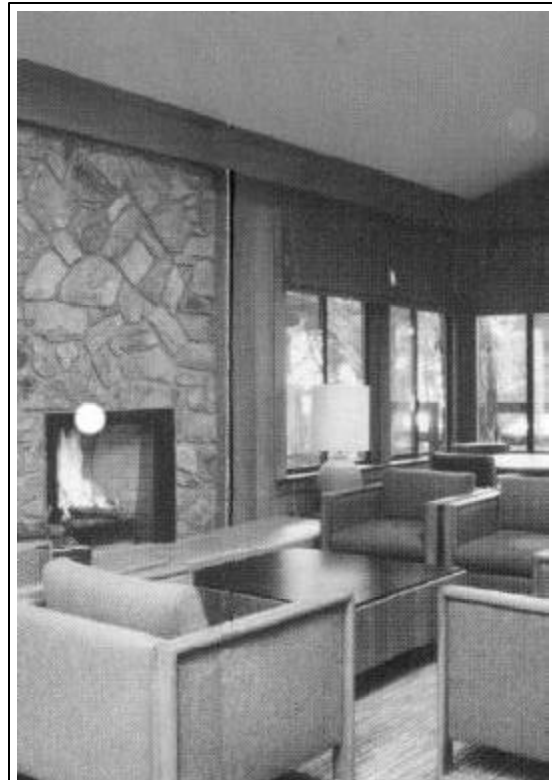


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Registration information for the Conference as well as the on-site lodging and meals package at Asilomar will soon be available at www.alcor.org, or an information package can be requested by calling Alcor Life Extension Foundation at 480-905-1906.

June 17-18, 2000: Mark Your Calendars Today!

The Fourth Alcor Conference on Life Extension Technologies

www.alcor.org

Preliminary List of Speakers:

Glenna Burmer, MD, PhD,
LifeSpan BioSciences

Fred Chamberlain,
BioTransport, Inc.

K. Eric Drexler, PhD,
Foresight Institute

Gregory Fahy, PhD.,
21st Century Medicine

James Hughes, PhD,
Univ. Chicago, Dept. Medicine

Ralph Merkle, PhD,
Foresight Institute

Natasha Vita More,
author, Panel Moderator

Robert T. Newport, MD,
BioTransport, Inc.

Gregory Stock, PhD.,
UCLA, School of Medicine

Brian Wowk, PhD.,
21st Century Medicine

The world is changing rapidly. Only a few years ago, most people considered the cloning of mammals to be no more than science fiction. Repeated successes in this area, however, have made it a reality today.



More importantly, medical technologies like cloning and the use of embryonic stem cells to regenerate tissues, promise to make it possible to reverse all the major degenerative diseases within our own lifetimes. Even aging itself is under very heavy attack by today's biological and medical technologies.

The Fourth Alcor Conference on Life Extension Technologies is a meeting of scientists, technologists and individuals who are working in fields leading toward the expansion of human health and longevity.

This conference will cover topics relevant to these pursuits.

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UP FRONT

BY BRIAN SHOCK, EDITOR

With a name like *Cryonics*, you'd expect this magazine to reflect the opinions and direction of the cryonics community as a whole. For the last two years, that's exactly what I have been trying to bring our readers. True, this is a publication of the Alcor Life Extension Foundation, but I have always believed that an honest organization can never "shoot itself in the foot" by presenting a broad point of view.

For instance, in this issue I'm grateful to many non-Alcor members for the contribution of their views and voices: my own editorial offers a very cautious opinion of individuals performing volunteer work for cryonics groups, while Charles Platt's column looks at this matter from the alternative standpoint of a volunteer; Ben Best, of CryoCare and the Cryonics Society of Canada, offers a first-person account of his visit to this year's High Roller's Conference; Jim Yount, of the American Cryonics Society, discusses the possible role of term life insurance in funding cryonic suspensions; and transhumanist Anders Sandberg shares a number of the fascinating technical items he often posts to the Extropians Digest.

Do you have something you believe the cryonics community should know? Whoever you are, by all means send it to *Cryonics*!



Announcement:

BioTransport/CryoCare/Advanced BioSciences Agreement

As of July 1st, 1999, principals of BioTransport, Inc., CryoCare Foundation, and Advanced BioSciences, Inc. have signed a binding letter of intent affirming that Advanced BioSciences intends to sublicense new cryopreservation technology to BioTransport, and BioTransport intends to use this technology to provide enhanced service to Alcor and CryoCare members.

While a formal contract has not been negotiated, principals at the three companies are optimistic that such a contract can exist by the end of this year.

BioTransport was formed initially by Fred Chamberlain, Linda Chamberlain, Joe Hovey, and Michael Riskin, of Alcor, as an independent provider of human cryopreservation services including remote standby, transport, perfusion, and cooldown. Michael Riskin, who is now CFO and Vice President of BioTransport, has taken a highly active role this year in developing the new company as an independent provider of human cryopreservation services including remote standby, transport, perfusion, and cooldown. It will first offer its services to CryoCare and Alcor members, with others to follow if satisfactory contracts can be negotiated.

Advanced BioSciences was created this year to develop cryonics applications from recent research at 21st Century

Medicine. 21st now conducts only cryobiology research, having spun off its hypothermia and resuscitation projects into a new, separate company named Critical Care Research. 21st has no involvement in cryonics and will be launching sales of its first product this summer, the SuperCool X-1000 Ice Blocker.

CryoCare Foundation and the Alcor Foundation are cryonics organizations whose needs are complementary. Alcor has expressed interest in results of recent research, while CryoCare wishes to restore its ability to deliver remote-standby service and enhance its cryopreservation services. BioTransport should be able to satisfy these needs on a basis that will be mutually beneficial.

In the future, BioTransport and/or Advanced BioSciences may negotiate agreements with additional clients. Currently, however, Alcor and CryoCare are the only cryonics organizations negotiating to receive improved technology from Advanced BioSciences and cryopreservation service from BioTransport.

This announcement is made jointly by Saul Kent, Chairman and CEO of Advanced BioSciences and 21st Century Medicine; Charles Platt, President of CryoCare; and Michael Riskin, CFO and Vice President for Business Development at BioTransport.

The 1999 High Roller's Conference

By Ben Best

On May 7-9, 1999 (Mother's Day Weekend) I attended the 5th Annual High-Rollers' Conference on Cryonics and Low Temperature Medicine in Laughlin, Nevada. The Conferences are run by H. Jackson Zinn, a lawyer who for 5 years was President of the American Cryonics Society. Jack left ACS during one of the bitter intra-organizational feuds and is now head of the International Cryonics Foundation, of Stockton, California [(209) 463-0429]. Jack has cryopreservation ("suspension") arrangements with Alcor, whereas other ICF members have arrangements with Trans Time or ACS. I'm still unclear as to the exact role of ICF.

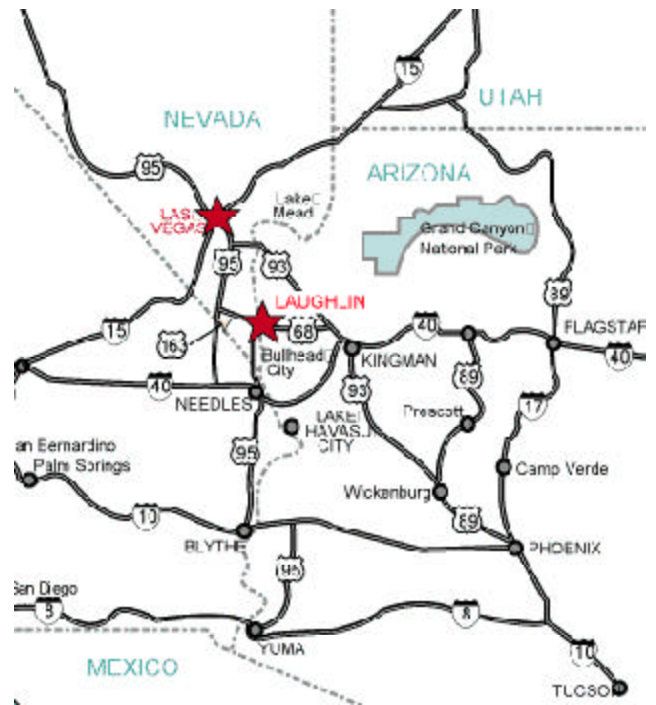
Several years ago Jack became extremely interested in the fact that Don Laughlin, who is reputedly worth hundreds of millions of dollars, has made cryonics arrangements with Alcor. Jack met with Don and arranged a "High Rollers' Conference," intended to be an elite conference for very rich cryonicists, and focused on how that money could be used to further cryonics and, hence, their survival. Twelve people attended the first conference, including the screen writer for the film *Demolition Man* and some other wealthy people.

Jack continued to hold the conferences every year with only a few presenters and attendees. Aside from

Don Laughlin, most of the more recent attendees have been "Low-Rollers or No-Rollers" (as Saul Kent likes to say), but Jack likes the idea of having conferences that are open to everyone. The focus of the presentations has been toward scientific research that could benefit from "High-Roller" financing, but big money has not been raised thus far.

For several years I attended every cryonics conference held anywhere, but the High Rollers' conferences seemed too small to justify my expense and effort. (And I am not a "High Roller.") Nonetheless, I have been curious about them — and very curious about Don Laughlin, who is a cryonicist, who is very wealthy, who sponsors these conferences and who never contributes much money for research.

I flew to Las Vegas from Toronto, Canada, where I live. I drove south, and arrived in Laughlin at 2:30am so that I could spend most of Friday being a Laughlin tourist. I had thought of going to Lake Havasu City, where the old London Bridge stands reconstructed in the desert (imported from England at a cost of



\$2.5 million in the late 1960s). But I decided time was too precious to spend several hours traveling to London Bridge and back, when I was wanting to immerse myself deeply in the ambience of Laughlin.

Laughlin, Nevada is located across the Colorado River from Bullhead City, Arizona — near the tristate border of California, Arizona and Nevada. A few miles up the river is Davis Dam which, when completed in 1953, submerged Bull Head Rock — the shape of which gave the Arizona city its name. According to the US Weather Service, Bullhead City is the hottest town in the United States. An average January night in Laughlin is 44°F, whereas an aver-



age July day is 113°F. On June 29, 1994, Laughlin broke Nevada's high temperature record by hitting 125°F.

In 1966 Don Laughlin bought a bankrupt baitshop/motel and six acres of land for \$35,000 down. Having acquired a gaming license in Las Vegas, he was able to open a gambling establishment and rent four of the motel's eight rooms, while his family lived in the other half. Business grew, and two years later a US postal inspector named O'Reilly told Don that the emerging city needed a name for mail delivery. Don suggested that "Laughlin" would be a good Irish name for the town. Don has joked that the town was named after his mother.

By 1980 there were several casinos, and the population of Laughlin had grown to 80, while Bullhead City, where most of the hotel staff lived, had a population of 10,000. During the 1980s there was a great boom of hotel-casino construction so that by 1990 Bullhead's population was 25,000 and Laughlin's was 4,791. Bullhead's population is now nearly 40,000 and Laughlin is receiving about 5 million visitors per year.

Don spent roughly a million dollars of his own money on road improvement, \$4 million for a bridge connecting Bullhead to Laughlin, and \$6 million on expansion of the Laughlin/Bullhead airport. In 1995 Don completed the South Tower of his Riverside Resort, which added 1,000 new rooms and a non-smoking casino. The city of Laughlin has a police & fire department, but no city government or Mayor.

THE LAUGHLIN NEVADA TIMES, the city's weekly newspaper is free of charge. On the front page of the issue I saw were stories about a summer reading program for children at the Laughlin library and a story of a Laughlin High School student who had won a state-wide competition for automobile repair. Page 10 contained a "Police Blotter" feature that listed every recorded police incident in and around Laughlin for the April 23-29 period. Many of these incidents involved consumption of alcohol by minors, indecent exposure and disorderly conduct. Real estate advertisements impressed me with the amazingly low prices for houses (by Toronto standards, certainly — see www.aroundtheriver.com and judge for yourself).

Inexpensive food and hotel rates are part of Laughlin's attraction. Although High Rollers' Conference attendees were given special rates (weekend \$35/night, weekday \$15/



Laughlin Riverside Resort

night) at the Riverside Resort, this is only a few dollars less than the going rate for hotel/casinos on The Strip. But the attendees were given rooms on the top floor (mine faced the river).

I began my day of tourism with the Riverside Resort's boat tour of the Colorado River. The tour runs at a leisurely pace to Davis Dam in the north to the bottom end of The Strip on the south. Then I drove around Bullhead and Laughlin. I dropped into the Colorado River museum in Bullhead City, where I was the only visitor. The caretaker was a retired school teacher who seemed pleased to have someone to talk to. He was informative concerning the history of the area.

The town of Laughlin is separated from The Strip by quite a few miles of desert road. The town is not old enough to have any run-down areas. The Shopping Centre was a quiet place with the exception of the supermarket, which was busy. I was



Ben Best is a Director of the Cryonics Society of Canada, editor of *Canadian Cryonics News*, Secretary of the CryoCare Foundation and a Contributing Editor to *Life Extension* magazine. He has collected a large assortment of his writings on his website at www.benbest.com

almost shocked by the size and collection of merchandise in the gun shop — I've never seen anything like it in Canada — and yet it sits innocuously amongst restaurants and garment shops.

The Strip itself is a self-consciously tiny Las Vegas, consisting of ten large hotel/casinos, nine of which are on the river side of the road. Ramada Express, the only hotel/casino on the west side of the road, is encircled by a miniature railroad which goes round-and-round, giving free rides to anyone who hops aboard. The railroad has some utility for those wanting to go to or from the parking lot, but for riders like me it was just a novelty.

At the north end of The Strip is Don's Riverside Resort. At the south end is Harrah's, past which there is an abrupt transition to stark desert. The largest hotel, with 2,000 rooms, is Don's neighbor the Flamingo (the Riverside Resort has 1,450). The hotel/casinos have themes, but they are not the fantasy-extravaganzas of the Las Vegas Strip. The most radical transformation from the appearance of a hotel is the Colorado Bell, which is built in the shape of a huge steamship, with paddlewheel. As with Las Vegas, although all hotel/casinos have special attractions, the predominant feature is sprawling floors of slot machines.

I had never driven a skidoo or seadoo before, but I took the opportunity to rent a seadoo for an hour at the Pioneer Hotel. I found it somewhat frightening and hard to control at first, but soon I was zipping the length of the river from Davis Dam to Harrah's and pushing the limit of high-speed turns.

Don's Riverside Resort is a city unto itself, and I challenged myself to become so familiar with it that I

would be able to go from any one part to any other part without getting lost. I can't say I was completely successful.

Throughout the casino there are monitors where, at the press of a button, you can watch a video of Don Laughlin's life story. It begins with Don's birth in 1933 in the rural district of Otatonna, Michigan. By age 11 he had saved enough money to buy his first slot machine and by age 15 he had a business that was earning him \$500 per week. This was over twice the income of his high school principal, who told Don to



Don Laughlin

“get out of slots or get out of school.” Don dropped out of school and continued his enterprise until 6 years later when Michigan made the slot machine business a felony.

Don moved to Las Vegas with his wife and infant son, worked as a bartender and dealer for a few years, and then bought a small bar, which provided him with a gaming license. Several years later, gaming license in hand, he was able to buy the prop-

erty near the Arizona border that was to make his fortune. On the video, Don described his efforts to build a bridge across the Colorado river at his own expense, saying that it took him four years to get approval from about 38 government agencies. Opened in June, 1987, the bridge was constructed in only four months. I bought a copy of the video at the gift shop.

On the second floor of the Riverside is a huge 24-hour bowling alley adjoined by some fast-food snack bars. Nearby is a room full of video games and related computerized entertainment equipment. The movie theatre has six cinemas. There is a large museum of antique and unusual cars and vehicles. The antique slot machine store sells several slot machines per week.

The Riverside watch store is reputed to be the largest in the world — over 20,000 watches all selling for \$20 or less. It has watches in rings, in necklaces, in stones, in toys, in chinaware — a mind-boggling assortment. I bought a talking watch for an uncle who is going blind, and a watch-in-a-hat for myself. A smaller luxury-watch store is located elsewhere in the casino.

I made sure my explorations did not continue beyond 5pm, when the 2-hour “Happy Hour” began in Don's Hideaway Lounge. There I met Jack Zinn, who was surrounded by Norm Lewis (of Trans Time), Dave Greenstein (of Alcor) and a number of other cryonicists I did not know. I had stayed with Dave when I was in Boston, and he had been very hospitable in driving me to MIT, Harvard, the Boston computer museum and other local attractions.

Jack said that his conferences continue to get bigger, and that he was expecting 60 people to attend



The author (center front, in t-shirt) during conference presentations.

this one. Since the conference is free and there is no formal registration, no one can say for sure how many attended, but judging from what I saw Jack's guess was probably close to the truth.

At around 6:00 pm Don Laughlin came into the Lounge. I joined the group around him and I asked Don what his next large project would be. He answered that he had no big projects planned and that his main focus is to pay off his debts — a project which he estimated could take about 30 years. I asked him if he was overly leveraged (having too much debt in comparison to equity in his property), but he denied this, saying that he simply didn't want to have any debt.

I pushed the envelope of risk by asking Don how many more years he

expects to live. He acknowledged that this is an uncomfortable question to think about. He said that he did not know the answer, but that he is currently 68. My question bears crucially on the issue of how long Don can delay spending money on cryonics research if his wealth is to do him the most good to save his life. But I did not raise this question. One thing I would hate about being rich (and there aren't many other reasons) would be having people persistently asking for money.

I asked Don if any of his family has taken an interest in cryonics (he is divorced, but he has two sons and a daughter). He said no, but one son has agreed to be the trustee of his cryonics trust. Don agreed with me that South Dakota is the best state in which to establish cryonics trusts,

and, in fact, he has established a trust there with Citibank. I had considered Citibank in my research, but decided it is too expensive. I have been spending time and money developing "bullet-proof" cryonics trusts for South Dakota. I would have liked to talk with him much more about this, but he abruptly left the room.

I saw Russell Cheney and asked him how the Technician Training had gone. His original thought had been that the team members would be attracted to the High Rollers' Conference and the recreational ambience of Laughlin, but as it turned out, there were only 2 others from Southern California (Dr. Robert Newport and Dr. Kat Cotter), plus one from Northern California (Bruce Cohen). Linda Chamberlain had joined Russell and the doctors in making it primarily a



Glenna Burmer, MD, PhD

training session for Don's team. Initially Don's security people did not have a very high regard for cryonics, but their perceptions have been becoming increasingly favorable (or less unfavorable).

I was eager to meet Dr. Bob Newport because he is playing such a crucial role in the negotiations between CryoCare and BioTransport — not least because of the physician's expertise he is expected to lend. In light of that, I was surprised to discover that he is a psychiatrist. But when I spoke to him about his role, he seemed confident that the surgical skills would not be a problem for him to master.

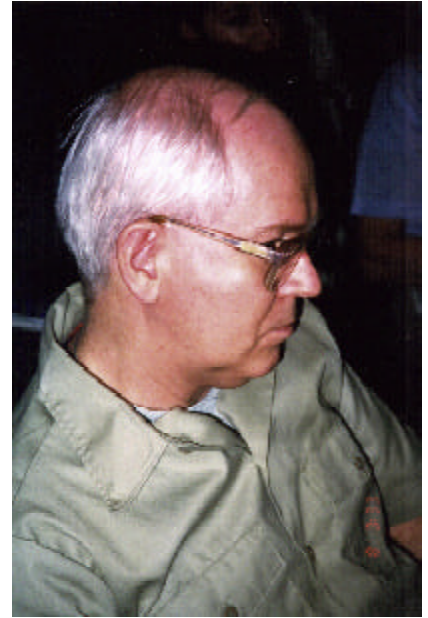
The Alcor people headed to The Gourmet Room for dinner, and I joined them, continuing my discussion with Bob. The Gourmet Room is one of the most expensive restaurants in Laughlin, and is the most expensive of the 6 restaurants in the Riverside Resort. But Laughlin standards of expen-

sive food means more than \$30 — the all-you-can-eat buffet in the Riverside costs about \$7. (Prices of restaurants in Laughlin can be seen at www.visitlaughlin.com/visitor/restaurants.html)

Mary Margaret Glennie had some touching things to say about her relationship with her cryopreserved husband during his dying days. He was concerned about spending so much money on being cryopreserved rather than leaving the money to her. She ardently assured him that the hope of seeing him again in the future meant much more to her than any money he might leave her. She asked him what kind of wife would rather have her husband's money than his life.

The first speaker at the Conference on Saturday morning was Dr. Glenna Burmer, MD, PhD, Chief Scientific Officer of LifeSpan Biosciences of Seattle, Washington (www.lsbio.com). The scientific calibre of her presentation, her work and her credentials knocked my socks off. She had become interested in anti-aging research at the age of 16, and steadfastly pursued her MD and PhD with the goal of becoming a researcher against aging (for life).

She mentioned that only 10,000 of the 100,000 genes in the human genome have been mapped and only



Hugh Hixon

350 are currently targeted by drugs. By implication, there is still a vast untapped potential for pharmaceutical intervention. She said that her organization is the only company in the world producing molecular pathology data for large pharmaceutical companies — and they count virtually every major pharmaceutical company among their clients.

Dr. Burmer said that telomeres are only the first example of aging-related genes. Using DNA chip technology, with 1,000 genes on each chip array, they have been able to monitor whether genes are turned off or turned on. Studying different tissues from different age groups, they found a kinase that increased expression in both heart & skin with advancing age. Their company is searching for genes that will either increase or decrease in a variety of disease conditions in more than one tissue. One particularly exciting discovery they had made was of a gene that is expressed in senile plaques and pre-senile plaques. This could lay the



Carol Shaw and Ralph Merkle, PhD



Paul Segall, PhD

groundwork for stopping senility in its tracks.

Dr. Burmer mentioned that hair follicles from bald humans will grow hair when transplanted to the skin of mice. She raised the possibility of a shampoo ingredient to reactivate follicles. Hugh Hixon emphasized the unimaginable wealth the implementation of this idea would bring to Dr. Burmer's company.

During the question period I asked if any of their results had been published in peer-reviewed journals. She said that they weren't ready to do that yet. I also asked, considering the focus on the genome, whether she thought mitochondrial DNA played a significant role in aging. She said that the fact that young nuclei can rejuvenate cells when substituted for old nuclei by transplant had made her doubtful that mitochondrial DNA is crucial, although she is now having second thoughts.

Ralph Merkle the next speaker. I have listened to Ralph's nanotechnology presentation umpteenth times at various conferences in

the last ten years. Ralph himself has told me that if I have already heard his presentation a few times, there is no need to hear it again. If Ralph was planning to only give updates, I would have stayed. But he asked for a show of hands of people who had not heard his basic talk before, and decided the number was large enough that he should deliver it.

I probably returned later than I should have, because Ralph was talking about a new topic — the upcoming release of a book on *Nanomedicine*. In this case, the technical book would be followed by a popularizing book — and Ralph gave reasons why he thought this sequence would have more impact than the reverse sequence followed by Drexler's books. My own perception of the basis on which people accept or reject ideas makes me doubtful that sequence makes any difference.

Opening the afternoon sessions, Dr. Paul Segall stated his thesis that the Syrian golden hamster is the best model system for cryonics research. He reviewed the protocol being used for hamster cryopreservation experiments at BioTime. In the mid-1950s

Audrey Smith had shown that hamsters could be cooled until 55% of body water was frozen. But the hamsters would die within 18 hours of re-warming. Examination of hamster brains shows widespread petechial (pinhead-to-pinpoint size) hemorrhaging. Paul said that Dr. Mark Voelker had been employed with BioTime for a month, and would be doing research with high-pressure chambers which might alleviate this problem.

Paul then introduced another new BioTime worker, Lee McCook, a graduate student who had taken an aging course at Berkeley with Dr. Paola Timiras (Paul Segall's "mentor," and author of the 1983 book *Neuroendocrinology of Aging*). McCook took the stage and explained that he wanted to continue the work Paul Segall had begun based on the neuroendocrine theory of aging. Since McCook has not yet had much time to do original work of his own, most of his presentation was a review of aging research material which would be familiar to anyone who has studied the subject carefully. I won't attempt to repeat this



Stephen "Tumbleweed" Kehrer and Mark Voelker, PhD



Fred Chamberlain (center, in tie)

material.

Lee argued that the signalling environment of the genome is the “ultimate determinant” of gene expression, rather than the genome itself, that the endocrine profile is an important part of this environment, and that the brain (under feedback control from the lower systems) controls the endocrine profile. He showed the beginnings of his work done in collaboration with a computer programmer named Steve Garran to study samples of brain tissue under a computer-controlled microscope.

After the lecture I spoke with Steve Garran who, it turns out, is a Canadian from Waterloo. He is eager to apply computer technology to the aging problem. He was impressed when I told him that I had taught a

Java course at George Brown College in the first quarter of 1999, because he was interested in having some of his code rewritten in Java. He was also impressed when I told him how much time I have spent installing and configuring Linux. He thought we might be able to find a way to work together, but was unable to come up with anything tangible. Steve invited me to visit his lab in Waterloo, but I told him I don't have a car. His website is www.arclab.org

When I asked Steve about cryonics, he told me that he is too young to be thinking along those lines. I told him that I too am hopeful that aging can be eliminated soon (“plan A”), but if that fails, I want to have cryonics (“plan B”) in place. I would expect that serious life-extensionists

would have both plans in mind, with increasing emphasis on “plan B” as they get older. But I see many life-extensionists who have no interest in cryonics as well as a surprising number of cryonicists who don't pay much attention to life-extension.

Dr. Mark Voelker had been in the program to speak on Sunday morning, but he decided to take advantage of the time available for BioTime. He spoke of his plans for high pressure research, rather than about electron microscopes — his topic scheduled in the program.

Mark explained that different solutes depress the freezing point of water to a different degree (sodium chloride has a eutectic temperature of -21.6°C , whereas for calcium chloride the eutectic temperature is -55°C). He said that both tempera-

ture and pressure are independent variables which may independently govern the minimum amount of cryoprotectant necessary to cryopreserve. He suggested that much can be learned from exploring the 3-dimensional space represented by a plot of temperature, pressure and % cryoprotectant. Mark showed a picture of the hamster-sized hyperbaric chamber he said he built to explore this 3-dimensional space.

Since the afternoon had been going so swiftly, Fred Chamberlain asked the participants if they would like to finish the entire conference that afternoon by having him give the BioTransport presentation originally scheduled for Sunday. The attendees favored the idea.

Fred began by describing the naive approach he had toward cryonics rescue when he first became involved, over 25 years ago. Instead of sending cards that said "Get Well Soon," he said "Sorry you're sick and going to die — you should make arrangements to be frozen." Fred was interrupted and given a note which shocked him into stepping up his pace and focusing on the current organization and plans for BioTransport.

But Fred was soon interrupted again. He announced that his presentation would have to be cut short because an emergency cryonics case had come up and the team needed to mobilize immediately. The timing of this event was ironic, in light of the fact that it had been 2 years since Alcor last cryopreserved anyone. In short order the Alcor people were packing-up and vacating.

Mary Margaret, Kat Cotter, and I had all agreed the night before that what the Riverside Resort needs is a good gym. I asked Don Laughlin if it would be possible to build a gym

under the South Tower (which has the non-smoking casino area), but he said ground-water would prohibit this. He told me that plans for a gym were already underway, and that construction would begin in the near future. I told him that another great addition would be facilities for guests to have Internet access — browse the Web and get their e-mail while away from home. He said that it should not be too difficult to have computer terminals set up in a room much like the one in which we had our conference presentations.

I spent the rest of the evening taking a final look inside some of the other hotel/casinos on The Strip. Sunday morning I ran into Paul Segall and Dave Greenstein in the lobby and we agreed to go to the Riverside buffet together for breakfast.

Paul said that the FDA approval had just been given for his Hextend blood-substitute and that the pharmaceutical company, Abbott Laboratories, would be doing the marketing. This should mean big money for BioTime. Paul described a few more blood substitute products BioTime has developed — and the differing conditions under which they can be used — but I have unfortunately forgotten the details.

When I mentioned the poor results Greg Fahy had with cryoprotectants at high pressure, Paul told me that he figured Greg's specimens had suffered from nitrogen toxicity ("the bends"). At BioTime they plan to use a helium atmosphere. He said that if fish can live in the Marianas Trench, there is no reason to believe that pressure itself is "toxic." Paul even suggested that high pressure may promote perfusion in such difficult areas as eyeballs and bones. His comments gave me a very different perspective on the high

pressure work — and it would have been very helpful if Mark's presentation had included this information.

On my drive back to Las Vegas I stopped by Hoover Dam, which has a large tourist centre. Hoover Dam appeals to my megalomania as a colossal "concrete" tribute to human engineering — set against a backdrop of towering mountain rock. Unfortunately, it is also a tribute to central planning and public works projects. At the time of its construction its psychological impact was equivalent to a moon landing. It was the highest dam in the world, and for ten years it was the world's largest hydroelectric installation. Lake Mead is still the largest man-made reservoir in the United States.

Dams are currently very controversial among environmentalists. Although dams generate one-fifth of the world's electricity as a "renewable" energy source, they impede fish passage and destroy riparian flora and fauna in a number of ways.

I took the "hardhat" tour, which went through some of the deeper passageways of the dam. The tour guide said that the entire electrical distribution system for the dam is now controlled by only 3 PCs, which he hopes are Y2K compliant. I am thinking of going to next year's High Rollers' conference. If I do, I will probably take the opportunity to see the Grand Canyon.



Cool Connections:

Cryonics on the World Wide Web

By Steve Bridge

Things are changing so rapidly in the world of the Internet that it seems anachronistic to be printing this article on paper. You should be reading this in your e-mail or an on-line version of *Cryonics* so you could immediately link to the web sites I list. But we don't have an on-line version of *Cryonics* — yet. And then there are those of you that aren't using the Internet or even getting electronic mail — yet, and you need to know about these sites.

Actually, if you have resisted “going on the Web” to this point in your life, my first paragraph already has you lost in a maze of unfamiliar terminology. I suspect that most subscribers to *Cryonics* are interested in future technology and are already

using the Internet. But maybe not. After all, Alcor Membership Administrator Brian Shock has e-mail addresses for fewer than half our members.

For those of you who already use the Internet and World Wide Web, I merely need to begin this article with one address and tell you to look there:

<http://dmoz.org/Science/Biology/Cryobiology/Cryonics/>.

You'll have to type it in by hand, of course, until we can convert paper images more easily into electronic ones. But I hope you'll bookmark it for future use (or place it in “Favorites” if you use Internet Explorer instead). The listings will be changing constantly.

The *first* site for you to Book-

mark is Alcor's own:

<http://www.alcor.org>.

Alcor's home page opens with a cheerful photograph of some of Alcor's staff and Transport Team volunteers. Click on “Photo Tour” and you'll see a series of pictures which show Alcor's building and basic cryonics procedures. Click on “Membership” to get a copy of Alcor's Membership Application. If a reader has software allowing for secure transmission of information, he or she can apply on-line.

Current or future Alcor members might wish to click on “Library” for many additional member forms, Alcor's history, the full text of Alcor's book, *Cryonics: Reaching for Tomorrow*, and interesting ar-



Steve Bridge was a co-founder of the Institute of Advanced Biological Studies, which merged with Alcor Life Extension Foundation in the early 1980s. He has been an Alcor Director since 1991, served as Alcor president/CEO from 1992 to 1996, and is currently Alcor's Chairman of the Board. By profession, he is a librarian, and by personal preference, a dedicated family man.

ticles from past issues of *Cryonics*. Click on "News/Events" to see the latest news or details on Alcor's 2000 conference in California. Then click on "Who We Are" to see pictures and biographies of the staff, Board of Directors, and advisors, including a very friendly picture of yours truly.

David Cosenza started Alcor's Web page back in 1995. Since then Brian Shock, Fred Chamberlain, and Derek Ryan have taken turns being Webmaster. Alcor currently needs some knowledgeable, dependable, and energetic help to keep the Web page up to date. Send a note to Brian Shock <brian@alcor.org> if you fit the bill.

Of course, Alcor isn't the only cryonics site on the Internet. You can use a Search Engine and sift through the hundreds of entries about cryonics it finds — or you can let ME do the work. I edit and maintain a "Cryonics" subject page on the Open Directory Project.

ODP was originally assembled by a small non-profit company called NewHoo. The premise was that automated search engines and/or small editorial staffs cannot put together a useful directory with such a rapidly growing Web. So... "The Open Directory Project's goal is to produce the most comprehensive directory of the web, by relying on a vast army of volunteer editors... These net-citizens can each organize a small portion of the web and present it back to the rest of the population, culling out the bad and useless and keeping only the best content." The assumption is that these editors will be highly knowledgeable in the areas they edit. Several months ago Netscape began financing the Open Directory Project and offering its information to Netscape users. Since then it has been growing rapidly. It really may al-

A few Internet terms:

Internet — the system of computers and software that allow us to use telephone lines to exchange written information all over the world.

World Wide Web — a particular use of the Internet that allows people to set up information files, pictures, computer programs, etc. on computers that are always on. Outside users may use the Internet to obtain copies of those files at any time.

e-mail (electronic mail) — messages that are sent via computer and the Internet, instead of by the Postal Service.

on-line — 1. If you are "on-line," you are connected to the Internet. 2. "On-line information" is available through the World Wide Web.

web site — a specific place on the World Wide Web which contains information accessible by computer.

address — Just like every business and home needs a postal mailing address, every web site or e-mail user needs a specific electronic address that no one else has - or you would ever find anything.

ready be the best index on the Web. Other advantages: "The directory will be more open than before. In the spirit of open development, and fitting with the Mozilla ideals, we are creating a free use license to allow

individuals and organizations to take advantage of and use copies of the directory that they can crawl, archive and reuse on their machines. The ability to do this was one of the key reasons for us to go with Netscape."

(Quotes are from the on-line info at the Open Directory Project website. "Mozilla" is ODP's symbol, a green lizard.)

Several internet search engines and indexes (at least 25 sites as of the beginning of June, 1999) are now taking advantage of that free use license to include ODP listings as a major part of the indexing they offer their own customers. Some of these companies include Hotbot, Lycos, Aardvarks Metasearch, Dogpile, and MetaPro. But the simplest and most direct way to use the ODP listings is to go to the source at <http://dmoz.org>. Searching is exceptionally fast.

As editor for the Cryonics subject heading (at <http://dmoz.org/Science/Biology/Cryobiology/Cryonics/>), my goal has been to create a listing of all sites which would be useful to people searching for cryonics information. Those "people" could be students, reporters, novelists, cryonicist relatives, prospective members, current members looking for more information, and more.

As a base, I have listed the web addresses for all cryonics groups for whom I can find a web page. These include many smaller groups outside of the United States. The sites for the American Cryonics Society, CryoCare, Cryonics Institute, and Trans Time are just as loaded with information as Alcor's site. Each is unique, as you might expect from the different writers and philosophies connected with the groups.

I added information sites like CryoNet and Timothy Freeman's "Cryonics FAQ" (a bit dated now, but still useful for many answers). I have included some of the best personal sites of cryonicists, as long as they contain unique information. The list also has direct links to web sites for books by James Halperin, Rob-

ert C.W. Ettinger, and K. Eric Drexler.

Other links include such diverse sites as a place that discusses "Was Walt Disney Frozen?", the home page for the documentary film *Synthetic Pleasures*, Scott Badger's Cryonics Survey (see *Cryonics*, 2nd Quarter, 1999), and articles by Ralph Merkle, Steven Harris, and Ben Best.

I have *not* included most personal web sites with brief or unoriginal mentions of cryonics. The goal of the ODP is not "completeness."

Don't stop at the main entries. "Simple Introductions to Cryonics" includes the best short introductions I could find. Send your friends or relatives there as a starting point or print out your favorites and pass them around. That's also a good starting point for students working on reports.

"Cryonics Humor and Satire" is still a small group of sites. Some cartoons are included, as is Derek Strong's funny account of a reporter's hoax call ("Carla Cranks Alcor"). If you know some more cryonics humor sites (just clean stuff, please), let me know.

"Futuristic sites of interest to Cryonicists" contains all those sites that don't have much to do with cryonics directly, but which most of you would like if you just knew about them. They include information about Extropianism, immortalism, and transhumanism, plus sites which index future speculation on the net. There is enough material for a thousand science fiction novels or future speculation books in those sites alone.

If you are wanting information about other "cryo" subjects, I also edit the ODP subject areas on Cryobiology (<http://dmoz.org/Science/Biology/Cryobiology/>), Cryotechnology ([\[Science/Technology/Cryotechnology/\]\(http://dmoz.org/Science/Technology/Cryotechnology/\)\), and Cryosurgery \(<http://dmoz.org/Science/Technology/Cryotechnology/Cryosurgery/>\).](http://dmoz.org/</p></div><div data-bbox=)

Each subject listing already has links to enough internet material to keep you awake for many nights (I have added over 200 sites in these subjects plus Cryonics, and some sites link with hundreds of other sites). Still, these other cryo-subjects are outside of my personal expertise. I greatly desire help finding and organizing more sites in each of these areas. If you would like to be a volunteer on this project, I would be happy to help you get started. You do not need to know HTML (the main Internet programming language). The Open Directory Project uses simple software that makes adding and editing sites very easy.

And if you just know a couple of favorite sites you think I should add, go to the ODP page in which you think it fits, then click on "Add URL." You will be prompted for the address and any information you might want to add. I will look at them and see if they fit in my category or somewhere else.





Cryonics: the Scourge of Volunteers?

by Brian Shock

In my incarnation as Alcor's Membership Manager, I really *like* volunteers, particularly *regular* volunteers.

At the moment Alcor has two regulars at the office: Jerry Searcy, who answers the phones, performs data entry, and stuffs envelopes for us; and Paul Garfield, who happily takes care of grunt work such as filing, copying, and collating. Jerry works Monday through Friday and Paul works one day a week. Alcor pays neither of them a cent.

These two retired Alcor members are incredibly helpful to us. With Jerry answering the phones, I don't have to interrupt my writing every five minutes to handle routine information requests. With Paul collating information packets for me, I have a few more hours to spend with Alcor sign-ups. When both of them are on the job every week, the office runs with gratifying smoothness.

And when one or both of them are gone, the office dissolves into a slow chaos of diverted thought trains and unproductive drudgery.

Please understand: I'm not blaming Jerry or Paul. I honestly, pro-

foundly, constantly appreciate their work, and I hope they continue helping us until the day they take up permanent residence in Alcor's Patient Care Bay. But as volunteers, they have every right to come and go as they like. Jerry even refuses any sort of payment just so he *can* remain totally free to vacation or travel.

Therein lies one of the central problems of volunteerism: the inability to count on volunteers' time.

I can almost hear someone out there muttering, "What's *he* complaining about? Volunteers donate their valuable time, even if they do it at their convenience. An irregular something for nothing is *still* something for nothing."

If you will, please forgive me the impulse to descend into aphorism for the beginning of my answer: "We may not get what we pay for, but we never get anything *more* than that."

(On a slight tangent, I might also point out that slavery — another apparent "something for nothing" — has always proven more expensive than it was worth.)

At this point, libertarians and other free-marketeers may feel an urge to defend my proposition (though most will assume I'm sufficiently self-reliant to defend my own ideas, if they're worth anything at all). "There Ain't No Such Thing As A Free Lunch." If you want something, you work for it or pay for it. From this philosophical standpoint, volunteer labor must seem fundamentally suspicious.

Perhaps so, but I believe the problems run even deeper than that.

I'm reminded of an incident at Alcor's latest CryoTransport Technician training course a few weeks ago. One of our attendees was enthusing about the wonder, excitement, and challenge of working in cryonics. Having labored in this field for a few years now, I could only shrug, noting that, "It's just a job, like any other." This observation seemed to thoroughly scandalize the volunteer CryoTransport Tech, still steeped in eagerness and novelty.

But come the end of that training course, the volunteer went home to his job, while I stayed here with mine. Since then, he's probably con-

templated working in cryonics once or twice, while I remain immersed in it on a daily basis. His eagerness will burn brightly for a certain amount of time, whether weeks, months, or years, and then like all volunteers, he will go on to his next avocation; meanwhile, I must perform consistently, Monday through Friday, January through December, with the knowledge that a burn-out might spell disaster for me *and* for Alcor.

Consistency isn't exciting, but in cryonics, it *is* vital. Volunteers show consistency only in their pattern of *inconsistency*.

The typical volunteer comes to us when cryonics still retains a shining newness for him, usually before he's even completed his sign-up process. He's eager as heck to make cryonics the biggest thing since sliced bread. To him, cryonics seems the most logical idea ever conceived, and so he's amazed to discover that everyone hasn't signed up yet. As a corollary to this amazement, he becomes convinced that Alcor and other cryonics organizations have been doing "Something Wrong." Imagine: we hold the key to the most obviously desirable thing anyone could ever want — the possibility of extended life — and our sales are laughably poor. We must be idiots and incompetents!

Our generous volunteer naturally has dozens of good ideas for promoting, marketing, or otherwise advancing cryonics. If he's fairly young or not well established in any professional circles, he will usually understand that his volunteer efforts must start out with simple rote work, stuffing envelopes or pushing a broom. If he's middle-aged or secure in his chosen career, he will prefer sharing his superior knowl-

edge and experience with us directly. Either way, he begins with the conviction that he knows how to correct our "Something Wrong."

Whether volunteers begin by performing useful bottom-rung tasks or march into the CEO's office with their plans for world domination, they inevitably find a deplorable lack of excitement awaiting them. Some take this as a snub, and immediately stomp off to some other pursuit, one that will hopefully show more appreciation for their efforts. Others are simply disappointed, and remain involved with cryonics, albeit with a somewhat lower level of energy than before.

This *always* happens. There is simply no way around it. Regardless of how much a volunteer has to offer — and almost directly proportional to how much he does for us in the meantime — cryonics dampens enthusiasm in short order. The more a cryonics organization depends on volunteers, then, the more it will suffer when those volunteers shuffle away in (perhaps justifiable) disgust, as they always do.

Why do we seem to drive them away?

1) Good Ideas — Our volunteers always have plenty of genuinely good, occasionally *brilliant* ideas. As newcomers, however, they haven't had time to realize that cryonics has survived for over three decades and involved hundreds of the most highly intelligent people on the planet. The cryonics organization of your choice may not have heard *every* good idea ever conceived, but its personnel have been subjected to 99.99% of them.

If cryonics has access to this vast memetic resource, then, why don't we take advantage of it? Two rea-

sons:

A) Most of those "good ideas" (particularly the ones about promoting cryonics and increasing membership) just don't work. We know — we've *tried* them. Shock's Law #1 states that, "Selling cryonics arrangements is more difficult than selling any beneficial product or service ever imagined." Unfortunately for volunteers (and probably many readers out there as well) Shock's Law #2 is, "No one believes Shock's Law #1. . . until he or she learns it for himself, through painful, frustrating experience."

B) Even for the best ideas, cryonics lacks money and time. Just as an obvious example, your cryonics organization would dearly *love* to market itself as thoroughly as McDonald's, but it doesn't have the funds and it doesn't have the personnel.

But don't volunteers at least *offer* an extra set of hands for such tasks?

That leads us to the next problem.

2) Long Term Projects — cryonics may be one of the few long-term projects in the Western world. It demands that we actively maintain cryonics patients in a frozen state over the course of decades or even centuries. It forces us to remain ready for a suspension day and night, year after year, even though suspension frequency is extremely low. It also involves permanently shifting the mind-set of millions of people — entire societies! — which can only be accomplished with slow, grinding, unceasing effort.

Continuity (even mediocre continuity) is the life-blood of cryonics. Without that, no one would trust a cryonics organization, and probably

shouldn't.

Completely aside from cryonics volunteers' disaffection curve, nothing holds a volunteer to his organization. As a volunteer, he can come and go as he pleases, refuse any job, or simply quit without significant consequences to his income or employment prospects. As much as cryonics organizations need and appreciate volunteers, these wonderful people potentially jeopardize *continuity* of every service a cryonics organization offers. If we put a volunteer in charge of a vital project and he suddenly decides to fade (as has happened, more than once!), we have wasted time and money that may weaken us to our foundations.

And this brings up a third and final volunteer issue.

3) Honesty and Reliability — If you've read this far, you are probably a very pleasant, rational, intelligent, well-informed individual. But if you show up on the doorstep of a cryonics organization or just call it on the phone, no one there can know this about you with absolute certainty. Considering that a cryonics organization may be responsible for the lives of hundreds of people, its personnel cannot afford to take chances.

Cryonics has experienced its share of disappointments with individuals. Some of these disappointments involved intentional dishonesty, some came from those with the best intentions but serious personal flaws, and some very unfortunate experiences arose from gray areas that many of us still don't understand.

What exactly do I mean?

■ A volunteer might believe he knows far more about cryonics than he actually does, and so accidentally

misinform countless people.

■ A volunteer might take on a task for which he has more enthusiasm than competence or time, and so undermine important work.

■ A volunteer *might* be a pathological liar, a con man, a thief. . . or worse.

As much as I'd like to discuss specific cases, I fear this would distract from the general point: newcomers to cryonics must earn a modicum of trust far out of proportion to that necessary in other fields.

With this minor screed exhausted then, I cannot emphasize enough that your cryonics organization *still needs volunteer help*. How then can you best avoid the pitfalls I've discussed?

1) Please try to understand the basic trust issues involved. If you volunteer for work with Alcor and you are not at least in the sign-up process, our responsibility to patients and members alike will *obligate* us to question your commitment.

2) Please be as patient as possible when approaching us. We'll fit you in wherever we can, but the farther away from us you are, the more difficult this becomes. Remember that you may have to make yourself available for dull, thankless tasks over the course of *years* before we can give you more responsibility.

(Remember also that most of Alcor's full-time staff worked as volunteers for quite some time, demonstrating their reliability and worth to the organization long before they were hired.)

3) Please don't feel that your most useful volunteer work involves educating us about what we should

be doing with our time. We are sincerely interested in your feedback, but please keep in mind that we've been around for many years and have gradually allocated existing resources to do the best job within our limitations.

4) Please don't just tell us what you can do for us — instead, *show* us what you can do for us. If you have a wonderful new idea for promotional items, videos, cryotransport equipment, etc., assemble something tangible that we might examine and test. If you believe you can sign up hundreds of people, *do* so.

(One important caveat: please do not refer to yourself as an Alcor representative, without specific written authorization.)

5) And finally, once again, it's Cliché Time: please put your money where your mouth is. If you have something specific you want to see happen, *donate the funds for it*.

(Though please keep in mind that existing company strategies may prevent us from acceding to every wish. For instance, you probably *can't* donate enough money to convince all of Alcor's staff to wear office uniforms that resemble costumes from *Star Trek: The Next Generation*.)





A Case Study in Promotion

by Charles Platt

During the past thirty years, no one has promoted cryonics successfully, if we measure success in thousands of new members rather than dozens. Build a better mousetrap, and the world will beat a path to your door; but where cryonics is concerned, we don't actually have the mousetrap, merely some plans to complete it when technology matures sufficiently. Therefore, I see two explanations for our lack of success: Either our plans are insufficiently plausible, or we need a more effective way to convince prospective customers.

When I was relatively new to cryonics I tended to believe the second possibility more than the first, because I saw that cryonics never had been promoted on a very coordinated or professional basis. With arrogance typical of many cryonicists, I automatically assumed that I could do what other people had failed to do; so I set to work.

First I wrote a one-page column for *Omni* magazine, describing my decision to join Alcor and suggesting that other people might do the same. This column generated more

than 1,000 information requests, which I was told exceeded the number of responses from the previous best attempt at promoting cryonics, when it was featured on the Donahue show. One reason my single page was so effective was that it was a personal testimonial, which is a powerful tool in PR. Another reason may be that print is more effective than TV, for selling cryonics. A more important reason may have been that *Omni* reached the ideal audience: Readers who knew just enough about science to feel optimistic about it, but weren't well enough informed to perceive the practical difficulties. To put it bluntly, they were naive.

I wondered how I could reach this audience more effectively, while still working within ethical limits. It occurred to me that one basic tool of PR had never been tried: A contest. If auto manufacturers routinely give away cars as a means to gain publicity, why shouldn't a cryonics organization offer a "free freeze"?

The editor of *Omni* at that time was Keith Ferrell, a very open-minded man who happened to like my writing. When I suggested to

Keith that *Omni* should co-sponsor an essay-writing contest in which the first prize would be a free cryopreservation, he immediately saw that the resulting publicity could benefit his magazine as well as our cryonics organization. He emphasized, though, that *Omni* would not contribute to the cost of the prize.

I proposed the idea to the Alcor board of directors, and pointed out that the contest wouldn't actually cost much (an annual life insurance premium and a free membership) until the winner required cryopreservation, which could be decades later. In fact this contest would be unique in that the prize would not be awarded until after the winner was dead!

Carlos Mondragon (at that time, the president of Alcor) was in favor of the plan, but later told me he had a hard time selling it to some of the directors. In retrospect I sympathize with their point of view: Alcor would be accepting a long-term unfunded obligation without any guarantee that the contest would attract enough paying new members to make it worthwhile. Still, ultimately the board did

vote to go ahead, and they put Ralph Whelan in charge of negotiating the details of the deal with *Omni*.

I felt unhappy about this. After all, I was the person who had created the idea and enjoyed the working relationship with Keith Ferrell. But Ralph was a director of Alcor, and his fellow directors preferred to trust him to represent Alcor's interests. This was in keeping with a general unwritten policy at Alcor in those days, which can be summarized as, "We'll do it ourselves, thanks." So far as I could see, the organization generally preferred not to delegate responsibility to volunteers, and some volunteers became discouraged as a result.

After several months Ralph and Keith Ferrell did reach an agreement, and to his great credit Ralph persuaded *Omni* to offer Alcor two free full-page ads, separately from, and in addition to, the contest. I was not happy that the event would be titled "The Omni Immortality Contest," since to me "immortality" always has religious connotations. Also I was surprised that the essay length for entries would be a mere 250 words, rather than the 500 which I considered minimal for a meaningful statement. And whereas I had imagined that entrants would be asked to describe what they wanted to see and do if they woke up in the future, *Omni* merely asked entrants to explain why they wanted to be cryopreserved.

Still, *Omni* did put the contest on the cover of the magazine (which PR professionals tell me is a mark of true success in their industry), and Keith Ferrell asked me to write a couple of pages of questions and answers about cryonics, explaining it in a fair and sober way, so that we could not be accused of tempting entrants with

unrealistic expectations.

After the contest was published, *Omni's* own PR department was able to set up numerous telephone interviews with radio stations, plus an appearance on a daytime TV talk show. The people who participated in this included (as I recall) Fred and Linda Chamberlain, Carlos Mondragon, and myself, as well as Keith Ferrell. Carlos, who is always calm in front of TV cameras, gave by far the best, most convincing answers.

A month later, *Omni* estimated that its promotional campaign had reached about 7 million people — in addition to the 500,000 regular readers of the magazine.

So, my idea worked. In fact it was the biggest piece of promotion in the history of cryonics. The results, though, were not quite what I had expected.

Alcor did receive literally thousands of information requests, necessitating extra volunteers to answer the phones. This aspect of promotion should never be overlooked: The more successful an effort is, the more problems it will create. You will have to invest a substantial amount of time, effort, and money merely to handle the calls and send out info-packs, without any guarantee that a reasonable percentage will result in sign-ups. But even when people do sign up, this creates more work, because there is always some hand-holding necessary, which can be managed only by someone who has sufficient experience or training.

Originally *Omni* had wanted some "celebrities" to judge the entries to the contest. I can't remember how this plan changed, but I ended up as the sole judge, with Keith Ferrell approving my decision. I found myself with around 350 es-

says: A tiny number, bearing in mind we were offering a free chance at "immortality."

The essays were interesting. About one-quarter were from people who seemed dissatisfied with their lives and wanted a second chance to start over. The general public often assumes that cryonics appeals mainly to people who are wealthy or successful, but more often, the reverse turns out to be true.

About a dozen essays were from people with incurable diseases that would cause death within a matter of months. These essays were extremely difficult for me to deal with. Alcor could not influence the judging in any way, but obviously would be happier if the winner of the contest was unlikely to die soon. I tried not to let this affect my decision. At the same time, how could I say "no" to the people with AIDS who wanted to be frozen, and could not possibly pay for it, because they had spent all their money on medical treatment and could not get life insurance?

I reminded myself that when we conceived the contest, we agreed that the winner would be chosen on the basis of the essay, not on grounds of hardship or need. (This is why I had wanted the theme of the essay to be "What I would like to see and do in the future" rather than "Why I would like to be cryopreserved.") Also I told myself that cryonics was offering, at best, a slim chance of future resuscitation, not a cure. Most of all, each of us has a responsibility to sign up for cryopreservation *before* we get sick. Still, the terminal cases remained a terrible burden on my conscience.

In the end, inevitably, I compromised. A young man in New Jersey described the constant pain he had experienced ever since he had been

in a car accident. He looked forward to a new life in which medicine would be able to alleviate this pain. So, here was someone who needed help, yet was (currently) in good physical health. His essay was simply expressed yet eloquent, and showed a clear understanding of cryonics. In many ways it seemed outstanding compared with its competitors. Therefore I felt ethically justified in selecting it.

This, however, wasn't the end of the story. Like so many anecdotes in cryonics, this one tells us how totally perverse human nature can be.

When I called the prize winner to tell him his good fortune, he was excited. "Gee, I never won a contest before," he said. Then he paused. "Uh, what contest is this?"

"The Omni Immortality Contest," I told him.

"Oh." Another pause. "What do I get, exactly?"

In the months since he'd written his essay, he seemed to have forgotten all about it. I wondered if he entered contests wholesale, as a spare-time occupation. I even wondered if he had really sustained injuries from a car accident. Still, I had announced our decision; there was no way to renege on it. We had to follow through.

After I reminded him of the details, and he remembered his interest in cryonics, he still turned out to be strangely uninterested in collecting his prize. He had to be told repeatedly to fill out his cryonics documents. More than a year passed, and he *still* hadn't completed them. Currently, I believe he is an Alcor member but has moved without leaving a forwarding address. I think Alcor needn't worry about the cost of cryopreserving this member; he seems likely to die in such a way that

it won't be possible.

What can we learn from this?

First, and most surprisingly, even if we give cryonics away — offering it free to millions of people — only a minuscule fraction will be interested. Of the seven million Americans who heard about this contest, only 350 bothered to enter.

Second, the people who do want it may not follow through. I suppose this should not be surprising. As a general principle, if someone pays for something, they value it more than if they get it free; and consequently I have come to the conclusion that it's a bad idea to give away cryonics services under any circumstances. We need members who are positively committed, not people who are lukewarm about it, and may actually change their minds. In a worst-case situation, this can happen when they are dying and a standby team has already been deployed.

On the upside, the contest did have some positive results. I've been told that after the winner was announced and the other entrants realized they would have to pay if they wanted membership, more than 50 of them decided to sign up. Do 50 new members justify the risk of offering a "free freeze" to one contest winner? I would tend to say "yes."

Omni magazine went out of business several years ago, and now, even the webzine version has died. I can't think of any comparable way, today, to reach such an ideal audience of potential members. Of course there have been other attempts to target likely segments of the population, most notably the plan by Michael Cloud, who hoped to use direct mail supplemented with audio cassettes and a tiered sequence of membership categories to encourage incremental involvement. I liked many of his

ideas, but I gather they have not been pursued to completion. Even if they had, I can't help wondering if Mr. Cloud's claim that he could double Alcor membership was realistic.

Generally I suspect (but cannot prove) that cryonics will remain hard to promote until our "better mousetrap" is finally up and running, rather than merely a set of plans that cannot be built until future scientists learn how to do it for us. Note that I am not suggesting we should abandon the whole idea of promotion; merely that if history is any guide, its results will be modest.



MOVING?

Let us know about it!
Call 1-602-905-1906
and ask for Joe Hovey.

Don't miss even *one* issue
of *Cryonics*!

Alcor's Board Makes Patient Care Trust Irrevocable

by Steve Bridge

"The Trust shall be for the exclusive non-profit scientific research and educational purpose of providing care for individuals (hereinafter called 'Patients') who have been placed into cryonic suspension or other forms of biostasis as long-term research specimens by Alcor until such future time as it may be possible to repair and revive them to such a condition as will allow them to be considered legally alive, functional, and independent. This applies both to those Patients currently held in biostasis at Alcor and to those Patients who may be placed into biostasis after this Trust has been established."

At the May 2, 1999 bimonthly meeting of Alcor's Board of Directors, Alcor's Board voted unanimously to make the Alcor Patient Care Trust irrevocable. This is the final step in a seven-year quest to provide multiple layers of security to the funds allotted to the care of Alcor's suspended patients.

This Trust is a unique charitable trust, formed under the umbrella of Alcor. It shares Alcor's tax-exempt status; but is a separate legal entity. The Trust document allows the Trust Board to apply for separate tax status in the future, should that become desirable.

The reasons for the Trust are to make sure that the Patient Care funds are only spent for expenses relating to patient care, and to protect that money (and the ability to keep patients frozen) from lawsuits which could target it. If there was no way

to protect that money from the potential of future misuse or litigation, then all of our patients — *including ourselves someday* — would be at risk.

The trustee of the Patient Care Trust is a Board of five Alcor members, at least three of whom *must* be related to patients in suspension at Alcor. One and only one individual Trustee must be a member of Alcor's Board of Directors. The individual Trustees are appointed by the Alcor Board to staggered five-year terms. Once the trustees are elected, they are difficult to remove, and a number of safeguards and checks/balances are in place to safeguard the Trust Board's independence.

Two years ago, on May 4, 1997, Alcor's Board passed a final form of the Trust and placed our Patient Care investments into it. Since this Trust form was created especially for Alcor

and we had no experience with what kind of practical problems it might present, the Board at that time chose to make it "revocable" and comparatively easy to amend for two years. "Revocable" means Alcor's Board could cancel it at any time.

Making the Trust "irrevocable" means that the Alcor Board cannot ever *cancel* the Trust until the purposes of the Trust are fulfilled. Since the purposes of the Trust can be summarized as "keep all the patients frozen until they can all be repaired and revived;" this Trust is going to be in existence for a long time.

We did amend the Trust in two small ways before making it irrevocable. We re-wrote some unclear language concerning who was to manage the Trust's investments, and Alcor's Board and Trust Board were given some more flexibility on how to fill a vacant Trust Board seat if

qualified patient relatives cannot be found.

To solve that problem (that may never occur), the following text was added:

(Page 4) SEVENTH: Election and term of Trust Board.

Add a new Paragraph (j).

(j) If Alcor's Board of Directors determines that there is no qualified and acceptable individual available to fill a vacant Trusteeship slot reserved for relatives of suspension patients, an Alcor suspension member who is not a relative may be elected to act as a Temporary Trustee. A Temporary Trustee must be elected by the combined unanimous vote of all Directors on Alcor's Board of Directors and all remaining Trustees. No more than two (2) Temporary Trustees may serve at any one time.

A Temporary Trustee will serve until a qualified and acceptable relative of an Alcor suspension patient is elected as Trustee or one (1) year, whichever is the shorter period. A Temporary Trustee may serve any number of one-year terms, but each time only by the unanimous combined vote of Alcor's Board of Directors and the remaining Trustees. As in (f) above, a unanimous vote of the Alcor Board of Directors is required to remove a Temporary Trustee, except when a qualified and acceptable relative of an Alcor suspension patient is elected to fill that slot. In such case, the Temporary Trustee would immediately be removed without any further vote.

An Alcor Director cannot be a Temporary Trustee. The qualifications for Temporary Trustee shall

otherwise be the same as for any other Trustee. A Temporary Trustee shall have the same duties, powers, and responsibilities as any other Trustee.

The Trust can be amended in the future, but only "if amendment of the Trust is necessary to accomplish the purposes of the Trust" and only by the combined unanimous vote of Alcor's Board and the Trust Board. It cannot be amended in any way that would change the purpose of the Trust. The Trust cannot be revoked.

Current Trustees are:

- Gary Meade (Alcor Director, patient relative, and a corporate attorney)
- Warren Robertson (patient relative and a CPA)
- Robert Schwarz (patient relative)
- Carlos Mondragon (former Alcor Director and former President of Alcor)
- David Brandt-Erichsen.

In the past two years, we have seen impressive growth in the Trust investments, even though we have had no new suspensions in the past two years. (Alcor places at least \$14,000 into the Trust for each neuropatient and at least \$70,000 into the Trust for each whole body patient.) Fortunately, the Trust holds the mortgage for the building that houses Alcor and its patients. All patient care expenses have been more than covered by the mortgage payments alone, allowing the rest of the Trust investments (primarily stock and bond investments managed by Salomon Smith Barney) to grow un-

touched. We anticipate that future growth in the Trust investments will allow the Trust to fund research into the technology of patient repair and resuscitation. The more optimistic among us predict that the growth in those investment funds during the next few decades will be enough to pay for the entire patient revival procedure.

One of the most important questions that people ask us is "What happens to the patients when (or if) you run out of money someday?" Believe me, every one of us Directors have asked ourselves the same question every year we have been involved in cryonics (more than 20 years each for three of us, more than 10 years each for four others). Now I feel a lot more confident in answering, "It is very unlikely we will ever run out of money to keep the patients frozen."

The full text of the Trust is available from Alcor — \$3.00 for Alcor suspension members and people in the sign-up process; \$18.00 for all others. The extra \$15.00 will be a donation to the Patient Care Trust to help cover some of the legal costs. Anyone who pays the \$18.00 and enters Alcor's sign-up process within 6 months will receive a \$15.00 credit against his or her sign-up fee.

For a history of how the Trust was put together from 1992 to 1997 and a summary of the Trust, see *Cryonics Magazine* 3rd Quarter, 1997.





Nanotechnology

by Thomas Donaldson, Ph.D.

The first thing I will say about nanotechnology is that, yes, we will probably need some form of nanotechnology [1] in order to revive many cryonics patients. Perhaps it's my imagination only, but I suspect that many readers will at first agree, but then notice the phrase "form of nanotechnology" and start to wonder. I do not agree with any attempts to restrict nanotechnology to only one form. By its roots, the word means "technology able to work on nanoscales." If we wish to find methods for to revive patients, it's quite wrong to look only at some particular forms.

One important point follows from this: *We already have some nanotechnologies, which continue to advance.* (And many scientists and engineers are working on others.) Biochemistry and biotechnology already provide us with one form; materials science gives us another. Even *chemists* often work now on nanoscales, with new molecules designed sometimes to do a task, sometimes simply to see what can be done. And slowly we are working out how to make our electronics even smaller.

. . . and thus faster. Whether or not quantum computing ever blossoms, we will have computers able to do the calculations needed to put lots of tissues back together after the damage of cryonic suspension. Such computations may well be done outside the patient; to make devices able to do them inside a patient seems quite unnecessary. And despite the fact that such technologies do not provide the complete control we dream of, we must still see them for what they are.

Yet nanotechnology in any form provides only a *necessary* technology. It cannot save us unless we learn many other things we now do not know: not about how to work on nanoscales, but about what happens on nanoscales in the first place. . . particularly within the brains of suspension patients. We must first acquire sufficient information not just about how healthy brains fit together, but also about all the ways in which damage happens to patients' brains. Nor is it enough to use global arguments [2] as some have done; we need to know what happens to the brains of cryonics patients in quite

thorough detail. Unhappily, we may find some patients destroyed; anyone who reads reports of suspensions will see that many different things can happen. The problem is not at all that global arguments are wrong; the problem is that they fail to tell us which patients are impossible to revive, and which are only very difficult. It's no consolation to know that most patients will be repairable, even though your father or your mother will not be.

Further, without knowledge of exactly what can happen to cryonics patients, it becomes impossible to design *any* system for repair. The possible kinds of damage get more complex the longer we study them. We're likely to end up not with one but many methods for repair, each with its own area of application. The point is simple: we not only need nanotechnology, but a much deeper understanding of the damage due to all the different kinds of cryotechnology so far applied to different patients (not to mention the patient's state of damage beforehand). Without such understanding we accomplish no more than flailing

about in the dark, even if we use nanotools to do so.

It's also quite true that some forms of nanotechnology may help us a lot in finding out just what we need to know about brains and damage to them. A very simple example already exists: using biotechnology, we can now create stains to show the presence of any given molecule in tissue, no matter how damaged [3]. Electron micrographs totally fail to provide such information. Moreover,

we can already tell the difference between some different kinds of neuron from the molecules they contain [4]. To repair brains, particularly those damaged by current or past suspension methods, we'll need to know much more. With that knowledge, we can then design methods for repair, which will once more use some form of nanotechnology.

So what do I think of nanotechnology? Even if we have one or more kinds developed as far

as they can go, they will remain only beginnings. To repair cryonics patients, or indeed to modify the world, requires not only that we have tools but understanding of the world, too. And that understanding will always be hard and long in the getting.



Notes:

[1] If we find ways to preserve brains perfectly, the problem of giving them bodies then needs solution. One way involves creation of a body with little or no brain cortex (or any other brain structure giving us our individuality, as we learn more about consciousness).

To actually connect such bodies to a brain, with close to 100% of neurons properly connected, requires surgery much finer than any yet done (nanosurgery).

There is also a method of body restoration that superficially does not need any nanotechnology. . . until we think about it a little. That is, we might use techniques to make the brain itself grow another body. The nanotechnology comes when we think about the details of just how we might do this.

[2] Hogg, T. "Information Storage and Computational Aspects of Repair," *Cryonics* (3)(1996) 18-25

[3] The best way to find out about these technologies now is to read various scientific papers. Briefly, one method involves the insertion of modified genes by using viruses. The genes put out, either alone or in addition to their usual product, a dye which will show up on suitable chemical treatment. This allows us to see those cells in which particular genes are activated. Another method involves using a second animal's immune system to raise antibodies against the biochemical of interest. A dye is then chemically linked to the antibody so that it does not interfere with its action. The antibodies latch onto the biochemicals of interest and the dye allows their location to be easily shown.

[4] See first Javier DeFelipe, *Journal of Chemical Neuroanatomy*, 14(1998) 1-19. The chemicals are *calbindin*, *calretinin*, and *parvalbumin*. Their presence in a neuron provides markers as to whether it is one of several different kinds of interneuron, including chandelier cells, double bouquet cells, bipolar cells, or basket cells, with a few others in addition. Each such interneuron has its own pattern of dendrites and axon in the brain. For those who subscribe to *Periastron*, DeFelipe's review article was discussed in *Periastron* 4(10) 1998, in "Cryonics and Brain Anatomy." This work, of course, provides only a small beginning.

Tech-Notes

by Anders Sandberg

Noted transhumanist Anders Sandberg graciously contributes a number of assorted technical items that caught his eye a few months ago.

[Editor's Note: This article was supposed to have been published in *Cryonics* 2nd Qtr '99. If any of the following items seem a bit dated to you cognescenti, please blame me rather than Anders.-- BRS]

Hardware

"Thumbcode: A Device-Independent Digital Sign Language"

Vaughan R. Pratt

<http://boole.stanford.edu/pub/PS/DVI/>

This article offers an interesting idea for a wearable typing method. Since the only thing that is truly device independent in typing is the hand, Pratt suggests using a code mapped on the hand to enter characters. The thumb is used to touch the phalanges (12 possibilities), and by shifting and holding together fingers, enough possibilities (96) become possible to have a general purpose keyboard. The mapping is somewhat arbitrary, but Pratt suggests a system partially based on frequency and various mnemonics to map characters to the hand ('t' would be touching the tip of the ring finger with the thumb, 'M' touching the middle section of the index finger while holding it together

with the middle finger, and so on). This seems quite possible to implement in hardware; whether it is useful and ergonomic is another question.

"Nanotechnology, Resources and Pollution Control"

Stephen L. Gillett

Nanotechnology 7 177-182 (1996)

This was a paper about the implications of nanotechnology on the environment, just the thing to put in the hands of the environmentalists. Gillett points out that the thermal paradigm used today in element separation is extremely wasteful, expensive, and dirty, and that the 'cut-off grade' of ore where extraction becomes uneconomical is a technological rather than physical limitation. He also shows that there are no increasing thermodynamic costs due to low grades; it doesn't necessarily take a lot of energy to extract or recycle something from a very dilute mixture. He then

goes on to discuss pollution control, molecular sieves, and solute extraction (such as desalination) in the perspective of nanotechnology.

"'Bucky Shuttle' Memory Device: Synthetic Approach and Molecular Dynamics Simulations"

Young-Kyun Kwon, David Tomanek and Sumio Iijima

Physical Review Letters, 82:7 1470—1473, 15 February 1999

When finely dispersed diamond powder (4-6 nm) is treated with thermal annealing under certain conditions (heated in graphite crucible in argon to 1800 degrees C for 1 hour) oblong multi-wall carbon structures appear. In some cases they can move around inside each other, like having a C60 [buckyball] trapped in a C480. It turns out that there are two potential energy minima corresponding to the ends, and if the buckyball is given a charge (e.g. by trapping an ion in it) then it can be shuttled

by an applied electric field. The article studies the possibility of using this for memory storage, and describes what would happen when writing a bit [one binary digit of a byte]; it turns out that the buckyball neatly shuttles to the right end, and gently bounces to rest (the energy is dissipated as 10 Kelvin thermal vibrations in the C480, far too little energy to disrupt the molecule). The article goes on to suggest a high density memory board with aligned buckyshuttles in a hexagonal lattice and addressing wires above and below, not unlike a ferrite core memory. The memory would likely be nonvolatile at room temperature (and could be made more stable by using La instead of K). Switching and access could be at least 10 Gigabyte/s, with an ideal frequency of 0.1 TeraHertz. Mass production could be based on self-assembly.

Hormones

“ACTH and Beta-Endorphin in Transcendental Meditation”
Jose Rafael Infante, Fernando Peran, Margarita Martinez, Ana Roldan, Rafael Poyantos, Concha Ruiz, Francisco Samaniego and Federico Garrido
Physiology & Behavior 64:3 311-315 1998

Meditation has physiological effects; there is nothing strange about that. The question is: what effects are there, how large are they, and can they be useful? One of the most obvious and practical application of Transcendental Meditation (TM) is stress reduction and relaxation. Earlier studies have shown that TM has some effects on the levels of various hormones. This study compared the amount of stress-related hormones

during the day among a group of non-meditators with those of meditators (who had at least been meditating twice daily for 12 months). It turned out that the normal variation of endorphin and ACTH during the day is changed in TM subjects: instead of showing a higher level in the morning than in the evening, the meditators had roughly constant levels. The morning levels of hormones were significantly lower among the meditators. Cortisol, another stress-related hormone, did not differ between the groups. Interestingly, both groups had similar anxiety levels; in this case meditation seems to have changed the body more than the mind. The authors speculate that the change is due to some modifications of the hypothalamic regulation of the pituitary hormone system.

“Testosterone Changes During Vicarious Experiences of Winning and Losing Among Fans at Sporting Events”

Paul C. Bernhardt, James M. Dabbs Jr., Julie A. Fielden and Candice D. Lutter
Physiology & Behavior 65:1 59—62 1998

Testosterone plays an important role in social status interactions (especially in dominance behavior) at least among primate males. It has been shown that testosterone levels increase in winners and decrease in losers (both rhesus monkeys and humans engaged in competitive activities such as wrestling, martial arts, tennis, chess and coin flips (!)). This might help dominant individuals to keep their dominance, since testosterone levels partially predict the outcome of contests. Since sports fans react strongly to the results of their teams and overall behave al-

most as if it were *they* who won or lost, it seems likely that their testosterone levels might change as well. This paper studied the testosterone levels in saliva from male sports fans before and after a match (the first, smaller experiment was college basketball, the second a world cup soccer match). As expected, winning significantly increased the testosterone levels, while losing decreased them. There is likely a complex bio-social web here, where hormone levels interact with self-esteem, mood, dominance, and social hierarchies. This suggests that we really ought to take a closer look at what effects our sex hormones have on our behavior, and what stimuli affect them.

Food and Drink

“Influence of the Composition of a Meal Taken after Physical Exercise on Mood, Vigilance, Performance”
P. Verger, D. Lagarde, D. Batejat and J. F. Maitre
Physiology & Behavior 64:3 317-322

How does exercise and the composition of food affect our mood? One obvious effect is that we become tired after exercise, but it is slightly uncertain what the effects of meals with protein, carbohydrates, and fats have on our mood and thinking. For instance, glucose improves memory, but carbohydrate intake can also produce a release of insulin making us less vigilant, and proteins can change the amino acid levels which in turn affect neurotransmitters. Obviously, the interactions are complex. The experiment in this article consisted of young men performing two hours of non-stop athletic activity, and afterwards eating one of two different kinds of meals, one high in proteins

and one low in proteins (but high in carbohydrates). The subjects were tested for vigilance, memory, and mood before exercise, after exercise, directly after lunch, and 2 hours after lunch. There was no significant difference in how much they ate. Exercise of course made them tired, and they were drowsy at the beginning and directly after the meal. The men who ate between 125 and 150 g of glucide were less drowsy than the men who ate more or less. The men who ate the protein meal reported being happier both immediately after the meal and 2 hours later. However, the glucose group apparently felt a bit peppier after exercise and lunch. People in the glucose group felt less depressed and anxious when they ate 125-175 g than when they ate more or less. There was no difference in memory abilities between the groups. Vigilance was increased by the exercise, but eating less than 100g or more than 150 g or carbohydrates decreased this effect. The conclusion seemed to be that eating the right amount of food is important. Carbohydrates reduce anxiety and depression (possibly by increasing serotonin release) while protein-rich meals increase happiness.

“The Impact of Long-Term Vitamin Supplementation on Cognitive Function”

David Benton, Joyce Fordy and Jurg Haller

Psychopharmacology 117 298-305 (1995)

“Vitamin Supplementation for 1 Year Improves Mood”

David Benton, Jürg Haller, Joyce Fordy

Neuropsychobiology 32 98-105 1995

These were two papers based on the same study. Benton had earlier argued that micro-nutrient deficiencies cause sub-clinical psychological symptoms in the population, so it would be interesting to observe the effects of supplementation. There is actually rather little known about the psychological effects of vitamins, but since at least some are relevant for brain chemistry, this idea is not far-fetched. The experimenters gave volunteers placebos or vitamin supplements (10 times the US recommended daily amount, except for vitamin A), and followed them for one year. After 3 months, the vitamin levels in the treated participants were significantly raised. In women, but not in men, mental health (as measured by a psychological questionnaire) was associated with B2 and B6, and feelings of composure were associated also with B2 and B6. Both men and women who had taken vitamins for 12 months felt more agreeable (associated with B1, B2, and B6). In women, reaction time and attention improved. B6 (thiamine) in particular appeared to improve mood in women, but not in men. Overall, the mood and cognitive effects only appeared after approximately one year of supplementation, despite the fact that the levels of vitamins stabilize after three. Some restructuring might be going on in the brain during this time.

“Thiamine Supplementation, Mood, and Cognitive Functioning”

D. Benton, R. Griffiths and J. Haller
Psychopharmacology (Berl), 129:1 66—71 Jan 1997

This was a follow-up inspired by the above study. The authors tested the effects of 50 mg thiamine (B6) or a placebo taken daily for two months

on 120 females, and studied the effect on mood, memory, and reaction times. Test subjects given the thiamine felt significantly more clear-headed. Although their feelings of composure and elation just missed statistical significance, overall mood seemed to have improved. There was no effect on memory (recall of famous faces or word lists), but reaction times improved by 5%.

“Blood Glucose Influences Memory and Attention in Young Adults”

David Benton, Deborah S. Owens and Pearl Y. Parker

Neuropsychologia 32:5 595-607 1994

By now most of my readers likely know that glucose can enhance memory. One reason might be that it increases the production or release of acetylcholine (ACh). However, since ACh is also involved in attention it is interesting to see if glucose improves attention too. The authors tested 70 female undergraduates at a rapid information processing task (detecting certain number series) and a memory task, after being given a drink with or without glucose. A high level of glucose correlated with forgetting less and having faster reactions. Rising and falling levels of blood glucose influenced the Stroop attention test, where people with glucose levels rising before the test scored higher. One interesting thing they discuss is that the ability to handle glucose load might be an important cognitive factor; the people who can get more glucose into the brain at the right time have an advantage. This is why it is not just the baseline levels of glucose that are interesting, but also how quickly the brain can suck

Continued on page 43

Cryonics Calls

by Brian Shock

The accounts below are real. The names were changed to protect the innocent . . . should we ever determine who that entails.

Ever wonder what it's like to work at a cryonics facility?

If you've ever worked in practically *any* office environment, you already know. We write paperwork, sign paperwork, copy paperwork, file paperwork, shuffle paperwork, and hang out around the water cooler as much as possible without arousing suspicion. (Oh yes, and in between this, we freeze people.)

We also answer a lot of phone calls. Most of our calls come from Alcor members, people in the sign-up process, or ordinary folks interested in finding out more about our organization. But inevitably, we have to deal with callers who are . . . well, let's just say "confused."

Misunderstanding Calls

"Eugenia Procnow" is an elderly woman from Minnesota who apparently speaks English only as a second language. After talking with her for five minutes, you're not sure that she comprehends her *first* language, either. Mrs. Procnow claims that her son is in a Federal Penitentiary in Florida; somehow she has become convinced that the Alcor Foundation can help to free her wrongly imprisoned child. When you try to explain what Alcor really does and why this has nothing to do with the Federal government or the prison system, Mrs. Procnow acts as though she understands for a few minutes, then returns to the subject of springing her son. Regardless of how many times you explain, she calls back again and again over weeks, months, and years.

Subtle Calls

When you begin speaking with "Oliver Lowell," you are convinced that he's as sane and sober a person as you might ever encounter. He speaks in ordinary tones, he makes ordinary sense, and he discusses perfectly ordinary topics. As your conversation continues, you learn that Mr. Lowell comes from a wealthy family, that he is involved with several scientific research projects, and that he has a deep and abiding concern for mankind. *However*, if you persist in listening to this very reasonable man long enough (thinking perhaps that he might wish to donate some of his family's fortune to Alcor), you gradually begin to realize that his plans and ideas are expanding even as he speaks, first encompassing all of planet Earth, then reaching out toward the Solar System, and soon drawing in the entire Milky Way galaxy. Although Mr. Lowell never quite makes the claim, he seems to believe that he will someday become Emperor of the Known Universe.

Not-So-Subtle Calls

When you answer the phone, the female caller interrupts you by gasping out (what is apparently) an introduction: "This is Annabella-Juliette-Hufnagel-Jones-Smith-Good Morning America-WXYZ-Sunshine-Kennedy-ABC-TV-Williams, owner and general manager of all radio and tv stations in the world!" (This staccato pronouncement emerges all in one breath, as if it were a single word.) As you struggle to come up with an answer to this cheery verbal blast, Ms. What's-her-name

jumps back in and starts gushing about what a wonderful, wonderful, *wonderful* thing your cryonics organization is doing, and how she wishes to use her limitless powers of media to publicize your good works. You stammer out some half-amused thanks and, unfortunately, ask for her name again. "This is Annabella-Juliette-Hufnagel-Jones-Smith-Good Morning America-WXYZ-Sunshine-Kennedy-ABC-TV-Williams, owner and general manager of all radio and tv stations in the world!" she gurgles, repeating her previous pronouncement word for word (as far as you can tell). She takes this as an invitation to continue babbling at you in breathless excitement for another fifteen minutes.

Harmless Calls

"Edward Cody Johnson" is an affable young man from Georgia who just wants to do what he can to help the cryonics movement. He's quite candid about the fact that he has no education, no skills, no money, no job, and has been diagnosed with schizophrenia. Although he may or may not want to join a cryonics organization someday, he has plenty of ideas on technology to help Alcor. He's proud to admit that most of these ideas come from Saturday morning cartoons.

Not-So-Harmless Calls

"Donald Engels" wants to know why you won't freeze his mother, who has been dead and buried for five years. The gentlest technical explanations seem to have no effect on him. "Who *would* you freeze?" he shouts in frus-

tration. "Hitler? Would you freeze Hitler, but not my mother?" When he begins to howl obscenities, you apologize and hang up. Ten minutes later you receive a call from someone with a very phony accent. "This is Don Vito Corleone," the caller mutters. "I want to ask you about what kind of program you have there." When you ask if this is really Donald Engels (for clearly it is), he says only, "Too bad the Unabomber never got around to sending you a little present."

Miscellaneous Wrong Numbers

Alcor's emergency number differs from the number for Merrill Lynch by only one digit. Most Merrill Lynch callers are satisfied when you correct them. *Then* you get a call from an elderly gentleman who gives you a Merrill Lynch account number and demands that you connect him with his broker. When you suggest that he's dialed the wrong number, he snaps that he's dialed this same number a hundred times, and that he *never* makes mistakes with it. He then repeats his account number. When you quickly explain that this is the Alcor Foundation, that you have nothing to do with Merrill Lynch, and that your organization is responsible only for freezing people, the elderly man tells you to shut up with this nonsense and connect him with his department. And again he repeats his account number.

A young woman calls and immediately starts asking you medical questions on how to treat an infant's case of croup. When you explain that Alcor doesn't deal with these problems, she insists that she called 1-800-FOR-A-BABY. Again, the correct number differs from Alcor's by only one digit.

For a time, Alcor's emergency number is very similar to the number for a Quebec Separatist group in Canada. You receive at least a dozen calls in French. When you try to explain that you don't speak this language, the call-

ers all spit some mercifully unintelligible obscenities at you and hang up.

When the Discovery Channel airs a program about how high-pressure cryogenic freezing can harden certain metals, you get a spate of calls from people who want Alcor to treat their tools, bicycle frames, skis, and old tubas.

A man calls to ask if Alcor "takes donors." You're not sure what he means (Is he angling for a free suspension?), and so you ask for clarification. "Well, I used to live in Michigan," he says, "and I was involved with this there. . ." Is he talking about Cryonics Institute, then? "No," he answers, "I thought you were a sperm bank." (Soon afterward, you receive a call from a woman who wonders if you take donations of "eggs, too.")

Hopeless Requests

A woman calls to ask if Alcor will freeze her pet. When you explain that Alcor only suspends the pets of members, she asks about joining. "Oh, that kind of thing doesn't interest me," she tells you at last. "I don't want my dog preserved so that it can be revived someday — I just want it preserved until *I* die, so that it can be buried with me."

A man calls and represents himself as head of a research organization. He asks various questions about cryonics, and seems genuinely interested. Eventually he asks about the possibility of storing bodies at temperatures slightly above the freezing point (to avoid ice-crystal damage, of course). When you assure him that this probably wouldn't be practical in the long run, he says something about the resurrection of Jesus Christ, blesses you, and hangs up. He calls back several times. Gradually you learn that his wife died a week before and was autopsied. The man wishes to store her remains in a refrigerator (until the miracle of her resurrection can occur), but the local coroner refuses to discuss the matter with him.

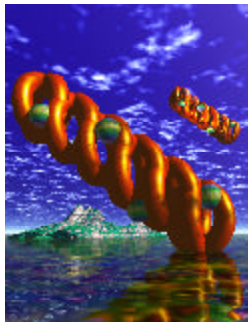
A young woman calls with a very brief, business-like question: would Alcor freeze a death-row inmate who was going to be executed by lethal injection? This turns out to be a very serious request for her, and she accepts no amount of reasoning that both money and logistics would be impractical in this situation (particularly since you believe that executions are almost always followed by autopsies). Nothing dissuades her. Finally you explain that Alcor simply does not want to be involved, and end the call.

A man with a thick Brooklyn accent calls and poses various Frequently Asked Questions. Finally he comes to his real point: would Alcor exhume and freeze bodies? When you explain that it's unlikely we could or would, he jumps to the next question: how long could Alcor possibly wait between the time of death and freezing? When you explain that Alcor wouldn't want to act after a few days at the most unreasonable extreme, he persists: "Even if this person were dead for six months, what if she had been given the best possible embalming and sealed in an airtight casket?" In the end, you convince him to reveal the name of his proposed patient: it's Princess Diana.

And The Standard Crank

Your caller is a man by the name of "Frank Rizzo," who seems to know a certain amount about cryonics (although he insists on referring to it as "cryogenics"). He talks loudly and rapidly, and tends to interrupt as you answer his questions. At last he explains that he's at work and can't talk on this particular phone. He asks that you to wait five minutes and call him back on his personal 800 line. As suspicious as you are, you do as he asks anyway. When the number answers, a sultry (though recorded) female voice murmurs, "Hi, baby. You've reached the Wet Party Line. . ."





4th Qtr 97



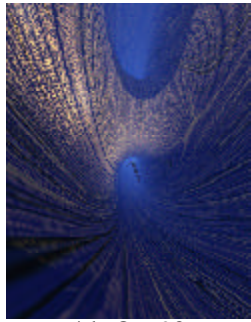
1st Qtr 98



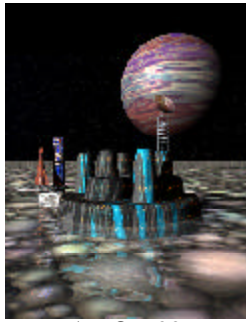
2nd Qtr 98



3rd Qtr 98



4th Qtr 98



1st Qtr 99

Cover Art by Tim Hubley !

Over the last year and a half, Tim Hubley has provided *Cryonics* with some of the most beautiful and creative CGI art we've ever seen. Now Tim is selling a *limited run (only 20 copies each!)* of matted 8.5" x 11" color ink-jet prints of these images (without all the messy text added in layout) for only \$15.00., plus shipping and handling.

To order your prints, contact Tim Hubley through email at:

102647.446@compuserve.com.

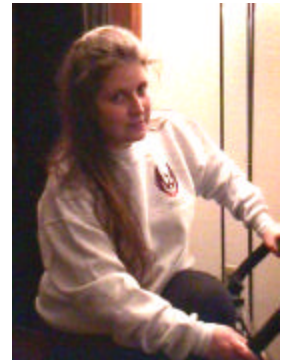
Show Your Support -- Wear Our Symbol!



(black, ash, white) Sizes (black): xlarge, xxlarge
Sizes(ash, white): small, medium, large, xlarge, xxlarge



T-Shirts
\$10.00 each



Sweatshirts
\$15.00 each

(ash and white) Sizes: small, medium, large, xlarge, xxlarge

The Official Alcor Patch!

This embroidered patch (left) is 3" in diameter, with a white background, dark blue phoenix symbol, black lettering, and a dark blue border. Price: \$4.00



The Official Alcor Pin!

This cloisonné pin (right) is 1.25" x 1", with a white background, dark blue phoenix symbol, black lettering, and a gold border. Price \$7.00



To order, call 1-800-367-2228 and give us your Visa/MC number, or send check or MO to Alcor Foundation, 7895 E. Acoma Dr., Ste. 110, Scottsdale, AZ 85260



In Search of the Spike

by R. Michael Perry, Ph.D.

*I saw a man chasing the horizon.
Round and round they sped.
I accosted the man.
“You can never. . .”
“You lie!” he cried, and ran on.
—author unknown.*

The above quote, which I remember seeing on a blackboard sometime in the '70s, might well apply to many of our modern endeavors—as long as we allow that sometimes the impossible does happen and the “horizon” is indeed “caught” and held fast. Examples of successful horizon-catching include the moon landing and the cloning of mammals. Future examples, we hope, will be the development of mature nanotechnology, the curing of old age, and the resuscitation of cryonics patients. This should not blind us to the fact that often the effort falls short or yields only a marginal success. Even then the process can be a learning experience, to help us do better next time, or at least offer insights.

Here I want to deal with one particular, unsuccessful attempt of this nature. It has a special relevance, since I myself was the horizon chaser, and my chase wasn't entirely unsuccessful (I used the results to

obtain a Ph.D. in computer science). But I have to say that what I was really after, an important step toward superhuman machine intelligence — what has been called the Spike or Singularity — didn't happen, though again I like to think it was a useful try.

Since this column is supposed to be about cryonics-related things, here is a good place for a comment about relevance to cryonics. Certainly the Spike would be relevant. If we had superhuman machine intelligence, we could ask it many things, including how to develop our nanotechnological tools and/or advanced forms of medical science, so we could bring the frozen out of suspension. So the relevance is clear enough, at least when it comes to the “end game,” when we *have* the machine intelligence and all we need do is start applying it. But getting there at least has indirect relevance too—plus in my case a little more than that.

I first had an interesting thought

in this area about 1965, when I was in high school. Say you had a computer programmed to work on problems of a general nature. You ask it to work on the problem of improving its own intelligence, and it starts out doing so. With each improvement it gets a little smarter, and better able to make more improvements. You get a snowball effect, and perhaps that would be a way to achieve high machine intelligence in a short time. (Actually, there is an interesting logical weakness in this argument, which I did not realize at the time, and for many years after—we'll get to it.) This idea of a snowballing self-improvement process made an interesting starting point for a project.*

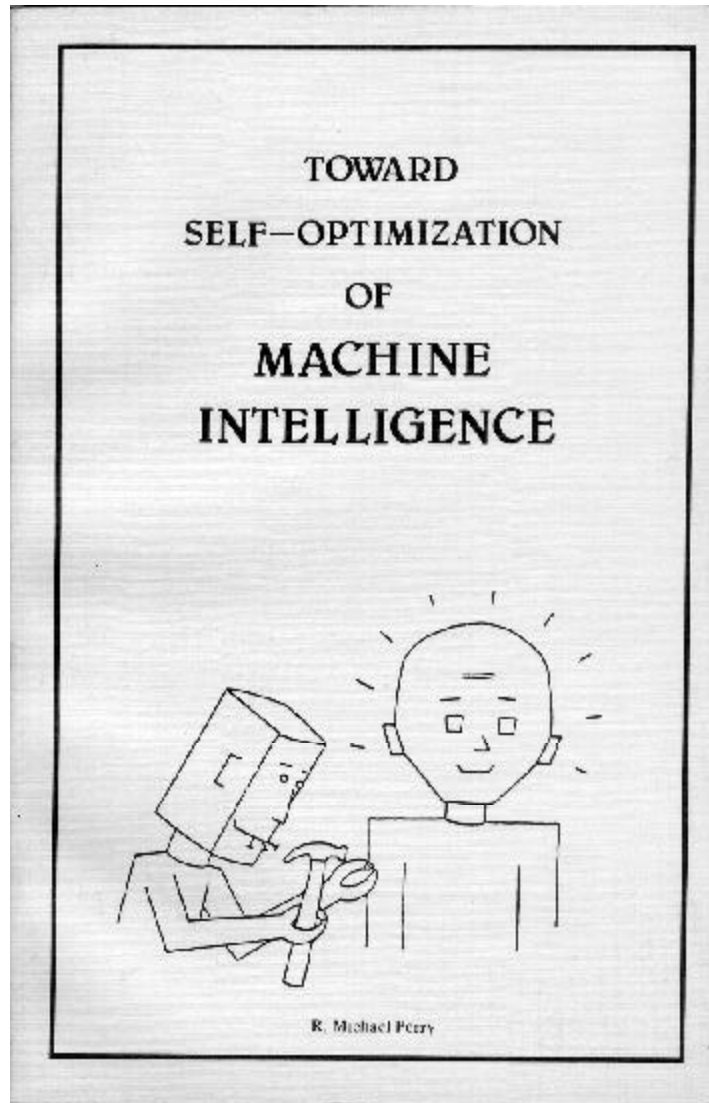
To make a rather long tale shorter, in 1976 I enrolled in graduate school at the University of Colorado, Department of Computer Science, and started working on my dissertation, with emphasis on self-improving AI. (As you may guess, I had

made up my mind what this dissertation was to be about before enrolling.) Actually there were two dissertations, a lesser one for the Master's and a major one for the Ph.D., but really it was one project. The first order of business, I decided, was to establish some sort of rigorous theory for what I was trying to do.

The problem wasn't that simple, even though intuitively we have an idea of the difference between a "dumb" AI program that doesn't do a very good job of coming up with the answers you are looking for, and a "smarter" one that does. Even here there are two issues: efficacy and efficiency, each with their own varieties of stupidity and smartness. Thus one kind of dumb problem solver, given one particular hard problem, won't come up with an acceptable answer at all, ever, no matter how long you let it run, even though there may be another solver that will get the "right" answer or a good answer, whether it takes a long or a short time to do so. So the first program fails the test of efficacy while the second, at worst, is only weak in efficiency—though this too could be serious, and generally will be. As it turned out, I was able to sidestep the problem of efficacy completely and just focus on efficiency. This required choosing the right domain of problems to work in, but I realized it could be done in a way that still left plenty of room for generality.

This is not hard to illustrate, as

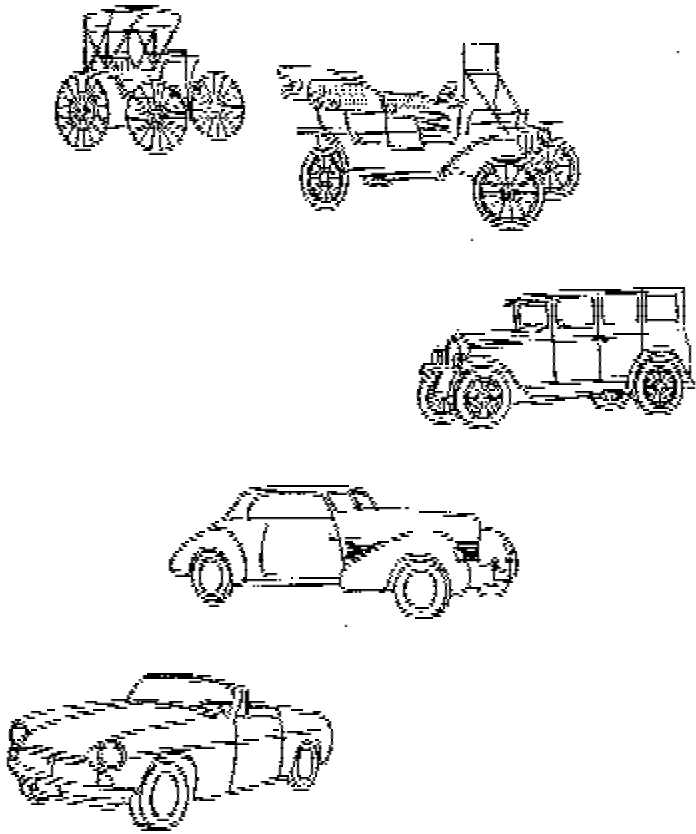
long as we are not much concerned with practical issues. An absolutely general, mathematical theorem prover might be based around nothing more than generating random strings of ascii text. To ask it to prove Fermat's Last Theorem, for example, means that you specify a checking procedure, so that if a correct proof is found, suitably encoded in ascii, it will be recognized as such. (That such a proof could be found, in fact, was demonstrated by Andrew Wiles with his 1995 proof of Fermat's Last Theorem. His proof would first have to be expressed entirely in formal mathematical notation, then formatted as ascii text.) This is rather like saying I can create a "great literature machine" by having monkeys pecking away at typewriters, with someone looking over their shoulder who is



able to recognize a great work when he sees one. Finding that "great work" is likely to require a long wait, of course, and the same applies in the more formalizable world of mathematics. General procedures are not that hard to come by, but they are likely to be weak.

Indeed, practical issues are *important*: we want our solvers to get

* I didn't know it, but others around that time — such as Marvin Minsky, sometimes known as the father of artificial intelligence — were having similar thoughts. Here is what Minsky had to say in 1968, when he was already an established guru: "Today machines solve problems mainly according to the principles we build into them. Before long, we may learn how to set them to work upon the very special problem of improving their own capacity to solve problems. Once a certain threshold is passed, this could lead to a spiral of acceleration and it may be hard to perfect a reliable 'governor' to restrain it." I finally saw that quote in the '80s when I was doing my own doctoral research, and I wasn't much worried about a restraining "governor"—nor am I now.



Automobile Optimizing Sequence

good answers in *reasonable time*, and not just within some limit as time goes to infinity. To be concerned about this in the way that interested me meant that the program *itself* would have to be concerned, i.e. optimizing the solver must be one of the problems in its repertoire. I had to put some thought into just what sort of “problems” the solver would be able to address, and how it would address them.

One thing seemed clear: mathematical theorem-proving, even if fully general, was not general enough, despite its great power and applicability—a more general, though still mathematical approach would be needed. This is because, roughly, a theorem-proving problem has an all-or-nothing outcome: either you solve your problem or you don’t.

For theoretical reasons, I wanted to **find an optimally** intelligent solver, instead of just a better, more intelligent one. That could be a tall order, especially if there was no finite program that was mathematically optimal. I might have to consider a succession of increasingly capable (though less than optimal) candidates.

So I was led to consider what I called *limiting optimization*, finding a best possible result over infinite time, and generating a succession of increasingly better results in the process. This succession of better results formed what I called an “optimizing sequence.” The solver would then generate such a sequence, and be committed, not to a single “run” or one execution only, but to an open-ended process of finding succes-

sively better examples of whatever it sought. The idea of limiting optimization is embodied, in rough form at least, in many of the progressive changes we see around us. As one example, the automobile has improved substantially since the horseless carriages of a century ago. There are forces at work, we might say, to create the optimal car, if we take account of some complicating factors such as just what our standards of quality are and that they can change with time. Certain things tend to stay constant: we want cars with better mileage, greater convenience, and more safety features. Even though fashions come and go, certain features are fairly constant there too, such as a preference for sleeker, streamlined models rather than the squared-off, boxy shapes of the early years (which also had higher air resistance). Creating the optimal car is no one-time operation but an open-ended process in which successive models of cars are produced over time. An overall, improving trend can be seen, a kind of optimizing sequence, and we see this also in many other types of devices and systems that form a progression in time, ranging from inventions of our own making to the products of natural evolution.

If you solve it, that might be fine and put you ahead of the game, but what if you don’t? You could waste a lot of effort with nothing to show for it. In addition, the case of “finding a better problem solver” doesn’t fit well with the theorem-proving paradigm; I wasn’t trying to “prove” something, I was trying to construct something.

Also, for cer-

In the world of computation, “objects of interest” take the form of chunks of information, which are reducible to strings of bits or characters in some alphabet such as `ascii`. (The 256 characters in `ascii` are in turn expressed as 8-bit strings or “bytes,” so `ascii` character strings in turn reduce to strings of bits. Similarly, other encodings of information reduce to strings of bits.) Included among the objects of interest are numbers, text files, tables of numbers, tables of other types of data, and

computer programs, which in turn instruct the computer how to operate on chunks of information. Programs thus can operate on other programs as data, and a program could modify a copy of itself, in an effort to create a better program.

Computerized problem-solving, in the usual, straightforward sense, can be regarded as a process of starting with one chunk of information, a statement of the problem in some computer-intelligible form, and generating another chunk of information, a solution. In the version of problem-solving I used, instead of outputting one "solution," a sequence of progressively better answers or optimizing sequence was created over time. A "problem" specification had four components:

- (1) A starting object or "seed."
- (2) A "productions program" or means of generating new objects, starting with the seed.
- (3) A "termination program" or means of putting the objects in a finished form as candidate solutions to the problem.
- (4) An "evaluator program" to assign a numerical rating to each candidate.

Each problem would come with its own, independent specifications of (1-4). The goal of the solver, then, became one of generating an object which, when put in finished form as a candidate solution, would score as high as possible under the evaluator program. The evaluator program thus defined what is known as an "objective function" for the space of candidate solutions.

The problem-solving in turn could be viewed as a type of hill-climbing (though not the standard, numerical type, for which there are well-developed algorithms). Each candidate solution was some surface

point in a landscape we were traversing. The goal was to reach a point with as high an "altitude" as possible, as measured by the evaluator program. The process of "traversal" was not specified in advance, but allowed the solver to make choices, so that a smarter solver would more quickly find its way to the higher ground. The productions program, in particular, did not specify every detail of a procedure to generate new objects, but allowed the solver to repeatedly choose among menus of alternatives. The solver would choose according to its "best judgment," which opened the way for a smarter solver to make better choices.

The problem-solving format had enough generality to handle a large variety of tasks, including theorem proving problems, though certainly more than this. But as an example, with a theorem-proving problem an object of interest might be a purported proof (a string of ascii text), which would rate 1 if correct and 0 otherwise. In a way, then, problems of great difficulty could be described and worked on by the solver—though such a rudimentary approach

	naive heuristic		grant = 10000		grant = 40000		grant = 100,000	
	avg	max	avg	max	avg	max	avg	max
steps	1	8	1	8	1	8	1	8
improv.	0	10	10	10	10	11	11	11
improv. gain	0	0	0	0	0	10	11	10
time, sec.	01.2	00.8	00.0	01.7	00.0	00.1	00.0	00.0
best tour length	10.14	8.47	8.78	7.74	8.00	8.00	8.78	8.57
advanced heuristic								
steps	0	4	0	0	0	0	0	0
improv.	0	0	1	4	0	4	0	0
improv. gain	0	0	1	0	0	0	0	1
time, sec.	00.0	00.0	00.0	00.0	00.0	01.0	00.0	00.0
best tour length	10.17	8.07	8.00	8.78	8.00	8.00	8.10	8.00

Results of testing of problem solvers (org 1, org 2) on a Traveling Salesman problem (reference problem). org 2 is a more advanced solver obtained by "self-improvement" or bootstrapping org 1, not using the reference problem as part of the "IQ" test. Upper table shows results for a simple, "naïve" starting heuristic, lower table for more advanced starting heuristics. "grant" is number of steps allowed; actual machine time will vary per unit time step. org 2 usually, though not always, finds a shorter tour in the same number of steps, though when we consider actual machine time, its performance is clearly superior only with the naïve heuristic.

might well yield nothing of interest in feasible time. A better approach, also feasible, would be to ask the solver to make "progress" on a proof problem, obtaining a growing body of mathematical results. This could possibly lead to the solution of the original problem but would not simply return empty-handed if none was found. An ascii string, text describing a body of results, would not rate simply 0 or 1 but could take intermediate values to reflect the fact that progress was being made. In addition, refinement in the statement of the problem, including the specification of the productions program, could greatly reduce the amount of

“noise objects” that might be considered. So we could replace the mindless generation of random, ascii strings with a more focused creation of relevant chunks of text, without sacrificing generality.

In general, optimization problems involved the creation of objects, expressible as text strings, with values intermediate between 0 and 1. For example, a Traveling Salesman problem, in the simplest form, calls for finding the shortest tour that visits all the cities in a given region at least once. (There are related versions involving visiting each city exactly once, starting at a particular city, etc.) Besides having some immediate utility, it is important because many other problems can be stated equivalently as Traveling Salesman problems. A “tour” in this case is simply a list of the cities in the order in which they are to be visited, which we can certainly express as a text string. Though a minimum-length tour is desirable, in this case we are not trying simply to find a “correct” answer, as in theorem proving. Different candidate solutions (tours) have greater or lesser length, with values on a continuum, so that two candidates could differ only slightly in length—both would be almost equally satisfactory. In this case it is easy to formulate the problem to fit the chosen format, so that the ratings of tours will fall between 0 and 1, with a maximal rating corresponding to a minimum length. A problem solver, if allowed to run long enough, will eventually find a tour having minimum length, and may find useful results—short though not optimal tours—long before then.

In the case of the Big problem—finding the best problem-solver—we have to define an “IQ test” to rate each candidate solver. We also have to define a space or “landscape” of allowable solvers, that will permit “visiting” different points in the landscape—generating different versions of solvers for testing. The solvers in turn are just pieces of executable code meeting certain specifications. (Lisp is a computer language that is especially suited to such tasks as generating pieces of executable code, so it was used extensively in the project.) We then embark on a quest to find the highest-rating or “smartest” candidate, something any one of our solvers, must be able to carry out. A complication is that, as usual, we don’t expect one guaranteed “smartest” candidate but must generate an optimizing *sequence* of candidates. A second complication concerns the “IQ test” itself, which realistically must come in different versions reflecting the amount of time we want to spend in assessing a program’s “intelligence.” The more thoroughly we test, the better and more reliable our estimate should be, but the tradeoff is that it will take more time.

In any case, I resolved these matters in a reasonably straightforward way. The “IQ” score, normalized as usual to fall between 0 and 1, reflected an average performance on a computer-generated set of test problems. It could be shown that, despite the approximate nature of what could be done in practice, a true optimizing sequence of the desired type would be obtained. The solvers would approach an optimal “intelligence,” as would be verified through

optimal testing, supposing we could allow an unlimited time in assessing the “IQ.”

In practice it meant that we could start with one problem-solver, give it the Biggie to work on, and come back sometime later to see what progress it had made. Generally I would use the solver itself to define the starting guess or “seed” for the optimization problem, and let it go from there, trying to find an optimal upgrade of itself. I remember that the main run of this attempted self-optimization took about 90 minutes on the computer I used, a Vax 11-780. In theory it might have generated a really spiffy, intelligent version of the problem solver, a Gateway to the Spike. In practice, one solver would generate a different version of itself, with a different mix of heuristics or “tricks” to use in attacking problems, one that dutifully showed an improvement in its “IQ” score, but nothing at all earth-shaking. I could then take *this* ostensibly better solver, and run it with *itself* as the starting guess, and so on. After two or three iterations, a solver would be reached that couldn’t improve itself any further in the allotted time, and was still very far from spectacular—and very far too, I’m sure, from having any practical value in the world of AI. It wasn’t a Gateway to the Spike, but at best maybe a tiny, tantalizing peephole. So there the matter rested.

The main writeup of this, with the title *Toward Self-Optimization of Machine Intelligence*, became my Ph.D. thesis. I received the degree in 1984, then had the book privately published and listed in *Books In Print*. It sold maybe ten copies. One

** In December 1987 Dora Kent died and was frozen at the Alcor facility, then in Riverside, California, which prompted a Coroner’s investigation and arrests and detention of Alcor staff members, including myself. Alcor was eventually vindicated in court, though having to bear considerable uncompensated expenses.

of the buyers was General Motors, though if they or any others were able to make use of it, I never heard. Wanting to work further on the idea (of course!) but not exactly finding demand for it in the job market, I ended up turning to another long-standing interest, cryonics, for a livelihood.

This represented quite a change from what I had spent years preparing for, but somehow it didn't seem inappropriate, given the way the world is, with death still so prevalent. My choice of careers didn't even seem inappropriate when there were hardships, such as during the Dora Kent crisis**. I was then a "volunteer" at Alcor, living on about \$400 a month from a generous benefactor, my job being to watch the patients and more or less "tend the fort." Often I was the only one at the facility, because others more important to the operation were somewhere else to avoid arrest in case there was another raid. With death, not even *smart* AI would help you much, I figured—so you may as well fight it, especially when your *cryonics* organization was in jeopardy and clearly could use the help.

How we longed for the 21st century back then! But, getting back to the Spike and *Self-Optimization*, some general comments are appropriate. The first has to do with the basic philosophy of my book, the second with an unavoidable weakness in the whole approach, the third

with grounds for optimism anyway.

The basic philosophy of the book has to do with the nature of progress, and is well-connected to the idea of a Spike. Progress overall seems to be accelerating and having a larger and larger impact in our lives. Arguably (and hopefully) this progress will continue until, by reasonable indicators, it goes "off the charts"—the Spike—and we are into a new era where the old rules no longer apply. Another term for this is the Singularity. (Both terms, it should be noted, were unknown to me with this intended usage and are not found in the book, but do match the underlying ideas.) It has been conjectured that the Spike will happen when advancing artificial intelligence (AI) catches up with and surpasses human intelligence***.

In the book itself I compare the anticipated drive to the Spike with other ongoing, advancing processes. The most venerable process like this is natural evolution, and more specifically the evolution of creatures with brains. In this development we see that there is, first of all, a long period in which a large variety of specialized mechanisms or "tools" are perfected: teeth, claws, fins, scales, wings, feathers, legs, etc. The brains of creatures are also evolving too, which is certainly important, but secondary. Instead, we may say that evolution is in a *tool-like* phase. The tool-like phase of multicelled, animal evolution has been going now for

several hundred million years. With the emergence of proto-humans a few million years ago, however, prominence moved from specialized tools a general-purpose tool, the brain. Evolution, then, entered a *brain-like* phase. (Meanwhile, of course, the tool-like phase continued too, but was no longer dominant.)

There is at least one other evolutionary phenomenon that also shows a subdivision into tool-like and brain-like phases: human technology. In this case, the general-purpose, brain-like tool is the computer, which first appeared around half a century ago, quite late in a process of ever-better tool-making that had been going on for many millennia.

Are there any other examples of this? We might consider the computer itself, with emphasis on software. A "tool-like" phase would consist of the development of numerous special-purpose programs, and a "brain-like" phase would involve AI. More specifically, when AI is powerful enough that it becomes self-enhancing and this enhancement process itself becomes dominant, software development will have entered a brain-like phase. Clearly, then, we are still waiting for the brain-like phase, but at least we do see it pre-saged in media such as animal and technological evolution. These two examples were cited in the introductory chapter of my thesis as a plausibility argument for the self-optimization of machine intelligence.

*** This is present-day human intelligence, and should not be confused with what we ourselves will become, which is likely to be something more. Your AIs will be able to *help* you solve your problems, including that of improving your own capabilities, and/or making use of AIs as extensions of yourself. So your mental powers will not necessarily trail *theirs* much if any, and you can be confident that we humans, or the more-than-humans we shall become, will remain in the driver's seat of the enterprise. But under these conditions, and with aging and present-day diseases hopefully eradicated, it seems reasonable that we will be in a totally new phase of life as we know it, where indeed many of the old rules no longer apply (new rules having replaced them, however).

It does, at least, seem reasonable that such a self-optimization is *possible*; that is, if the computer spends enough time trying out different tricks, it is bound to arrive at a good bag of them for doing things. But this overlooks the time factor, and we are led to ask if the self-improvement process, which also goes under the name of “bootstrapping,” would be expected to have any special merits as a tool for reaching high proficiency quickly.

In doing my dissertation, I thought the answer of course was yes, based in part on the idea of snowballing: a smarter solver would have greater insight into further bootstrapping, and thus enhance its rate of improvement over what the dumber, original solver might do, given the same starting point. Keep in mind, of course, that the solver was not limited to *self*-improvement but could consider improving other solvers as well. So I’m saying that if Joe is a smarter solver than Pete, then Joe should do better at improving Joe than Pete would do at improving Joe, other factors equal — hence a snowballing effect.

But there is a weakness in this argument that I didn’t address and didn’t really think about until later, a necessary limitation on the rate of improvement that the solver could ever achieve through bootstrapping. The reason is simple: bootstrapping *itself* could be used as a heuristic in problem solving! In other words, the solver, faced with a really tough task, might elect to improve its general capabilities first, *then* tackle the problem proper. A smarter solver that has already improved itself by

bootstrapping would gain a head start, but for a really difficult task this advantage would lose significance. If Joe, for instance, a smarter solver, was obtained from Pete by 24 hours’ worth of bootstrapping, it may not help Joe much, relative to Pete, if the two of them tackle a problem they both must crunch on for a month. Pete must have enough savvy to realize that first it should spend a day spiffing up, and afterward might lag a day behind, but otherwise would not be outclassed by Joe.****

This is not, of course, to say that the bootstrapping approach is without merit, just that I don’t see it as the Big Fix. I think it *could* be a useful tool in leading us to the Spike, and that it has not had the serious attention it deserves. It is also worth noting that the problems that we want proficiency with are not arbitrary, but in particular include certain real-world problems such as improving our health. Machine intelligence must address such problems to be useful. The sort of self-contained approach I took to optimizing would no doubt need considerable supplementation and coaching from the outside if we expected it to address the real problems that most concern us.

Meanwhile, computers have grown considerably more powerful since I did my thesis work. On p. 24 of Ray Kurzweil’s book, *The Age of Spiritual Machines* is an interesting chart comparing the performance of different computers through the years, in terms of raw processing power. The vintage 1979 Vax 11-780, the machine I used for my thesis work, is rated at about 1000 cal-

culations (instructions) per second, while the 1998 PC Pentium II rates at 100 million, a factor of 10,000 increase. (This fantastic improvement over a 19-year interval, by the way, amounts to a doubling in processing power about every 17 months. It fits a general rule of thumb known as Moore’s Law, in which computer power and miniaturization are both improving exponentially, doubling over time periods variously estimated at 1-3 years.) What is especially interesting is that a PC Pentium II (with a 450 MHz processor) sits in a small tower case by my desk; indeed, it is the machine on which I am typing this very article. I also happen to own this machine, and could use it in spare time for AI work. So I’m left wondering how a vastly more powerful computer would handle the bootstrapping problem, and one way or another, I intend to find out.



Sources:

- Broderick, D. *The Spike*, Reed 1997.
Kurzweil, R. *The Age of Spiritual Machines*, Viking 1999.
Perry, M. *Toward Self-Optimization of Machine Intelligence*, Dove Systems 1984.

Illustration credits:

Illustrations are from *Toward Self-Optimization of Machine Intelligence*, (1) cover, (2) p. 15, (3) p. 140.

**** So I submit that Minsky’s aforementioned “spiral of acceleration” has some logical limitations built in: a restraining “governor” we don’t have to worry about “perfecting” (if indeed we would have to worry anyway).

Funding Suspensions with 20-Year Term

by Jim Yount

Good news, and bad news:

Twenty-year term life insurance is cheaper than ever; but it may soon get more expensive.

Does Term Life Insurance Have a Place in Cryonics Funding?

Quite a number of cryonicists believe that term insurance just plain should not be used for cryonic suspension funding. That viewpoint is understandable. The usual use of term insurance is for a *temporary* insurance need, which certainly does not describe cryonics funding. A typical use for term insurance is to provide cheap life insurance for a mother or father should death occur during the time the kids are growing up. When everyone is through college, then the family no longer needs such financial cushion, and the insurance is dropped.

Whole-life (permanent) insurance policies (including universal life plans) generally do better now than they once did (in terms of interest rates on fund accumulation), and still retain the remarkable safety record

of years past. But cryonicists often prefer to establish a savings plan or use a stock purchase strategy to provide suspension funding. The dilemma is that any savings plan or stock purchase (unless substantial initial endowments are provided), will not pay for much of a suspension should that need arise during the early years when so little has been put into the plan.

That is where term insurance can fill a gap. The term insurance gives the policyholder the cheapest possible insurance coverage thus freeing up more dollars to go into high-return investments. You've all heard the strategy: buy term and invest the difference.

Unfortunately, all too often this strategy becomes: buy term and *spend* the difference! Also the cryonicist must set up his estate so the funds from investment are earmarked for cryonics funding. This

delegation of resources is not difficult: use of trusts, purchase of annuities, or proper execution of a will, are all effective estate planning strategies.

There is a tendency to put off such estate planning. "After all," (you say to yourself) "I've got this neat term policy, and the rates won't increase for twenty years! Plenty of time to establish that trust." Twenty years later, you are still saying the same thing!

So, funding cryonic suspension through term insurance is not for everyone, but for those who are prudent planners and savers, it can represent one important element in the over-all plan.

What about the rest of us not always so diligent? Term insurance may be used by all of us as *supplemental* suspension funding. Once you have satisfied your cryonic



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society's funding requirement (with, say, a whole-life policy owned by the society), then a second policy can provide back-up funding. The proceeds can go directly to your society, or to a trust or fund managed by another entity. Two such funds (established by cryonicists) are 1) the Reanimation Foundation or 2) Patient trusts and dedicated funds managed by the American Cryonics Society. Endowing either of these "outside" management groups may provide a way to diversify your cryonics funding and (perhaps) help "fail safe" your primary suspension money.

Cryonicists may also wish to establish a family trust with their reserve funds. Family members may act as trustees for each other. A trustee's duty is to see to it that each member is suspended and remains in suspension. Cryonics societies (often named in the trust in order of succession) act as back-up trustees should the family members decline to serve.

Cheap Term Rates

With eighteen hundred companies, more or less, licensed to do business in California (similar numbers in many other states), competitive pricing has produced some real bargains in term insurance. One of the reasons for this is the (relative) ease of doing comparison shopping for term policies. Term is fairly easy to understand, and to compare. Pro-consumer protection insurance regulation tends to require full disclosure, so even fairly unsophisticated buyers can shop for bargains.

Internet companies have made it even easier. However, even with term insurance, buyers often benefit from purchasing insurance from an

agent, rather than through the mail, or over the internet. Although term is, for most people, easier to understand and compare than other life insurance policies, there are a number of complications (some discussed in this article) that an agent can help you sort out. One way to have the best of both worlds is to browse the internet to familiarize yourself with companies and rates, then make an appointment with an independent insurance agent. Such agents will be willing to sell you policies from more than one company, and can (many times) sell most of the policies whose rates you have been perusing by internet.

Internet sites you might want to check are:

- www.accuquote.com
- www.insuremarket.com
- www.insweb.com
- www.quotesmith.com
- www.term4sale.com

This list is provided as information only and is *not* an endorsement or recommendation for any of these sales companies or the insurance companies whose products are available through these sites.

Readers may also want to consult the *Consumers Union Guide to Life Insurance*, which rates policies and gives prices for some age groups for a number of term products. This booklet is available at most libraries.

How cheap is it?

Figure 1 shows some typical (but competitively priced) 20 Year Term rates. They are for the best rates (for each age and sex) among several good companies. The ages are for both age last birthday, and actual age. Companies will use one or the other of these age categories for determining rates. Rates are for "Class 2," Preferred Non-Smoker, and for Standard Non-Smoker. All are based upon California rate information (insurance costs will vary from state to state; some plans may be unavailable in some states). This is *not* an advertisement, a solicitation for sale of insurance, an illustration, or a proposal, but simply intended to give readers some idea of what costs could be.

Age 65 is the last age (for this group of companies) where 20 Year Term applications are accepted. Only one company (of nine looked

**Figure 1:
Yearly Premium Payments
for \$100,000 20 Year Term Insurance**

Age	Preferred Non-Smoker		Standard Non-Smoker	
	Male	Female	Male	Female
20	\$113	\$96	\$128	\$108
30	116	96	135	116
40	149	125	199	170
50	299	211	367	268
60	665	444	858	548
65	1,415	887	1,415	887

at) issue at age 65 (the other companies stop issuing 20 Year Term at age 60). Preferred and Standard non-smoker have the same rates at age 65 for this company (the "preferred" category is eliminated).

Term insurance is generally cheaper (per thousand dollars of coverage) on larger face-value policies. For example a \$500,000 policy will likely cost less per \$1,000 of coverage than a \$100,000 policy. When doing comparison shopping it is a good idea to "price" policies in a death-benefit "range" including and above what you have in mind. You may find that you can obtain more coverage for almost the same price that you would pay for lesser coverage.

Some applicants can qualify for "Class 1," Super-Preferred non smoker. These rates are even cheaper than the "Class 2" rates given above; however the underwriting requirements are very strict, making them unattainable for a lot of people. An applicant with some health problems may not be able to qualify for insurance at all, or if so, at rates much higher than those given here.

The "medical underwriting requirements" for the various rating classes vary from company to company with considerations of such factors as cholesterol, Cholesterol/HDL Ratio, Motor Vehicle Record, Build, and Family History.

Living Benefit Rider

This rider is available with many term policies. It is usually included at no additional cost to the applicant. Typically the rider allows prepayment (payment before death occurs) of a portion of the death benefit if the insured is terminally ill (with life expectancy of six months or less).

Under some circumstances this "early benefit" can provide funds to pay for a cryonic suspension "standby," so by all means check out this possibility.

Benefits vary from company to company as does the period of life expectancy (the expected time before medically predicted death that triggers payment of these early benefits). Some companies will pay under this rider *only* if the life policies have the *same* owner and insured. Also, check out the tax consequences of such before-death fund withdrawal.

Why 20 Year Term?

Term is typically available as annual renewable, five year, ten year, fifteen, and twenty year. Some companies also have 30 Year Term, and "Term to Age 65." Premiums are typically guaranteed for those time periods. The fewer the years guaranteed, the lower the rates. So why go for twenty year term when five year term is cheaper? Often people elect the more expensive 20 Year Term because of the guarantee. If rates go down in the future (provided you are still in good health) you can always apply for a new policy. However, if rates stay the same or go up, or if your state of health declines, then you have locked the company into very good rates for a long period. Also, twenty years is more time to accumulate savings or for your investments to grow.

Convertibility of Term Policies

Many term policies have a policy provision that allows the policy owner to "convert" his term insurance policy to a permanent (whole-life) policy regardless of the state of health of the insured. This means

that the term policy is "surrendered" and the company issues as replacement, a permanent policy. The new policy is usually issued at the same rate category (such as Standard non-smoker) as was the term insurance policy, but some conversion provisions guarantee conversion only at "standard" rates. They are issued at the insured's "attained age." Generally it is a good idea to have such an option, even if your plans are to replace the life-insurance portion of your suspension portfolio with other assets. Changes in circumstances can effect your plans, and allowing for flexibility is wise.

Check out the conversion option carefully. Be aware that this option varies considerably between companies, and even on various term plans within the same company. Some companies will allow conversion only on given policy anniversary dates (such as on the 5, 10 and 15th policy anniversaries), or just during the first policy year. Some companies will only allow a term policy to be converted to particular plans, which may exclude the company's most competitive whole-life policies.

One final word on this option. If you now own a term policy that has restrictions on conversion and you want to convert it to whole-life, make your wish known to the insurance company. Sometimes companies will relax policy restrictions for the sake of convenience (and with the expectation of getting a whole-life sale). For example, even though a policy is next convertible on the fifth anniversary, a company may accommodate a policyholder's wishes by allowing the conversion prior to that time. On the other hand, when purchasing a policy, don't depend upon such future flexibility. The company has the legal right to play hard-ball.

Requalification and Continuation

What happens to the policy after the twenty years are over and you have not converted the policy to a permanent plan? Some policies may be continued, but at *very substantial* yearly increases in premiums. Other policies provide that you may obtain a new (replacement) policy by "requalifying." That is, you provide full evidence of insurability by showing that you are in good health: the company then issues you a new policy at your "attained age." Since you could apply for a new policy anyway, which would be issued based on your then current state of health, such a "requalification" provision may not mean much.

Even if your health is good, and

you can get another 20 Year Term policy for the same rate-class as you did before, since you are twenty years older, you will be paying substantially more for your insurance.

Next Year the Rates May Increase

A new reserve requirement called Rule XXX could cause rate increases in many states starting next year. This regulation would require insurance companies to set aside a certain amount of money as a cushion against losses on policies with long-term premium guarantees.

Perhaps higher reserve requirements will be a good thing for the consumer. However, for cryonicists seeking to take advantage of the current low rates, there is no time like

the present!

Not enough information

It is not the intention of this article to be a complete primer on term buying. There are a number of important subjects not discussed, including various riders, and comparing companies. Read further on the subject, talk to your agent, consult with estate planners, your accountant, and attorney.



Tech-Notes, continued from page 29

it from the blood. Lots of potential here for enhancement.

"Effects of Alcohol on Scientific Thought During the Incubation Phase of the Creative Process"

Torsten Norlander, Roland Gustafson

The Journal of Creative Behavior
1996, 30:4 231—248

Creativity is a process; Wallas suggested the now familiar four-stage model of preparation, incubation, illumination, and verification. How does alcohol (or other drugs) affect this process? Alcohol at low doses decreases inhibitions, so it might be expected to influence creativity. The authors divided 60 students (male and female) into a control, a placebo, and an alcohol group. The control group got two bottles of tonic water, the placebo group tonic water with

vodka essence and the alcohol group tonic water mixed with vodka (total alcohol content was 1.0 ml of 100% alcohol per kg body weight). The participants were given a scientific problem (to design an experiment to test nature vs. nurture) to discuss, a notebook, and one week to think about it. On the evenings of the experiment's first two days they were to drink their bottles before going to bed. At the end of the experimental period they wrote reports about their solutions, which were scored by three panels: one to identify stages of creative thought in the original discussion, notebook and report; one panel to judge the reports on scientific value and creativity; and a third panel to judge the reports on originality. The panels concluded that there was no difference in scientific value or scientific creativity between the groups, but the alcohol group showed

overall more originality and more incubation of the plan. The paper suggests that the alcohol might affect creativity using some kind of rebound effect: the alcohol group had more incubations the mornings after drinking than the other mornings (a combination of alcohol and sleep might be the real cause). In earlier studies the authors apparently found that alcohol consumption during the illumination phase of the creative process reduced the number of creative solutions, as well as decreased the effort and deductive thinking in the preparation phase. A moderate amount of alcohol may help just the incubation part.



*In The Mind of the Machine:
the Breakthrough in Artificial Intelligence*
by Kevin Warwick
Arrow Book Ltd., 1998

Reviewed by Thomas Donaldson, PhD

This book has one major flaw which destroys its primary message entirely. However it does have many interesting things to say along the way. Kevin Warwick is a Professor of Cybernetics at the University of Reading in UK, and has done significant work with robots that use neural nets to help them move about in the real world. Several chapters in his book describe that work. (A part of the background behind it comes from frustration of some AI people with systems which do very well when modeled in a computer but behave disastrously when actually made into physical robots. This frustration led some AI people, Warwick included, to start building robots that were activated by computer systems with neural nets.) The chapters in which he describes this work seem to me to be the best and most interesting. This strain of AI doesn't aim to make a humanly intelligent robot at the start. Instead, it tries to develop smarter and smarter robots, working up from machines about as intelligent as paramecia. Though even Warwick has a good way to go before his robots are able to perform most human actions, they have indeed grown more ca-

pable over time. Neural nets do, after all, provide systems much better able to cope with the real world than other kinds of computer systems, no matter how "powerful." (I would say that the difference between neural nets and ordinary computers comes directly from the fact that neural nets do not use symbols at all in their processing, while ordinary computers are designed basically to manipulate symbols.)

The major fault of this book, however, comes from its basic message: that relatively soon, computers will take over the world and turn most human beings into tame animals to do their bidding. Yes, a few humans would still run wild, but would provide good hunting sport if nothing else. Warwick's argument for this thesis is simple: the computers will become more intelligent than human beings, and therefore must take control of their environment, as humans did originally. (And yes, if that were to happen we might as well forget our hopes for cryonics.)

You can read the book and see for yourself whether or not his argument is plausible. I think it is poor enough to be almost laughable. If you

don't see why immediately, here it is: even if we don't get into the definition of intelligence, we can look around us and see that those in political and business control of the Earth (and all its nations) do not have the highest intelligence among human beings. No Nobel prize scientist has ever been head of a nation; the number of former scientists in legislatures has always been quite small. Not only that, but a little history tells us even more: in Roman times, Romans would have an intelligent Greek slave to teach their children and other intelligent, educated slaves to advise the Emperor. No such slaves ever revolted or took control. (The slave revolts came from lower down.)

Even if we were to build robots more intelligent than ourselves* (it's far from obvious why we'd need to do this, but let's suppose), in building them we would control their desires in a stronger way than any Roman ever controlled the desires of his slaves. For them to take over from us they would have to have the necessary *desires*, and such desires do not come automatically with intelligence at all. (Presumably this re-

* This means more intelligent in *all* respects: not just able to play a better game of chess, but able to do anything and everything better than a human being (there are extra questions here, too, that Warwick does not explore, about just what is better in all situations. Chess rules contain a definition of better, but many other life situations do not).

mains true even with neural nets.)

Moreover, there is no reason why we must give the full operation of *any* task over completely to our robots. After all, we can always require them to consult us beforehand, and if we do not understand the situation they are dealing with, explain it to us. If our robots foresee events happening for which consultation with humans would be too slow, then they can come to us for consultation *before* those events. We can even do with such robots what was done with slaves or is done now with subordinates: give them some ability within a circumscribed area to make their own decisions, and require them to come to us if there is any chance at all they are outside that area.

Part of Warwick's thesis also

claims that we won't be able to acquire the same level of intelligence as our robots. Basically, he thinks augmenting human intelligence will take long enough that robots will have taken over before then. Warwick's date of takeover comes a minimum of 10 and maximum of about 50 years from now.

A lot hangs here on just what is meant by robots "acquiring the same level of intelligence as humans": even if some robots came to operate completely independently of us, that does not necessarily eliminate our robot slaves. Moreover, even though direct connections between our brains and computers are likely to be much more complex (and so take longer) than some computer people believe, there is no reason why we

cannot ultimately have and use them. (Whether we will ultimately migrate into a "computer" form — whatever is then meant by "computer" — remains an open question. Our connections may simply allow us to work with computers far more directly while we retain our original biological form**). As I've argued above, though, intelligence alone is in no way enough for our robots to take over from us.

Nonetheless, inside his fallacious argument Warwick has produced an interesting account of some work with neural-net guided robots. Such robots clearly have a future.



** In fiction I have written of such connections; we'd add another set of input/outputs to our brain. But given the vast number of things we may want to do with such brain additions, it may make better sense to not have any of them permanently attached. Just have the ability to connect directly. It will be interesting to see just how our relations with our devices change in the future.

Review: Nonfiction

Robot: Mere Machine to Transcendent Mind

by Hans Moravec, Oxford University Press, 1999

The Age of Spiritual Machines

by Ray Kurzweil, Penguin Putnam Inc., 1999

Reviewed by Brian Shock

Machines with human-level intelligence are inevitable, or so Moravec and Kurzweil insist in their separate books. Moravec predicts the birthdate of such machines around 2040. Kurzweil places them around 2019. In either case, I'm left with a mild depression at the prospect of upgrading my home computer to a mere Pentium III-500 this year.

If you have read Moravec's previous book, *Mind Children*, you will find *Robot* more than slightly familiar. Moravec reviews robotics developments, discusses the progress of machine intelligence into the future, and speculates about exotic computation with quantum effects and time travel. The ideas he expresses are perhaps better developed

in this later work, but they are rarely fresh.

The primary difference I found between *Mind Children* and *Robot* was one of tone. In his first book, Moravec blithely stated that while robots will be humanity's intellectual offspring and evolutionary successors, individual humans will also maintain continuity by uploading

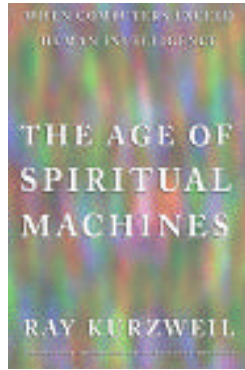


themselves into robots. In *Robot*, Moravec seems to take a darker approach: while he still feels that uploading humans into

robots will be possible, he seems to suggest that we should just get out of the way and allow our mechanical heirs to take our place. Moravec grants that robots may keep Earth as a comfortable wildlife preserve for their biological progenitors over decades or centuries, but soon enough the needs of growing hyper-intelligence will make such considerations obsolete.

From a cryonicist point of view, then, I wasn't thrilled with Moravec's new vision of the future. But since we're shopping around for predictions (and since our attitude toward the future has some small role in shaping it) I was heartened by Kurzweil's considerably more optimistic view, even though his method of expressing that view didn't always please me.

Once each chapter, throughout the book, Kurzweil "interviews" (or is interviewed by) an imaginary reader. In the earlier chapters, where he discusses the accelerating evolution of intelligence and related topics, this device seems condescending, as though the average reader couldn't deal with Kurzweil's abstractions without another member of the audience to ask predictable questions. Later, as Kurzweil begins making a series of predictions for 2009, 2019, 2029, and 2099, he balances the scales by pretending that his imaginary reader has lived to each of these dates, and now condescends



to him. These "future interviews" introduce us to a future of intelligent agents, nanotechnology, neural implants, and uploading so gently that we feel more a sense of wonder than future shock.

During his section on nanotechnology, Kurzweil makes what is apparently a cute mistake: he states that Eric Drexler's *Engines of Creation* "actually inspired the cryonics movement of the 1980s, in which people had their heads (with or without bodies) frozen in the hope that a future time would possess the molecule-scale technology to overcome their mortal diseases, as well as undo the effects of freezing and defrosting." Of course *Engines* did "inspire" cryonics, in the sense that it offered new hope to members of the cryonics community, but Kurzweil's use of language seems to suggest that Drexler's work *started* the cryonics movement.

Immediately following this, Kurzweil goes on to add a strangely gratuitous note of skepticism: "Whether a future generation would be motivated to revive all these frozen brains was another matter." This comment seems "gratuitous" in light of his speculative chapter on the year 2099, where his imaginary reader reports that a certain Dr. Drexler is alive and well and working on something called "femto-technology," which involves using quarks for computation. Kurzweil's character confirms that this is indeed the original K. Eric Drexler of *Engines of Creation*, more than 150 years old, uploaded and enhanced. Despite the

playfulness of Kurzweil's imagination in this section, he clearly suggests that radical life extension is possible for ordinary people, rather than restricted to a few luminaries such as Drexler. If ordinary people such as you or I can survive to 2099 — effectively becoming a "future generation" — why then would Kurzweil doubt our motivation to revive friends and family members in cryonic suspension?

And so between *Robot* and *The Age of Spiritual Machines* (and *In the Mind of the Machine*, by Kevin Warwick, reviewed by Thomas Donaldson in this issue of *Cryonics*), the consensus seems to be that machines will indeed become more and more intelligent at a progressively faster rate, until they soon exceed current human intelligence by incalculable orders of magnitude (a boringly obvious conclusion to many readers, I'm sure). The question that remains is whether we — as cryonics patients or lifespan-enhanced humans — have any long-term place in this evolutionary surge. Unfortunately, the answer we give to such questions is probably less dependent on our knowledge and intelligence than on our current dosage of Prozac.





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