you read this, I will be closing in on 2500 days in the role. Given that none of us have perfect memories and many members have joined us relatively recently, this seems like a good excuse to convey a bit of history.

Alcor Presidents

1. Linda Chamberlain took office 23 Feb 1972 (date of Alcor incorporation). [1 year]
2. Fred Chamberlain took office 16 Feb 1973 [2 years 6 months]
3. Linda Chamberlain returned to Alcor presidency Aug or Sep 1975 [1 year]
4. Allen McDaniels, MD took office Aug or Sep 1976 [9 or 10 months]
5. Laurence Gale took office 12 Jun 1977 [5 years 3 months]
6. Mike Darwin (Federowicz) took office 12 Sep 1982 [5 years 5 months]
7. Carlos Mondragon took office 07 Feb 1988 [5 years]
8. Steve Bridge took office 23 Jan 1993 [4 years 1 month]
9. Fred Chamberlain took office 01 Feb 1997 [4 years 2 months]
10. Linda Chamberlain took office 01 Apr 2001 [5 months]
11. Jerry Lemler took office 09 Sep 2001 [2 years 4 months]
12. Joe Waynick took office 01 Jan 2004 [1 year 7 months]
13. Steve Van Sickle took office 28 Aug 2005 (acting CEO) [2 years 9 months]
14. Tanya Jones took office 09 Jun 2008 (Exec. Director). [7.5 months]
15. Jennifer Chapman took office 28 Jan 2009 (Exec. Director) [1 year 11 months]
16. Max More, PhD took office 01 Jan 2011 (President & CEO).

In descending order of length in office, total time only: (as of September 14, 2017)

1. Max More
6 years 8 months, 2 weeks
2. Fred Chamberlain
6 years 8 months
3. Mike Darwin:
5 years 5 months

4. Laurence Gale:
5 years 3 months
5. Carlos Mondragon:
5 years
6. Steve Bridge:
4 years 1 month
7. Steve Van Sickle:
2 years 9 months
8. Jerry Lemler:
2 years 4 months
9. Linda Chamberlain:
2 years 5 months
10. Jennifer Chapman:
1 year 11 months
11. Joe Waynick:
1 year 7 months
12. Allen McDaniels:
9 or 10 months
13. Tanya Jones:
7.5 months

When I first took on the job, I was surprised (and worried) to calculate that the average tenure of an Alcor president from 1972 to end-2010 was 2.6 years. For the last six presidents, the average tenure was only 1 year, 7.25 months. That kind of turnover results in loss of institutional knowledge (especially if matched by rapid board turnover). We have been addressing that by various means, but I hope to keep on doing this job for years to come – or for as long as the board will let me.

Given that there was no solution that would make everyone happy, the evidence is that the Underfunding Plan has been working well.

CASE REPORTS

We continue to push ahead with catching up on case reports. Getting these produced and published is extremely valuable as it provides accountability and transparency

and an opportunity to keep learning from experience in a structured manner. As of September 9, there are 7 cases in first draft stages, 8 drafts done and being reviewed in house, one with the Cases group and final stages, and one recent report submitted for publication.

Alcor's underfunding challenge has improved mightily over the last six years. At the same time, we need to acknowledge in our attitudes and policies going forward that realistic pricing and future planning are critical to long-term survival and success.

CONFERENCES

I was invited to speak at the Silk Road Life Science Forum & the Beijing Biomedicine Summit 2017, July 31-August 1, 2017 in Yinchuan, capital of the Ningxia Autonomous Region, China, on life extension and cryonics. It turned out that the organizer not only wanted me to speak to the audience about cryonics, but was seriously interested in starting a cryonics organization in the region.

Shortly after my first trip to China, I headed to San Diego for the 2017 RAADfest (Revolution Against Aging and Death). Due to concern about some unscientific beliefs of some of the main organizers, I went under my own name and not as an Alcor representative. I was in good company, including pioneers such as Michael West, Aubrey de Grey, and Michael Rose, not to mention friends and loved ones such as Natasha Vita-More, Ben Goertzel, and Maria Abramson-Entraigues and Gary Abramson. Even though I was not there as “the guy from Alcor,” naturally I was able to talk to many people about cryonics.

Finally, it was an honor to take over from Mike Perry this year in representing Alcor at Martine Rothblatt's MIO Assembly meeting in Florida. Martine, a public Alcor member and extremely successful entrepreneur, holds an annual gathering of attorneys, property managers, and various others including an Alcor official, with the goal of protecting her family's assets and cryopreservation arrangements over the long term.

Next issue, look for a major report on all the construction and expansion that has been going on at Alcor since June. That work should be completed within a week or so of writing this. ■

AGE LESS WITH GEROPROTECTORS AND ARTIFICIAL INTELLIGENCE

Longevity scientists have designed
GEROPROTECT™ Ageless Cell™
to combat **aging** at the cellular level.

By activating cell **signaling** pathways, **geroprotectors** represent a new way to advance healthy aging strategies.



Proprietary Nutrient Formula
Utilizing **Insilico Medicine**
Deep-Learning AI Technology

Just one **GEROPROTECT™ Ageless Cell™** softgel daily provides:

Myricetin	50 mg
N-Acetyl-L-Cysteine	450 mg
Epigallocatechin Gallate [EGCG]	100 mg
Gamma tocotrienol	25 mg

GEROPROTECT™ Ageless Cell™
Item #02119 • 30 softgels

Retail Price: \$40.00
Your Price:
\$30.00

Call **1-866-820-4967** toll-free or visit **www.LifeExtension.com**.

Please mention Discount Code **PIM701X** • Offer expires December 31, 2017

Consult your healthcare provider before use if you have a bleeding disorder, are taking anticoagulant or antiplatelet medications or beta-blockers such as Nadolol. Keep out of reach of children. Do not exceed recommended dose.

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.



Prospect of Human Age Reversal

By William Faloon, Co-Founder
Life Extension Buyers Club, Inc.

William (Bill) Faloon has had cryonics funding in place for himself longer than virtually anyone.

Bill, now 63, bought life insurance around 1971 to ensure funding would be available for someone to cryopreserve him. Back in those early days (before ALCOR), finding a cryonics organization was difficult, and none offered reliable services.

Bill Faloon established the first cryopreservation facility in the southeastern United States. In 1977, he incorporated the **Florida Cryonics Association**, which is now named **Life Extension Foundation, Inc.**

Along with Saul Kent, Bill Faloon is responsible for financially assisting ALCOR in earlier years, along with establishing cryopreservation research facilities, including 21st Century Medicine, Inc., Critical Care Research, Inc., Suspended Animation, Inc. and the Timeship project, which is designed to house tens of thousands of cryonicists in perpetuity in the safest geographic location in the United States.

This article describes Bill's latest project, which is to identify and fund research aimed at reversing biological aging in people today!

For ALCOR members who don't know me, I've co-founded entities over the past **40 years** that support **research** to extend healthy human lifespans.

These organizations have contributed over **\$200 million** to initiatives that focus on perfecting cryopreservation, slowing aging and providing long-term security for cryonics patients (via the Timeship project).

Cryonics research is our priority, for it represents the best way of gaining access to future medical technology.

Starting about 3 years ago, however, we opened a new front in our quest to achieve human immortality.

Our inspiration was ignited by findings showing consistent **reversals** of aging processes in experimental rodent models.^{1,2,3,4,5,6,7}

Even more compelling are pilot studies where degenerative aging is apparently being **reversed** in **humans**.^{8,9,10,11,12}

It has become abundantly clear that therapies may exist now to systemically **rejuvenate** elderly people.

Some researchers we are helping to support have approvals from the **FDA** to launch full-scale clinical trials. The goal is to

methodically **validate** **age-reversal** in study groups of 30-50 people.

Healthy young blood donors have been recruited to provide **plasma concentrates** that will be infused into elderly people. Preliminary data indicates old people receiving concentrated **young plasma** may be growing **younger**.¹³

In **August 2016**, we announced the formation of **Age Reversal Therapeutics, Inc.** The company's mission was to fund human studies and rapidly make effective therapies available to those who have a short time to live.

Age-Reversal Human Projects

- Repair cellular DNA with NAD+ infusions
- Systemic regeneration using young plasma
- Stem cell-mobilized young plasma infusion
- Thymic regeneration to reverse immune senescence
- GDF11 restoration to help mimic parabiosis
- Purge senescent cells with dasatinib/quermetin
- Remove cellular debris with rapamycin

*These technologies are ready for clinical trials.
No new drug development is required.*

Age Reversal Therapeutics, Inc. was only allowed to accept funds from "accredited investors," which required burdensome SEC paperwork. When the offering expired on **March 31, 2017**, there was **less** than

\$1 million invested or committed. This amount was **insufficient** to fund the clinical studies. So 100% of the funds we received were **returned** to investors.

Our **Life Extension Society** also received tax-deductible **donations** of about **\$54,000** that remains in a charity account and will **only** be used to fund **human** age-reversal projects.

Each day, **5,000** Americans perish from age-related illnesses.¹⁴ Based on what's been recently discovered, many of these lives can be saved.

As cryonicists, these human age-reversal initiatives provide two critical benefits:

1. Delay expiration of our first life cycle, thus enabling us to benefit from improved cryopreservation techniques.
2. May eliminate the current, absolute need to be cryopreserved, assuming we can accelerate age reversal in a way analogous to the computer revolution that began in the early 1980s.

This article describes a plan to fire up a **biomedical renaissance** and how you can personally participate.

We live in an unprecedented era as it relates to our understanding of what causes pathological aging.

This knowledge enables us to investigate and measure the effects of interventions that may enable meaningful reversals of degenerative processes.

The enthusiasm surrounding the prospect of age reversal has not gone unnoticed. Headline news routinely reports on today's **billionaires** who are funding projects aimed at achieving markedly longer lifespans.^{15,16,17,18,19,20,21,22,23}

We at the **Life Extension Buyers Club™** applaud all those seeking to turn "aging" into a relic of the past, as was done with smallpox, polio, and other diseases.

Multiple factors involved in aging make it unlikely that any one person alone will discover the ultimate cure. A concerted effort to coordinate with activist individuals/organizations is a more rational approach.



PULLING RESOURCES TOGETHER

The new strategy is a *"private association"* that brings together like-minded individuals into a collective group that seeks to rejuvenate aging people...like many readers of this article.

The group has engaged in daily communications whereby information is disseminated about participating in age-reversal studies, self-experimentation, investing/donating to specific projects, and raising public awareness.

This *private association* is analogous to groups formed in the past to advance a **science** when the medical profession showed little interest.

On the next column is an excerpt from *Life Extension* magazine that describes such a private association:

"In 1767 a few wealthy and civic-minded citizens in

Amsterdam gathered to form the *Society for Recovery of Drowned Persons*.²⁴ Amsterdam is a city of canals and hence people fell in and drowned. It thus became the birthplace for the teaching and promotion of the **resuscitation of dead persons**.

Within 4 years of its founding, the society in Amsterdam claimed that **150 persons** were saved by their recommendations.²⁵

The *Society for Recovery of Drowned Persons* introduced scientific principles and techniques, along with ethical changes that started a collective belief that **resuscitation of the dead** was possible.

Many of these techniques (or variations of them) are used in modern emergency medical practice."

Our **private association** will seek to rescue aged humans who may not live long enough for rejuvenation therapies to be fully validated. Our goal is to save lives, as did the civic-minded Amsterdam group 250 years ago.

Here is the game plan:

1. We believe aging is at least partially reversible using existing therapies;
2. There is a growing interest in transforming this into clinical reality;
3. Those interested in age reversal want active (not passive) engagement;
4. The most efficient way to advance age-reversal research is via a *private association* (analogous to the Amsterdam rescue society).

CHOOSING A NAME

Based on the lives saved by the Amsterdam group, I initially proposed our private association be called *Society for Rescue of Senescent Persons*.

We later amended the name to reflect the wisdom inherent in elderly persons, along with the respect shown to elders in long-lived populations.

The name of our group is thus:

Society for Rescue of Our Elders
(RescueElders.org)

Ben Franklin quote:

"We must, indeed, all hang together or, most assuredly, we shall all hang separately."

(Relating to signers of the Declaration of Independence)

.....

Paraphrase relating to age-reversal research:

"We must, indeed, all work together to defeat aging, or, most assuredly, we shall, each alone, be defeated by aging."

The purpose of **Rescue Elders** is to unite people in ways that will accelerate the availability of rejuvenation technologies to benefit all of humanity, including members of the association.

This **private association** consists of activists, self-experimenters, physicians and scientists involved in age-reversal initiatives. These individuals share a common desire to regenerate aged people.



HOW THE PRIVATE ASSOCIATION OPERATES

The *Society for Rescue of Our Elders* currently has about 1,700 individuals who have demonstrated their desire to donate, invest, and/or actively participate in advancing human age-reversal studies.



Partnerships may form within or outside the group in any manner the individual members choose. Information will be shared at the discretion of the individual members.

There are some prestigious individuals in this group who are bound by confidentiality/nondisclosure contracts. We nonetheless welcome their input and any meaningful scientific data they are permitted to disseminate. A key to our success will be open-source information sharing whenever feasible.

To reiterate, the *Society for Rescue of Our Elders* purpose is to exchange scientific information, foster strategic alliances, and support biomedical endeavors aimed at reversing degenerative aging.

WHO IS ELIGIBLE TO JOIN?

Since 2015, I have asked supporters of the **Life Extension Buyers Club** for assistance in advancing this humanitarian mission to abolish pathologic human aging.

We've since gathered an impressive group of scientists and activists who want to participate.

To register for informal membership in the *Society for Rescue of Our Elders*, you can log on to: www.rescueelders.org/join

By registering on this website, you can learn about ongoing research projects and the various ways you can participate as a study subject. When a major advance occurs, you'll be informed about how

to access the scientifically validated rejuvenation therapy via emails that will be sent to you.

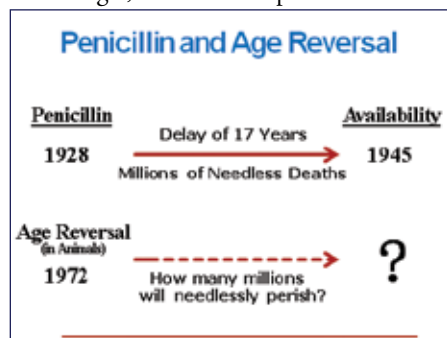
If you want these age-reversal updates, it's essential that you register at: www.rescueelders.org/join

MOVING FORWARD...

We live in an era whereby limitations on maximum lifespans are likely to be soon vanquished.

Multiple biomedical technologies are emerging comparable to the personal computer/communication revolution that arose in the early 1980s.

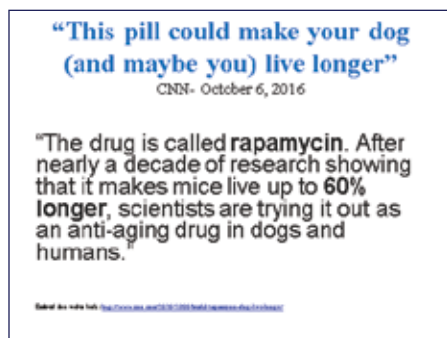
Our mission is to demonstrate statistically significant human **age reversal** so that an eruption of charitable and capitalistic forces will compete to induce even longer, healthier lifespans.



Each day our research is delayed, we grow older and more frail. There is tremendous **urgency** to the effort to move human rejuvenation projects forward.

I've dedicated significant personal resources towards helping to fund rejuvenation research that is occurring now.

Every time you purchase a blood test, nutrient, or other product from the **Life Extension Buyers Club**, you help contribute more funds towards **human** age-reversal endeavors.



To review current regenerative medicine research projects, log on to www.RescueElders.org/update

For longer life,

William Faloon, Volunteer
Society for Rescue of our Elders
and long-term ALCOR member ■



William Faloon



FOOTNOTES

1. Conboy IM, Conboy MJ, Wagers AJ, Girma ER, Weissman IL, Rando TA. Rejuvenation of aged progenitor cells by exposure to a young systemic environment. *Nature*. 2005 Feb 17;433(7027):760-4.
2. Young blood reverses age-related impairments in cognitive function and synaptic plasticity in mice. Available at: <http://www.nature.com/nm/journal/v20/n6/full/nm.3569.html>. Accessed April 4, 2017.
3. Katsimpardi L, Litterman NK, Schein PA, et al. Vascular and neurogenic rejuvenation of the aging mouse brain by young systemic factors. *Science*. 2014 May 9;344(6184):630-4.
4. Functioning of aged brains and muscles in mice made younger. Available at: <http://hsci.harvard.edu/news/functioning-aged-brains-and-muscles-mice-made-younger>. Accessed April 4, 2017.
5. Ruckh JM, Zhao JW, Shadrach JL, et al. Rejuvenation of regeneration in the aging central nervous system. *Cell Stem Cell*. 2012 Jan 6;10(1):96-103.
6. Loffredo FS, Steinhauser ML, Jay SM, et al. Growth differentiation factor 11 is a circulating factor that reverses age-related cardiac hypertrophy. *Cell*. 2013 May 9;153(4):828-39. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3677132/>. Accessed April 4, 2017.
7. New York Academy of Sciences 1972 Nov;34(7). Parabiosis for the study of age-related chronic disease. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4082987/>. Accessed April 4, 2017.
8. Growth Differentiation Factor 11 is a Circulating Factor that Reverses Age-Related Cardiac Hypertrophy. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3677132/>. Accessed April 5, 2017.
9. Wu JM, Hsueh YC, Chang HJ, et al. Circulating cells contribute to cardiomyocyte regeneration after injury. *Circ Res*. 2015 Feb 13;116(4):633-41.
10. Stem Cell Therapy ‘Reverses Ageing Process’ in Millionaire Peter Nygard. Available at: <http://www.ibtimes.co.uk/stem-cell-therapy-reverses-aging-process-millionaire-peter-nygard-1438362>. Accessed April 5, 2017.
11. Age-reversing pill to be tested on humans this year. Available at: <http://dennismichaellynch.com/age-reversing-pill-tested-humans-year/>. Accessed April 5, 2017.
12. Bernardes de Jesus B, Blasco MA. Aging by telomere loss can be reversed. *Cell Stem Cell*. 2011;8(1):3-4.
13. In Revival of Parabiosis, Young Blood Rejuvenates Aging Microglia, Cognition. Available at: <http://www.alzforum.org/news/conference-coverage/revival-parabiosis-young-blood-rejuvenates-aging-microglia-cognition>. Accessed April 5, 2017.
14. Deaths and Mortality. Available at: <https://www.cdc.gov/nchs/fastats/deaths.htm>. Accessed April 5, 2017.
15. Silicon Valley Is Trying to Make Humans Immortal—and Finding Some Success. Available at: <http://www.newsweek.com/2015/03/13/silicon-valley-trying-make-humans-immortal-and-finding-some-success-311402.html>. Accessed 5, April 2017.
16. Tech titans’ latest project: Defy death. Available at: http://www.washingtonpost.com/sf/national/2015/04/04/tech-titans-latest-project-defy-death/?utm_term=.89719f48a575. Accessed April 5, 2017.
17. Could humans one day live to 500? Available at: <http://www.dailymail.co.uk/sciencetech/article-3022363/Could-humans-one-day-live-500-s-group-eccentric-billionaires-believe-spending-fortunes-research-hope-make-possible.html>. Accessed April 5, 2017.
18. Live for ever: Scientists say they’ll soon extend life ‘well beyond 120’. Available at: <https://www.theguardian.com/science/2015/jan/11/sp-live-forever-extend-life-calico-google-longevity>. Accessed April 5, 2017.
19. Tech searches for fountain of youth. Available at: <http://www.cnn.com/2016/11/22/tech-searches-for-fountain-of-youth.html>. Accessed April 5, 2017.
20. The Immortality Financiers: The Billionaires Who Want to Live Forever. Available at: <http://www.thedailybeast.com/articles/2013/08/20/the-immortality-financiers-the-billionaires-who-want-to-live-forever.html>. Accessed April 5, 2017.
21. Billionaire Philanthropists Funding Anti Aging Research. Available at: <http://www.lifeextension.com/magazine/2015/10/billionaire-philanthropists-funding-anti-aging-research/page-01>. Accessed April 5, 2017.
22. Silicon Valley’s Quest to Live Forever. Available at: <http://www.newyorker.com/magazine/2017/04/03/silicon-valleys-quest-to-live-forever>. Accessed April 5, 2017.
23. A controversial effort to defeat death is underway. Available at: <http://www.businessinsider.com/how-immortality-and-life-extension-research-could-help-the-world-2015-8>. Accessed April 5, 2017.
24. Society for Recovery of Drowned Persons. Available at: <https://play.google.com/books/reader?id=peNbaAAAQAAJ&printsec=frontcover&output=reader&authuser=0&hl=en>. Accessed April 5, 2017.
25. Society for Recovery of Drowned Persons. Eisenberg M. History of the science of cardiopulmonary resuscitation. In: Ornato JP, Peberdy MA, eds. *Cardiopulmonary Resuscitation*. Humana Press. 2005;1-9.

ARE YOU TAKING THE BEST FORM OF **CoQ10?**

*Every cell requires
CoQ10,
particularly
your heart, brain,
and kidneys.*

Life Extension® has formulated the most advanced form of CoQ10 utilizing **ubiquinol**, the *non-oxidized, active form* of CoQ10.

SUPER UBIQUINOL CoQ10 with Enhanced Mitochondrial Support™ is absorbed into your blood at a substantially greater rate than conventional CoQ10.^{1,2}

To further enhance CoQ10's vital activity, the Himalayan natural resin **shilajit** has been added to boost CoQ10's power throughout the body's cells.³

Kaneka QH Ubiquinol® is a registered trademark of Kaneka Corporation.
PrimaVie® is a registered trademark of Natreon, Inc.



Super Ubiquinol CoQ10 with Enhanced Mitochondrial Support™
Item# 01426 • 60 softgels • Non-GMO

	Retail Price	Your Price
1 bottle	\$62	\$46.50
4 bottles		\$39.00 each

References

1. *Regul Toxicol Pharmacol.* 2007;47(1):19-28.
2. *Exp Neurol.* 2004;188(2):491-4.
3. *Pharmacologyonline.* 2009;1:817-25.

To order **Super Ubiquinol CoQ10 with Enhanced Mitochondrial Support™**,
call 1-866-820-4967 or visit www.LifeExtension.com
Be sure to mention code **PIM701X**.



Bring in a **NEW** member and save **a year of dues!**

Membership growth has been slowly accelerating since bottoming out in 2013. But we would benefit from faster growth. Alcor is now at a point where we could enjoy considerable economies of scale: We could manage many more members with minimal or no increase in staffing costs. That would enable us to *reduce membership dues* while building up our resources. A modest acceleration in membership growth would move us into a virtuous circle where growth enables reductions in dues which further spurs membership growth. Growth will also make it easier to hire highly skilled people in medical and technical areas.

The most effective way to bring in new members has been through direct encouragement by existing members. Many of us realize this, but may not make it a priority to nudge our friends a little more to sign up and potentially save their lives. How can we spur more members to gently persuade those they care about to move ahead with making cryonics arrangements? Perhaps some financial incentive will help.

Anyone who is primarily responsible for getting a new member to sign up will, at their request, be given a one-year waiver of membership dues.

For an existing member to receive the dues waiver, they must (a) be credited by the person who has signed up; (b) ask for the waiver; (c) not be otherwise profiting from the signup; (d) wait until the new member has completed all essential cryopreservation paperwork and has paid at least six months of dues; and (e) the new member must not be a member of their family. If the member signs up two new members, they are eligible for a two-year waiver of dues. If the new member is a student, the existing member is eligible for a waiver of six months of dues.

Who do you know who could do with some encouragement to sign up? Please, give it some thought, then help yourself and help the organization by helping to stimulate membership growth. Bring in one new member per year, and you will never pay dues again!





photo by: JoshuaLee@SunyataStudios.com

MEMBER PROFILE CHRISTINE PETERSON

By Nicole Weinstock

Christine at the 17th Foresight Conference in 2014. Image by Sunyata Studios

“I care tremendously about health, but I also care tremendously about the environment,” says Christine Peterson. To satisfy both passions on a daily basis, it helps that she is a co-founder, board member and workshop facilitator at the Foresight Institute. The Palo Alto-area nonprofit has a thirty plus-year track record of cross-disciplinary research, advocacy and innovation related to cutting edge technologies—nanotechnology in particular.



Christine testifies before Congress on the societal implications of advanced nanotechnology.

According to Christine, Foresight and the key publication that spurred its founding,

Engines of Creation: The Coming Era of Nanotechnology, are responsible for the first widespread definition of nanotechnology. “The original definition that caught on in the U.S. and most of the world was the one that Foresight put forward, which really is molecular nanotechnology, the coming ability to build molecular machines, systems, materials—everything—with atomic level precision.” But this scope became greatly broadened by the U.S. National Nanotechnology Initiative near the turn of the century, whose definition continues to encompass any science, technology and/or engineering performed at the scale of 1 to 100 nanometers. As a result, researchers who pursue the original goal often refer to their work as “molecular nanotechnology,” or “atomically precise manufacturing,” to avoid confusion.

The relationship between this extremely small-scale technology and the areas of health and the environment may seem, in a time characterized by the likes of prescriptive and conservation-driven efforts, rather elusive, or, as Christine has joked in so many of her presentations, “like science fiction.” Yet the ability to manipulate matter at the atomic level promises mammoth improvements to healthspan,

lifespan, and Earth’s environment. Major pollutants like carbon dioxide can in principle be converted into methanol to power fuel cells, atomically-precise sensors can someday be sent through the body to detect and eradicate cancer cells. The applications are endless.

For Christine, the road to possibility of this magnitude started in upstate New York. Her father was an engineer, an orientation which encouraged her scientific world lens from early on. Christine credits good local public schools in helping to secure her college acceptance to the prestigious Massachusetts Institute of Technology (MIT), as a chemistry major. “My high school teacher taught chemistry better than any professor I had at MIT later on,” she praises, but adds that, nonetheless, “I can’t say that chemistry was my great love.”

She explored and eliminated other fields from consideration—economics, philosophy, history, law, and medicine—before toughing it out and finishing her chemistry degree. Still it became clear that her strengths lay elsewhere than chemical lab work. “It’s like cooking,” she jokes. “I wasn’t very good at it.” As an alternative to becoming an experimental scientist, she opted to pursue semiconductor



Christine shares a nibble with her mother, Norma Peterson, who is also an Alcor member.

engineering. Her chemistry background in fact would strengthen her talents for semiconductor electronics, which is central to modern computers and a mainstay of modern technology. (Silicon, the chemical element from which many semiconductors are made, made its way to the very name of the country's most tech-saturated region: Silicon Valley.)

In addition to its improved alignment with her natural talents, the semiconductor engineering pathway furthered another career objective: supporting early publications in nanotech. Christine assumed responsibility for underwriting Eric Drexler's seminal publication, *Engines of Creation: The Coming Era of Nanotechnology*. Engines reached bookstores in 1986, the same year that Peterson and Drexler co-founded Foresight Institute. The concurrence of this was key, Christine explains:

"We realized that just one book wasn't enough...There needed to be an organization. We actually incorporated the organization before the book came out. And in the back of the book we gave our postal address...Because we knew people were going to be very excited about these ideas."

One of the concerns to which the nanotech duo gave particular attention

in Foresight was responsible use. They both smartly and earnestly anticipated concerns about the potential misuse of nanotechnology, amidst its many benefits. Foresight then became a forum and a mechanism for information exchange and ongoing research into the entire spectrum

of consequences and applications, kept flexible enough to address related technologies like artificial intelligence and space technology.

For Christine, who has been an Alcor member since the mid-80s, nanotechnology and cryonics have been associated since college. It was then that she first became acquainted with Drexler and his earliest insights into molecular nanotechnology, which also shifted his technical view of cryonics in a favorable direction. Christine became aware of cryonics during this shift, finding it quite sensible. "When you're nineteen and someone explains something to you, and it sounds logical and technically correct, you're not really surprised at that age. Everything is new at that point." Many on first learning about cryonics have reacted negatively, but not her. "To me, cryonics is sort of an obvious thing. With sufficiently advanced repair abilities, it could work. My early introduction to this made it harder for me to see why people have these emotional reactions. I didn't have to go through that myself. I skipped that stage."

Nevertheless, Christine has a track record of success in communications. A simple YouTube search under her name



Christine on a hike at Pinnacles National Park in Central California. Check out that shirt!



Badassery at its best, courtesy of Minda Myers.

yields several videos of nanotechnology and longevity lectures and presentations. In fact, it was her sensitivity to the nuance and perception of language that led her to coin the term “open source software.” This indirectly stemmed from her experience

with the Xanadu hypertext project, a collaboration by a group of forward-looking thinkers initially scattered about the country (but later centered in the Bay Area) who were working on a technology similar to the World Wide Web. Xanadu



Christine shows off her stem cells now stored at Forever Labs.

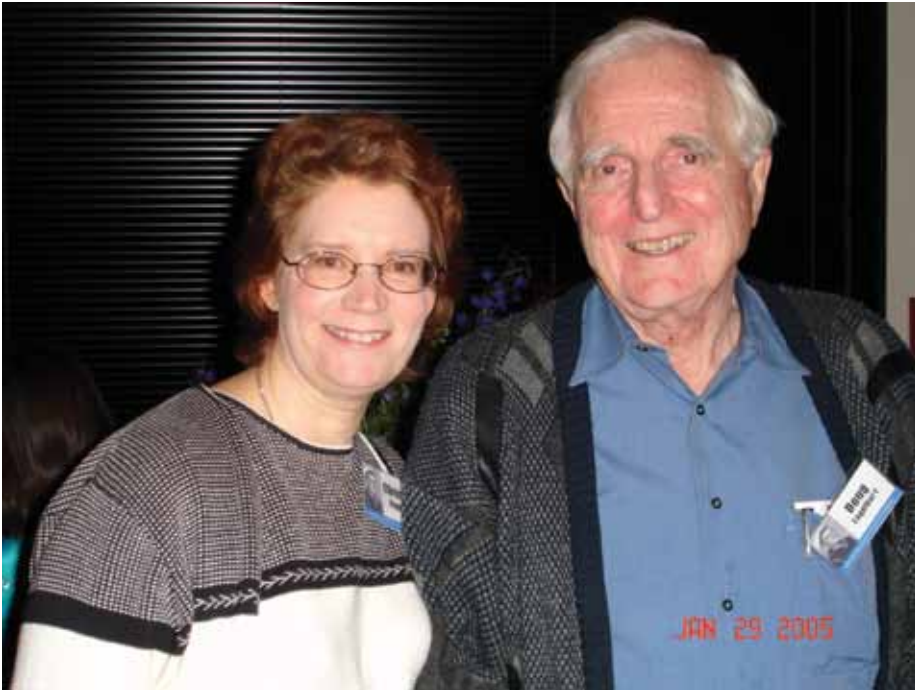
was proprietary, but the software that ultimately caught on was instead publicly available and modifiable. The licensing model for such software was frequently referred to as “free,” but as Christine recalls:

“I had seen, so many times, newcomers to the concept of free software becoming very confused by what was meant by the term ‘free’ software. People always assumed it meant ‘free’ as in price. But while that software was free in price, that’s not what the name means by ‘free.’ It means ‘free’ in terms of freedom.”

After several brainstorming sessions she came up with “open source software,” which is now widely used as a more understandable term.

Christine’s communications strength isn’t just limited to technology. She has had a lot of success giving talks about love and finding a life partner. Drawing on examples from evolution and biochemistry, Diana Kirschner’s book, *Love in 90 Days: The Essential Guide to Finding Your Own True Love*, and her own experience finding love in 115 days—just a few weeks off from Kirschner’s estimate!—she guides people—women in particular—through the meaning and implications of cuckoldry, oxytocin, and dopamine in heterosexual pair bonding. She’s written an ebook and hopes to find time to write a more robust publication in the future.

Not excluding the health benefits of a long-term love, well-being in general is an area of ever-increasing passion for Christine. Chronic stress is one area of particular interest, spurred by research into vagus nerve stimulation, which can “basically turn off the fight or flight mechanism of the body and turn on the healing mechanism of the body.” A part of the parasympathetic nervous system, many studies have drawn a connection between it and your health and longevity. To this end, she regularly meditates, practices yoga, and sings. Yes! Singing is, according to Christine, a great *social* (extra health points for that) way to stimulate the vagus nerve. “Right now, I’m learning ‘Just in Time,’ and ‘I’m in the Mood for Love.’ I would like to get good at ‘I’m in the Mood for Love,’ because my husband really likes that song.”



Christine with the late Doug Engelbart, inventor of the computer mouse and Silicon Valley legend.

The value of sleep in the stress and overall health equation is also important to Christine. She wears an Oura ring every night. A waterproof Finnish sleeping ring made of high-tech ceramics, it uses a pulse oximeter and other sensors to give very detailed information on your sleep. “I have found it super helpful,” she reports.

Amidst all these successful experiments, Christine shares less enthusiasm for the popular life extension topic of permanent calorie restriction. “A long-term period of calorie restriction over decades sounds like hell to me. I hate feeling cold! But it sounds like there are ways to get similar benefits

without that.” She has found ample proof of calorie restriction reducing chronic diseases that impact healthspan, but is less convinced of its efficacy in boosting human lifespan. As to the alternatives with similar benefits, she has been researching intermittent fasting, and a distinct type of fasting that involves restricting one macronutrient at a time. Cold thermogenesis—regular exposure to cold temperatures—is another area of inquiry.

As is abundantly clear, “Increased healthspan is kind of a routine thing for me to be interested in,” says Christine. “You go to your dentist, you do your life extension stuff.”

Looking to the future of cryonics, as the co-founder of an institute with “foresight” in the title is wont to do, Christine hopes the next five to ten years at Alcor will focus on recruitment with a futuristic edge. She hopes for an updated recruitment book and perhaps even a video. Such resources might have strong appeal to the tech-minded cryonicists-to-be and the younger generations that cryonics has yet to capture. A commendable combination, Christine’s vision is balanced by a strong

sense of sincerity and commitment to the field’s progress. “Promoting cryonics and then carrying it out—actually performing the cryosuspensions—and trying to carry forward the research is extraordinarily challenging. It’s one of the hardest things I know that people do anywhere, so I’m tremendously admiring of the whole team.”

To read more about Christine’s work in nanotechnology and the Foresight Institute, please visit www.foresight.org. Her ebook on finding a life partner can be requested by Alcor members for free by emailing ChristineLPeterson1@gmail.com. ■



Hot tip from Christine! Driving bumper cars is a great way to de-stress.



Christine with her daily tea—another longevity strategy or at least a stress-reducer.

Brain Preservation and Personal Survival: The Importance of Promoting Cryonics-Specific Research



By Alexandre Erler

INTRODUCTION: CRYONICS AND THE BRAIN PRESERVATION FOUNDATION

As someone who is fully supportive of the ultimate goals of the cryonics enterprise, but still views the current state of the practice with some degree of skepticism, I make a point of acquainting myself with the latest evidence regarding the quality of cryonics procedures and their ability to preserve the foundations of a person's identity through time. Over the past 18 months or so, I have increasingly seen a recent achievement by 21st-Century Medicine (21CM) cited by some cryonics supporters as demonstrating the scientific validity of those procedures: namely 21CM's research on aldehyde-stabilized cryopreservation (ASC), a technique that allowed them to win the Small Mammal Prize awarded by the Brain Preservation Foundation (BPF) last year by demonstrating excellent preservation of the ultrastructure in a whole rabbit brain (McIntyre and Fahy, 2015). Were I to follow this line of reasoning, I could happily set aside my concerns about the adequacy of today's cryopreservation procedures, which had now been verified by scientific experts; or if I still wasn't convinced, I could simply donate money directly to the BPF via their website, in order to support further research aimed at perfecting brain preservation methods.

It turns out, however, that things are not

so simple. ASC is no doubt an important achievement for the field of brain banking, and as its name indicates, it is indeed a form of cryopreservation, since it involves vitrification of the brain at -135°C . Nonetheless, ASC does not count as *cryonics*, insofar as it uses a fixative solution prior to vitrification and cooling, which could potentially preclude revival of the original biological brain (an essential part of cryonics as traditionally understood). And indeed, biological revival with the help of future technology is not a priority for the BPF's president, Dr. Kenneth Hayworth. Rather, he envisages brain preservation as conducive to radical life extension via *mind uploading*: a process that would involve cutting the preserved brain into thin slices, scanning each slice, and feeding the resulting data to an advanced computer that would thereby be able to map out the entire network of neural connections in the person's original brain, and ultimately to emulate that person's mind (Hayworth, 2010). This is quite different from cryonics.

Assuming that a technique like ASC is compatible with mind uploading, but not with the revival of the original brain, it should not be treated as a landmark in cryonics research. Admittedly, there is some uncertainty about the truth of that assumption. It seems at least conceivable that the chemical cross-links created by the fixation process could be reversed,

and the original brain revived, using future technology. Nonetheless, ASC does introduce empirical and philosophical uncertainties (e.g. could we really restore, as opposed to recreate, the original neural structure following the various molecular changes involved?) that traditional cryonics does not.

But why, it might be asked, should one remained fixated on pursuing biological revival via traditional cryonics, if the evidence in favour of good ultrastructure preservation is better for ASC than it is for contemporary cryonics procedures? It is for instance known that, up to now, 21CM's cryonics protocol involving the use of cryoprotectant M22 has been causing the brain to shrink to almost 50% of its natural size due to osmotic dehydration, hindering our ability to establish the quality of ultrastructure preservation using electron microscopy (The Brain Preservation Foundation, n.d.; De Wolf, 2017). If so, why not join the BPF in focusing simply on the type of brain preservation that seems to yield the best evidence of success, even if this means turning away from cryonics towards mind uploading?

In what follows, I will argue that, given the current state of our scientific and philosophical knowledge, doing so would be irresponsible. Brain preservation research targeted at mind uploading is interesting in its own right, and could

potentially help foster breakthroughs in the field of artificial intelligence. Furthermore, the BPF's commitment to holding such research to the highest standards of scientific rigour is laudable, and worth emulating. Nonetheless, for those interested in brain preservation with a view to enabling radical life extension, supporting cryonics-specific research remains the safer bet. We should not leave it to organisations like the BPF to figure out how to save those whom modern medicine cannot help.

TWO DIFFERENT VIEWS ABOUT PERSONAL IDENTITY AND SURVIVAL

To see why this is so, let us begin by noting the two main philosophical theories of personal identity through time that are relevant when discussing the respective merits of cryonics and mind uploading in this context. The first one, which we can call the "Physical Continuity" (PhyCon) theory, asserts that a person is identical with the physical substratum from which her mind emerges: that is to say, her brain, with its intricate web of neurons and synaptic connections. (For a good exposition of the theory, see e.g. McMahan, 2002.) According to this theory, saving a person from destruction after she has been pronounced dead requires preserving enough of her brain, in a state in which that brain retains at least its potential for viability. What exactly counts as "enough" of the brain is of course a difficult question that would deserve much more discussion. While we can safely say that, all else being equal, it is always preferable to preserve as much of the original brain as we can, the survival of the person arguably does not require perfect preservation. Intuitively, people can survive limited forms of brain damage, such as those caused by strokes. What is more, as cryonicists have pointed out, brain damage that causes significant disability today might no longer be a serious problem (as long as it is limited enough not to undermine personal identity) in a future where cryonic revival has become possible, as the technological means will then likely exist to fully repair that damage, e.g. based on inferences from the state of the person's brain prior to repair.

The second relevant theory can be referred to as the "Psychological Continuity" (PsyCon) theory. Roughly speaking, it says that you are identical with the set of psychological features

(memories, beliefs, desires, personality traits, etc.) that constitutes your mind. On this view, preserving you after you have been pronounced dead requires ensuring the persistence of enough of those psychological features, in an embodied mind of some sort (but one that need not be embodied in your current biological brain). One variant of PsyCon, endorsed by many supporters of mind uploading including Hayworth, states that preserving a person after legal death requires preserving her connectome, understood as the mapping of neural circuitry encoding one's memories, skills, and other psychological features – that is to say, the connectome as an informational entity rather than a physical one (Hayworth, 2010), even though the information in question will by necessity be stored in some physical substratum, whether a brain or a computer.

Like virtually all philosophical theories, both the PhyCon and PsyCon theories have their partisans and detractors. PhyCon, for instance, has been said to imply that there is a fundamental difference between a scenario in which a person had her brain suddenly destroyed and replaced by an exact copy of it, perhaps produced via scanning and 3D printing using neurons as basic material; and a scenario in which the person's brain cells were gradually replaced by new ones over an extended period of time, in the same way as the rest of the human body regularly regenerates itself. While most PhyCon theorists would agree that the second scenario is compatible with the preservation of the person's identity through time, they will deny that the first is – if the original brain gets destroyed, they will say, so must the person as well, and the new replica brain must belong to a new person not numerically identical with the first one. Some find this difference of treatment between the two scenarios arbitrary (e.g. Parfit, 1984).

Some versions of PsyCon, on the other hand, imply that multiple copies of yourself could all be you. Indeed, suppose that after scanning your brain to obtain a map of your connectome, we then created two identical copies of your mind running on two different computers. Since both copies would demonstrate the same degree of psychological continuity with your previous self, we would have to conclude that both are you – something many find intuitively unacceptable. Other versions

of PsyCon strive to avoid that implication by stipulating that you are only identical with an upload of your mind if no more than one copy of it has been created, yet this move leads to other philosophical problems. Hayworth, however, happily endorses the implication that multiple copies of a single individual can co-exist at the same time, and contends that those who object to that implication are simply confused (Hayworth, 2010).

HOW TO MAKE A PRUDENT CHOICE UNDER (PHILOSOPHICAL) UNCERTAINTY

For the record, I personally find PhyCon more plausible than PsyCon (although I also agree that the preservation of one's psychological features after cryonic revival is highly desirable, even if it is not required for sheer survival). However, my personal opinion on the matter can be set aside for the sake of the present discussion. The important fact is that there are reasonable, honest and intelligent people on both sides of that debate, and that neither side has so far managed to present arguments that would convince all reasonable people on the other side. In such a situation, the intellectually responsible path to take is surely to eschew certainty, and acknowledge that the other side *could* be right, even if one thinks that this is unlikely and that the arguments favoring one's own position are very strong.

If that is the case, what is the prudent choice to make for those who wish to promote radical life extension through brain preservation? I submit that traditional cryonics is the more prudent option to pursue. (This remark could be extended to ASC *if* one could show that it is in principle compatible with the revival of the original brain, and provided that it is not combined with mind uploading.) This can be demonstrated using a simple argument that considers what the implications are if we assume that PhyCon and, respectively, PsyCon are true.

Suppose first that PhyCon is true. If so, a cryonics procedure carried out properly will save a person's life, whereas fixing the person's brain using a technique like ASC, followed by scanning and uploading, will kill that person. If PsyCon is true, on the other hand, *both* methods can ensure survival. Indeed, adequate cryonic preservation of a person's brain would also

preserve the ultrastructure grounding the various psychological features that defined that person. Insofar as traditional cryonics can secure survival whether PhyCon or PsyCon is true, whereas mind uploading of the kind envisaged by the BPF can only do so if PsyCon is correct, traditional cryonics is the safest bet.

This conclusion is reinforced by the fact that the success of mind uploading at securing personal survival might depend on an additional factor, namely the possibility of creating conscious or sentient machines. If, for whatever reason, computers – which, unlike biological brains, rely on hardware rather than “wetware” – happen to fundamentally lack the capacity for consciousness, regardless of how powerful and sophisticated they might be, then uploads turn out to be no more than computer “zombies” mimicking now deceased people. It’s unclear that someone could “survive” as such an entity. And even if we assume that they could, the value of such survival, devoid of the conscious experiences that make our lives worth living, would be dubious, somewhat like the value of surviving with only a brain stem. This point about machine consciousness equally applies to the idea of a “Moravec transfer,” i.e. a procedure involving gradually uploading a person’s mind to a computer (neuron by neuron if necessary), unlike the BPF’s proposed method (Moravec, 1988). Traditional cryonics, by contrast, can succeed at preserving a person regardless of whether or not machines can be conscious.

Hayworth would presumably deny that any such doubts about the possibility of machine consciousness are legitimate. Indeed, he seems to confidently embrace the so-called computational theory of consciousness, according to which consciousness is fundamentally the product of – highly complex – computation, which we know computers to be capable of at least in principle (e.g. Hayworth, 2015). However, there is currently no general agreement among philosophers of mind or neuroscientists that the computational theory of consciousness is correct, and Hayworth does not demonstrate that it is (although he dogmatically equates the idea that there might be physical properties required for the production of conscious experience which are found in wetware, but not computer hardware, with invoking “magic”).

Furthermore, even if taken for granted, the computational theory of consciousness cannot, absent additional philosophical arguments, show mind uploading to be consistent with personal survival. Assuming that R2-D2 from *Star Wars* is conscious does not commit us to accepting that a perfect replica of R2-D2 built from fresh parts, after – let us assume – it was destroyed by the Empire’s forces, is numerically identical with the original robot. In response, Hayworth could perhaps abandon PsyCon and instead invoke the claim, famously defended by philosopher Derek Parfit, that personal identity does not actually matter in the way many of us tend to think – rather, psychological continuity is what really matters (Parfit, 1984). (In his reply to an article by neuroscientist Michael Hendricks critical of cryonics, Hayworth actually appears to move in that direction: see Hayworth, 2015.) However, besides the fact that this is again a controversial philosophical view, it notably led Parfit to dissociate psychological continuity from personal survival, and to conclude that the latter was, in itself, also overrated. This position is very much at odds with the life extension project, which the BPF claims to be pursuing.

I cannot but see some irony in the fact that Hayworth, the author of an essay titled “Killed by Bad Philosophy,” should show a degree of overconfidence in his philosophical views that might potentially lead his followers to experience the very same outcome his essay is warning against.

The differences previously highlighted between traditional cryonics and the BPF’s approach are summarised in the table below.

WHAT THE CRYONICS MOVEMENT CAN LEARN FROM THE BPF

None of this is meant to imply that the work of the BPF is without merit. On the contrary, the Foundation’s approach demonstrates a number of virtues that can provide a model for the cryonics movement

to follow. These include a commitment to rigorously and impartially evaluating the quality of brain preservation procedures, in accordance with the standards of scientific peer-review. Another example is the BPF’s successful effort at crowdfunding its incentive prizes for brain preservation research, such as the Small Mammal Prize won by 21CM. For those seeking to promote life extension through brain preservation, who I have argued need to prioritize cryonics-specific research, this suggests two main paths worth pursuing in the future:

- a) *Incentive prizes.* Such prizes are a powerful tool for stimulating research, particularly in neglected areas of science. While the BPF’s prizes can in principle help promote cryonics-specific research, whether or not they are actually doing so is made less certain by the fact that – perhaps unsurprisingly, given Hayworth’s philosophical beliefs – none of these prizes include a requirement to preserve the brain’s potential for viability. On the basis of the arguments I have provided so far, I submit that the institution of a prize (possibly crowdfunded) incorporating that requirement would be highly desirable.

How demanding such an incentive prize should be with regards to the winning entry is a matter for further debate. A relatively modest version would require demonstrating adequate ultrastructure preservation in a small mammalian brain, but using a procedure that secured the brain’s potential for viability more clearly than ASC does. However, based on a recent talk by Dr Greg Fahy from 21CM, which I attended in May at the International Longevity and Cryopreservation Summit in Madrid, such a goal

If:	Traditional cryonics*	ASC + mind uploading*
Physical continuity theory is true	Survival	Death
Psychological continuity theory is true	Survival	Survival
Machines can’t be conscious	Unaffected	Compromised (creates computer “zombie”)

*(*It is assumed that the relevant procedures are performed in accordance with the highest standards of quality)*

may soon be achieved. Indeed, Dr Fahy reported having found a way to largely overcome the abovementioned problem of dehydration and shrinking that has so far prevented a proper assessment of the quality of ultrastructure preservation offered by traditional cryonics protocols (e.g. using M22). Assuming Fahy has now reached that milestone (and I look forward to the publication of his paper on the topic), one could set up a prize with a more ambitious goal: for instance, one could add that besides showing good ultrastructure preservation and retaining the preserved brain's potential for viability, one should also demonstrate *actual* viability, say via measurable electrical activity, either at the level of the whole brain or in slices obtained from that brain. Ultimately, the details of such a prize should be worked out by scientists with the relevant expertise (as long as the constraints I have outlined here are respected).

Those who believe that ASC holds greater promise could support a prize rewarding the first team who found a way to reverse the fixative process involved in that procedure, and restore the original neural structure. As I have indicated earlier, however, there seems to be greater uncertainty about the viability of such a project.

b) *Research funds.* Such a fund, which could also be crowdfunded, would be managed in a transparent manner by an organization committed to promoting cryonics-specific research. In accordance with standard practice when it comes to funding scientific research, project proposals would be solicited from active researchers in cryobiology (and other relevant fields), and a committee of experts would select the proposals that it deemed most worthy of funding. The organization would then help disseminate the results of the

completed projects (e.g. as laid out in peer-reviewed publications).

The scientific experts tasked with evaluating the submissions for either an incentive prize or a research fund should ideally be publicly identified, and sufficiently independent of both the authors of the submissions and of cryonics companies (e.g. they should not be receiving research funding from those companies). Furthermore, while an organization that might implement solution a) or b) could be created *de novo*, existing institutions might already be able to fulfill that role. Some examples – all of which currently accept donations from the public – include:

1. The UK Cryonics and Cryopreservation Research Network (<http://cryonics-research.org.uk>), led by Dr João Pedro de Magalhães, who has connections with other scientific experts, including Ken Hayworth. Despite the scientific rigour with which it approaches the issue of cryonics, the network is currently underfunded.
2. The Life Extension Foundation (<http://www.lifeextension.com>), which already has a substantial track record of supporting cutting-edge research relevant to cryonics.

It is also worth mentioning the Organ Preservation Alliance (<https://www.organpreservationalliance.org>), even though it is focused solely on advancing the science of cryopreservation for organs other than the brain. Besides its potential to help address the current shortage of organs for transplant, this type of research is also relevant to perfecting whole body cryonic preservation, and might yield insights that would also apply to brain cryopreservation.

While most people may understandably not be able to commit substantial amounts of resources to supporting cryonics research, the success that the BPF has enjoyed so far with its incentive prizes demonstrates that large numbers of even small donations can foster impressive breakthroughs and help strengthen the credibility of research projects of the most audacious sort. I believe it is now time to apply a similar approach to the safer bet of cryonics-specific research. Further raising the public profile of such research, and improving its image among the mainstream scientific community, can help promote a virtuous

cycle leading in turn to more funding and greater professionalization. The sooner we can make this happen, the better. The clock is ticking! ■

Alexandre Erler is a Research Assistant Professor in Philosophy and Bioethics at the Chinese University of Hong Kong. He holds a doctoral degree in Philosophy from the University of Oxford. His research focuses on the ethical and social implications of emerging technologies.

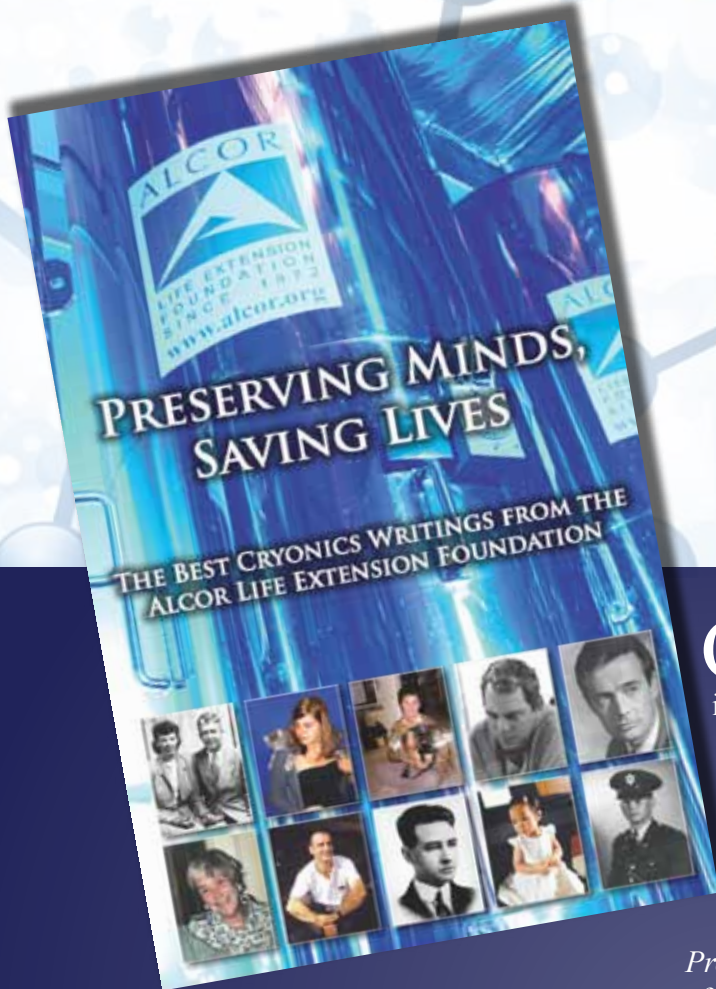
REFERENCES

- DE WOLF, A. August 21 2017. Cryonics Without Cerebral Dehydration? *Evidence-Based Cryonics* [Online]. Available from: <http://www.evidencebasedcryonics.org/2017/08/21/cryonics-without-cerebral-dehydration/>.
- HAYWORTH, K. 2010. Killed by Bad Philosophy: Why Brain Preservation Followed by Mind Uploading Is a Cure for Death. Available: <http://www.brainpreservation.org/content-2/killed-bad-philosophy/> [Accessed 09/09/2017].
- HAYWORTH, K. September 16 2015. Ken Hayworth's Personal Response to MIT Technology Review Article. *Brain Preservation Foundation* [Online]. Available from: <http://www.brainpreservation.org/ken-hayworths-personal-response-to-mit-technology-review-article/>.
- MCINTYRE, R. L. & FAHY, G. M. 2015. Aldehyde-Stabilized Cryopreservation. *Cryobiology*, 71, 448-58.
- MCMAHAN, J. 2002. *The Ethics of Killing: Problems at the Margins of Life*, Oxford, Oxford University Press.
- MORAVEC, H. P. 1988. *Mind Children: The Future of Robot and Human Intelligence*, Cambridge, Mass., Harvard University Press.
- PARFIT, D. 1984. *Reasons and Persons*, Oxford, Clarendon Press.
- THE BRAIN PRESERVATION FOUNDATION. n.d. *Overview of 21st Century Medicine's Cryopreservation for Viability Research* [Online]. Available: <http://www.brainpreservation.org/21cm-cryopreservation-eval-page/> [Accessed 17/09/2017].

**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.

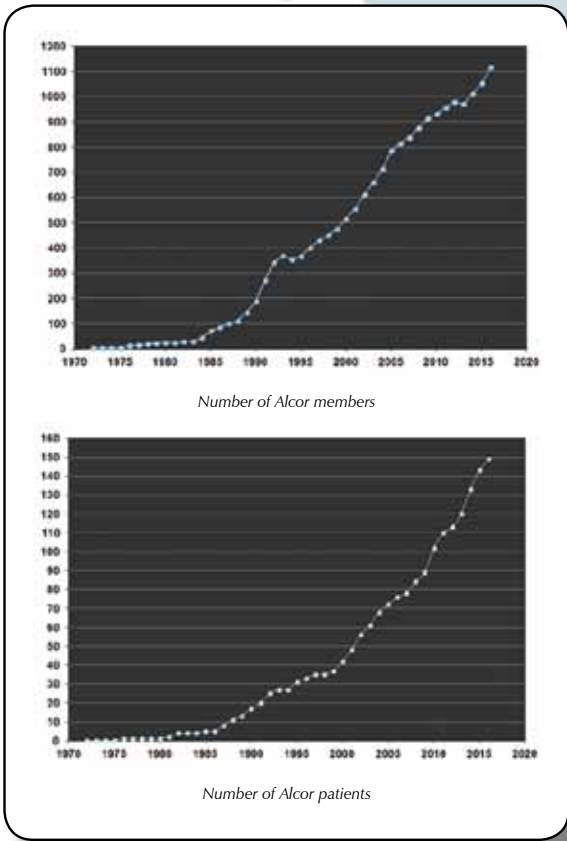
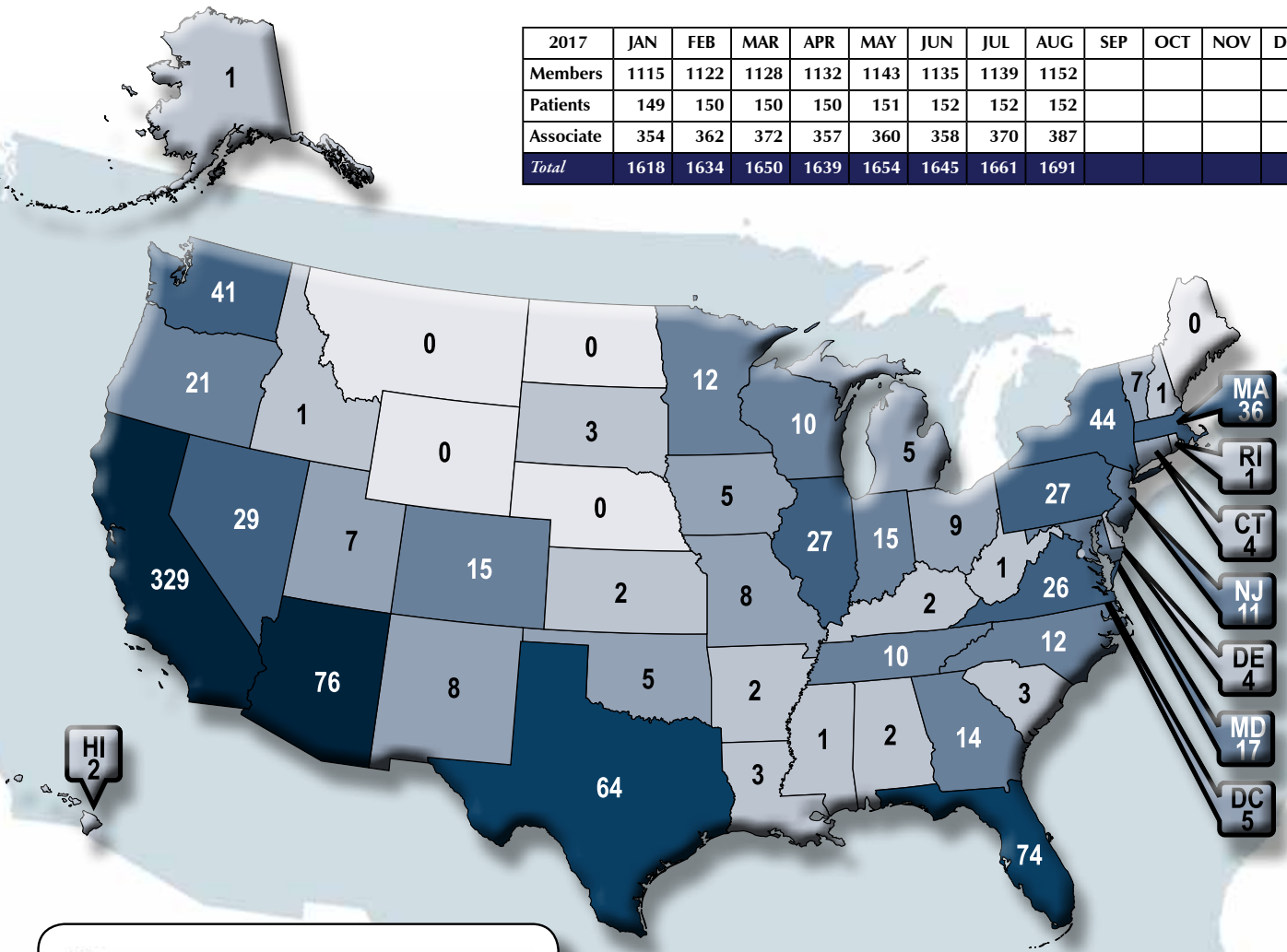
I'm proud to be a part of this effort."

– Michael D. West, Ph.D.

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

Membership Statistics

2017	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Members	1115	1122	1128	1132	1143	1135	1139	1152				
Patients	149	150	150	150	151	152	152	152				
Associate	354	362	372	357	360	358	370	387				
Total	1618	1634	1650	1639	1654	1645	1661	1691				



- 0 Members
- 1-4 Members
- 5-9 Members
- 10-24 Members
- 25-49 Members
- 50-74 Members
- 75+ Members

International Members & Patients

Country	Members	Patients
Australia	13	3
Brazil	1	0
Canada	56	2
Chile	1	0
China	0	1
Germany	12	0
Hungary	2	0
Hong Kong	1	0
Israel	1	1
Italy	3	0
Japan	4	0
Luxembourg	1	0
Mexico	4	0
Monaco	1	0
Netherlands	2	0
New Zealand	1	0
Norway	1	0
Portugal	5	0
Singapore	1	0
Spain	3	1
Thailand	5	1
United Kingdom	32	3
TOTAL	140	12



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.



THE PRICE OF LIFE: ISAAC ASIMOV, CRYONICS, AND HUMAN DEATH EXTENSION

By R. Michael Perry

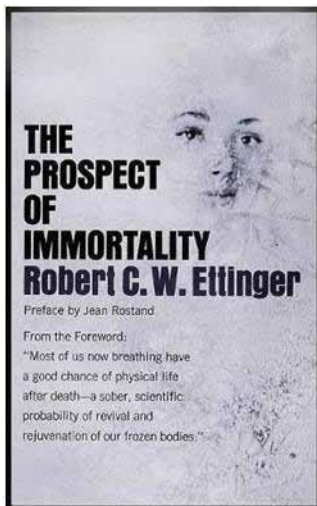


In 1962 Robert Ettinger completed a first draft of his book, *The Prospect of Immortality*, and hoped to have it published to spread his ideas. At Doubleday, Inc. he found a sympathetic junior editor, Tom McCormack, who thought the book was good but needed more length. Ettinger got to work and by 1964 had an expanded version which he again showed to McCormack. Now the book was long enough, McCormack said, but there was an important additional requirement that had to be met. Ettinger's "prospect" called for what he said was a scientific approach to overcoming death: storing the very newly deceased at low temperature where deterioration would essentially halt, until advancing technology could restore them to a functioning, healthy state. (So they really weren't "deceased" after all.) True, the technological breakthroughs that could allow such restoration might be many years in the future, but meanwhile the donors or patients could wait with matters safely on hold, until whatever was needed was developed.

To see how far Ettinger's ideas might have plausibility, someone with a good scientific background was needed to check them out; Isaac Asimov was chosen. Asimov had a Ph.D. in biochemistry and was a leading science popularizer as well as a world-famous science fiction writer. He had, moreover, published many of his own numerous books with Doubleday (and would publish many more through them). He was well-grounded in science, both as to

its strengths and its limitations, and was, on the other hand, very open to possibilities of the future that might be achievable through reasonable extrapolations of what was known and available.

Asimov studied *Prospect* and pronounced the science respectable even if he had other, nontechnical misgivings about the whole idea. Doubleday went ahead with the publication.¹ The book eventually did well, becoming a best-selling selection of the Book-of-the-Month club and being translated into numerous languages.² Through it, people became aware of the possibilities that cold storage could offer, as an alternative to burial or cremation of remains after what conventional wisdom said was "death" or a point of no return. A practice called cryonics grew up which continues today, with better techniques and a larger following but still the same basic idea.³



Isaac Asimov deserves much credit in cryonics for the important if peripheral contribution he made in helping start the practice. Yet he had no personal interest in it, and he died in 1992 and was cremated.⁴ To those of us in cryonics at the time (self included) such a loss hurt. Many of us grew up reading the science fiction stories of Asimov and others and dreaming about a future we would like to reach ourselves. Cryonics became a possible way of doing that, and, if it didn't work after all—well, what other prospect was as good? (We were, of course, discounting supernatural or mystical or other such means that we didn't have confidence in.) But the loss of someone so respected was tragic inasmuch as we hoped that people like Dr. A (as he was sometimes affectionately known⁵) would be in that future to share it with us. His sharp, scientific mind was informed by a voluminous, retentive memory, yet he also cared about people and was not just a "reasoning machine"—far from it. Moreover, he loved writing and produced or edited more than 500 books and an estimated 90,000 letters and postcards.⁶ He made himself well-loved and respected by forward-thinking people, including those like us who took Ettinger's proposal seriously and made arrangements for it. We wanted him onboard—as we want others, too.

But we have to live with frustration. Cryonics, despite its durability, has not garnered much support at the personal level, and there are relatively few of us

who now have the arrangements (about 2,000 people worldwide, mostly in the U.S.)⁷) The apathy toward cryonics, which sometimes erupts into hostility, has been a puzzle. Not everybody will be attracted of course; religious people in particular may sense a threat to their firm reliance on a supernatural power for their greater needs. There are many others though, who you would think might be more favorable, wealthy people in particular, who are not religious and could invest a relatively tiny portion of their estate for the necessary coverage—yet haven't and don't appear about to do so.

Isaac Asimov, with his many years of success and steady income as a writer, was at least moderately wealthy and should have had little problem funding his cryopreservation. (It is worth noting too, that cryonics isn't just a luxury for the rich since there are avenues such as life insurance to make it affordable to persons of modest means who are at least in good health.) Studying why people such as him can do as he did can shed light on the more general problem of why people who we might say "ought to know better" do not sign up or express any serious wish to do so. In the case of Asimov, at least, we have a large body of his writings, along with commentaries of others and such, to attempt the difficult task of mind reading and light-shedding. One particular Asimov essay, *The Price of Life*, specifically addresses his reaction to—and rejection of—the cryonics idea, despite its acknowledged merits and not contesting its technical feasibility. Instead it is clear that Asimov had deep misgivings about the more general idea of radically extending the human life-span, again, not as to technical feasibility—eventually at least—but the desirability of doing it in the first place.

Here we offer some background on Asimov then go on to the main topic at hand, his reaction to the cryonics idea and the more general idea of radically extending the human life-span.

BACKGROUND⁸

Isaac Asimov was born of Jewish parents about the beginning of 1920 (the exact date is uncertain, but the event was celebrated Jan. 2) in the Russian village of Petrovichi, near the present border with Belarus. (Though of Jewish background, the parents, Judah and Anna Rachel *Berman* Asimov, did not make special efforts to

bring up their children in the family faith, and the young Asimov grew up without religious beliefs.) In 1921 Asimov and 16 other children in the village caught double pneumonia; he was the only survivor. In 1923 the family emigrated to the U.S. and he grew up in Brooklyn. (He never learned Russian but did speak fluent Yiddish along with English.) Over the years his father owned a succession of candy stores where the son worked long hours alongside his parents and siblings, acquiring a lifelong habit which carried over to his writing career. At the age of five he taught himself to read, a feat which so impressed his father that Asimov was granted unrestricted access to the local public library, which greatly furthered and supplemented his education along with nurturing a love of learning.

*Asimov studied Prospect
and pronounced the science
respectable even if he
had other, nontechnical
misgivings about the
whole idea.*

Another source of written material for the future writer was the candy store, which also sold newspapers and magazines. The young Isaac was particularly attracted to the science fiction pulp magazines, inexpensively produced for a mass market, which his father initially proscribed as trash, despite their being sold in the store. But the son convinced him to relent, noting the "science" upon which they were (nominally at least) based. Asimov wrote his own first stories at age 11; by 19 he was selling science fiction to the magazines himself. With his precocious intelligence and learning he graduated from high school at 15, in 1935, and went on to college and university studies, finally obtaining a Ph.D. in biochemistry from Columbia University in 1948. For three years during World War II he took time off from schooling and worked as a civilian at the Naval Air Experimental Station in Philadelphia. Drafted into the U.S. Army in September 1945 when the fighting had just ended, he was honorably discharged a few months later, ending his military career.

After completing his doctorate at Columbia he joined the faculty of the Boston University School of Medicine. There he remained, nominally, for the rest of his life, though in practice his teaching career ended in 1958 when he turned full time to writing, also making his home in Brooklyn and mostly refusing to travel. An obituary in the *New York Times* (April 7, 1992) offers this comment on his writing career:

"Mr. Asimov was amazingly prolific, writing nearly 500 books on a wide range of subjects, from works for preschoolers to college textbooks. He was perhaps best known for his science fiction and was a pioneer in elevating the genre from pulp-magazine adventure to a more intellectual level that dealt with sociology, history, mathematics and science. But he also wrote mysteries, as well as critically acclaimed books about the Bible, physics, chemistry, biology, astronomy, limericks, humor, Shakespeare, Gilbert and Sullivan, ancient and modern history, and many other subjects."

In science fiction, perhaps his magnum opus was the *Foundation* series, initially a trilogy but eventually expanded, and harmonized with other work, to cover fifteen novels, dealing with a future galactic empire, with a time scale stretching to hundreds of centuries. The main hero of the series is Hari Seldon, a thinking wizard who devises psychohistory, a mathematical prediction scheme able to foretell the general drift of historical events, though not the finer details. At one point it is predicted that the empire will collapse and 30,000 years of dark ages will follow unless certain actions are taken which will shorten the chaos to 1,000 years. Persons individually are mortal much as today. (Seldon himself dies in his eighties, near the beginning of the long time interval covered by the series, and clearly thousands of years beyond our time.) The idea of conquering aging, rather than, say, intergalactic space, does not appear to enter most if any people's minds. (Instead there is faster-than-light travel so events can unfold on a galaxy-wide scale within one person's lifetime.)

Though primarily a writer, Asimov's interests were broader than merely literary or scholarly. From 1985 until his death in 1992 he served as president of the American Humanist Association (AHA), underscoring a long-standing interest in

promoting the betterment of humanity through its own efforts. Exercising another interest, he was a founding member of the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP, now the Committee for Skeptical Inquiry), and is listed in their Pantheon of Skeptics.

In private life, he was twice married, with three children by the first marriage. His second wife, Janet *Jeppson* Asimov, was also a literary collaborator on many of his works in later years and the marriage by report was a happy one that ended only with his death. (Initially his death at age 72 was described as from kidney and other organ failure. Much later it was revealed that the principal underlying cause was AIDS acquired through a contaminated blood transfusion some years before, when he had a heart bypass operation.)

WHAT ROBERT ETTINGER HAD TO SAY⁹

We have noted the great favor extended to the nascent cryonics movement and Ettinger personally by Asimov's approving Ettinger's book, *The Prospect of Immortality*, for publication in 1964. But this stopped short of an actual endorsement of cryonics, and this shortfall is critiqued in *Man into Superman*, Ettinger's sequel to *Prospect* that appeared in 1972. There, in a chapter entitled "Copouts and Dropouts: The Threat of Immortality," Ettinger takes Asimov to task, his main reference being a short essay by Asimov, "The Price of Life," which appeared in the January, 1967 issue of the men's entertainment magazine *Cavalier*.

Ettinger first reminds the reader of the accomplishments of his target (omitting Asimov's help in publishing his previous book): "Dr. Isaac Asimov is a very well-known writer of popular science and science-fiction, formerly a biochemist at Boston University, a man of prodigious knowledge and towering IQ, who has spoken and written about the cryonics program several times."

He then turns to Asimov's above-mentioned essay (which we consider in detail in due course) and wastes no time noting its glaring (from an immortalist's viewpoint) deficiencies. Asimov thinks (1) no one would want to live more than five centuries anyway, (2) society would be stagnated by super long-lived individuals, and (3) the species itself will

die out eventually, but that's okay if it can give rise to a new and better species in the process. Indeed, "life and intelligence in the abstract" are seen as "the only worthwhile immortality."

Ettinger is swift in his expected rebuttal, in particular noting sarcastically: "This man apparently would die happy—almost any time, one supposes—if only he could be assured that a billion years from now on a planet of Antares, a race of giant spiders would discover a way to spin more beautiful webs." He then asks, "Can he really mean it?" and concludes that no, a man of Asimov's intellect could surely see the same flaws in his own arguments that are so evident to Ettinger himself. So the real motivator for these clearly straw-man arguments must lie elsewhere. Ettinger suggests it is in some way a deep-seated fear of the unknown, a malady that afflicts "[a]lmost all our prophets." They are terrified of "the vast black spaces, the vertiginous open reaches, the vertiginous depths." Frightened enough, evidently, that they cannot even voice their true feelings but must conceal them with comforting (to them) rationalizations that miss the true point. What are they afraid of? An obvious possibility is just death itself—more later—but one must marvel at the lengths some people go (particularly Dr. Asimov) in defending their own viewpoint—again more later.

So really we need to hear from Asimov himself on all this, but first I'd like to consider another essay on the man's pro-death, we might say death-extensionist attitudes, one that appeared shortly after his death, by a longtime fan and admirer who nevertheless is pro-cryonics.

WHAT STEVE HARRIS SAID¹⁰

Steven B. Harris, M.D. is a longtime cryonics activist and is currently Alcor's Chief Medical Advisor. During his many years of involvement in cryonics he has conducted life extension-related research, and has assisted with many cryonics cases and more generally with cryonics technology, such as devising an "e-hit" algorithm for estimating ischemic exposure prior to a patient's cooldown. In 1992 when Asimov died Harris sent a message to CryoNet, quoted from here, lamenting the great man's passing and noting his own, futile efforts to persuade him to change his thinking on cryonics. He writes:

"He was one of my boyhood heroes. From early on I read every book of his that I could lay my hands on, from science fiction to science fact. It was Isaac Asimov who got me interested in chemistry at the age of 10, with books on the chemical elements and the history of chemistry. Because of him I started on organic chemistry at age 15 with *The World of Carbon* (can't start any more basic than that book) and later taught myself biochemistry early in high school, all from Asimov's books. (Anyone who says that science is a mystery to them has no excuse: just go to your local library and look in the author index system under 'A'). I had originally planned to be a medicinal chemist and did not quite end up going down that path, but it is no exaggeration to say that Asimov is in a major way still responsible for my career in medicine."

Harris next writes of his efforts to convince Asimov to reconsider his stance on cryonics:

"Last Fall [1991], when I heard through a mutual acquaintance that Asimov was gravely and irreparably ill, I obtained his New York City address and wrote a belated first and only fan letter to him at his apartment, one which not only said Thank You, but which also contained a lengthy plea that he reconsider the idea of cryonics (I also sent him the most recent Alcor handbook). I didn't have much hope for this last action, since for years I'd been reading Asimovian essays on overpopulation, and I was even aware of one essay from the 70's in which Asimov had specifically attacked the idea of cryonics. Still, I thought it no harm to try, and I did need to tell the man how much his writing meant to me. If my letter gave him a single smile it was worth the time it took to write it."

Unfortunately, Steve's frail hopes on the cryonics issue went unfulfilled:

"He never answered [the letter]. And (worse) he didn't take

me (or anybody else) up on the challenge. I learned later that he had long had some contact with certain members of Alcor NY, so it turned out that even as regards Alcor I probably wasn't telling him anything about cryonics that he didn't already know. Asimov's problem with cryonics was not lack of access or money (his writing had made him rich), and certainly was not lack of brains or scientific knowledge—his problem lay elsewhere."

So what was his problem? Dr. Harris notes how Asimov "was a contradictory man." His mind ranged far and wide through space and time in his books yet he was afraid to fly in an airplane. (It appears he did this only twice in his life, both before he turned 30.) He did not like to travel at all and did it only rarely, by train or other land conveyance. He liked the cozy security of a small room in a crowded city with a typewriter he could peck away at rather than "physically exploring new things." Perhaps it was this sense of alienation from strange surroundings, coupled with certain political views, that so colored his outlook that he really didn't want to see the future even as he loved writing about its possibilities. Harris writes:

"[W]hile Asimov was a rationalist, an atheist, and a committed humanist ..., he was also heavily liberal or even socialist in his politics. In consequence, many of his popular writings abound with cautionary warnings about the damage which would be done to 'society' or 'mankind' by personal immortality (such as overpopulation, stoppage of natural selection, stultification of research because of lack of fresh viewpoints in positions of power, etc.). Whatever you and I may think of these arguments, they were enough for Asimov, and he had enough integrity to back them up with his life when the time came."

Harris continues:

"And perhaps this was not so hard to do, considering the way Asimov saw things. For as a science fiction writer his view of the future was not overly bright,

and (again) his phobias seem to blame. Asimov's future worlds are either giant warrens of humanity (where overpopulation would make the idea of life extension a joke), or else empty worlds where people live in such psychological isolation that living long seems a punishment. Neither of these futures sounds like much fun, but Asimov could not seem to break free of one idea or the other. Asimov's stories also frequently describe another kind of joylessness: people fighting hopelessly against some ridiculous and restrictive social custom or belief in either a crowded or empty world—a custom which seems perfectly rational to the persons who hold it. There is considerable irony here, for Asimov himself died doing exactly what everyone around him was doing in the way of dealing with death, as much caught up in the social norms of his own culture as any of the various 'enforcers of the status quo' in one of his stories. Again he could not seem to break free."

WHAT ASIMOV HIMSELF HAD TO SAY¹¹

We turn now to Asimov's aforementioned essay, "The Price of Life," which Ettinger referenced in his critique and which is one good source of his views on both cryonics and the prospect of radical human life extension. The article starts by referring to population increase as "not the only danger" facing humanity. Instead, "a more subtle one is the drive for extended lifetimes and even immortality." The essay was written apparently just before the freezing of James Bedford, "the first cryonaut." Asimov is well aware of the budding cryonics movement, as he is quick to tell us:

"There are organizations in being now that aim to organize the deep freezing of freshly-dead or about-to-be-dead bodies. The idea is to revive the frozen bodies when science has learned how to cure the disease that has killed them, reconstruct their broken bodies, reverse old age, restore life. We will then each one of us be a Lazarus."

At this point Asimov briefly waxes positive, echoing a familiar argument often advanced for the cryonics idea:

"Why not? What do we have to lose? If science never learns how to restore us to life, youth, and health, we are no deader than we would have been anyway, and at least we died with hope. If science learns, then we are essentially immortal."

This cryonics-friendliness goes for one more sentence, then it's all over, with a vengeance:

"Who can complain about a game in which the possible gain is infinite and the possible loss is nothing? The funny part is, I can. For it is the gain that is nothing and the loss that is infinite."

What? Really? The gain from achieving immortality would be "nothing" and the loss from achieving it—"infinite"? By what twisted logic is this sort of conclusion arrived at?

"In saying this," Asimov starts out, "I am not thinking of the individual [heaven forbid that!], though even in his case, immortality is not what it might seem to be. After all, who has ever pictured a really attractive heaven?" Ah yes, eternal life could not be worth living at the individual level: would we want to spend eternity doing things like Asimov suggests, wearing a white robe and a halo, flying over golden streets all day, singing hosannahs and hallelujahs in perfect chorus, smiling purely at attractive opposite-gender angels, and the like? "I might be able to stand it as a curiosity for a couple of days," Asimov offers, "especially the flying part, but after that I'd start drumming my fingers." Even alternatives that incorporated other behaviors, like making love to a Valkyrie in Valhalla, would get insufferable after a while. "There is a strange alchemy about forever. It can take all that is finest and best and change it into boredom. Nothing can escape. Weariness is all."

A semblance of immortality might be okay, he offers, with extra-long life, provided there was an eventual escape into oblivion: "In such a society, the very cap and climax of life may be the civilized death. It might even be that special centers would be established where one can hold the equivalent of a convivial wake before death; one last celebration, one last clasp to

the breast of the loved ones who have not yet gone before, one last shake of the hand of all the trusty friends.”

One wonders how these in turn would feel about the presumably avoidable demise of someone they held dear. In any case, Asimov envisions the actual euthanasia as a scene closely resembling what would be used in the movie *Soylent Green* a few years later (as a voluntary means to control excess population): “Then, to the strains of soft music, and to a last burst of waving hands and finger-kissing, the compartment closes about you, the nerve gas sifts in and you are gone.” (In the movie the euthanees drink poison rather than being gassed, and the main well-wisher is the technician offering the red-colored potion in a big glass flask. But there’s an inspiring picture show of the beauties of nature as it used to be but now was no more, along with sweet music from Beethoven’s sixth symphony.)¹²

Must heaven—or any approximation to it we might create for ourselves in the future—be invariably boring and insufferable? Asimov, it would appear, thinks that no one has ever pictured it otherwise, but I wonder if he ever looked in the Christian philosophical work *On First Principles*, written in the 3rd century by Origen:¹³

“I think that the saints as they depart from this life will remain in some place situated on the earth, which the divine scripture calls ‘paradise.’¹⁴ This will be a place of instruction and, so to speak, a lecture room or school for souls, in which they may be taught about all that they had seen on earth and may also receive some indications of what is to follow in the future ...”

This is further elaborated, as in this nearby passage:

“And so the rational being, growing at each successive stage, not as it grew when in this life in the flesh or body and in the soul, but increasing in mind and intelligence, advances as a mind already perfect to perfect knowledge, no longer hindered by its former carnal senses, but developing in intellectual power, ever approaching the pure and gazing ‘face to face,’ if I may so speak, on the causes of things.

And it attains perfection, first that perfection by which it rises to this condition, and secondly that by which it remains therein, while it has for the food on which it feeds the problems of the meaning of things and the nature of their causes. ...”

The rise to perfection will not happen all at once but might occupy “no small interval of time,” but for a worthy purpose, so that those who participate, “through their acquaintance with it all and the grace of full knowledge ... may enjoy an indescribable gladness.” Heaven, then, is portrayed as an institution of higher learning (*really* higher, we may imagine), and those who have a love of learning and are well-disposed in other ways should find ample to spark their interest so that life could be an endless joy. Just learning for its own sake with no output is not likely either. The “saints” (as any rational being may become, with due diligence) would be expected to occupy themselves with good and benevolent works and be part of a harmonious, loving community. In a heaven we might make for ourselves, but somewhat along these imagined lines, the eager students would also be happily engaged in creative pursuits, adding to the store of knowledge themselves rather than just imbibing it from somewhere “above,” while working in other ways to sustain and improve the world they found themselves in.



The 3rd century Christian philosopher Origen, who was influenced by Greek pagan thinkers such as Plato and Aristotle, imagined paradise (heaven) as “a lecture room or school for souls,” suggestive of Raphael’s c. 1510 fresco, The School of Athens, depicting thinkers and rational endeavors through the ages.¹⁵

Asimov seems at least haltingly aware of the possibility that persons who are highly creative might find an unlimited life desirable, particularly if they are also useful

to others: “If [someone] is fortunate enough or able enough to work out a life in which he faces a truly challenging problem—if he directs the affairs of humanity or guides the assault of knowledge upon the unknown or distills beauty out of the universe—he is not likely to be bored quickly and may last a long time before the final wave of the hand.” How long? “Shall I guess? Five hundred years on the average?”

To me it would seem tragic in the extreme to lose someone after five hundred years. Presumably we are talking about a person of good will who is at least not a threat to society. (Otherwise—if they *were* a threat—I would still say heal, don’t kill—but that is another issue.) Destruction of any good or even potentially good person after any amount of time is bad, I would say. But the longer someone lives in good health, developing their powers and knowledge and improving their goodness all around, the worse it is if they are finally killed. Still, someone not wanting suicide for five hundred years would be an improvement over, say, wanting it after only one hundred years. A worthy goal would, I think, be to study the problem of what would make a long life ultimately boring or otherwise insufferable and not worth it to someone, and what might be done to sustain an interest in things and help in other ways so this outcome is unlikely. So we might have support groups for people who think they might want the euthanizing scenario Asimov describes (or other self-destruction) to help them find more meaning and reward and ward off this pathological outcome.

Asimov, though, sees the matter differently, inasmuch as he feels that very long-lived individuals *ipso facto* would constitute a threat to society: “The statesmen of the world, the scientists, the artists, the scholars will be vigorous multi-centenarians on the whole and there, exactly there, is the real danger.” What is this danger? It is the perceived inevitability of stagnation, which seems to follow if we just consider the human condition today:

“...The human mind hardens quickly. This has nothing to do with physical deterioration of the brain or its limited capacity, and the problem won’t vanish if we assume a society of immortals with brains that remain physically young. Once a brain develops

a way of thought, that way wears a quick rut among the convolutions, so to speak, and it is only with the greatest effort that the line of thought can force its way out of that rut.”

Well, who said this tendency (if we accept Asimov’s judgment at face value) is something carved in stone, that no future endeavor of any kind could remedy? And on the other hand, it seems clear that not all “stagnation,” “hard-wring,” whatever you want to call it, would be a bad thing. Suppose we imagine a world of radical life extension, where people progress to what we might call sainthood, something like Origen imagined. If such people were very firm, even “hard-wired,” in their benevolence and other goodness, and their desire to increase their knowledge and powers to accomplish more good than ever, and support and participate in a loving, harmonious community of joy and purpose all around, would that necessarily be something bad? (In the hands of a science fiction writer it might tend to be, inasmuch as sales of the forthcoming book might improve if things that ought to be good went awry, but that is another matter.)

But no, Asimov can’t see it that way, and advocates death extension rather than life extension. “Death is the price we pay for meaningful life,” he insists. “Death makes way. Death forces the tired and old to give ground to the bright and new. Death wipes clean and prepares the ground for new advance.” In case this would seem too hard to accept, he offers as consolation the idea that dying for one’s family or one’s country, if the occasion demands it, is considered an honorable and worthy sacrifice, so why shouldn’t dying for the sake of abstract humanity? “All men live lives which are in their every detail the conglomerate accomplishment of other men that live now and have lived before. The life which has been made possible to the individual by the species, he surely owes to the species.”

Oh really? Does “the species” have the right (even the duty) to take my life just because it gave me life and whatever has gone into it, other than what I may have originated myself? How would that be different from parents having the right to kill their children, just because they gave them life? He also admits that the species itself may die out, but it could be replaced by a better-yet species, which would be

okay by his criteria. In the end, though, all he can say is that this eventuality too would be but “another step” toward “the only worthwhile immortality,” which he claims, as we have noted, is “life and intelligence in the abstract.”

Going back now to the idea that death “wipes clean and prepares the ground for new advance,” we may ask if the “new advance” he had in mind was something like you see in his *Foundation* series.¹⁶ There a civilization persists and struggles for untold centuries, where people die on schedule like they do today after short, futile struggles with aging. There are scientific advances that help defeat the more aggressive bad guys, and much action and intrigue on a grand scale, but where is there any real “advance” that would impact the lives of individuals concerned with basic survival? Instead behind the façade of whatever may be offered as “progress,” there is deadening stagnation, sustained by the death of each person, one by one after a few decades of declining health, that is supposed to renew, to “give ground to the bright and new.” But the alternative is understandably something that would be hard to depict in a science fiction series, or any other way. We are talking about not only radical life extension, but *radical life expansion*—in particular, becoming more intelligent and having other superior attributes to those of the species we are today. Enough to make the whole thing worthwhile, maybe forever. Poor Asimov—you couldn’t take this idea seriously—or not as seriously as it deserved—despite your great talents.

ANTI-IMMORTALISM AS TERROR MANAGEMENT

Cryonics, of course, is a possible pathway to radical life extension (and expansion too, we hope), and we who are involved have placed our hopes in it at the personal level. Asimov’s unfortunate anti-immortalist arguments seem tragically misguided and mistaken, and we wonder how someone like him could think and write as he did. His arguments do, of course, carry little weight on our side of the fence, so that Ettinger thought Dr. A himself must have also realized their flimsiness, with his sharp mind, and had other underlying motives, suggesting a fear of the unknown. On the other hand, I find it hard to believe that someone with Asimov’s seeming integrity and scientific objectivity would just spin

shaky arguments whole-cloth and not say what was really on his mind—unless maybe he thought he *was* being objective and wasn’t fully aware of what was really driving him. An attempted full psychoanalysis at this point is beyond our scope, but a possible clue to the mystery is provided by the Terror Management Theory of Sheldon Solomon and colleagues, in which people are psychologically impelled to defend their consciousness against “mortality salience” or being reminded of death.¹⁷ Some main points are summarized here:¹⁸

Throughout their lives, people are constantly interacting with their culture, which plays a sustaining and nurturing role. Culture in turn is nothing but the combined effects of individuals—each person forms part of the cultural web that surrounds and helps sustain any other participant. Conforming to the values and expectations of one’s culture is perhaps the most important source of a sense of self-worth, and it is natural that this dependency would be fostered by a selection process.

People especially turn to their culture in times of crisis when the problems are too serious to deal with individually. Among the problems of this sort are natural disasters, medical emergencies, and major threats or harm from groups or individuals. The death of a loved one is such a problem too—authorities must be notified, if not already involved in rescue attempts or medical treatment—and grief must be managed, which generally calls for outside help. Finally, culture plays an important role in the problem of anticipating one’s own death, establishing an anxiety buffer to shield against terror and despondency.

The cultural anxiety buffer—the shielding sense of self-worth provided by participation in one’s culture—typically draws on religious or philosophical systems. These offer survival—in some form—beyond the biological limits, or a worldview in which one’s endless survival is not so important and death is not to be feared. With such a psychological bulwark, people are relieved of much of the burden of concern over their own mortality. When the unpleasant subject does intrude (mortality salience) a natural response is to strengthen the anxiety buffer by defending or upholding one’s culture. The anxiety buffer in particular becomes a means whereby the culture maintains control over

the individual and thereby fosters its own survival.

In submitting to and participating in their culture, people take part in a cultural drama—an unfolding of events as seen from the vantage point of the worldview their culture provides. Such participation conveys a reassuring sense of self-worth—again, the cultural anxiety buffer. Participants must meet two main requirements: (1) they must accept the worldview of the culture, along with the standards of value inherent in that worldview; and (2) they must feel that they are living up to these standards and thus have a significant role in the cultural drama. The resulting feeling of self-worth, with its sense of participation in something meaningful and protection against mortality salience, offers great benefit, and people are willing to pay the price of conformity that their culture demands. The nature of the cultural drama, the worldview, and the standards of value will, of course, depend on the culture and differ in detail from one culture to another.

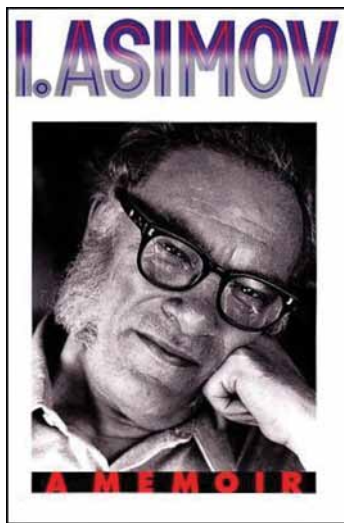
Cultures vary but have certain features in common, dictated by the state of knowledge and belief over the time they have flourished and the logic of the selection process that has operated in their own survival and evolution. In dealing with the short-term problem of death, there was certainly much that could be done in physical terms, even in ancient times, through common-sense strategies, medical practices, and the like. Yet it was recognized that there were certain insurmountable barriers. Aging, with its eventual termination of the life process, could not be forestalled, nor could a person be restored to function if too much time had passed without vital signs, as would always happen eventually. These long-term problems were both intractable and universal and could be clearly distinguished from ailments of a more special nature (short-term problems), which often could be remedied. For the long term it was necessary to focus on terror management rather than unobtainable physical solutions. Cultures accordingly grew up that, for example, favored medicine and even medical progress but did not waste effort on more radical life extension, such as alleviating aging or reversing clinical death.

So how, we ask, might all this apply in the case of Asimov? At least we have a large body of his writings to draw from, as noted, in making an educated guess. Here is what

he says in an autobiography, written in the last years of his life, about his views on religion and an afterlife:¹⁹

“Since I am an atheist and do not believe that either God or Satan, Heaven or Hell, exists, I can only suppose that when I die, there will only be an eternity of nothingness to follow. After all, the Universe existed for 15 billion years before I was born and I (whatever ‘I’ may be) survived it all in nothingness. ... There is nothing frightening about an eternal dreamless sleep. Surely it is better than eternal torment in Hell or eternal boredom in Heaven.”

(I note here that just a little before this he says: “Where is there a Heaven with an opportunity for reading, for writing, for exploring, for interesting conversation, for scientific investigation? I never heard of one.” You should have considered Origen, Dr. A!)



Asimov wrote several volumes of autobiography; this “memoir,” quoted here and independent of the others, was the last, finished in 1990, about two years before his death.

At any rate, we may imagine that Asimov, surrounded by the culture of the early-to-mid 20th century and developing nonreligiously, formed his attitudes about death early on. Death he accepted as inevitable and final. I think also he probably accepted the present biological limits to life as more-or-less unchangeable, despite the interest he had in science and

(some of) its possibilities for transforming the future. When finally he was confronted with the cryonics possibility (he would have been 44 years old in 1964 when Ettinger’s book was published by Doubleday), his natural reaction was not to start rethinking his position. Instead, in keeping with the Terror Management Theory, it was to “defend his culture,” that is, argue *against* the newfangled ideas on how death could be challenged. His scientific bent and personal integrity came into play, inasmuch as he didn’t express any strong doubt that cryonics *might* work, and even that life spans *might* eventually be greatly lengthened or even made infinite. But his ingrained anti-immortalism still carried the day in his arguing that radical life extension was a bad idea from the start. So he was afraid, at a basic level, and what we are seeing in his arguments is the baring of his cultural anxiety buffer. Indeed, he may have believed he was responding with reasonable objectivity, even if it doesn’t seem that way to those of us who, like Ettinger, have a very different outlook and cultural anxiety buffer.

BRIEF AFTERTHOUGHTS

There are others like Asimov: highly intelligent, creative, scientifically minded, not attracted to religious beliefs, and non-suicidal, who still show little interest in cryonics. We should not be surprised at their generally unenthusiastic, sometimes hostile response. For most people generally, and these in particular, cryonics offers a competing worldview and thus, we should expect, will be seen as a threat and a call to defend their culture, if the Terror Management Theory has substance, as it seems to have. To persuade such people to accept cryonics would apparently require full conversion to a different worldview—a difficult task, as it proved impossible for Dr. Asimov. What do we do? I don’t have any good answers at this point, except that we must keep trying, promoting our approach to whomever will listen. We must also support advances such as antiaging research and therapies along with research more directly relevant to cryonics. In addition to any direct benefits this might offer, it would exert further pressure on people to change their attitudes about death. ■

SOURCES

- AL1. <http://www.alcor.org/AboutAlcor/membershipstats.html>, accessed 19 Aug. 2017.
- AL2. <http://www.alcor.org/AboutAlcor/indexdir.html>, accessed 20 Aug. 2017.
- AL3. (Alcor case reports referencing Dr. Harris), https://www.google.com/search?source=hp&q=Alcor+case+reports+harris&coq=Alcor+case+reports+harris&gs_l=psy-ab.3..33i160k114.3249.8695.0.9258.27.26.0.0.0.158.2812.6j19.25.0....0...1.1.64.psy-ab..2.24.2652.6..0j35i39k1j0i131k1j0i20k1j0i22i10i30k1j0i22i30k1j33i21k1.j_bnNNh6GRE, accessed 20 Aug. 2017.
- AW. Aschwin De Wolf, "Critical Cooling Rate to Prevent Ischemic Brain Injury," <http://www.evidencebasedcryonics.org/2008/07/10/critical-cooling-rate-to-prevent-ischemic-brain-injury/>, accessed 20 Aug. 2017.
- CI. <http://www.cryonics.org/ci-landing/member-statistics/>, accessed 19 Aug. 2017.
- CRY. <https://en.wikipedia.org/wiki/Cryonics>, accessed 18 Aug. 2017.
- CS. Cryonics Society, http://www.cryonicsociety.org/free_ebooks.html, accessed 18 Aug. 2017.
- FS. https://en.wikipedia.org/wiki/Foundation_series, accessed 20 Aug. 2017.
- FG. <https://www.findagrave.com/cgi-bin/fg.cgi?page=gr&GRid=10325>, accessed 18 Aug. 2017.
- IA1. Isaac Asimov, "I Just Make Them Up, See!," *Fantasy and Science Fiction*, February 1958, reprinted in Isaac Asimov, *Nine Tomorrows*, Greenwich, Conn.: Fawcett Publications, Inc., 1959, 7-8.
- IA2. Isaac Asimov, *I, Asimov: A Memoir*, New York: Doubleday, 1994.
- IA3. https://en.wikipedia.org/wiki/Isaac_Asimov, accessed 19 Aug. 2017.
- IA4. Isaac Asimov, "The Price of Life," ch. 28 of *Is Anyone There?*, New York: Doubleday, 1967, 234-238 (orig. appeared in *Cavalier*, Jan. 1967).
- MP1. (Estimates of how many are signed up for cryopreservation, with funded contracts). Author's estimates based on AL1, CI, CRY, and contacts within the cryonics community.
- MP2. (Movie *Soylent Green*) author's personal experience.
- MP3. R. Michael Perry, *Forever for All*, Parkland, Fla.: Universal Publishers, 2000, 53-59 (discussion of Terror Management Theory).
- OR1. (Origen biography) https://en.wikipedia.org/wiki/Origen#Philosophical_and_religious, accessed 19 Aug. 2017.
- OR2. Origen, *On First Principles*, G. W. Butterworth tr., Gloucester, Mass.: Peter Smith, 1973, 151-53.
- RE1. Robert Ettinger, *The Prospect of Immortality*, http://www.cryonics.org/images/uploads/misc/Prospect_Book.pdf, accessed 18 Aug. 2017, orig. ed. New York: Doubleday, 1964.
- RE2. Robert Ettinger, *Man into Superman*, <http://www.cryonics.org/images/uploads/misc/ManIntoSuperman.pdf>, mainly 166-67, accessed 18 Aug. 2017; orig. ed. New York: St. Martin's Press, 1972.
- RE3. Robert Ettinger, "Address to the Venturist Festival," *Venturist Monthly News* 6(7) 1-6 (Jul. 1994).
- SA. (*School of Athens* fresco). https://en.wikipedia.org/wiki/The_School_of_Athens, <http://artsnap.org/3-cool-things-you-might-not-know-about-raphaels-school-of-athens/>, accessed 20 Aug. 2017.
- SC. (Scriptural allusions to "paradise"). See Gen. 2:8 (Sept.), Luke 23:43.
- SG. https://en.wikipedia.org/wiki/Soylent_Green, accessed 20 Aug. 2017.
- SH1. <https://lifeboat.com/ex/bios.steven.b.harris>, accessed 20 Aug. 2017.
- SH2. "Antioxidant Skepticism," <http://www.evidencebasedcryonics.org/tag/steve-harris/>, accessed 20 Aug. 2017.
- SH3. Steven B. Harris, "Isaac Asimov, R.I.P.," <http://www.cryonet.org/cgi-bin/dsp.cgi?msg=705>, accessed 19 Aug. 2017 (minor spelling errors silently corrected by present author in quotes from this source).
- SS. Sheldon Solomon, Jeff Greenberg, and Tom Pyszczynski, "A Terror Management Theory of Social Behavior: The Psychological Functions of Self-esteem and Cultural Worldviews," *Advances in Experimental Social Psychology* 24 (1991): 93-159.

ENDNOTES

1. RE1.
2. CS.
3. CRY.
4. FG.
5. IA1.
6. CRY.
7. MP1.
8. IA2, IA3, FG.
9. RE2 (quotations source).
10. SH1; SH2; AW; AL2; AL3; SH3 (quotations source).
11. IA4.
12. SG; MP2.
13. OR1; OR2 (quotations source).
14. SC.
15. SA.
16. FS.
17. SS.
18. Adapted from MP3.
19. IA2, 333 (quotations source).

Personalized Cancer Vaccines Successful in First-Stage Human Trials

A cancer vaccine is one of the holy grails of modern medical research, but finding a way to stimulate the immune system to specifically target and kill cancer cells has proven to be a difficult task. Now two recent clinical trials that have produced encouraging results in patients with skin cancer are providing hope for the development of personalized cancer vaccines tailored to individual patient's tumors. Both studies focus on neoantigens, which are mutated molecules found only on the surface of cancer cells. Neoantigens prove to be ideal targets for immunotherapy as they are not present on healthy cells. A vaccine's challenge is to train the body's immune cells, known as T cells, to hunt and kill only those specific tumor cells that hold the target neoantigens. In the first trial, at Boston's Dana-Farber Cancer Institute, four out of six patients showed no recurrence of their cancer 25 months after vaccination. In the second trial, by Biopharmaceutical New Technologies (BioNTech) in Germany, after 12 to 23 months eight of 13 subjects were cancer-free.

Rich Haridy / *New Atlas*
9 Jul 2017

http://newatlas.com/cancer-personalized-vaccine-success-trial/50402/?utm_source=Gizmag+Subscribers&utm_campaign=ccf9755572-UA-2235360-4&utm_medium=email&utm_term=0_65b67362bd-ccf9755572-89801958

A New Theory on Cancer

Paul Davies, a theoretical physicist at Arizona State University (ASU)—and therefore somewhat of an interloper in the field of cancer— theorizes that cancer is a return to an earlier time in evolution,

before complex organisms emerged. When a person develops cancer, he posits, their cells regress to become more like the single-celled life prevalent a billion years ago. Some researchers are intrigued by the theory, but plenty more think it's silly. Yet gradually, evidence is emerging that Davies could be right. If he is—if cancer really is a disease in which our cells act like their single-celled ancestors of eons ago—then the current approach to treatment could be all wrong. The atavistic theory portends new approaches. Drugging tumors with the lowest possible dose could prevent the evolution of therapy-resistant pathways that would otherwise enable the cancer to spread around the body. “You don't have to get rid of it,” says Davies, “you just need to understand it and control it.”

Jessica Wapner / *Newsweek*
17 Jul. 2017

<http://www.newsweek.com/2016/07/29/cancer-evolution-cells-637632.html?spMailID=2072121&spUserID=MzQ4OTU0NjEwMTIS1&spJobID=831231430&spReportId=ODMxMjMxNDMwSO>

New 3D Imaging Shows How Human Cell Nucleus Organizes DNA and Chromatin

Sixty-four years ago, James Watson and Francis Crick described the now-iconic double helix structure of DNA. In a new paper, published in the July 28, online issue of *Science*, a team of researchers at the University of California San Diego School of Medicine and the Salk Institute for Biological Studies describe development and application of new electron microscopic imaging tools and a selective stain for DNA to visualize the three-dimensional structure of chromatin — a complex of molecules that helps pack six feet of DNA into each cell nucleus, construct chromosomes and control gene expression and DNA replication. “The primary functions of chromatin are fundamental,”

said study co-author Mark Ellisman, PhD, Distinguished Professor of Neurosciences and Bioengineering and director of the National Center for Microscopy and Imaging Research (NCMIR) at UC San Diego. “It efficiently packages DNA to fit inside the cell nucleus, making it possible for chromosomes and cells to divide and replicate safely and correctly. It's a basic, working element of life.”

Scott LaFee / UC San Diego News Center
27 Jul. 2017

http://ucsdnews.ucsd.edu/pressrelease/new_3d_imaging_reveals_how_human_cell_nucleus_organizes_dna_and_chromatin_o?ga=2.72451543.512351946.1504056249-491102103.1504056249

Breakthrough Stem Cell Study Offers New Clues to Reversing Aging

This week, a study published in *Nature* threw a wrench into the classical theory of aging. In a technical tour-de-force, a team led by Dr. Dongsheng Cai from the Albert Einstein College of Medicine pinpointed a critical source of aging to a small group of stem cells within the hypothalamus—an “ancient” brain region that controls bodily functions such as temperature and appetite. Like fountains of youth, these stem cells release tiny fatty bubbles filled with mixtures of small biological molecules called microRNAs. With age, these cells die out, and the animal's muscle, skin and brain function declines. However, when the team transplanted these stem cells from young animals into a middle-aged one, they slowed aging. The recipient mice were smarter, more sociable and had better muscle function. And—get this—they also lived 10 to 15 percent longer than mice transplanted with other cell types. To Dr. David Sinclair, an aging expert at Harvard Medical School, the findings represent a “breakthrough” in aging research.

Shelly Fan / Singularity Hub

6 Aug. 2017

<https://singularityhub.com/2017/08/06/these-stem-cells-are-key-to-controlling-aging/>

Regenerative Medicine Breakthrough

Researchers at The Ohio State University Wexner Medical Center and Ohio State's College of Engineering have developed a new technology, Tissue Nanotransfection (TNT), that can generate any cell type of interest for treatment within the patient's own body. This technology may be used to repair injured tissue or restore function of aging tissue, including organs, blood vessels and nerve cells. Results of the regenerative medicine study were published August 7 in the journal *Nature Nanotechnology*. "By using our novel nanochip technology, injured or compromised organs can be replaced. We have shown that skin is a fertile land where we can grow the elements of any organ that is declining," said Dr. Chandan Sen, director of Ohio State's Center for Regenerative Medicine & Cell Based Therapies. Dr. Sen co-led the study with L. James Lee, professor of chemical and biomolecular engineering with Ohio State's College of Engineering, in collaboration with Ohio State's Nanoscale Science and Engineering Center. Researchers studied mice and pigs in these experiments.

Eileen Scahill / Ohio State University
7 Aug. 2017

<https://news.osu.edu/news/2017/08/07/regenerative-med-study/>

A New Method of 3D Printing Living Tissues

Scientists at the University of Oxford have developed a new method to 3D-print laboratory-grown cells to form living structures. The approach could revolutionize regenerative medicine, enabling the production of complex tissues and cartilage that would potentially support, repair or augment diseased and damaged areas of the body. Printing high-

resolution living tissues is hard to do, as the cells often move within printed structures and can collapse on themselves. But, led by Professor Hagan Bayley, Professor of Chemical Biology in Oxford's Department of Chemistry, the team devised a way to produce tissues in self-contained cells that support the structures to keep their shape. The cells were contained within protective nanoliter droplets wrapped in a lipid coating that could be assembled, layer-by-layer, into living structures. Producing printed tissues in this way improves the survival rate of the individual cells, and allowed the team to improve on current techniques by building each tissue one drop at a time to a more favorable resolution.

University of Oxford News & Events
15 Aug. 2017

<http://www.ox.ac.uk/news/2017-08-15-new-method-3d-printing-living-tissues>

Drug-delivering Micromotors Treat Their First Bacterial Infection in the Stomach

Nanoengineers at the University of California San Diego have demonstrated for the first time using micromotors to treat a bacterial infection in the stomach (mouse model). These tiny vehicles, each about half the width of a human hair, swim rapidly throughout the stomach while neutralizing gastric acid and then release their cargo of antibiotics at the desired pH. Researchers published their findings on Aug. 16 in *Nature Communications*. This micromotor-enabled delivery approach is a promising new method for treating stomach and gastrointestinal tract diseases with acid-sensitive drugs, researchers said. The effort is a collaboration between the research groups of nanoengineering professors Joseph Wang and Liangfang Zhang at the UC San Diego Jacobs School of Engineering. Wang and Zhang pioneered research on the *in vivo* operation of micromotors and this study represents the first example of drug-delivering micromotors for treating bacterial infection. Gastric acid can be destructive to orally administered drugs such as antibiotics and protein-based pharmaceuticals.

Liesel Labios / UCSD News

16 Aug. 2017

http://ucsdnews.ucsd.edu/pressrelease/drug_delivering_micromotors_treat_their_first_bacterial_infection

Tripping the Light Fantastic

A team of researchers at MIT has developed a super-fast, prototype chip that uses light rather than electrons to crunch data. The optical chip, which could one day process information as much as a million times faster than the chip in a typical Intel Core i7-based personal computer, won the grand prize in the MIT \$100K Entrepreneurship Competition earlier this year. Essentially, the researchers have found a way to manipulate light inside a chip so it processes vast quantities of data simultaneously, similarly to the way a human brain does. "Today's computers do operations one by one," says Yichen Shen, a post-doctoral associate at MIT and co-founder of Lightmatter, a start-up the MIT research team has forged to bring its prototype chip to market. "We do operations all together, when light is passing through. It's all simultaneous. We change the architecture completely." "Deep learning algorithms that are traditionally computationally-hungry, or expensive, can now be efficiently deployed with our chips," says Darius Bunandar, another Lightmatter co-founder.

Joe Dysart / ACM News
17 Aug. 2017

<https://cacm.acm.org/news/220279-tripping-the-light-fantastic/fulltext>

Custom-Made Molecules

Imagine a deadly virus emerging in a part of the world without the resources for vaccine development. Now imagine if researchers on the other side of the world could send local medics an effective vaccine by email. Dan Gibson, Craig Venter and colleagues of Synthetic Genomics in La Jolla, California, have done exactly that, based on earlier work. Their new digital-to-biological converter (DBC) can, upon receipt of a DNA sequence, prepare appropriate oligos

(short nucleotide chains for initiating DNA synthesis), carry out DNA synthesis, and then, as required, convert that DNA into a vaccine, or indeed into any RNA molecule or protein. The team has so far programmed the DBC to make fluorescent proteins, antibody polypeptides, an RNA virus (H1N1 influenza), an influenza vaccine, and a full bacteriophage. “The authors paint this future where one might be able to, in a completely digital and automated fashion, go from DNA sequence to functional output,” says Michael Jewett, a chemical and biological engineer at Northwestern University who was not involved in the research. “... exciting.”

Ruth Williams / *The Scientist*

21 Aug. 2017

<http://www.the-scientist.com/?articles.view/articleNo/49877/title/Custom-Made-Molecules/>

Parkinson’s Disease Cell Therapy Relieves Symptoms in Monkeys

Cell therapy for Parkinson’s disease (PD) is closer than ever. In a study published August 30 in *Nature*, an international team of researchers improved symptoms in a monkey model of PD by grafting dopamine-producing neurons derived from human induced pluripotent stem cells (iPSCs) into the monkeys’ brains. Kyoto University neurosurgeon Jun Takahashi and colleagues generated eight iPSC lines from skin or blood cells collected from seven human subjects—three with PD and four without—and derived dopaminergic progenitors from these cell lines. The seven monkeys that received either cells derived from individuals with PD or healthy individuals showed a 40 to 50 percent improvement in symptoms. “This is an important step in the translation of iPSC-derived technology to clinical cell transplants in Parkinson’s,” Patrik Brundin, a neuroscientist at the Van Andel Institute in Michigan who did not participate in the work, tells *The Scientist*. “There were no major surprises, but these were essential experiments that were required before moving forward to clinical trials.”

Abby Olena / *The Scientist*

30 Aug. 2017

<http://www.the-scientist.com/?articles.view/articleNo/50228/title/Parkinson-s-Disease-Cell-Therapy-Relieves-Symptoms-in-Monkeys/>

Single Molecules Can Work as Reproducible Transistors—at Room Temperature

A major goal in the field of molecular electronics, which aims to use single molecules as electronic components, is to make a device where a quantized, controllable flow of charge can be achieved at room temperature. A first step in this field is for researchers to demonstrate that single molecules can function as reproducible circuit elements such as transistors or diodes that can easily operate at room temperature. A team led by Latha Venkataraman at Columbia Engineering and Xavier Roy, assistant professor (Arts & Sciences), published a study (DOI 10.1038/nnano.2017.156) August 14 in *Nature Nanotechnology* that is the first to reproducibly demonstrate current blockade—the ability to switch a device from the insulating to the conducting state where charge is added and removed one electron at a time—using atomically precise molecular clusters at room temperature. Bonnie Choi, a graduate student in the Roy group and co-lead author of the work, created a single cluster of geometrically ordered atoms with an inorganic core made of just 14 atoms.

Holly Evarts / Columbia Engineering

14 Aug. 2017

<http://engineering.columbia.edu/news/latha-venkataraman-single-molecule-transistor>

New, Tiny Antenna Could Be Used for Brain Implants

A revolutionary antenna, hundreds of times smaller than existing models, could help shrink phones and satellites, and even make smart brain implants a real thing.

Researchers at Northeastern University have made a major advance in developing significantly smaller antennas, hundreds of times tinier than currently existing versions. “Current antennas are limited to large sizes, which are hard for many applications like bio-implantable, bio-injectable, and bio-ingestible antennas,” Nian Sun, a professor of electrical and computer engineering at Northeastern, told Digital Trends. The antennas described by Sun and his colleagues are based on an entirely different design principle to the traditional ones currently used. Traditional antennas receive and transmit large electromagnetic waves, and have to remain a certain size to function with electromagnetic radiation. Northeastern’s new antennas, on the other hand, are designed for acoustic resonance, which uses a wavelength thousands of times smaller than electromagnetic waves.

Luke Dormehl / Digital Trends

24 Aug. 2017

<https://www.digitaltrends.com/cool-tech/tiny-antenna-brain-implant/>

Ethanol: a Lethal Injection for Tumors

If ethanol (the type of alcohol found in adult beverages) is injected into a tumor, it destroys proteins and causes the cells to dehydrate and die. Ethanol ablation is used to treat one type of liver cancer, and its success rate is similar to that of surgery. Better yet, it costs less than \$5 per treatment. Ethanol ablation faces several limitations, however. First, it only works well for tumors that are surrounded by a fibrous capsule. Second, it requires large amounts of ethanol, which can damage nearby tissue as it leaks out. And third, it requires multiple treatments. Now, a team of researchers from Duke University has shown that injecting an ethanol-based gel directly into a specific type of tumor, called squamous cell carcinoma, resulted in a 100% cure rate in a hamster model. In their work they mixed ethanol with ethyl cellulose, creating a solution that when injected into the watery environment of a tumor turns into a gel, which remains close to the injection site. As merely a proof-of-

concept in an animal model with small sample sizes, more work needs to be done; still, the results are promising.

Alex Berezow / American Council on Science and Health
3 Sep 2017

<https://www.acsh.org/news/2017/09/02/ethanol-lethal-injection-tumors-11779>

Long-Range Communication for Very Low-Power Sensors

University of Washington researchers have demonstrated for the first time that devices that run on almost zero power can transmit data across distances of up to 2.8 kilometers—breaking a long-held barrier and potentially enabling a vast array of interconnected devices. For example, flexible electronics—from knee patches that capture range of motion in arthritic patients to patches that use sweat to detect fatigue in athletes or soldiers—hold great promise for collecting medically relevant data. But today's flexible electronics and other sensors that can't employ bulky batteries and need to operate with very low power typically can't communicate with other devices more than a few feet or meters away. This limits their practical use in medical monitoring, home sensing, and many other areas. By contrast, the UW's long-range backscatter system, which uses reflected radio signals to transmit data at extremely low power and low cost, achieved reliable coverage throughout a 4800-square-foot house, an office area covering 41 rooms and a one-acre vegetable farm.



*The research team built this flexible epidermal patch prototype — which could be used to collect and wirelessly transmit useful medical data — that successfully transmitted information across a 3,300 square-foot atrium.
Dennis Wise/University of Washington*

Jennifer Langston / UW News
13 Sep. 2017

<http://www.washington.edu/news/2017/09/13/uw-team-shatters-long-range-communication-barrier-for-devices-that-consume-almost-no-power/>

Researchers Have Linked a Human Brain to the Internet for the First Time Ever

Researchers from Wits University in Johannesburg, South Africa have linked a brain directly to the internet. Data gathered from this project could help fuel the next steps in machine learning and brain-computer interfaces. According to a release published in Medical Express, for the first time ever, researchers have devised a way of connecting the human brain to the internet in real time. It's been dubbed the "Brainternet" project, and it essentially turns the brain "...into an Internet of Things (IoT) node on the World Wide Web." The project works by taking brainwave EEG signals gathered by an Emotiv EEG device connected to the user's head. The signals are then transmitted to a low cost Raspberry Pi computer, which live-streams the data to an application programming interface and displays the data on an open website where anyone can view the activity. Adam Pantanowitz, a lecturer in the Wits School of Electrical and Information Engineering and the project's supervisor, said this is just the beginning of the possibilities of the project.

Futurism.com / Hard Science
14 Sep. 2017

<https://futurism.com/researchers-have-linked-a-human-brain-to-the-internet-for-the-first-time-ever/>

World's First 'Molecular Robot' Capable of Building Molecules

Scientists at The University of Manchester have created the world's first 'molecular robot' that is capable of performing basic tasks including building other molecules. The tiny robots, which are a millionth of a millimeter in size, can be programmed to

move and build molecular cargo, using a tiny robotic arm. Each individual robot is capable of manipulating a single molecule and is made up of just 150 carbon, hydrogen, oxygen and nitrogen atoms. To put that size into context, a pile of a billion billion of these robots would still only be the same size (volume/weight) as a few grains of salt. The robots operate by carrying out chemical reactions in special solutions which can then be controlled and programmed by scientists to perform the basic tasks. In the future such robots could be used for medical purposes, advanced manufacturing processes and even building molecular factories and assembly lines. The research, which was funded by the Engineering and Physical Sciences Research Council (EPSRC) will be published in Nature 21st September. Professor David Leigh led the research.

University of Manchester
20 Sep. 2017

<http://www.manchester.ac.uk/discover/news/scientists-create-worlds-first-molecular-robot-capable-of-building-molecules/>

Regenerating Tissues with Gene-Targeting Molecules

A synthetic DNA-targeting molecule could pave the way for tissue regeneration. Stem cells can be triggered to change into heart muscle cells by a new method involving synthetic molecules. The method overcomes challenges facing current approaches and can be fine-tuned to prompt the formation of a variety of cell types. Junichi Taniguchi and Ganesh Pandian Namasivayam at Kyoto University's Institute for Integrated Cell-Material Sciences (iCeMS) in Japan constructed a synthetic molecule that can recognize and bind with a specific DNA sequence involved in the differentiation of hiPSCs into mesoderm, an intermediary cell type that can be stimulated into changing into heart muscle cells. When the synthetic molecule, called PIP-S2, binds to its target DNA sequence, it prevents a protein, called SOX2, from binding to the same site. Human induced pluripotent stem cells (hiPSCs) are generated from adult cells and can be programmed to change into any cell

type in the body. The cell type conversion is controlled by coordinated regulation of signalling cues and genes.

Kyoto University / Eurekalert!
25 Sep. 2017
https://www.eurekalert.org/pub_releases/2017-09/ku-rtw092417.php

New Human Protein-Based Surgical Glue Seals Wounds in 60 Seconds

To repair ruptured or pierced organs and tissues, surgeons commonly use staples, sutures and wires to bring and hold the wound edges together so that they can heal. However, these procedures can be difficult to perform in hard-to-reach areas of the body and wounds are often not completely

sealed immediately. They also come with the risk that tissues are further damaged and infected. The new study, led by Harvard University Professor Ali Khademhosseini and Northeastern University Assistant Professor Nasim Annabi, presents a robust solution for the efficient repair of wounds in mechanically challenging body areas—a surgical glue called MeTro. They and their colleagues showed that MeTro can be photochemically tuned to effectively seal incisions in arteries and lungs of rats and to repair wounds in the lungs of pigs, all suture and staple-free. “MeTro sets in just 60 seconds once treated with UV light, and the technology has a built-in degrading enzyme which can be modified to determine how long the sealant lasts—from hours to months ...” to allow time for wounds to heal.



The surgical glue MeTro is applied directly to the wound and activated with light. University of Sydney.

Sci-News.com
9 Oct 2017
<http://www.sci-news.com/medicine/human-protein-based-surgical-glue-metro-05298.html>

A Roadmap to Revival

Successful revival 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 is a list of landmark papers and books that reflect ongoing progress towards the revival 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(1) (January 1994):16-31 (Part I) & *Cryonics* 15(2) (April 1994):20-32 (Part II).

Ralph C. Merkle, “**Cryonics, Cryptography, and Maximum Likelihood Estimation**,” First Extropy Institute Conference, Sunnyvale CA, 1994, updated version at <http://www.merkle.com/cryo/cryptoCryo.html>.

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, 685-805.

Chana Phaedra, “**Reconstructive Connectomics**,” *Cryonics* 34(7) (July 2013): 26-28.

Robert A. Freitas Jr., “**The Alzheimer Protocols: A Nanorobotic Cure for Alzheimer’s Disease and Related Neurodegenerative Conditions**,” *IMM Report No. 48*, June 2016.

POWER UP!

TURN ON YOUR CELLULAR ENERGY

RESVERATROL activates critical longevity factors in our cells.

For **resveratrol** to deliver functional results, it requires a coenzyme called **NAD+**.

NAD+ levels **plummet** with **age** but increase in response to **nicotinamide riboside**.

Optimized NAD+ Cell Regenerator™ combines **250 mg** of **nicotinamide riboside** with **resveratrol** and other **plant extracts**.

For those already taking resveratrol, we also offer **NAD+ Regenerator™** that provides **250 mg** of **nicotinamide riboside**.



Non-GMO



Non-GMO

NAD+ Cell Regenerator™
Item #02144 • 30 vegetarian capsules

	Retail Price	Your Price
1 bottle	\$42	\$31.50
4 bottles		\$28 each

Optimized NAD+ Cell Regenerator™
Item #02145 • 30 vegetarian capsules

	Retail Price	Your Price
1 bottle	\$50	\$37.50
4 bottles		\$34 each

Call **1-866-820-4967** toll-free or visit **LifeExtension.com**.

Please mention Discount Code **PIM701X** • Offer expires December 31, 2017

Consult your healthcare provider before use if you have a bleeding disorder, are taking anticoagulant or antiplatelet medications or beta-blockers such as Nadolol. Keep out of reach of children. Do not exceed recommended dose.

pTeroPure® and NIAGEN® are registered trademarks of ChromaDex, Inc., Patents see: www.ChromaDexPatents.com

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

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 second 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.

NEW YORK CITY

Alcor members in the NYC area can contact Javier El-Hage at javier.elhage@gmail.com for information about local meetings which are held once a month at a midtown location.

PACIFIC NORTHWEST

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

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>.

BRITISH COLUMBIA (CANADA):

CryoBC, a special interest group within the nonprofit Lifespan Society of BC (<http://www.lifespanbc.ca/>) holds meetings for cryonists in the Vancouver area. To be notified of meetings join the CryoBC mailing list: <https://groups.yahoo.com/neo/groups/cryobc/info>.

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@yahoo.com.

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.

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 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



7895 East Acoma Drive
Suite 110
Scottsdale, AZ 85260

What good is longer life if you spend it in poor health?

Life Extension Magazine® gives you the knowledge you need to make educated decisions about your health, so you can stay young and healthy for as long as possible. Each monthly issue is packed with the latest medical findings, research results, and innovative treatment protocols — and a 12-month subscription is yours for only **\$12.00**.

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 scientifically 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 Wellness Specialists 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.



PROD
CODE:
SUB12

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 PIM701X** to get these savings • Offer expires December 31, 2017

LifeExtension®
Stay Healthy, Live Better