Cryonics

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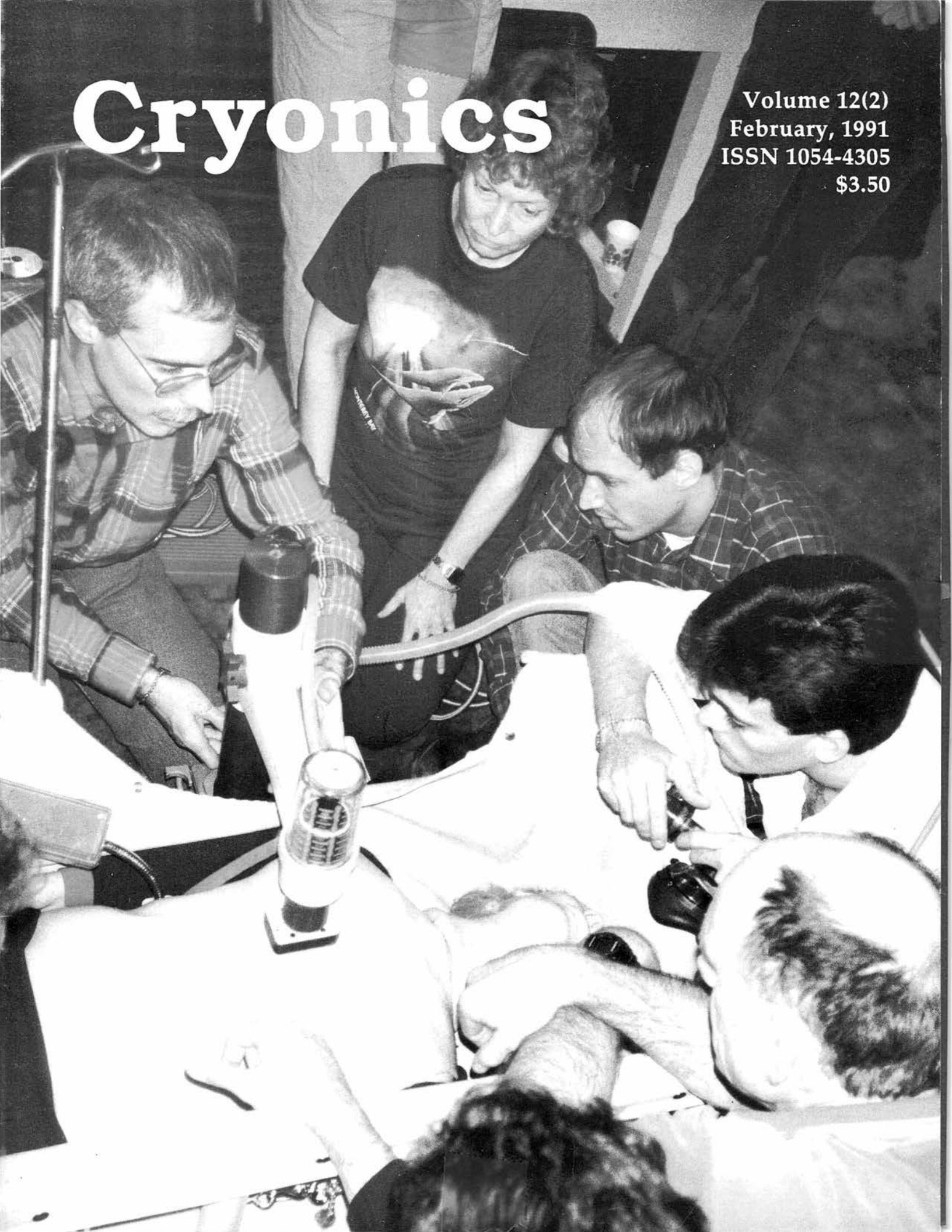

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Cryonics

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Cover:

Transport Training Course. Clockwise from upper left: Mike Darwin, Linda Chamberlain, Arthur McCombs, Russ Whitaker, Fred Chamberlain, Mark Voelker.

Up Front

Mike Darwin and Ralph Whelan

17th Alcor Member Enters Suspension

December and January have been busy, busy months. Not the least of what was keeping us occupied was the suspension of an elderly Alcor member from the Los Angeles area. The member had been in poor health for some time, although she was not considered terminal. Her deanimation came with little warning on December 31st. Fortunately, the Alcor Transport Team was ready and waiting and the suspension went well. More details on this suspension will be forthcoming in an article by Ralph Whelan currently scheduled to appear in the March issue of *Cryonics*.

Membership Status

Alcor has 200 Suspension Members, 572 Associate Members, and 17 members in suspension.

STM Progress

Early in December, *Science* reported on further Scanning Tunneling Microscopy progress by Don Eigler at IBM's Almaden Research Center. (Early in 1990 he spelled out "IBM" in individual xenon atoms.) Eigler, who had previously used van der Waals forces to drag the atoms across a nickel surface, has now devised a method for picking up the atoms and putting them down as he pleases.

According to the *Science* article, Eigler applies a small positive charge to the STM tip, thus drawing the atom to it. He then moves it to a new location, without dragging it, and deposits it by applying a small negative charge. Through this technique, Eigler hopes to initiate controlled chemical reactions, for instance the addition of an oxygen atom to a carbon monoxide molecule to form carbon dioxide.

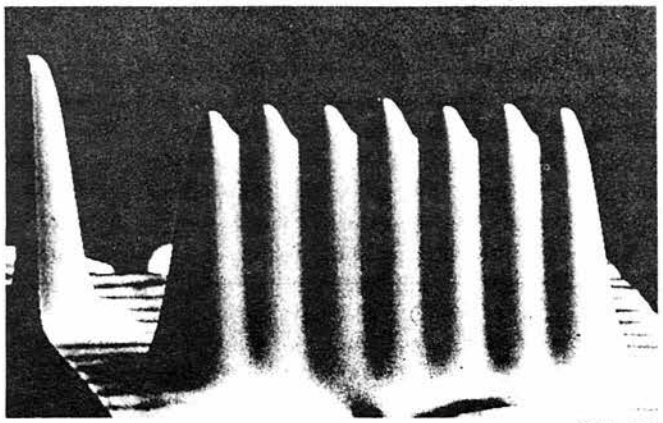


Photo: IBM

Seven individual xenon atoms.

These miniscule movements are actually giant steps on the nanotechnological path. Although we're still very far from having the know-how to build (for instance) molecular assemblers, it's comforting to see that we may have the engineering skills there when we're ready for them.

APOLOGIA

Last month we failed to credit the pictures present in the magazine. Several people commented on this. Tactfully enough, none of the commentees was one of the slighted photographers. Herewith, we correct our error starting with the cover: the photo is by Mike Darwin, and the people in the photo were Jerry Leaf (back to camera) and Hugh Hixon at the controls of the fork lift. The picture on page 1 is by Elleda Wilson. The photos of the Bigfoots and the MALSS cart on pages 2 and 4 respectively are by Mike Darwin. The Donaldson dinner photo on page 4 is by Brett Bellmore and the photo of Arlene Fried on page 17 is by Benjamin Hartwick. Our apologies and our thanks to all for the great pictures. Keep 'em comin'!

SURVEY

Jim Stevenson, Alcor member, is conducting a study involving people who think that cryonics might work and who do not believe in a non-physical afterlife, but who have not signed up. The study involves up to two hours of telephone interview, which Jim will pay for. If you're interested in participating, please call Jim at 415-494-1234, or contact us and we'll forward your information to Jim.

Letters to the Editor

Dear Editor:

Let this be my last, and briefest, response to Mike Darwin in our running discussion on the cost of cryonics. This subject may be boring to some readers, but I assure everyone that we all need to closely examine our financial policies, as the flow of money is what provides for all the other things that we do. Mismanagement of income is the main item that has led to the thawing of patients of other organizations, and both Mike and I want to see that Alcor stays financially sound.

There are so many new claims in Mike's last response that he alleges that I hold but in reality I never advocated and do not hold, that I do not feel obligated to respond to most of his concerns. Rather, I would like to summarize what I think are the main differences of opinion Mike and I have.

1) I believe that the overhead costs of running Alcor are real costs that have to be addressed when figuring what it really costs to perform a suspension. I believe we cannot freeze and keep frozen a member just with things like liquid nitrogen, dewar space, and only the actual labor during a suspension.

I believe Alcor must also supply: legal fees to keep the patients safe from bureaucrats; research in advance of each suspension; public information packages to garner support for the patients; maintenance of an ambulance for when the time comes; telephones and beepers for when the time comes, etc. etc. etc.

I do not think we can raise dues and sign-up fees at this time; therefore I feel we must recover some of our overhead expenses when we do the actual suspensions, rather than cut service.

2) I feel that the patients do directly benefit from all the things we provide besides liquid nitrogen.

3) However, our main point of difference is that I feel that whatever the costs of neuro and whole-body are (we cannot seem to agree on what the actual costs are), I feel that whole body costs are not three to four times as much as neuro. I feel that when one adds in the daily overhead costs of running Alcor, which are the same for both, that whole body costs only twice as much as neuro. Therefore, in the name of fairness, I feel that we should only charge twice as much for whole-body as we do for neuro.

Mike disagrees with me. Neither one of us has been able to convince the other. In fact, I think we have made things more confusing.

Lastly, I feel that neuro might be a very risky option, especially for young members. There is a chance that in their lifetimes science may develop vitrification. *(Which would, Mr. Pizer presumes, provide for relatively easily reversible suspended animation. –Eds.)* Regardless of when it is perfected, vitrification will probably be available long before we can clone new bodies. With vitrification we might suspend terminal patients for a few years while they waited for science to discover a cure to their disease. When the cure was on hand, we could unfreeze them and they could go on with their life ONLY IF THEY HAD A BODY.

Therefore, when (and if) we have vitrification, many persons who are signed up for neuro will want to change over to whole body. If they did not buy enough insurance for whole body when they were young, they may not be able to afford it when they are older.

I want to thank Mike for discussing these issues with me and thank our editor, Ralph Whelan, for providing the space.

Sincerely,
David Pizer

Mike Darwin responds:

The above response leaves me stunned since it fails completely to address in any meaningful way the issues I have raised. Were the issues involved not so critical to the survival of Alcor and the position Dave Pizer holds as Alcor's Chief Financial Officer not so sensitive, I would probably consider the foregoing a capitulation and drop it at that. This I cannot do, but, like Dave I will make this, my final response, brief as well. I will respond per Dave's points above:

1) Dave says he does "not think we can raise dues or sign-up fees at this time, therefore [he] feels that we must recover some of our overhead expenses when we do the actual suspensions..." Again and again I have tried to make the point that THERE ARE NO FREE LUNCHES. Raising the minimums means higher insurance premiums for the member—and Alcor doesn't even get the money! This is absurd.

2) This is an unproved assertion with no evidence cited to support it.

3) Dave and I can't agree on the costs for whole body and neuro because he has provided no evidence whatsoever to support his position and blind assertions on the basis of authority don't score many points with me.

Also, Dave makes all kinds of assertions about neurosuspension being risky and how suspended animation will be here when vitrification arrives. Several points need to be made here:

1) Vitrification is not the Philosopher's Stone. It will almost certainly be difficult (maybe even impossible) to apply to whole organisms and may in fact only be applicable to the isolated brain for a substantial period of time after it is developed. Nor is this assessment my assertion. No less an authority than Dr. Greg Fahy has indicated that the problems associated with whole head, let alone whole body vitrification, are likely to be far more complex than those in dealing with the brain in isolation.

2) Suspended animation or not, most (and, sooner or later, all) patients face multisystem organ degeneration due to aging as the real root of their problems. Definitive treatments for preventing and, more to the point, *reversing* the ravages of aging will be needed. Most people are *old* when they are suspended. Vitrification and having their whole bodies along isn't, in my opinion, going to solve their problems.

3) Alcor has long advocated that persons choosing neurosuspension buy enough life insurance to cover the cost of switching to whole body. Having plenty of extra insurance is good advice in any event. And I might add that most neuro-members are heavily overfunded. However, debates about who's coming back first and who will or won't have a body if

vitrification or other means of suspended animation are developed will look pretty sterile to people dying **today**. For many of those people, neurosuspension represents a low cost path of entry into our program and virtually their only shot at continued life. Having enough money for whole body vitrification when and if it's developed is meaningless if you're dying NOW and only have $41,000.

Finally, it is my hope that this debate has educated the readers of *Cryonics* about the issues involved and perhaps about the workings of Alcor. If it has achieved nothing more than that, then it has been very worthwhile indeed.

Hey You, Cryonics People:

Here's an idea that I think could help Alcor both increase the number of sign-ups *and* make it more affordable:

How about offering discounts on the price of suspension to people who get others to sign up? For example, if you gave 20% off for each new member someone brings in, individuals who recruit five people could get suspended for free (or nominal fees). Naturally any discount beyond that would be treated as "overfunding."

I'm sure a number of potential suspension members who haven't committed for financial reasons would become excellent salespeople for you. Even those already signed up would love it.

An off-the-cuff analysis indicates that the average member thus recruited would have to pay dues (assumed constant at $200 per year) for about 15 years to make up for a 20% discount on a neurosuspension (at $41,000) (with 10% interest). This doesn't seem at all outrageous to me, though of course I don't know what the average "life" expectancy of a cryonic suspension member is.

Also, if you offer (smaller) discounts for recruits *of* recruits, you could develop a multi-level system like those that have had such great success elsewhere. (Consider: who hasn't at least *heard* of Amway?)

A more radical approach was suggested by the observation someone made that you never know what real peace of mind feels like until you're signed up. You could use that feeling to help sell people on the idea by offering it for free! For example, tell people that if they sign up (and are an acceptable risk), they can have a zero suspension minimum for a year with no obligation to renew. If I'm right, they'll feel so insecure by contrast at the year's end that many will pay the money to feel safe again.

I hope you'll give these ideas some thought. Perhaps you should even put them in the next issue of *Cryonics*. . . .

Ever onward,
David O'Herron

Ideas of this nature will definitely always find a place in Cryonics. *Comments on Mr. O'Herron's piece or the topic in general are hereby formally solicited. –Eds.*

Dear *Cryonics*,

With the help of Russell Whitaker, we have opened a SIG (Special Interest Group) for cryonicists on a PC BBS (personal computer bulletin board system) called the New World's BBS. I am the system operator (sysop). I have been an associate member for over a year and feel that the data communication medium is an excellent way to communicate with each other while giving an opportunity for interested users to encounter cryonicists for dialogue.

The cryonics conference was started on December 15, 1990. The conference is open to the general public on a no-fee basis. The only charges involved are your regular phone call connect charges as when you make a voice call. Call evenings or early mornings when phone rates are reduced.

For those that have access to a personal computer and would like to visit the CRYONICS conference in the New World's BBS, all you have to do is:

1) Set your baud rate to 2400 and your communication parameters at 8 data bits, no parity, and 1 stop bit. Also known as 8-N-1. 1200 baud also supported.

2) Dial 1-201-729-9538. The line is available 24 hours and 7 days a week.

3) Log on and complete the registration.

4) After registration you will read the "NEWS." Enter the letter "N" when you are finished. You will then be on the COMMAND line. Then type JOIN CRYONICS and enter. You will now be in the CRYONICS conference.

5) In the CRYONICS conference you will see a user-friendly menu that lists the commands available. The most used options are:

R for read mail
R Y for read your mail
R A for read all mail
B for reading bulletins
F lists cryonics text files which can be read online or downloaded
E for enter message to any cryonics member or system user
C leaves a comment to the sysop (me)
A abandons the cryonics conference and enters the main board
G for good-bye or hang-up

The New World's BBS is looking for files to be posted in the conference. If any members have text or program or data files they feel might be of interest to users, please upload them to the BBS or mail them to me. Messages regarding meetings or any other events can be posted.

For those that have a modem and are in need of a good communication program so that you can call, let me suggest PROCOMM. PROCOMM is the easiest full function BBSing program available. If you cannot locate a copy I can send you a full function shareware version complete with documentation for three dollars ($3.00) on a 5 1/4 or 3 1/2 inch disk. I'll also include simplified set-up instructions to get you going quickly.

I have also received interest in opening cryonics conferences at other BBSs from their sysops. I will be sharing the files with any and all interested sysops, as I would like to see cryonics conferences on BBSs in every major city. I am also looking forward to creating a mail network with these non-commercial PC BBSs by the middle of 1991.

Visit the New World's BBS today and let me know what your suggestions are for the cryonics conference and enjoy the full use of all system options and download file areas.

Joe Dumanov

Cryonics Precursor

R. Michael Perry

(Reprinted from Venturist Monthly News, *June, 1989, with the permission of the editor.)*

"The Bedbug" is a 1928 play by Russian author Vladimir Mayakovsky (1893 – 1930) that satirizes soviet life in the "honeymoon" era preceding the Stalinist purges (when life became such that it could no longer be satirized without jeopardy to the writer). Suppressed in Russia for many years, it was eventually restaged and is now a popular work. I had no trouble finding an English translation by Max Hayward, in *Vladimir Mayakovsky:* The Bedbug *and Selected Poetry*, Meridian Books, 1960. The play contains an interesting anticipation of the cryonics idea and, perhaps, some food for thought for the would-be futurist.

The hero of the story is a dissipated, guitar-strumming young "ex-worker" named Ivan Prisypkin who lives in Tambov, U.S.S.R. (treated as being within the permafrost zone, though not really so). Prisypkin's 1929 wedding is tragically cut short by a fire caused by revelry; his remains cannot be found, so he is presumed lost. Fifty years later his ice-entombed body is discovered in what was the cellar of the burned building. By that time it is possible to revive frozen bodies. The Institute for Human Resurrection, which "considers that the life of every worker must be utilized until the very last second," favors restoration to life immediately, while others, aware of Prisypkin's dissipative habits, call for postponement. No one, significantly, favors thawing *without* revival, the "World Federation" (a worldwide soviet state), having by now declared human life inviolable. A vote is taken involving major cities around the globe; evidently the sovietized world is fully democratic. An overwhelming majority favor immediate resurrection, and it is carried out.

There is a scene involving a professor, an aging assistant (a former lover of Prisypkin, who attempted suicide when he passed her up for his bride-to-be) six doctors, and the patient-about-to-be-resurrected. The assistant is questioned about the patient's habits (too much blood alcohol could cause an explosion, for instance) but is not able to furnish much information. No news is good news, and the patient is slowly warmed and (how easy!) soon resumes breathing. Some "unnatural spasms" cause worry, but are soon identified as scratching: "Evidently the parasites inseparable from these specimens are reviving."

Mayakovsky

On waking, Prisypkin is duly worried when he learns how long he has been (as we would say) in suspension: "... All my unpaid union dues! For fifty years! The forms I'll have to fill out! For the District Committee! For the Central Committee! My God! ... Let me out of here!" Bewildered by the strange, new surroundings, Prisypkin is reassured when he discovers a familiar sight on his collar: "A bedbug! My sweet little bedbug, my darling ... ." He tries to catch the bedbug but it escapes. But he soon proceeds to infect others with his dissipative habits; even the dogs in the laboratory complex are begging. To ease his transition into modern life he is allowed to have an old (and now obsolete) staple—beer. Some workers take a swig "by mistake" and soon hundreds are hospitalized. The terrible epidemic rages, "mowing everybody down on its foaming path." Another symptom is "an acute attack of an ancient disease they called 'love,'" brought on, in the case of a young girl in a nearby apartment, by Prisypkin's crooning at night and playing his guitar (found frozen with him).

The scientists, of course, are excited about the prospect of recovering two previously extinct creatures, *Bedbugus normalis* (the insect that escaped from Prisypkin is recaptured), and *Bourgeoisius vulgaris* (Prisypkin himself). The director of the Resurrection Institute comments: "They are different in size, but identical in essence. ... *Bedbugus normalis*, having gorged itself on the body of a single human, falls under the bed. ... *Bourgeoisius vulgaris*, having gorged itself on the body of all mankind, falls onto the bed. That's the only difference!" The last scene finds our hero, now referred to as "it," caged in a zoo with his bedbug in a small glass case, surrounded by bottles and spittoons, with sonic filters to muffle any dirty words he might utter. Spectators looking on are "mute with delight" on first viewing the strange pair. Prisypkin is briefly released from the cage, and suddenly the tables turn as he confronts his audience, a

first among equals. "Citizens! Brothers! My own people! Darlings! How did you get here? So many of you! When were you unfrozen? Why am I alone in the cage? Darlings, friends, come and join me! Why am I suffering? Citizens! ..." The guests are duly horrified. "Remove the children! ... Muzzle it ... muzzle it!" they plead, then add, "... Ah, but don't shoot it!"

As a satire, *The Bedbug* is a poignant example of double entendre. Ostensibly a banal, sanitized spoof of anti-socialist vices, it is really a critique of the society it seemingly defends, a society guilty of repression and murder, that has seemingly forgotten the value of loving, caring, and having a good time. It required courage to produce it in the time and setting in which it was written. Soon it would not be possible. As the Stalin regime tightened its grip, the more independent and creative intellectuals were increasingly attacked for "anarchism" and "Trotskyist left deviations." Vsevolod Meyerhold, the co-producer with Mayakovsky of *The Bedbug*, would eventually perish in a Russian concentration camp. Mayakovsky would likely have shared his fate, but took his own life by Russian roulette on April 14, 1930, an ironic contrast to the resurrected hero of what is now considered his greatest play.

Despite the obvious parallels with cryonics, *The Bedbug* is not primarily an anticipation of the principal cryonics theme of attainment of biological immortality through freezing and eventual revival. People still grow old in Prisypkin's future world, at the usual rate (though Prisypkin himself, at least, emerges from his frozen sleep unaged!), and nothing is said about deliberately freezing the newly deceased or the terminally ill, for revival *at a time when their ailments can be cured*. Instead the "cryonics" element in this story is mainly a device to render plausible a certain caricature of society. On the other hand, remember, this was 1928. Very few were thinking about the idea of resurrection at all, at least through a scientific process. Mayakovsky deserves at least a small amount of credit for his partial anticipation of the theme of the scientific conquest of death.

The Bedbug, however, is significant to cryonics for another reason. It was a major inspiration of cryonics pioneer Ev Cooper. That is another story which hopefully can be told later, when space permits.

Immortalist Philosophy

Meaningfulness And Mortality

Max More

The oddest arguments are used to support the view that death has its proper place. Even some philosophers, renowned for questioning everything, are apologists for death. Bernard Williams, in his essay "The Makropulos Case: Reflections on the Tedium of Immortality," is a case in point.

Williams grants that death is indeed to be regarded as an evil. Even so, we should be glad that we die, for an unending life would be devoid of meaning. Williams supports this view by appealing to a play by Karel Capek concerning a woman named Elina Makropulos, who has lived 342 years. "Her unending life has come to a state of boredom, indifference, and coldness. Everything is joyless." She refuses to take the immortality serum again and dies.

In claiming that an immortal life would be meaningless, Williams is saying that life would be devoid of interest, joy, or freshness; it would be a life of boredom and stagnant repetition. Makropulos stays at the apparent age of 42, and she maintains the same character throughout her life. She has become bored because all the things that could happen to a woman of 42 have happened to her. Williams believes that this result is not an accident of her particular character; it's an inevitable consequence of living too long. He concludes that we should hope to die before reaching this unavoidable point of stagnation and dullness. He worries that technical progress may thrust upon us this unattractive prospect. Williams has expressed his views on a British documentary about life extension and cryonics. Since Williams now resides in Berkeley, California, let's hope that he doesn't sit on any committee setting regulations for gerontological or cryonics research!

Williams is presupposing one or both of two things: either that I must have an unchanging character if it is really me who lives forever, or that if I avoid boredom by changing then the changed person is not me. Relying on these assumptions, he gets to the conclusion that I must necessarily become horribly bored with living. For me to live forever, rather than be replaced by someone different, I must remain unchanged. But someone who remains unchanged must become bored and his/her life must lose meaning. While I agree that an unchanging person going through an unchanging routine would become bored and life would pale, I reject the idea that we must stay the same to survive eternally, and I reject the idea that we must become bored or that we could ever run out of new experiences and activities.

Actually, even unchanging persons might escape boredom. Perhaps there would be drugs capable of making repeated experiences seem perpetually fresh and exciting. Regardless of this, clearly we will *not* stay the same. We will change psychologically, neurologically, and biologically, and our social, scientific, artistic, and recreational contexts will change.

Williams' argument is weakened by his heavy reliance on the implausible character of Elina Makropulos. This woman never matured, grew or changed. She did the same things in the 20th century as in the 17th. We immortalists, if we become immortal or close to it, need not stagnate. Makropulos's problem is one shared by some of the deathists around us: She couldn't enjoy life and so found the prospect of more life an intolerable burden. Other people, including all the cryonicists and immortalists I've met, enjoy life now despite its tribulations, and can be expected to continue wanting more of it. Some people will never be attracted to cryonics as a good idea for themselves because they feel burdened by *any* amount of life.

Whether or not we ever stagnate is up to us. There will never be a shortage of new activities, new understanding, and new experiences. Perhaps we might one day come to know a completed physics and chemistry, though even this is denied by some theorists. But we cannot exhaust the technological applications of those physical laws. There will always be innovative art—music, graphic art, writing, dance, and forms as yet unconceived. There is no limit to the personal relationships we can create and develop. There is no limit to the social forms we can develop, and no limit to the games we can invent.

In the early universe there was an evolution of physical law; this was followed by chemical evolution, then biological, psychological, social, scientific, artistic, and intellectual evolution. Why should we expect an upper limit to new forms of evolution? And if there is no such limit, then stagnation is unnecessary. As our lives expand and we pass from human to transhuman to posthuman, we will not only transform our knowledge and social forms, we will change our environment, and change our selves. We cannot expect to forever keep unmodified human bodies and brains.

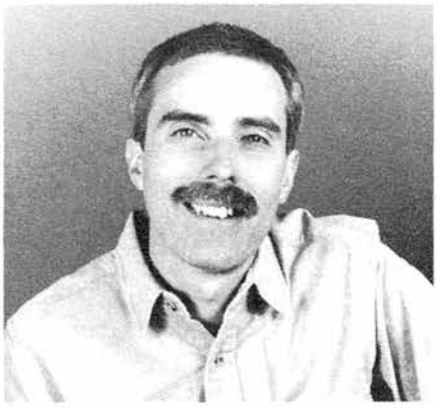
We will give ourselves penetrating new senses, keener intelligence, superior memory, and perhaps even migrate out of biology into another form of life (the uploading hypothesis). We may even create new universes by harnessing the forces that brought forth our universe 15 billion years ago. Williams' parochial views of our future existence contrast starkly with those held by cryonicists, immortalists, transhumanists, extropians, and Venturists. [The transhumanist/extropian view is explained and advocated in my "Transhumanism: Towards a Futurist Philosophy," and in *The Extropian Principles*, EXTROPY #6 (Summer 1990).]

Although I will change radically over time, still I will be the same person in the sense that matters. My self of 1991 will be qualitatively different from my self of the year 5220, yet I am the same person because of a continuity across time. Not only do some of my basic values remain over long periods, but also the self that I am now explains and causes the self it becomes. It is not as if my future self kills off my earlier self. So long as I change in ways that do not destroy continuity, I can continue to exist through massive changes in personality, values, interests, goals, and abilities.

We can look forward to an infinite process of transformation and improvement with no fear of an inevitable boredom and meaninglessness. There is no guarantee of being engaged with life, but ennui has to do with laziness rather than the availability of too much time.

MARK

Mike Darwin



Let's call him Mark. His privacy demands that I do not disclose his real name here. I do not know if he is still alive. If he is, he will not be so for long.

Mark showed up at Alcor as a "routine" visitor about six months ago. We take people through the Alcor facility almost daily now, and he, like so many others, had called and scheduled a tour a week or so in advance.

I wasn't the one who took him through that day. He had made his appointment with Carlos Mondragón (Alcor's President) and in fact, the first I knew of him was when I got a call from Carlos as I was on my way out the door leaving home for Alcor. "You need to come down right away if you can," Carlos said. "There's this fellow who came for a tour today and he's dying. I mean he's *really* dying. He looks awful."

I liked Mark from the instant I laid eyes on him. He greeted me with a weak smile, and slowly walked back into the facility from his car outside (where he had been waiting with his fiancée, who refused to come into the facility). He projected a sense both of vulnerability and strength, which lent him great charm.

Mark was a 22-year-old student just wrapping up a degree at a top-notch university when he discovered he had a recurrence of an aggressive cancer which he thought had been cured by previous radiation and surgery. A technophile whose walls were covered with photographs of military aircraft, he had read *Engines of Creation* and, since he had recently been diagnosed as terminal, had decided to evaluate cryonics. He was very active in his college's libertarian group, and despite the obvious ravages of his disease, still came across as an extremely bright, articulate and strikingly handsome blond-haired young man who towered above Carlos and me with 6'4" of height.

We spoke for maybe 20 more minutes and laid out what needed to be done. Mark

was "sold" on cryonics and felt he needed no convincing, just help putting things in place. Finances were going to be a real problem, although Mark was optimistic he could persuade his mother to come up with the money for neurosuspension. We talked over his options and agreed to speak by phone in a few days. Since he and his fiancée were now living in the Los Angeles area, it was anticipated we could set up a "family conference" and discuss the issues.

When more than week went by and I hadn't heard from him, I called to find out if he was okay; he was extremely weak and short of breath at our first meeting; Carlos hadn't exaggerated. I was afraid he might be hospitalized and comatose, or even that he might have died.

He was okay, it turned out, and was in fact feeling better since he had been given a couple of units of blood. But the bad news was that neither his mother nor his fiancée wanted anything to do with cryonics. Again we spoke at length and I offered to do what I could to try to raise (by soliciting voluntary giving) the money he would need to make up the shortfall to afford suspension (about $15,000). We spoke several times over the next few weeks and I was increasingly impressed with his warmth, good nature, and above all his intelligence.

Unfortunately, there was little I could do to help, and more to the point, Mark appeared to be demoralized or ashamed (or both), for he quit returning my calls and became impossible to reach since he used an answering machine to screen his calls.

Several months went by. Then, one morning of early in December I was given a message by Alcor staffer Mike Perry that a woman had called to make arrangements for her son's cryonic suspension. The surnames didn't match, so it wasn't until I was several minutes into the call that I realized that I was talking to Mark's mother. The call started out rocky, but smoothed and ended well and, with a few more calls back and forth, it was finally settled on that Alcor member Russ Whitaker (acting as a witness) and I would go over to Mark's and his fiancée's apartment and execute his paperwork.

Nothing prepared me for what I saw when Mark, his fiancée, Russ, and I crossed paths at the foot of the stairs of their apartment building (they were arriving home just as we arrived). Mark was a skeleton. I have seen photos of prisoners from Treblinka who didn't look any better. He was also desperately short of breath and constantly coughing up blood. It was torture to see him drag himself up the two long flights of steps to their second-story apartment.

With many interruptions for Mark to lie down or recover from fits of coughing during the course of the evening, we completed his paperwork. His fiancée was civil, but very distant, and totally inappropriate concerning Mark's condition. Here this man was in agony and dying, and she refused to acknowledge that even the slightest thing was wrong, pooh-poohing this whole cryonics thing and the notion that Mark was even sick, let alone going to die. For instance, she showed not the slightest concern at the torture climbing the stairs represented for Mark. When I gently suggested a ground-floor apartment would be more suitable, she acted as if she hadn't any idea why I would suggest such a thing.

And his fiancée is not stupid either. She is a graduate student in organic chemistry at one of the best schools in California!

We left Mark and his fiancée, expecting to hear from Mark shortly regarding logistics and finances. Mark had managed to raise about $25,000, but was still $10K short of the needed $35K.

Mark didn't call. After several unsuccessful attempts to reach him, my next call was to Mark's mother. She informed us that Mark was going to be considered for an experimental chemotherapy program in a neighboring state. They were going to hold off for a few days on cryonics details until they saw whether or not Mark was accepted.

As it turned out, he was. And that was the last I heard about Mark, although I did talk with his mother once or twice more. Mark's mother understood about cryonics pretty well. She read the literature I sent and seemed realistic and even a little supportive. She was especially aware of the complex preparations that would have to be put in place if Mark were to be suspended under reasonable conditions.

But now, everyone involved went into massive denial. There was HOPE now for Mark to go on living. Despite my best efforts to explain that cryonics coverage should be in place for Mark even if he wasn't sick and had never been sick, I never heard from Mark or his mother again. I have called several times and left messages on the answering machine. Once, recently, I reached Mark's fiancée who told me icily that he had not improved, and could not speak to me because he was asleep. She flatly refused to discuss his response to the new rounds of chemotherapy.

My best guess is that very soon now Mark will be dead. I cannot know for sure why he turned his back on cryonics. But I can guess, and I think my guess is pretty good.

From my observations of his body language and his reluctance to return my calls, I believe that there was only one thing that terrified Mark more than cryonics: dying. But not by very much more. Because, like it or not, inevitably dying and cryonics were and are closely related for Mark.

There are two ways to look at cryonics. You can view it as a life net under a tightrope act, a welcome safety feature like an air bag in your car or like a catastrophic illness health insurance policy. Or, you can view it as palpable and real evidence that you are going to die, or at least to be unconscious, helpless, and displaced through time for decades or even centuries.

If you have the latter point of view, then every step of the way towards making suspension arrangements is agony; it is a clear, unavoidable, and objective acknowledgment that you are running out of time. Mark, his mother, and certainly his fiancée didn't and apparently couldn't face the reality that Mark was dying. The experimental chemo program was an out, an escape from what was to them a terrifying and grim situation.

I have seen a lot of people deal with terminal illness. Mark and his family were not unusual, they had a lot of denial and they were very, very afraid.

It is also important to point out that Mark was not a cryonicist. He didn't have that special something that allows us, as cryonicists, to confront the fact that we are going to die and to deal with the rush of deep seated fear, avoidance, and loathing that that realization evokes. I should have been prepared for this by now, and in fact something Mark said during our first meeting should have prepared me even more; he mentioned that he had read Drexler's book shortly after his first bout with cancer. And yet, two years had to go by and a terminal diagnosis materialize before Mark, reluctantly, came to visit Alcor. And keep in mind that when he made the appointment he **didn't** mention that he was dying.

If Mark's family had been more supportive and more realistic, I think things might have turned out differently. But they weren't. Indeed, if anything their denial

was worse than Mark's.

As it is, I don't want to think what life for Mark must be like now. It must be very difficult to deny that he is dying and that the new treatment is not working. It must be very difficult to think about what will happen next.

There will be more Marks. A lot more Marks. Alcor is growing rapidly and cryonics is penetrating our culture deeply and on many levels. Already the number of people trying to sign up with Alcor markedly exceeds the number of signed up members we now have. Yes, there will definitely be more Marks.

And we need to prepare for them. First and foremost we need to be aware of the potential for harm that they represent to us, the Alcor staff. I spent a great deal of time on Mark and a not inconsequential amount of Alcor money; over a hundred dollars on labor, FedEx charges, phone calls, gasoline, and the like which was never reimbursed; Mark never came through, as he promised he would, with his $300 sign-up check. Not to mention a grueling and ultimately wasted evening for a good-natured and generous Russ Whitaker who served as a witness to Mark's paperwork.

But leaving aside the financial element, there is the emotional one. Carlos, myself, and several others who met Mark badly wanted to see him have cryonics available when he needed it. There is real pain, damaging pain, in what happened. I cannot quit thinking about Mark and I find myself wanting to pick up the phone, or drive over to his apartment and find out just what the hell went wrong and if there is anything I can do to fix it. There is a fine line between encouragement and harassment and I feel I have come perilously close to harassment in Mark's case.

We need to find better ways of helping the Marks of the world not to turn away at the critical moment. How we can do that, I assure you I haven't a clue. But what I do know is that Mark can and does serve as a grim reminder that trying to make cryonics arrangements when you are dying isn't by any means the best way to go about it.

Most people are terrified when they are dying. They are also usually low on energy and fogged in judgment. What modest resources of energy and initiative they have at their disposal are usually focused on just staying alive; just getting from one day to the next. It is hardly a time to absorb complex new information, ask lots of tough questions, and think over and integrate a whole new world-view into your lifestyle. Unfortunately, while it is easy for me to see this and to know this, it is impossible for me to communicate it on an emotional level to the people who really need to understand it. To that problem I see no answer at all.

We also need to protect the Alcor staff from the very real emotional harm that comes from these incidents, and the others which are to come that will be even worse: where someone really wants to be suspended and is working hard to "make it," but the money isn't there and it **doesn't** happen. We need to learn to distance ourselves and perhaps be prepared to seek and accept professional counseling to deal with our pain and grief when the load of these cases increases, so that we can put the Marks behind us as quickly as possible and focus on the people we can save.

And yet I can't forget Mark's face and his smile, nor his obvious terror at his predicament.

Sometimes, just before I fall asleep at night, I can't tell his face from mine or separate where his terror ends and mine begins. Because, when all is said and done, "there, but for the grace of God, go I..."

Sometimes this is not an easy job.

"Molecular Repair of the Brain": A Scientific Critique

Gregory M. Fahy, Ph.D.

The October, 1989 (vol. 10(10)) issue of *Cryonics* magazine carried an impressive and seminal article by Dr. Ralph Merkle entitled "Molecular Repair of the Brain" (pp. 21-44). One index of the influence of this article is its citation by Arthur C. Clarke in his November, 1990 book, *The Ghost from the Grand Banks* (Bantam; pp. 221-222, 259-260), which mentions both Merkle and Alcor (complete with an address) by name. The importance of this paper lies in its attempt to demonstrate the likely feasibility of cryonics through a series of logical and mathematical arguments. Such an attempt, if successful, should send doubting cryobiologists packing and make the world safe for cryonics forever. Dr. Merkle's article, therefore, should be evaluated carefully and honestly by cryobiologists. Since I am a cryobiologist, and one who likes to consider new ideas, I have decided to undertake the task of providing such an evaluation, and the present article contains the results of this evaluation. Unfortunately for the readers of this periodical, I must report that the conclusion of my critique will be that Dr. Merkle's attempt to provide persuasive arguments for cryonics fails in a number of basic ways.

The Problem of Chemistry

Merkle notes, quite correctly, that "The thawing process. . . causes damage and, once thawed, continued deterioration will proceed unchecked by the mechanisms present in healthy tissue. This cannot be tolerated during a repair time of several years" (p. 32). For this reason, he notes that "it seems likely that repair will take place when the tissue is still frozen" (p. 30). Although he says that temperature of repair is left open, he clearly favors repair at temperatures below the glass transition temperature, e.g., at liquid nitrogen temperature. For example, there are references to "an assembler operating at (perhaps) liquid nitrogen temperatures" (p. 30), and "Fractures made at. . . temperatures below the glass transition temperature" (pp. 33-34). He also makes the following general statement: "it seems unlikely that reducing the temperature will create a barrier that will inherently require longer synthesis times. Assemblers are basically mechanical in nature, and so they can be designed to operate across a broad range of temperatures. If anything, the reduction in thermal vibration as a consequence of reduced temperature should allow more accurate positioning and facilitate, rather than hinder, the assembler-based synthesis process." The same basic idea has been restated also in two subsequent documents

by the same author (an as-yet unpublished update and revision of "Molecular Repair of the Brain" renamed "The Technical Feasibility of Cryonics," and a short article called "Cold Starting" in the November, 1990 issue of *Cryonics* (vol. 11(11), p. 11).

There is just one problem with sub-T_g repair: physical law! The fatal error is that although assemblers may be "basically mechanical in nature," what they do is not. What they are supposed to do is chemistry. At normal temperatures, this is clearly reasonable: enzymes do chemistry all the time. But enzymes do not work below T_g, and neither will assembler-induced chemical modifications. Enzymes take advantage of thermal energy that is already available within the reacting species to supply the activation energy required for chemistry (the making or breaking of covalent bonds) to occur. Below T_g, this activation energy is not present [1].

The breaking and making of chemical bonds under these circumstances can only be achieved mechanically: by ripping atoms from other atoms and/or by slamming or jamming atoms into other atoms with sufficient force as to provide the equivalent of the ordinary thermal activation energy. (Conceivably, spectroscopic approaches could also be used in some cases, but, most likely, not as a general rule.) "Slamming" would involve accelerating the reacting species to velocities comparable to (and perhaps greater than) their velocities at normal body temperature. "Jamming" would involve a vice-like compression of molecule against molecule so as to overcome intermolecular repulsions and thus catalyze the reaction. However, the latter is the rough equivalent of increasing the local hydrostatic pressure, and it appears that absolutely enormous pressures would generally be required to drive chemical reactions at -196C. To give one indication: Whalley and colleagues [2] have shown that pressures on the order of 15,000 atmospheres are required to convert ice into amorphous solid water at liquid nitrogen temperature, and this is a reaction that involves no chemistry! This reaction also involves a decrease in volume. Driving reactions that result in a net *increase* in volume in this way might not be possible. This seems to leave the "slamming" approach as the main possibility.

But the "slamming" approach and the "jamming" approach are fundamentally similar, the main difference being the time scale over which energy is applied. In any case, how will the accelerations required for this approach be produced? At a minimum, it seems to me, one must rip the desired molecule free from its embedding medium (without hurting it), attach it to an assembler arm, orient it with extreme precision on that arm in some fashion, and then slam it against the desire reactant, also perfectly oriented on a second assembler arm. The basic problem that arises from these requirements is: How can you attach each of the reacting molecules to the assembler arms using only forces weaker than covalent bonds in such a way that the force of the collision, which must be powerful enough to make or break covalent bonds, does not dislodge them? (This will be an especially large problem for smaller molecules.) Another important complication is waste heat and the limitations it may put on assemblers: How much waste heat will be generated during the acceleration of the assembler arms to sufficiently high velocities, and what is the likelihood that this waste heat will accidentally lead to local warming and diffusion or to the catalysis of some undesired reaction?

The opposite problem is: How does one grip a molecule on both ends in just the right way as to be able to rend it asunder at exactly the correct bond in every case? The answer is likely to be: One doesn't.

Possibly some technique in which harmonic oscillations of progressively greater magnitude are mechanically induced between individual atoms could break selective bonds and begin to approach these problems. But the problem is, nobody knows. Merkle's paper simply fails to appreciate the fundamental problems of doing chemistry on stable molecules below T_g, and one is left with only wild speculations about how such a problem could even be approached in principle. It thus seems to be something of an understatement to say that Merkle's approach of sub-T_g repair (or even near-T_g repair) falls short of providing convincing evidence for the technical feasibility of cryonics. Solving these problems seems to be not just a matter of engineering, but also of creating an entirely new branch of chemistry (or materials science), i.e., cryomechanical chemistry, to use as a basis for the engineering that is needed. But it is by no means obvious that it is possible, even in principle, to duplicate room temperature chemistry using only mechanically-driven reactions at sub-T_g temperatures. At these temperatures, we are not dealing with the kind of concept Feynman and Drexler have considered, in which it is only necessary to position atoms appropriately and lean on them just a little to get what you want. This is not chemistry as cells and as nature know it. It is therefore quite obviously inappropriate to assume that normal biological repair processes provide anything comparable to a "proof of principle" that repair can be effected below T_g.

I believe Merkle's response to this problem may be to disassemble the frozen brain into its individual molecules, warm them to room temperature individually to permit them to react, and then to cool them back to liquid nitrogen temperature and reassemble them at that temperature back into the intact, repaired brain. But even this scenario is doubtful. It supposes that the brain is like a house made of bricks, which only need to be stacked next to each other to complete the edifice. The reality, however, is that there is a significant degree of covalent bonding between many of the molecular components of the brain (e.g., membrane proteins are linked to the cytoskeleton, which in turn is linked to organelles, and so forth). It seems unlikely that an entire brain can be disassembled and reassembled at liquid nitrogen temperature without requiring the performance of any chemistry at that temperature, even without considering the issue of molecular repairs. Another suggestion Merkle has proposed informally is to use free radical chemistry. Unfortunately, once again, it is far from clear that free radical chemistry can entirely or even mostly duplicate ordinary, thermally-driven chemistry.

Problems of Physics

On page 39, Merkle says "we must generate a plan for reassembly of the tissue components (the molecules) back into the healthy state. . . that is, we must determine how to actually rebuild the healthy tissue." The meaning of this is explained on page 37 by, for example, the following: "If the initial data base describes tissue with swollen or non-functional mitochondria, then the revised data base should be altered so that it describes fully functional mitochondria." (This idea is repeated also in "The Technical Feasibility of Cryonics.") Confirmation that this is what Merkle actually proposes be done (i.e., restoration of a healthy functional state at sub-T_g temperatures) is given by Merkle's "Cold Starting" article.

Unfortunately, this approach is fun-

damentally nonsensical for a variety of reasons. The simplest of these is simply that tissue cannot exist in a healthy, functional state at -196C! For one thing, a functional mitochondrion contains liquid water and no cryoprotectant. Even if such a state (in vitreous form) could be created at very low temperatures, it would revert to a mitochondrion containing massive amounts of internal ice within microseconds or less on warming (hence Merkle's proposal in "Cold Starting" for a means of warming fast enough to outrun this crystallization process!).

The more basic and general point is that some kinds of repair would be extraordinarily difficult, futile, or even counterproductive to carry out at the lowest, most protective temperatures for fundamental physical reasons. Consider the following examples.

Osmotically-Induced Cellular Shrinkage. Slow freezing causes cell volume reduction, which in turn may cause the reduction of cellular surface area and a resulting extrusion of lipids and proteins from the membrane. Extruded lipids and proteins cannot be reinserted into the membrane until the cell volume is once again increased because there is no room for them. Restoring cell volume while the cell is in the vitreous state would be a seemingly ridiculous and superfluous task to attempt, and would again create a cell whose interior will freeze within a fraction of a second during warming!

Phase Transitions. Low temperatures and membrane dehydration *per se* cause membrane lipid species to crystallize or undergo Hex_{II} reorganizations. This is therefore the natural state of these lipids at the prevailing temperatures. Any attempt to reorder the membrane lipids into a lamellar phase will lead to spontaneous re-separation of these phases either at the prevailing temperatures or on warming. Thus, simply "repairing" this membrane defect at cryogenic temperatures would be futile. Introduction of alien lipid species to prevent re-separation would be problematic due to the absence of room in the membrane for such species and the need to subtract native lipid to make room. These changes would all have to be reversed later, and might create more problems than the original phase separations.

Denaturation. Any denatured proteins will also prefer to be denatured under the prevailing conditions. Renaturing them will tend to lead to re-denaturation as temperatures inevitably rise later on.

Changes in Tissue Volume: Thermal Expansion vs. Brittleness & Elasticity. A fracture represents anisotropic contraction of cerebral tissue due to temperature reduction. Local rips in axons may arise for similar reasons. To fill in gaps caused by the inherent thermal contraction of cerebral tissue may create a problem when the temperature is raised and all of the existing structure, both the native structure and the added structure, is inevitably forced to expand: expansion lesions such as buckling and shearing of axons may replace the previous contraction lesions. Likewise, many axons may be very stretched while frozen. Destretching them by adding material to them could cause the same buckling problem when warming occurs. Finally, tissue will be brittle below T_g and may be brittle even at temperatures moderately above this. Physically moving structures around under such conditions may damage them, and attempting to close a fracture by physically forcing the two sides together is liable to rip structures on both sides of the gap. Thus, some repairs made below T_g could induce the need for more repairs!

Incidentally, the thermal contraction-expansion cycle may also make Merkle's "Cold Start" fail: even if the heating rates he wishes to achieve could be attained, the result would quite possibly be a brain macerated or exploded from the stresses of expanding its volume by several percent in a one microsecond interval. (Consider the kinetic energy of brain tissue expanding outward at a speed of 0.5 cm/microsecond, or, in other units, 18,000 km/hr!)

Problems of Power

How will nanomachines be powered? No comments from Merkle. At body temperature, nanomachines could be powered by chemical energy the way metabolism is powered. But at -135C? This is not just a detail to be left to future designers: it is a point of principle. Is it feasible in principle to power complex molecular manipulations (not even chemistry *per se*, but just physical manipulations) at cryogenic temperatures? How can energy be translated from the macroscopic to the molecular level? Without answers to these questions, the central idea of Merkle's paper stands on a very flimsy foundation.

Presumably the power would have to be supplied via electrical cables or sliding rods going in through the vascular system. How much power is needed? Can it be supplied on wires small enough to thread through capillaries without warming the tissue through resistive (or frictional) heating?

Problematic Time Estimates

On pages 29-31, Merkle tries to estimate the time required for the repair of individual molecules. He does this by multiplying the *in vivo* synthesis time by 10 to account for the fact that not only molecular synthesis but also computations about such synthesis will be needed. He then notes, on page 30, that "the times for the various biological synthesis steps give here must be viewed as general 'proofs of principle' times rather than specific estimates of the actual time that will be required by an assembler operating at (perhaps) liquid nitrogen temperatures."

But in no way is the time for biological processes a "proof of principle" for estimated cryogenic repair times: the biological processes depend on DIFFERENT PRINCIPLES than the repair processes, both in terms of the mode of operation (diffusion vs. conveyance) and in terms of the power supply. The biological systems, at best, tell us how long molecular reactions take under one set of conditions. However, without more detailed calculations (which, as indicated above, may be impossible), the biological time scales and the nanotechnological repair time scales (assuming that nanotechnological repair is possible at -196C in the first place) cannot be related to one another. Assuming that the two time scales are even in the same ballpark amounts to pure handwaving. This invalidates the entire discussion of the time required for repair, which is a central point of the paper.

Merkle does not really address the issue of determining WHERE molecules ought to be and carrying out the actual procedure of repositioning them. It could, for a variety of reasons, be time-consuming to figure out where to place a molecule if it is misplaced, especially since placing one molecule influences the proper placement of subsequent molecules. Consider that image analysis systems with good resolution store individual images at 1-3 megabytes or more per 2-D frame, exclusive of any analysis of the image. How many 2-D or 3-D images would be necessary to carry out the needed repairs? Possibly a very very large number, with correspondingly long times required for analysis.

The Problem of Vagueness

Merkle says, on page 40, "We will not examine the problem of generating a feasible assembly sequence here. . . [but] it should be clear that it is indeed possible to build living tissue. It is, after all, done by every living creature on the planet. It also follows from the general thesis of nanotechnology: that the construction of almost any chemically stable object that has been specified to the atomic level is feasible. The revised structural data base clearly specifies such an object (the brain) and specifies its structure in precise molecular detail. Its construction should therefore be feasible, particularly when we consider that existing biological systems already demonstrate 'proof of principle.'"

Thus, Merkle's paper does not seek to tell us how to repair a frozen brain. It seeks only to describe peripheral issues of information content, computational speed, etc. But it is hard to evaluate the possibility of repair if no actual suggestions for repair are give. We have already exploded the analogies noted in the preceding paragraphs: the workings of living systems have nothing to do with the problem of constructing a brain at cryogenic temperatures, and the tenet that specified structures can be built does not imply that specified structures can be built under impermissive conditions such as in black holes, stars, or vats of liquid nitrogen. Merkle says, on page 37, "if any cracks are present in the initial data base (describing the frozen tissue) then the revised data base (describing the healthy tissue) should be altered to remove these cracks." But "removing these cracks" is a non-trivial exercise, and we are told nothing about how this might be possible. In the end, we are left only with an apparently unsupportable assertion that it should be possible. And this is the problem that cryobiologists have had with cryonics all along.

Problems of Biology

On page 38, Merkle says "all current estimates of tissue 'viability' based on functional criteria [are] irrelevant." However, functional damage is related to structural damage. The greater the functional loss, the greater the structural loss, and the less likely it is that the previous structure can be inferred.

Conclusions

Ralph Merkle has written an excellent paper which attempts to identify important issues of the repair of frozen brains. He deserves praise for his great intellectual effort and for many of his results. From the point of view of a cryobiologist, however, Merkle's analysis falls far short of being convincing. It is based on a number of assumptions that have dubious validity, and it fails to be specific. While the present critique by no means rules out the possibility of developing repair technology for frozen brains, it may help to clarify why the disagreements between cryonicists and cryobiologists are not likely to be settled by Merkle's paper.

References

1. Just below the glass transition temperature, available thermal energy is insufficient to drive even diffusive processes, but ordinary biochemical reactions require much more energy than does diffusion. Thus, the temperature below which ordinary chemistry becomes almost impossible is likely to be considerably higher than the glass transition temperature.

2. E. Whalley, O. Mishima, Y.P. Handa, and D.D. Klug. *Pressure below the glass transition: a new way of making amorphous solids.* In: *Dynamic Aspects of Structural Change in Liquids and Glasses* (C.A. Angell and M. Goldstein, Eds.), *Ann. N.Y. Acad. Sci.*, **484**, 81-95, (1986).

Alcor Abroad

Report On The European Cryonics Conference

Brian Wowk

On the weekend of October 26-28, 1990, the first European Cryonics Conference was held by Alcor at the Gatwick Moat House hotel at Gatwick Airport, England. The conference drew about 50 attendees from Great Britain, France, Germany, Austria, Portugal, Italy, Japan, Canada, and the United States. The result was a weekend of lively discussion, seminars, and intense media interest.

Media coverage effectively began on Thursday morning, with the appearance of Saul Kent and Thomas Donaldson on the Kilroy Show. Kilroy is roughly the U.K. equivalent of Phil Donahue: a talk show in which a studio audience debates topical social issues. The show focused on whether Thomas (who has a life-threatening brain tumor) has a moral right to seek elective cryonic suspension (suspension before legal death). The studio audience was surprisingly hostile toward cryonics and individual rights in general (seemingly more so than a U.S. audience would be). Several members of the audience did offer a spirited defense of cryonics, though, including Alcor U.K. member Garret Smyth.

By Friday morning, most of the rest of Alcor's U.S. contingent had arrived at the Moat House, including Carlos Mondragón, Mike Darwin, Ralph Merkle, Carol Shaw, JoAnn Martin, and Brenda Peters. They were kept busy all day fielding questions from a seemingly endless stream of radio, television, and newspaper reporters. Some of the interviews were very brief and businesslike, while others were quite protracted and personal. One case in particular, a literary critic from *The London Times* prompted Thomas Donaldson to comment, "This is different. A reporter being interviewed by cryonicists!"

Aside from being barraged by reporters, there was also some substantive discussion about the cryonics situation in the U.K. and Europe. For, while the opening of the facility is a real "high," there are also some serious problems which need to be confronted and solved if things are to remain as they are, let alone progress (See Mike Darwin's *Reflections On The European Cryonics Conference and Alcor U.K.*,

Photo: Brenda Peters

following this article).

By evening most of the international participants had arrived and were congregating in the conference hospitality room. Everyone seemed to have a working knowledge of English, and numerous small clusters of conversation quickly developed. The past scarcity of media coverage in Europe was evident as many of the attendees had only the most basic knowledge of cryonics and were full of questions about its history and scientific basis.

These questions began to be answered in a comprehensive way Saturday morning. Saul Kent opened the conference with a brief sketch of cryonics history and introduced Alcor Director of Research Mike Darwin. Mike proceeded to deliver his "How Cryonics Can Save Your Life" talk with his usual articulate professionalism.

This presentation led to to the first "excitement" of the conference; a young man got up and walked out of Mike's presentation about 2/3rds of the way through. This, in and of itself, wouldn't have caused much of a stir. The trouble is, he didn't make it very far. He collapsed while waiting for the elevator and cut his head, requiring a visit from the paramedics.

Mike was quite concerned that perhaps the slides of the suspension procedure had caused the reaction. Later, when the young man returned from the hospital we found out what the source of the trouble was. It wasn't the slides showing the surgical approach used, or the pictures of patients being suspended. Rather it was a slide of a perfectly healthy golden hamster and the discussion of the work of Audrey Smith freezing these animals that prompted the reaction. In animal-rights-conscious Britain even the *thought* of doing research on animals was enough to cause someone to lose consciousness.

Several other people remarked that ANY discussion of animal research in England is considered taboo. Cutting up people is fine, but not so little furry creatures. Chalk that one up to "greater attention needed to cultural differences in the future."

Mike was followed by Dr. Ralph Merkle and "The Promise of Nanotechnology." Ralph has assembled a fine slide-augmented presentation on nanotechnology with a cryonics angle. Ralph's speaking skills and impressive credentials make this talk a winner. I particularly liked his response to critics who say cryonics has not been "experimentally proven." Ralph points out that a cryonics experiment, by definition, requires 100 years to complete, and we cannot afford to wait that long.

The next item on the agenda was "The Controversy Over Cryonics." Actually, this turned into some fascinating discussion of the controversies within cryonics. Ralph and Mike squared off over issues like the probability of recovery from suspension and the likelihood that memory is preserved. The debate was lively and positive, with the respect each party held for the other very much in evidence. Afterwards, several participants remarked that they found such debate encouraging and that it helped to dispel any lingering doubts they might have had about cryonics being a "cult" or a slick salesmanship routine. The honest discussion of the problems and shortcomings of cryonics was welcomed.

The audience then asked questions about the social, technical and legal aspects of cryonics which interested them. This went on for an hour or so, with most of the questions being quite good.

After lunch, Saul Kent filled in for Dr. Joseph Knoll (who was unable to attend the conference) and delivered the talk "Can Deprenyl Extend the Human Lifespan?" Saul outlined the impressive evidence suggesting that the drug Deprenyl, used to treat Parkinsonism, can extend the lifespan of healthy adults if taken regularly after age 40. Saul, who has

Photo: Brian Wowk

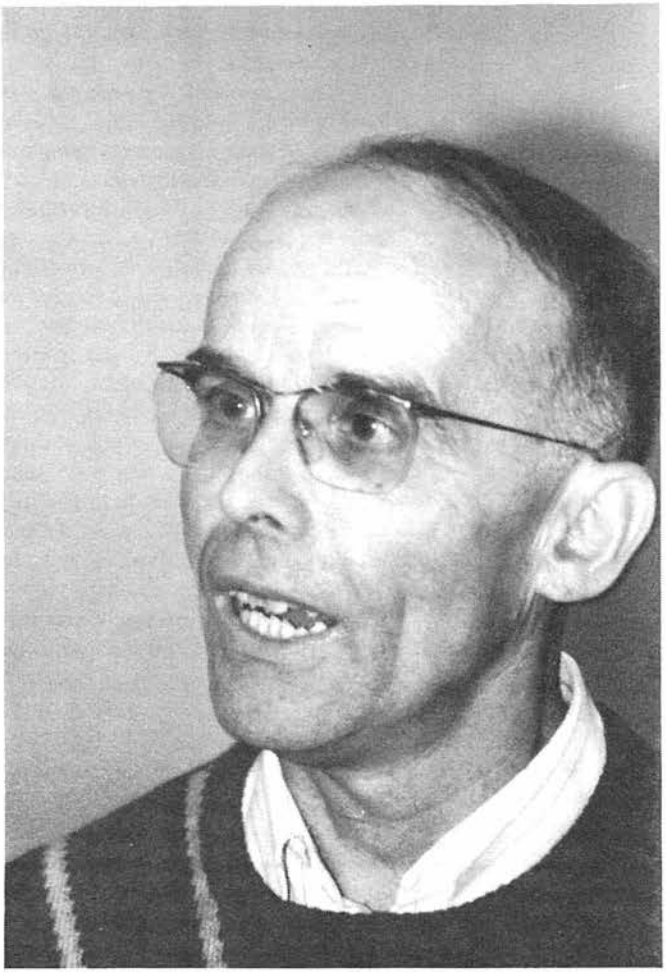


Photo: Brian Wowk

Pierre Boutron.

been involved in life extension research for years, specifically mentioned that this was the first time he has taken a position of general advocacy for a life extension drug.

Saul's presentation lead to the second "excitement" of the day. A British medical reporter (and former Pharmacist) for a leading (left leaning) London Daily went berserk during Saul's presentation. She was outraged! She was furious! What he was doing was I-L-L-E-G-A-L! Why, the nerve of him suggesting that mere *individuals* take a drug. Imagine the D-A-N-G-E-R of taking a drug which the government hadn't determined was safe or effective for treating old age. How D-A-R-E he! Didn't he know that it was illegal for a doctor to prescribe a drug for an indication not approved by the British Ministry of Health (or whatever British government agency that rules in such matters)? Did he K-N-O-W what he was doing?

The next day a vicious article appeared in her paper about the conference, mentioning cryonics only in passing and instead devoting itself entirely to attacking the advocacy of deprenyl. Accompanying that "conference coverage" was another article repeating the claims Saul made for deprenyl and the ominous responses of eminent British medical and regulatory pooh-bahs. Thus, rather amazing claims for deprenyl which only 50 or so "loony" cryonicists would have heard were trumpeted around the country for millions to hear... and wonder about. There must have been more than one or two old codgers out there with flagging libidos who said to themselves, "The hell with government, I'm going to GET SOME OF THAT STUFF!"

Finally our shrieking Pharmacist calmed down. Chalk that one up to "remember you are in a country with no First Amendment."

Dr. Pierre Boutron from the Joseph Fourier University at Grenoble, France followed with a technical discussion on "The Cryopreservation of Organs." Dr. Boutron is a chemist whose work may soon lead to the development of cryoprotectants much more effective than glycerol at preventing freezing damage. Boutron had some interesting things to say and acquainted the audience with the basics of cryobiology, as well as an introduction to his work searching for better "glass forming compounds." The significance to cryonics here is great: the glass forming agents Boutron is developing may well lead to vitrification of the brain and other body organs.

Thomas Donaldson next took the floor defending his right to an elective cryonic suspension. Conference participants were informed of the latest developments in his case, and numerous questions were asked and answered.

"Cryonics in Europe" featured representatives of various nations discussing the state of cryonics in their countries. Garret Smyth began with an overview of the progress of Alcor U.K., which included a hilarious account of the Kilroy show a few days earlier. (Garret is a superb stand-up comic.) Anatole Dolinoff, with the aid of his English-speaking nephew, spoke of his past and present work with the Cryonics Society of France, and of the numerous government obstacles to cryonics in France. Austrian Ernst Fasan spoke about cryonics in Austria and Germany. As far as Ernst knew, he was the only cryonicist in Austria and there was only a small group in Germany. Italian businessman Dan

Photo: Brian Wowk

Ralph Merkle (left) and Mike Darwin.

Photo: Brenda Peters

The Alcor U.K. facility.

David and Alcor President Carlos Mondragón spoke about the small but growing groups of Alcor members in Italy and Spain.

After a dinner filled with debates about permafrost interment and identity, Saul Kent took the podium once more to talk about his Reanimation Foundation. The Reanimation Foundation is based in Liechtenstein, which has no rule against perpetuities, and allows cryonicists to carry large estates with them into the future. It is expected that the Foundation may also eventually become involved in reanimation research.

The final event of the evening was Carlos Mondragón explaining "How to Sign Up for Cryonics," and answering numerous accompanying questions.

Conversation continued informally for many hours afterward. The atmosphere was warm and lighthearted as friendships grew amongst the many participants.

The conference ended Sunday with a tour of Alcor U.K.'s new facility in Eastbourne. The operating room, ambulance, and building in general were very impressive. Alan Sinclair, his family, and other members of Alcor U.K. are to be commended for their fine work on the facility —and the conference. Thanks also to Saul Kent for organizing and financing this historic event.

The follow-on from the conference has been greatly increased interest in the U.K. In fact, Alcor now has 17 people in the sign-up process in the U.K. We hope that this will provide some badly needed new blood and support for Alan's incredible effort in establishing the Alcor U.K. facility.

Reflections On The European Cryonics Conference And Alcor U.K.

Mike Darwin

I stayed on after the conference to work with Alan Sinclair and train some of the London Alcor Members in transport/stabilization techniques. I found my weeks in Britain very worthwhile and I learned more than a little.

But I also was struck by a sense of *deja vu* which was not altogether welcome. I found myself a potential Cassandra; able to see the course of events likely to come and perhaps powerless to change them.

For while Alan Sinclair has done an incredible thing in creating Alcor U.K., the fact remains that he has done it largely alone. It seems that as cryonics begins in each new environment, the same old pattern with a few simple variations exists. A lot more people like to **talk** about cryonics than really DO something about it. When someone comes along who is willing to make a real commitment and DO something, there is often a long, thankless period of time before his or her commitment is matched with anything like the effort it deserves. I was painfully reminded of the colossal labors of early pioneers like Ev Cooper, Curtis Henderson, and Saul Kent whose efforts were rewarded with neglect, envy, and being taken for granted. These men found little support for their enormous endeavors, but plenty of criticism and freeloading by people who compounded the affront by considering themselves superior.

Alan Sinclair has spent nearly 300,000 pounds ($600,000, U.S.) setting up the Alcor UK facility. Sadly, he has found little support, financial or otherwise, amongst the few other cryonicists in England. Indeed, while some effort at securing training has been forthcoming from other locals, there is missing a key ingredient of pride and team-work which I have observed in other groups and which I consider essential to any hope of long-term success.

Sometimes it's the little things that tell you so much. When I found only myself (or Alan) cleaning the windows and washing the dishes at the facility, I knew there were problems. BIG problems. I also observed that other than in Alan, his wife Sylvia, and his business partner Janet, there was absolutely no sense of proprietary interest in the facility.

Here in Riverside as well as with the local groups, there is a steady stream of support: people have pride in our facility and give us art to hang on the wall or make life more convenient or more attractive for staff and visitors. That is missing there.

More to the point, what is also missing is financial support. Alan cannot continue to carry the heavy financial load he is carrying alone. To this end, we are doing what we can here and have begun to refund most of the U.K. Emergency Responsibility dues to support the Alcor U.K. operation. However, we must be realistic; our efforts in this regard must only be regarded as "band-aids" and will do little to address the magnitude of the problem.

We are also working very hard to speed up membership processing for over-

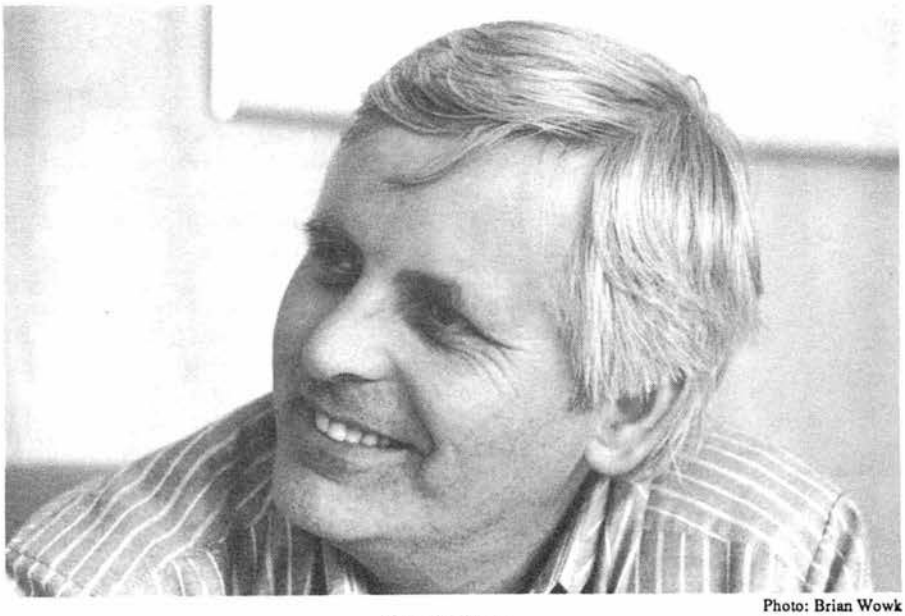


Photo: Brian Wowk

Alan Sinclair.

seas applicants so that the AUK revenue base will expand as rapidly as possible. But beyond that, a message needs to be sent out to ALL the cryonicists in England and in Europe. Quite simply: You have been handed an incredible advance and an incredible asset. It is the kind of progress that should make you dizzy with gratitude, for it represents an accomplishment and a capability that took us in the United States nearly 20 years of aching, backbreaking toil to create. Don't blow it. Get behind it and make it work.

Both Carlos Mondragón and I believe that because Alan put everything into place himself and so generously and decently made it available to others, he set himself up for being taken for granted. We have made the same mistake here once or twice in trying to equip field units. The rule of thumb is simple: If you didn't work and slave and sweat and plan for it, you don't really *care* about it. This realization has lead to some real changes in the way we handle local groups. We no longer just "give" local groups a capability. Now they have to both work for and pay for it.

There are very few faces left at Alcor from the first few days of Alcor when it was all talk. Talk is cheap, fun and easy. Real cryonics can be fun, but it is neither of the other two. It's time that the cryonicists in England and throughout the rest of Europe wake up to this. The time for idle philosophizing and regional factionalism is OVER. You have been handed an opportunity to have a real, high quality, workable capability in your neighborhood. And whether you are German or Italian, French or Dutch, Alcor UK is your best shot and you'd damn well better get behind it and make it work while you still can.

That means voluntary giving, it means investment (yes, Alan is not only willing but anxious to take on other investors), and above all it means doing work to polish that capability and to transform that facility from a well equipped but otherwise lifeless, empty, hulk into a working, living, breathing entity in which you can all take pride.

It's really all up to you.

A Busy Week

Part I: The Transport Protocol Training Course

Ralph Whelan

The last week of 1990 was so busy, it's going to take two months just to talk about it.

Actually, let's take the last five days of 1990 and the first two of 1991. That is Busy Week Proper. (And how could we count December 25th, when everyone was home celebrating Newton's birthday?)

So we'll start with December 27th, which saw fourteen cryonicists converging in the operating room of Alcor Southern California for Day One of what was to be an intensive five day cryonic suspension Transport Training Course course. Present were Fred Chamberlain, Linda Chamberlain, Arel Lucas, Arthur McCombs, Carlos Mondragón, Mike Perry, Naomi Reynolds, Joe Tennant, Mark Voelker, Ralph Whelan, Russell Whitaker, and Resusci-Annie (honorary cryonicist). Mike Darwin presented the first day's instruction, with Hugh Hixon *behind* the camera (not an accident).

The course was designed to train us in the emergency stabilization procedures Alcor uses to recover and transport cryonics patients for subsequent perfusion and freezing. And if you're thinking that this probably amounts to calling Alcor and then promenading down the block to Lou's Discount Liquor for some ice, you've got another thing coming.

Day One

Mike had circulated the Transport Protocol Manual—with specifications of what was to be memorized—weeks before the course began, so we all had plenty of time to think about how little sleep we'd get on December 26th.

Though the transport medications were all in the Manual, Fred and Linda had been nice enough to provide Mike with a medications "glue sheet" for circulation to everyone in the course. They used simple mnemonics, alphabetically ordered, as a memorization aid. A typical example: "Methyl bread is nice alone" becomes *methylprednisolone*. Pretty silly, huh? Not if it's *your* cell membranes that I'm stabilizing. The memorization aid methods they use I found absolutely priceless.

So that's how it began. A few of the attendees—myself, for instance—had never taken part in a suspension and had no real medical experience, formal or informal. Plus, high school chemistry and biology are deep in the past, buried under layer after synaptic layer of Bart Simpson and Oprah Winfrey. We needed a refresher.

Mike Darwin began with a description

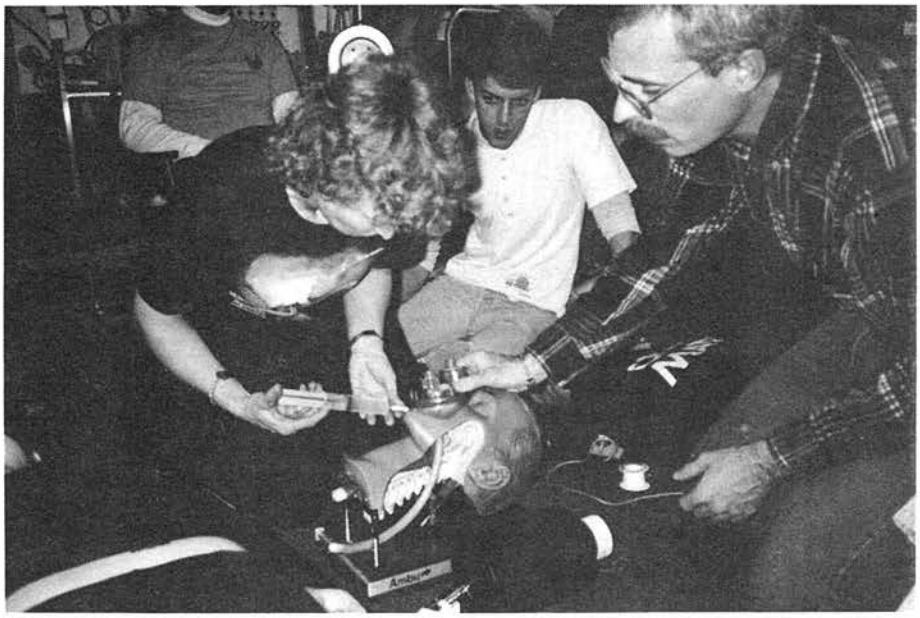


Photo: Russ Whitaker

Learning to apply the EGTA.

of basic cell structure and function. To understand what sort of damage we'd be combating and why, he examined how the normal cell operates, what sort of functional level it strives to maintain, how it generates its energy, what it does with its energy, what it does when it *doesn't get* energy, et cetera. Something that I got out of that presentation that will really stick with me is a sense of a crucial *balance*. It seems that a cell is an incredibly complex system of checks and balances, expending the bulk of its energy trying to minutely raise or lower its ratio of *this* to *that*, with the windows of acceptably concentrated *this* and *that* being very unforgiving. (Pardon the obtuse medical terminology.)

What is the importance of looking at it this way? Well, beyond making every minute of ischemic time much more ominous (ignorance was bliss), this outlook lends a structure to the order and quantity of the transport medications. Further, as the process of death stops being merely *decay* and takes on a stratification of damage that can be ordered in importance (according to speed of imbalance, reversibility, repercussions, *et al*), "death" loses its sudden Dying of the Light aura and becomes. . . *just another series of potentially reversible chemical changes.*

Albeit a dire one.

But I digress. Mike wrapped up his discussion of cell structure and function and moved on to groups of cells. We examined some of the broader aspects of ischemia (absent or inadequate blood flow), the things that we try to reverse and the things that we know we can't, etcetera.

Then we went a step further, to reperfusion injury (the damage that occurs as a result of re-starting circulation). This is an aspect of injury that most people don't consider when they think about the damage with which we are contending. Third spacing, tissue swelling, alterations in the permeability of the capillary beds. . . all of these things and more lead to forms of damage that we grudgingly accept in exchange for damage that we think is far more severe. Function is sacrificed for structure, and information preservation becomes the gold standard.

Then Mike's presentation became somewhat non-technical. He spoke about proper preparation and the things we should always have at hand (for instance the Overnight Kit). We discussed the psychology of dealing with hospital personnel, from nurses and doctors to hospital administrators. He also described our responsibilities as transport team leaders or members, and the conditions under which our obligation to the patient may be transferred to someone else or even ended altogether.

As we got more on the track of hospitals and hospital staff, the instruction turned to medical charts and records. After telling us a bit about what to look for and how to understand it when you find it, Mike turned the floor over to Arel Lucas, Alcor stalwart from Northern California.

Arel gave a very informative overview of medicalese. Specifically, she dispelled my secret conviction that every hospital runs all its reports through a Random Acronym Generator. That alphabet soup *means something*, and once you have the secret decoder ring, you're privy to almost all the information that the hospital has about the patient. And just as importantly, you can log and understand the treatments that the patient has received, and when and how s/he received them. This is crucial to your understanding of what the hospital is doing to keep the patient alive, which often isn't much. (More on that when I cover Steve Harris' presentation below.)

Arel also spent a good deal of time covering medical examiners, coroners, coroner's cases, and how to deal with all of the above. She described in detail just exactly *what happens* to coroner's cases, just in case anyone was thinking of volun-

Photo: Carlos Mondragón

Checking vital signs.

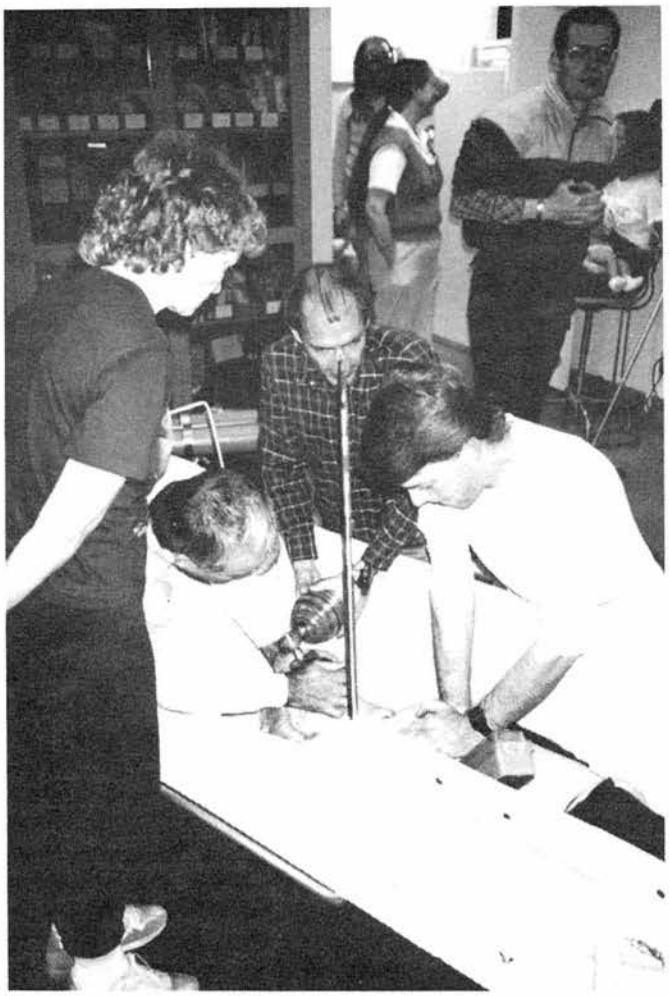


Photo: Carlos Mondragón

Manual cardiopulmonary support.

teering. She gave the standard advice about how to avoid becoming a coroner's case ("Don't die"), plus a lot of very good advice about how to open lines of communication with your coroner or medical examiner right now, to avoid confusion and suspicion later. I think the moral of that story was that no one likes to have the rug (and the floor, and the surrounding few city blocks) yanked out from under him. Human beings do not like surprises. *Neither does your coroner.* Tell him what's going on and what to expect. If he starts fumbling for his red tape, *call the movers.*

Exeunt fourteen cryonicists. (Casualties: zero.)

Day Two

Day Two essentially belonged to Dr. Harris. Here we had an hours-long and extremely informative session on diagnosis and prediction. Steve endeavored to give us a one-day seminar on how to predict, at least broadly, how much time remains in a patient's first life cycle. (How's that for conciliatory phraseology?)

Steve began with basic anatomy and physiology. He actually talked us through the broad strokes of all the major organ systems. This was done so that we would understand what each system does for the body, what would happen if it stopped doing it, and how the cessation would manifest.

The simplest and most insightful way to analyze a patient's condition is to let the hospital do the work for you. Accessing the patient's records isn't always easy, but once you're in the loop it's all there for you, if you know how to read it. (See Day One.)

But knowing how to read it is at most half the battle. Okay, so I can look at an inch of chicken scratch and determine that the patient's creatinine level is 4.0. What does that mean? All right, so I can describe to you, in medical terminology, exactly what it means to have a creatinine level of 4.0. What does that imply? What can I deduce about the patient's overall condition from that datum?

This was the thrust of Day Two: how to make the hospital work for us. If the patient is in a hospital, those lab results are hanging around there somewhere. You should be able to acquire them (Mike's discussion of how to deal with hospital personnel), you should be able to read them (Arel's discussion of Dr. Cryptic Scrawl), and you should be able to interpret them (Dr. Harris' discussion on patient diagnosis).

One way of interpreting them in order to assess the patient's condition and prognosis is to complete what's known as an APACHE profile on him/her. APACHE stands for "Acute Physiology And Chronic Health Evaluation." It is an analytic method developed by intensive care physicians which (among other things) divides a patient's organ systems into eight categories, and then assigns "points" to certain key lab test results in each category which indicate how well that particular organ system is doing its job. This allows you to visualize the areas of acute injury to the patient, as well as the patient's overall condition. Adding up the total number of points which come from abnormal lab test values has also been shown to give a good estimate of how likely the patient is to deanimate on that hospital admission.

This allows you to visualize the areas of acute injury to the patient, as well as the

Photo: Carlos Mondragón

Drawing up the transport medications.

Photo: Carlos Mondragón

Aspiring phlebotomists.

patient's overall condition. Properly used, the APACHE system should allow the Transport Team to *predict* with about a 90% degree of accuracy whether or not a patient will survive a given ICU admission. Obviously, this can be critical in determining whether or not to dispatch a remote standby team. Also, the APACHE system—coupled with other indicators that Mike Darwin spoke of later in the day—can be used as an indicator to tell the Transport Team when they *really* need to start getting ready and drawing up medications and so on.

A very important offshoot of the knowledge thus gained is the ability to set treatment priorities. Often we (cryonicists) think of our patients as beginning from an equilibrium point—at the time of legal death—and then rapidly declining. Usually, in fact, the physiological decline begins before—sometimes long before—death is declared. In every case, the "pre-mortem" damage will be different, and the ability to assess this difference where it affects the brain, and adjust to it during suspension, could mark the difference between deanimation and death.

A further benefit of knowing how to make the hospital work for us (as well as the patient) is the ability to be able to tell when the hospital isn't working all that hard. Here we encounter the DNR (Do Not Resuscitate—a.k.a "No Code") orders, which are often a signal to do much less than the maximum available treatment. This is not to demean hospitals, though. Often the attending physician decides, justifiably, that resuscitating the patient will only briefly prolong a very low quality of life. In such cases, the patient may be "No-Coded," which means that no attempt to resuscitate him/her will be made should legal death occur. The "No Code" order is also often a clue that the attending physician is going to order a lot less lab work (depending on the situation), because the patient is "terminal."

For your average dwindling citizen at the end of his/her life, this graded scale of medical care is probably not such a bad thing, since it conserves scarce medical resources and shortens that part of the dying process where everyone "just wants to get it over with." For cryonicists, though, decreased high tech medical support of the "moribund" can be good or bad depending on the situation. On one hand, we don't want cryonicists who are going to deanimate anyway kept alive a few more hours or days by high-tech medicine, while brain damage continues. On the other hand, sometimes lab tests that would make no difference to a "dying" patient in the traditional medical setting, can be very helpful to a suspension team that is naturally trying to figure out what's going on physiologically with the patient right to the very "end" (and past it). The rub is that doctors aren't used to backing off on one kind of care without turning off the other.

Toward the end of the day, Steve turned the floor back over to Mike for a look at the question of predicting short-term disease outcomes using the "hands-on-the-patient" approach. Mike presented his rules of thumb for a clinical determination of when a patient is very close to requiring our services. This approach entails dealing with the sort of information you'd get in confronting the patient directly, rather than through his lab results, and includes blood pressure, heart rate, responsiveness, respiration. . . all the telltales that you can gather right at the bedside. Here the hospital does not need to work for you (you're assessing the patient yourself), and these methods become extremely important in situations like those discussed above where the patient may be getting less than maximum medical care—and especially where a patient will be deanimating in a non-hospital setting, such as a hospice.

I left Day Two feeling like I'd just

Photo: Steve Harris

Mike Darwin explains cardiopulmonary support.

Photo: Steve Harris

Mark Voelker demonstrates onion ring agglutination.

uploaded the contents of a pre-med chip.

Day Three

Day Three was all hands-on. Mike introduced us to the Thumpers, the automated cardiopulmonary support machines, of which there are two models: the conventional Thumper, and the Hi-Impulse Thumper. Mike stated his expectations very plainly: we all were to be able to adjust the height setting, lock into place, and turn on either of the Thumpers in seven seconds or less (the setting mechanisms and procedures for the two Thumpers are quite different).

So, after explaining how to put the Thumpers together, how to hook up their oxygen supplies, how to adjust their settings, etcetera, Mike did a few dry runs for us and then cut us loose to set and reset and rereset the Thumper on Resusci-Annie.

The Thumper training went very well. Everyone got his/her Thumper setting time down to seven seconds or under (or just *slightly* over), everybody got to repeat the performance with the variations on the Hi-Impulse Thumper, there were no equipment or personnel failures, and no fingers got Thumped.

So we moved on to airway management. The instructions for intubating the airway are, I think, more involved than the Thumper instructions. Although the principles remain constant, practical variations abound, with divers tracheal tubes and esophageal tubes and the like. Mike compounded the frustration by noting that there was a new type of tube that was basically idiot-proof, but that we couldn't use "just yet."

Our learning efforts were focused on the Esophageal Gastric Tube Airway (EGTA), which is supposedly simple and straightforward to use. We also learned about endotracheal tubes, since they will often be already in place in hospitalized patients whom we transport. After learning where and how to apply each type of tube, we learned how to properly seal the EGTA, how to apply the end-tidal CO_2 detector, how to make the switch from the manual (bag) respirator to the Thumper respirator, and other particulars. It was time to move on.

Linda Chamberlain, co-founder of Alcor, took our attention with instructions for CPS (which is basically CPR, but with a few minor changes since our goal is Support rather than Resuscitation). We were fortunate to have a Resusci-Annie designed to indicate proper CPR compressions, so I'm confident that everyone got comfortable with the process.

Then, with all the pieces in place, we ran repeated support scenarios, in which we each took turns giving Annie CPS until someone else took over with the Thumper with less than seven seconds of compression interruption. All of this we did in the Patient Ice Bath, to simulate what is likely to be the case in the field.

In between episodes of practice with the above, we experimented with taking each other's pulse and blood pressure.

So went Day Three.

Day Four

Day Four was busy. The early part of the day was taken up with something about which I think everyone was a bit dubious at first, but which may have been the runaway hit of the course. Mike decided to run a brief bit of role-playing, in which someone would play the Cryonicist On Call and someone would play the Hospital Administrator. In the scenario with which we experimented, it was the job of the calm, cool, collected, informed cryonicist to succinctly present our case to the cynical, unimpressed, borderline hostile, litigation fearing, steeped-in-convention-and-tradition deathist hospital administrator.

For the first take, Mike was the administrator and I was the cryonicist. Mike took it easy on me, so I did fairly well. Unfortunately, Mike made the mistake of offering to switch places with me. But the truth is, Mike did quite well despite my contrived intransigence.

For the third and final take, Russell Whitaker took the role of cryonicist and I stayed on as hospital administrator. In this enactment I think I became even more difficult, and all of us—especially Russell—got a taste of what it's like to be On The Spot. Having everyone else around and a camera running did a lot to simulate the kind of pressure one would actually feel in the administrator's office. I think the consensus was that the next course will have more time allotted for this.

Most of the rest of the day we spent on medication administration and phlebotomy. That is, giving shots and IV's and taking blood. This included drawing up the medications, keeping the needles sterile, avoiding infiltrations and hematomas, keeping air out of the syringes, and keeping air out of the *patients*. We spent a lot of time examining how easy it can be to accidentally inject large (and lethal) amounts of air into a patient, and Mike minced no words about how irresponsible an act this was.

Naomi Reynolds (a licensed phlebotomist and Emergency Medical Technician) assisted in instruction when we concentrated on phlebotomy. This took a couple of hours, since everyone had to demonstrate proficiency on an arm mock-up. Eventually, though, we were able to put all of this aside and let the real fun begin: the testing.

I won't say much about the transport medications quiz and the final exam, except that there is a lot of information in

that transport protocol manual. Pick it up and look at it some time. A lot.

Day Five

The mathematically minded may now note that we've reached New Year's Eve. It being thus (and the final exam being past), the Day Five mood was borderline festive. Furthermore, we all knew that we had a *very* interesting day ahead.

How right we were.

Miss Piggy, the second honorary cryonicist of the course, was a 105-pound pig. After a little help in the Feel Good department, she was to be the proof of principle that we all had the right stuff. We began gearing up for our demonstration of knowledge.

But when Missy Piggy was still only shortly down the Yellow Brick Road, Carlos Mondragón excused himself to take a telephone call. After a brief absence he returned to say that Miss Piggy may have received a stay of sentence. He asked Mike to pick up and talk to the doctor on the line, who'd called to advise us that one of our members was about to go in for surgery, would certainly die if she didn't have it, and would almost as certainly die if she did.

Photo: Carlos Mondragón

The final exam.

Next Month: ***A Busy Week, Part II: The Cryonic Suspension of A-1268.***

Book Review

Queen of Angels by Greg Bear

Warner Books, 1990, $19.95

Steve Bridge

One of the things we as cryonicists talk about most often is: How will we react when we awaken fifty or one hundred years from now? What will it be like to confront a world where we have missed decades of change in technology, style, history, culture, even language?

It will be like this novel.

I don't mean that the specific details of the future will be the ones of Greg Bear's imagination. I mean that reading this book is like waking up in the future. In *Queen of Angels*, Bear attempts to give us a novel that feels like it was *written* in the future. He describes future scenes and action with no rhetorical explanation, very little exposition, a minimum of fake quotes from future writers (and these are primarily of a philosophic nature), and no authorial interjection. He invents a future Los Angeles (City of Angels, to point out only one variation on the title), bizarrely and magnificently altered by nanotechnology, advanced psychotherapy, genetic manipulation, and space travel—and tells you his story from *inside* that future.

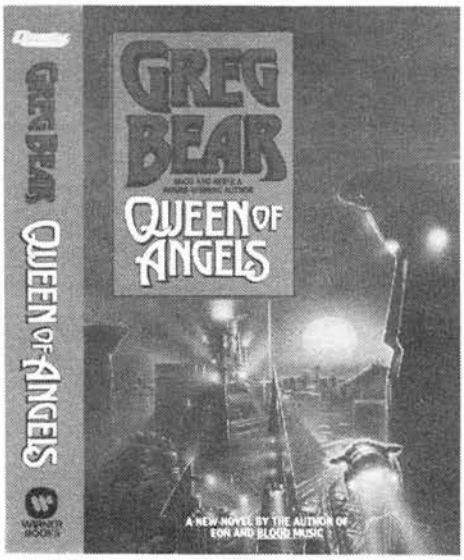
To open this book is to wake up in Bear's future, no explanation, just winging it, trying to figure out what is happening as you go, picking up clues as you are propelled through the story. Even the language is changed. Bear has not merely invented new terms and technical words; the very pattern and flow of the words is different, sometimes to the extreme of a poetic stream of consciousness (when part of the story is told from the internal point of view of a poet). While some may be put off by the lack of punctuation and unusual word choices in these sections, I think it sets a tone that makes it more remote from us and makes it possible to believe (in a fictional sense) that the book was written in the future. (Besides, why should all books be easy?)

Queen of Angels uses nanotechnology as a key to social change more than any other novel yet published. (There is no mention of cryonics, but that subject is treated in another recently published Bear novella, *Heads*, which we hope to review soon.) While nanotechnology forms a framework for the civilization in this novel, nanotechnology is not really the *subject* of the book. Bear uses this society as a background for a story about guilt, sin, retribution, and the discussion of whether or not these concepts are necessary for self-awareness.

Queen of Angels takes place in 2047, just before the "Binary Millennium" (in binary numbers 2047 is 11111111111 [eleven 1's] and 2048 is 100000000000 [1 + eleven zeros]). In

this time, advanced neurotherapy has led to most criminal types being *therapied* (an involuntary, literal rearrangement of neural pathways). One does not "receive therapy"; one "gets therapied." A new class structure is developing between the therapied, the *naturals* (those who don't need therapy), and the *untherapied*, (those who haven't been therapied but whose neighbors think they should be).

There are also psycho-vigilante groups called Selectors, who feel it is their duty to ferret out the "criminals" (by the Selectors' definition, of course) and subject them to a particularly brutal and illegal form of mental torture called the Hellcrown. While many artists and other purposeful outsiders remain untherapied, to keep alive their individuality, it is thought that all of the



really awful homicidal types have been caught and changed. But in this perfect psychological world, a well-known Black/Jewish poet, Emanuel Goldsmith, has apparently murdered eight young people who were part of his adoring circle.

This incident drives the plot of *Queen of Angels*, along with one other unrelated happening. Humanity has sent its first automated probe to Alpha Centauri B, the nearest star, to look for planets and life. The probe is guided and commanded by AXIS, an artificial intelligence "being" which is developing close to the level necessary for self awareness.

The book is seen through the points of view of three human characters and a non-human one:

Mary Chou is the super-moral police investigator assigned to track down Goldsmith. She is a transform, an enhanced human (by choice) whose physique and inner workings have been changed to make her stronger, quicker, and nearly tireless.

Richard Fettle, failed poet and friend of the murderer, is shocked by the killings. As he attempts to write a piece which explores Goldsmith's motives, he begins to contemplate murder himself.

Martin Burke is a psychotherapist who several years previously had developed a system for sharing the subconscious of another person in such a manner as to learn about his fears and aid his therapy (the voluntary kind). (An acquaintance has suggested to me that much of the psychology in this book is influenced by Minsky's *Society of Mind*, but I haven't read that book and cannot confirm that.) A wealthy friend of Goldsmith (who is also the father of one of Goldsmith's victims) hires Burke to enter Goldsmith's mind to find out why he murdered these young people.

The fourth point of view is that of Jill, another artificial being assigned to monitor and interpret the output of AXIS, but who seems to be having an identity crisis of her own. Jill's attempts to understand human concepts provide some of best insights of the novel. "I am limiting my systems to human processing volume and speed to try to simulate a human personality, to pick up clues on what being humanly self aware implies. I am worried that being self aware could be a limitation not an advantage..." Bear also hints that if self awareness is a product of something more than mere complexity, of some further "psychological" process, then perhaps "a significant percentage of human beings may also be little more than convincing automatons."

Bear's future society has many of the logical technological results of nanotechnology and advanced computer power. Some of the more interesting include "nano-art," which can change color and have motion, and the incredibly detailed forensic report on the murders, which is provided by molecular investigators. Another striking description is that of an old building being transformed by nanotechnology, which makes an interesting contrast with Mary's own previous reconstruction by nanodevices.

Another use of nanotechnology is more chilling (though obvious to many of us)—Bear refers to "nanowatchers in the paint," nearly undetectable anti-privacy devices. One theme of the book is the conflict between the need to protect the privacy of individuals and the need to protect society and individuals from harm. It should, perhaps, be obvious to us that an advanced control over matter, especially the ability to control and change ourselves, will change how we THINK about our humanity. One possible reaction to the assumed ability to be "perfect" is that some groups (such as the Selectors) will

Greg Bear

assert that everyone has a *responsibility* to be perfect. And that their group can and should decide when others are in compliance with that notion of perfection. I suspect that few of us would be happy with someone else deciding for us what the ideal of perfection will be (an opinion expressed a couple years ago by Cath Woof in the pages of *Cryonics*).

Bear, through the personage of the computer simulation Jill, implies that while making such extreme mental changes might get rid of the most harmful deviants, they might also lose humanity its creative people; not just artists, but "'mover shaker', 'captains of industry' leadership types," who tend to operate outside of the bounds of convention. These are important considerations for us as potential residents of a future in which such things are possible, perhaps

as the people who will make some of those very decisions or who will influence the philosophies of those who do.

Queen of Angels will be a fascinating book to many of our readers, but perhaps an irritating one to others. The characters are not as deeply explored as I would like, perhaps because the point of view is spread between four. And the language changes, especially in Richard Fettle's sections, will not please those who want a story told logically and all spelled out. It is not an "easy read." But the book also reminds us that "reality" is not really knowable, that we can only deal with comparing each other's *individual perceptions* of reality. Insights like these, and the many others Bear offers, makes this an adventure of the mind for the persistent reader. We will need many such explorations of reality to prepare us for the real future, still unimaginable in many ways.

Questions (And A Few Answers) About Memory

Part Two of Two

Thomas Donaldson

This is a continuation of my 1990 Asilomar conference talk, the first half of which ran in the January, 1990 issue of Cryonics.

[The figure numbers are an artifact of the talk and will not correspond to their sequence here. —Ed.]

***Question 2:** How does neuron memory work?*

This is a question about the units which make up the brain, rather than the workings of the brain as a whole. Regardless of whether or not we accept a computer analogy, it seems fairly clear that we can separate them—at least partially.

Almost everyone thinking about this problem makes one fundamental assumption. Any assumption so widespread at least deserves discussion, so I shall turn the assumption into a question: Are neurons the fundamental units of our thinking?

Many neurons have widespread branches. It's reasonable to ask if something so spread out has any unity at all. Perhaps we will find out that neurons, generally, do not. In this respect they might resemble computer chips much more than many anticipate: the chip (i.e., the neuron) serves to support many processors, conceivably acting quite independently. At least one team of experimenters have found evidence that they interpret as exactly this (W. Ross et al, *PROC ROY SOC*, **24**, 173 (1990)). Currently no one else supports this idea, but in logic and truth that should mean nothing.

Such an idea might not even be unreasonable. After all, not every neuron conforms to the axon-dendrites plan. Some have more than one axon; others apparently none at all. Furthermore, most neurons have a very extensive, branching tree of dendrites. Why shouldn't independent processing go on in the different branches? Just like any other widely unspoken assumption, this one deserves experimental attention (cf. Figure 3).

The synapses are special regions in neuron walls where they contact other neurons and pass impulses, generally for each synapse only in one direction. Current biological work on memory is filled with experiments studying a synaptic phenomenon called Long Term Potentiation (usually spoken of by its initials, LTP). The phenomenon is that neurons respond differently to single bursts of electric current across a synapse than they do to repeated ones. In the latter case the synapse changes its state: where before it would take more voltage to cause a response, afterwards it takes significantly less (Figure 13). This effect is known to persist for days, although to my knowledge no one has attempted to show it persists for times equivalent to what we know of as "long term memory," i.e., decades. Even experimental proof showing persistence for six months would help answer that question.

If I'd given this talk three months ago, I would have reported that the explorations of the actual biochemical mechanism of LTP had almost come to a conclusion. That conclusion would have stated that events in the postsynaptic part of a synapse (the cell receiving the impulse) controlled the development of LTP. We were close to tracing out the entire biochemical path causing LTP in a given synapse. Thompson's article, already cited (R.F. Thompson, *Science*, **233** 941 (1986)), reviews an earlier view of the subject.

However, other experiments recently have made the issue less clear by suggesting that events on the other side, the presynaptic side, really control LTP (cf. *Science*, **248**, 1603 (1990)). We must tolerate some more ambiguity for a while. Furthermore, if we scrutinize work on LTP closely one question comes up immediately: just exactly how do LTP and memory relate?

The question arises first because neuroscientists do a great deal of work on LTP with brain slices in culture. The experimental technique is convenient, but brain slices aren't known for their learning. Neuroscientists have tried to answer this question both by drug treatments which may inhibit LTP (N-methyl-D-aspartate, NMDA, plays an important role in LTP; blocking it

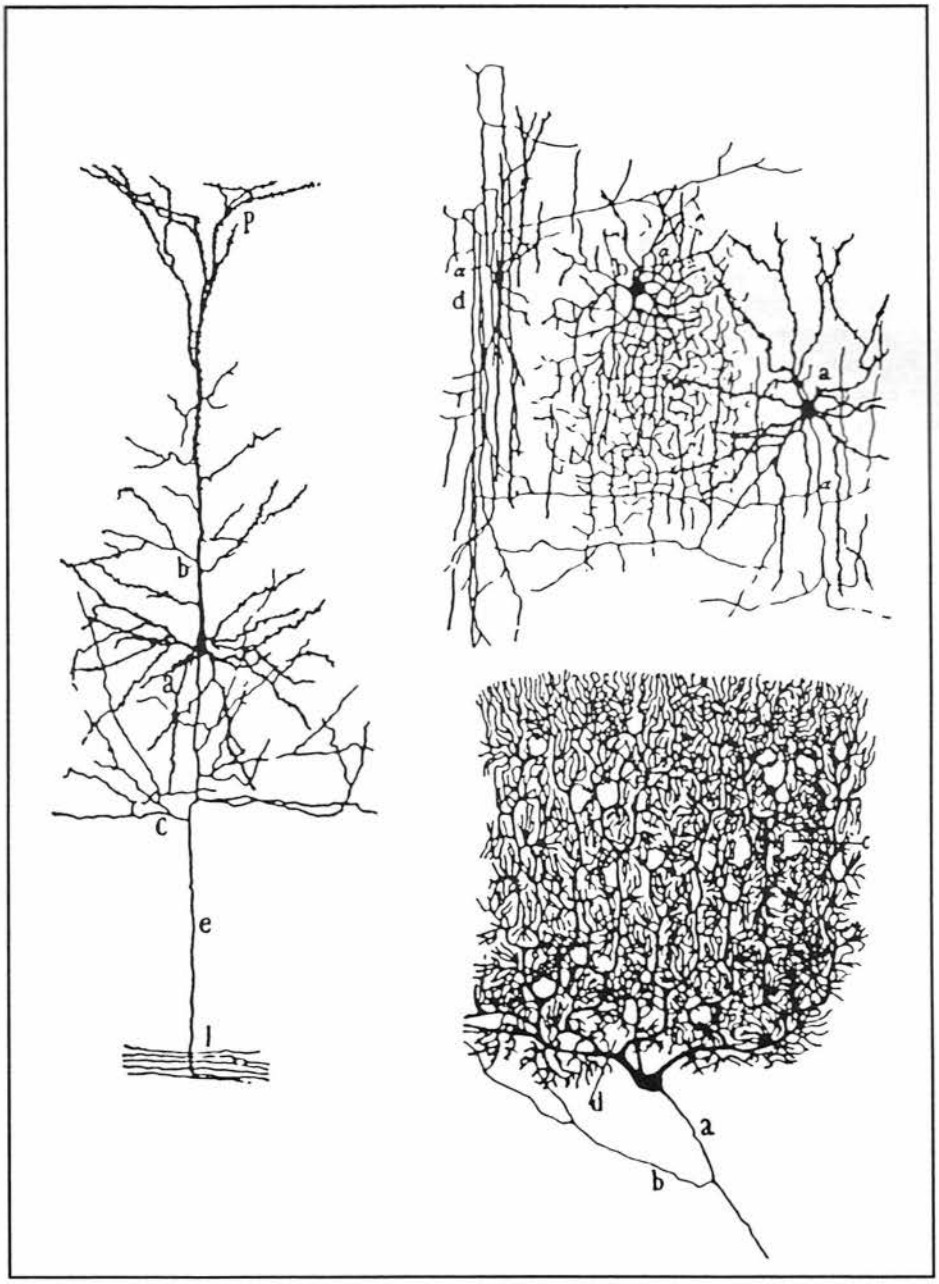


Figure 3. A view of several different kinds of neuron.

prevents LTP (R. Morris et al, *Nature*, **319**, 774 (1986))) and by studying invertebrate learning (E.R. Kandel and J.D. Sweatt, *Nature*, **339**, 51 (1989); and many others).

Unfortunately, both methods have faults. The transmitters we keep from acting may also play other roles. Blocking it only proves NMDA essential for learning, not that LTP is needed. The experiments on invertebrate learning have similar faults.

One experiment with LTP in live rats may even have shown that LTP does *not* play a role in actually encoding memory (T.W. Berger, *Science*, **224**, 627 (1984)). The experiment stimulated the hippocampus of live rats, producing an LTP-like phenomenon. It then showed that stimulated (LTP) rats learned more quickly than untreated rats. The problem with this experiment is that it goes in the wrong direction: clearly neurons showing this LTP effect cannot carry the results of training before it happens. To understand how memory encodes in our brains we need first to find changes which happen because of the coded memory itself.

Finally, we should not let LTP mesmerize us. Work on it has made rapid progress, and may ultimately lead to an explanation of memory—whether or not we ultimately find that LTP plays a direct role in coding. LTP begs for investigation. But LTP isn't the only thing happening, even to individual synapses. Synapses which carry lots of messages even change anatomically. These changes as yet have unknown relations to memory itself. As we have just discussed, they may easily result from memory without allowing any reverse deduction of the memory.

For cryonicists, however, the argument isn't between presynaptic and postsynaptic, or whether LTP actually underlies memory. The major question about synapses for cryonicists is: What is the significance of synapses to memory?

Synapses must have some significance because messages between neurons pass through synapses. Certainly we need synapses to express memory. The issue is whether or not they encode it.

Here is an analogy to make the distinction clear. Suppose an archaeologist studying a vanished civilization finds evidence of an extensive road system. Some roads look as if they carried large amounts of traffic. Others carried less. To reconstruct this civilization, the archaeologist would like to know not only that the roads carried traffic, but what traffic they carried. Our synapses may show many effects of our memories (the traffic). Their condition may even promote better memory (as better roads promote traffic). They still are not the traffic itself.

In neural terms, we know that individual neurons can use more than one transmitter (T, Hokfelt et al, *PROG BRAIN RESEARCH*, **68** (1986); I.B. Black et al, *Science*, **236**, 1263 (1987)). Synaptic signals can have different strengths. Finally, two neurons usually connect at more than one synapse (Figure 12). Each of these facts at least allows other kinds of transmission between two neurons than simply an ON-OFF signal.

One very well established experimental fact even proves definitively that events at individual synapses cannot, alone, code for memory. (They must play essential roles in the coding process, of course. But that's not the code itself). Widely accepted evidence shows that animals that engage in lots of

learning develop many more synapses, each on their special dendritic branch, than those deprived of experience (W.T. Greenough, *Science*, **206**, 227 (1979)). This process must involve creation of new synapses, and new branches on the dendritic tree. Certainly changes in an individual synapse might signal its neuron to make more synapses, but we have no evidence at all that synapses reproduce themselves. The neuron itself must have changed to create and maintain more connections.

Other changes happening to neurons along with memory don't easily fit into a model concentrating solely on synapses. Synapses contain no DNA. How then does it happen that brains undergoing learning make more DNA than those that do not? (One observation is that at the root of each projection we often have a mitochondrion. These are cell parts which actually combine food and oxygen to make ATP, the cell's energy substance. They also contain DNA. Could the new DNA be going there?)

I'm certainly not claiming that the encoding consists of a multiplication of synapses, either. But we know that other things are happening that must necessarily involve the entire neuron. Focusing solely on synaptic changes will not explain these other changes. Even if synapses themselves turn out to be extremely stable over very long time periods (about which I've already raised some very serious questions), that gives us no better reason to believe they encode memory than before.

Cryonicists will want to know answers to another question, too. Currently the only serious attempts at long term storage aiming at eventual revival involve freezing: *What happens to neurons when frozen?*

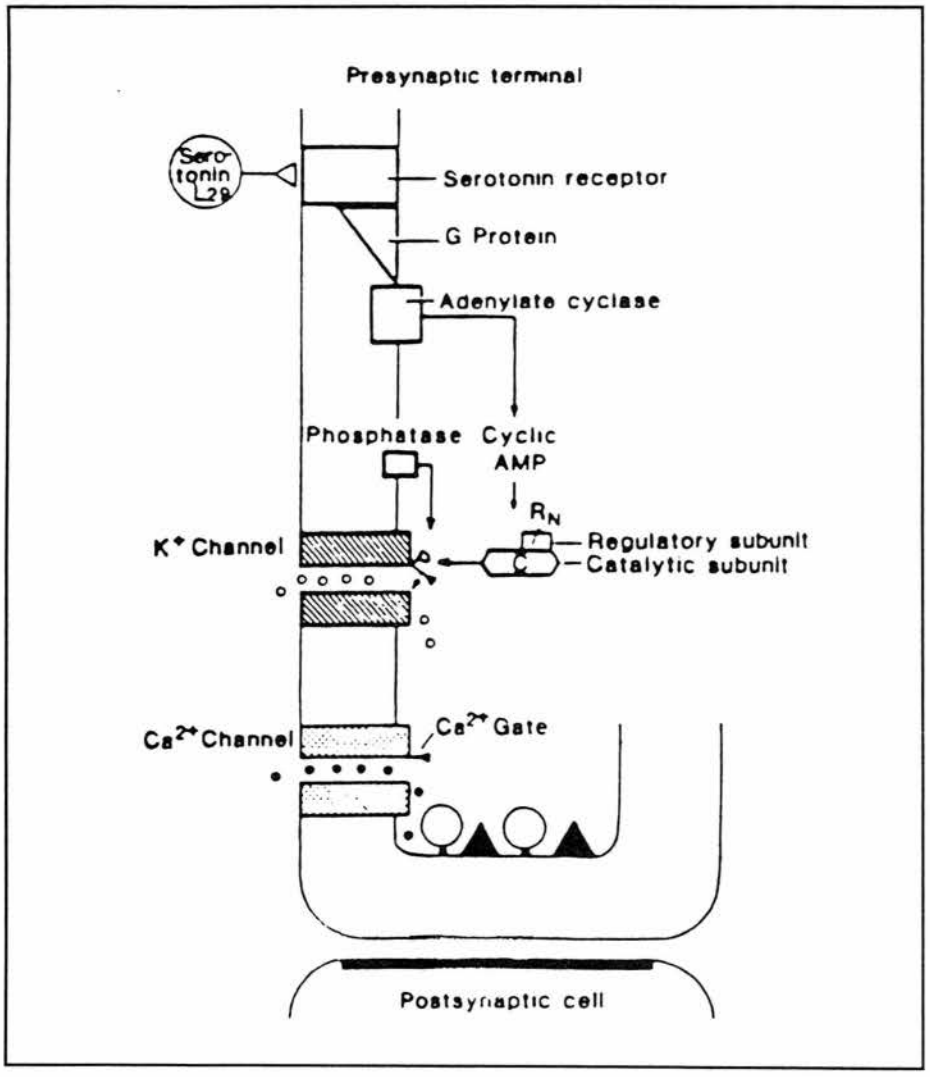


Figure 13. Kandel and Schwartz model of LTP.

In a sense, some serious—though simple—progress on brain preservation has occurred during the last fifteen years. When I first searched through scientific literature for evidence that neurons could survive freezing as isolated cells, nobody had done that experiment. (Neuroscientists had an excuse, since this would take experimental abilities they did not have at that time). However, since then individual nerve cells, at least from embryos, have definitely been shown to survive freezing, just as does any other body cell type (cf. the work already cited by Houle and Das).

As cryonicists, we'd like more direct evidence that individual adult neurons survive freezing than we have now. Work on embryonic cells was done for "ulterior" motives: to show that embryonic brains cells can be stored for use in later transplants.

Unfortunately, these experiments haven't gone as far as they might. Judgment that the neuron survives comes from its appearance (as a neuron) and ability to perform normal and general cell functions. Any connection with memory, for instance with survival of LTP or any of the chemical substrates of LTP, hasn't yet been tested. This would require preservation of adult neurons, of course.

Further, what happens to synapses when frozen? So far as I know, nobody has tested for persistence of LTP after freezing. Nor has anyone explicitly tested for any of the other synaptic changes. However, for cryonicists we have some moderately good news: several different investigators have shown that individual synapses will survive freezing down to LN2 temperatures. They will function afterwards (P. Drapeau, *J NEUROSCI METH*, **24(2)**, 111 (1988)).

Here is what is done: synapses, just like other cell parts, will separate into their own bits of membrane if the cell is disrupted. Neuroscientists call these synaptosomes, though we should understand that synaptosomes as such don't exist in living neurons. The value of doing this is that much more detailed biochemical study becomes possible. When these scientists say that their synaptosomes "function after freezing," they mean (primarily) that they will respond properly to the right nerve

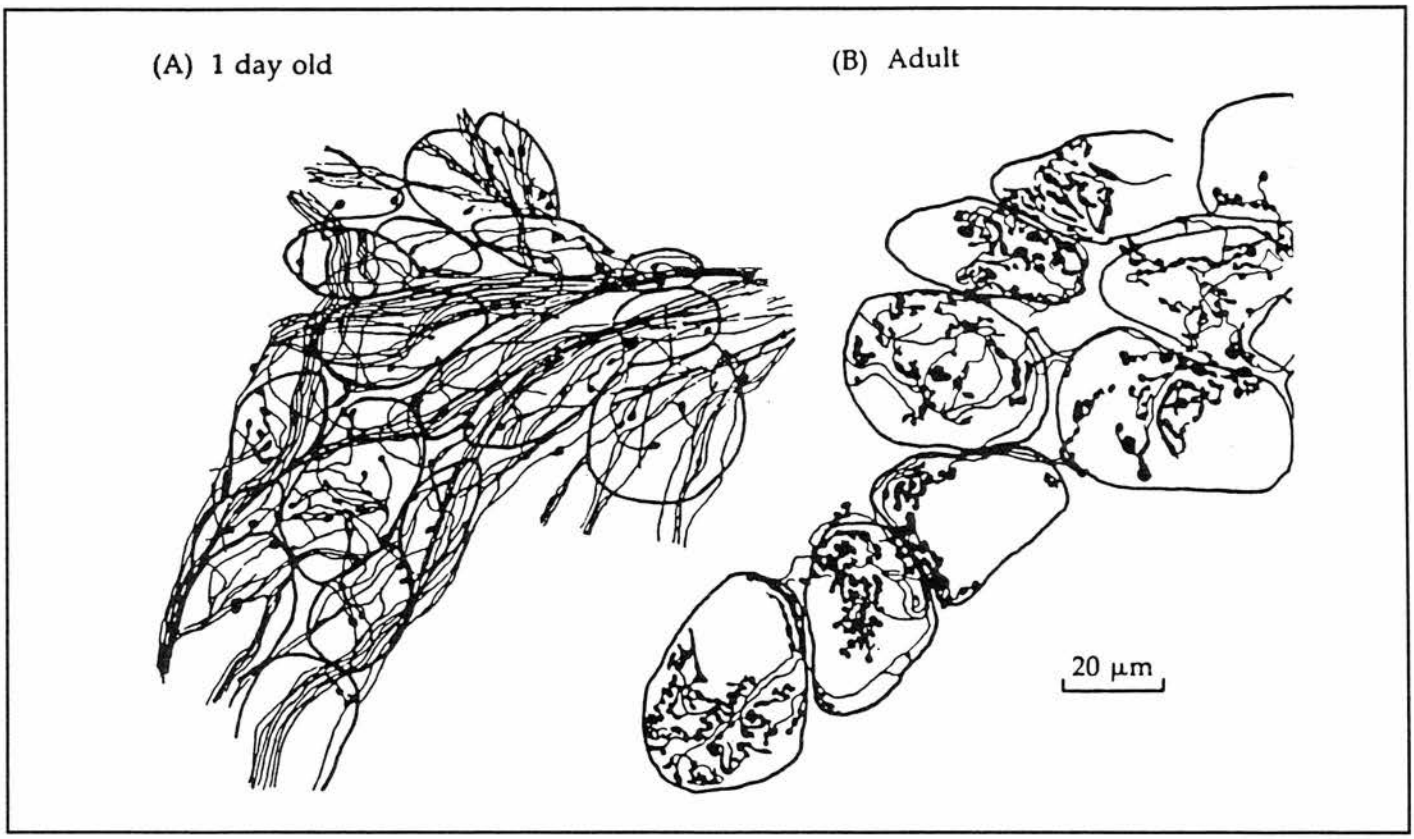


Figure 12. Multiple connections between the same two neurons.
From D. Purves, J.W. Lichtman, *Principles of Neuronal Development*, 1985.

transmitting chemicals, such as dopamine or acetylcholine.

True, this is at best moderately good news to any cryonicist. The real point is that substantial preservation of the synaptic mechanisms for response to messages still remains, even in this fragmented system.

What Conclusions Can Cryonicists Draw From All This Information?

Above I have tried to summarize what we now know about brain function, with special reference to memory. We can see that a lot more remains to be discovered. And, as I stated at the beginning, it's still premature to draw many conclusions we'd like to draw.

However, I also said that our knowledge of brain physiology and brain freezing might allow us to draw a few conclusions about what we should do, separate from the issue of just what happens in brains when they are frozen.

Point One: We know quite precisely some of the repairs needed to repair frozen brains.

Almost certainly we don't have a full list of what needs repair. Even so, the most prominent repair consists of repairing cracks, either those created by the freezing process or developing during thawing. Advocates of nanotechnology (or even just those believing in speculative chemistry!) would do well to focus on some of the real problems to revival so far discovered.

Not only do we know some of the problems, but our current knowledge of the brain can help with solutions. Even if adult brains contain none of the guiding chemicals which induce proper neural circuits to form, we can use current knowledge of biochemistry within the neuron to deduce how to reconnect severed connections (the biochemical traffic on each neuron should be characteristic). Of course, I would also emphasize that any sane attempt to envision repair would also first examine those trophic chemical connection cues, rather than ignore them. Any system able to unscramble scrambled brains deserves extremely close attention. That system raises the notion that after treatment with the right trophic chemicals our brains could survive freezing, almost on their own.

(Embryonic tissues differ from adults in levels of these chemicals. Houle and Das got better survival using whole pieces of embryonic brain than cell suspensions. Is this because they are small, or because their growth hasn't been switched off? Test: find an embryo brain (whales? elephants?) large enough that it needs circulatory support to recover. Freeze it. The results might be interesting.)

Repair devices for preventing cracking when a brain is thawed also need attention. One possibility might be a system able to thaw the frozen brain immersed in a solvent other than water (ammonia?) at low temperature. The cracking comes from stresses set up by the water ice, after all. Furthermore, repairing a crack for which we carefully recorded the connections before the crack is vastly easier than repairing one we only get to look at afterwards.

The problem may not even need

that: if we can extend the time neurons survive without oxygen or nutrients (we're close to doing this *now*), then devices to quickly repair the vascular system might serve. We could try, for instance, to create a system of clotting chemicals and modified platelets able to operate at just above freezing.

We can also see that with current methods we cannot accurately diagnose the problem. Nor can we yet experiment on many systems. We don't know whether or not synapses are stable inside the brain because the experiments are very hard to do. Diagnosis, after all, must precede repair, no matter what notions of method we have. Ideas for systems to do this ought to produce interesting ideas in cryonics and elsewhere.

Point Two: It is extremely likely that virtually all neurons will actually survive in the frozen brain.

This point comes, first, from the very likely ability of individual neurons to survive; second, from the indirect evidence of cell survival from cell structure. It's true that at the level of an electron microscope many changes become visible in frozen-revived cells. But the neuron still recovers, so long as it has enough oxygen and other supplies to support it while it does so.

Of course, this conclusion isn't certain, but nothing (including taxes) is certain. One interesting experiment yet to be done would simply test this: can we recover neurons frozen while still in a brain and separated out afterwards? Apparently no one has tried this. (When Suda and Pascoe did their experiments, nobody could culture neurons!)

One conclusion from Point 2 needs emphasis. Given that a patient is frozen well, means for revival don't need much understanding of how memory works in order to succeed. Repairing connectivity (or preventing thawing from destroying that connectivity) would alone suffice. The individual neurons would still keep their secrets about memory all through suspension and afterwards.

A full answer to the problem of memory is an answer to the problem of death. Just like current medicine, we may not need such answers in order to start revival. Unlike current medicine, though, we must also contend with patients who are poorly frozen, for which answers to how memory is stored become critical to revival. And perhaps all our current suspensions classify as "poor," so everyone living now needs such answers.

Point Three: Our current understanding of memory still is not sufficient for us to attach it to any single type of structure within neurons.

For the most obvious instance of this, it seems unwise to focus solely on survival of synapses, since little information exists even about whether they remain stable over long times in a healthy adult brain. Just as with muscle tissue alluded to above, they may result from a dynamic balance rather than a passive one. That is, always the same neurons remain connected, but their exact connections, the synapses, come and go. Synaptic processes remain fundamental to memory itself. Yet no cautious cryonicist could willingly accept gross structural survival of his/her synapses as survival of his/her memory.

And this is not a criticism of current scientific work on synapses in memory. Even more than that, some major workers on LTP themselves think that the ultimate storage location for memory would be the neuron's DNA (E.R. Kandel et al, *Nature*, **322**, 419 (1986)). It would be a major victory for this work to show that memory storage really lies elsewhere. The synapses are a road to an answer, not the answer itself.

Recent Abstracts of Interest

Goodrick CL Ingram DK Reynolds MA Freeman JR Cider N

Effects of intermittent feeding upon body weight and lifespan in inbred mice: interaction of genotype and age.

Mech Ageing Dev 1990 Jul;**55(1)**:69-87

Beginning at either 1.5, 6 or 10 months of age, male mice from the A/J and C57BL/6J strains and their F1 hybrid, B6AF1/J were fed a diet (4.2 kcal/g) either ad libitum every day or in a restricted fashion by ad libitum feeding every other day. Relative to estimates for ad libitum controls, the body weights of the intermittently-fed restricted C57BL/6J and hybrid mice were reduced and mean and maximum life span were incremented when the every-other-day regimen was initiated at 1.5 or 6 months of age. When every-other-day feeding was introduced at 10 months of age, again both these genotypes lost body weight relative to controls; however, mean life span was not significantly affected although maximum life span was increased. Among A/J mice, intermittent feeding did not reduce body weight relative to ad libitum controls when introduced at 1.5 or 10 months of age; however, this treatment did increase mean and maximum life span when begun at 1.5 months, while it decreased mean and maximum life span when begun at 10 months. When restricted feeding was introduced to this genotype at 6 months of age, body weight reduction compared to control values was apparent at some ages, but the treatment had no significant effects on mean or maximum life span. These results illustrate that the effects of particular regimens of dietary restriction on body weight and life span are greatly dependent upon the genotype and age of initiation. Moreover, when examining the relationship of body weight to life span both between and within the various groups, it was clear that the complexity of this relationship made it difficult to predict that lower body weight would induce life span increment.

Bech OM Sorensen JD Jensen MK Diamant B Steiness E

Effects of long-term coenzyme Q10 and captopril treatment on survival and functional capacity in rats with experimentally induced heart infarction.

J Pharmacol Exp Ther 1990 Oct;**255(1)**: 346-50

The effects of coenzyme Q10 (CoQ) and captopril on functional capacity, hemodynamics and survival were studied in 154 rats that recovered after experimental myocardial infarction. Rats were randomized into four groups receiving either CoQ, captopril, a combination of the two drugs or 1 ml of tap water once daily for 12 weeks from the day of coronary artery ligation. CoQ as well as captopril and the combined treatment significantly improved exercise capacity as evaluated by lactate production during a standardized treadmill exercise test. No significant changes in heart rate or mean blood pressure were observed during the study in

the captopril-treated group. CoQ treatment increased the maximum heart rate significantly, whereas no effect on mean blood pressure was observed. Both captopril and CoQ decreased pulmonary congestion. Furthermore, the data may suggest that captopril prevents right ventricular hypertrophy seen in placebo-treated rats with large infarcts. This was not observed after CoQ treatment. Captopril treatment improved 3-month probability of survival (93%) as compared with placebo (74%) (P less than .05). CoQ and the combined treatment tended to improve survival, but this was, however, not statistically significant.

Finnegan KT Skratt JJ Irwin I DeLanney LE Langston JW

Protection against DSP-4-induced neurotoxicity by deprenyl is not related to its inhibition of MAO B.

Eur J Pharmacol 1990 Aug 2;**184(1)**:119-26

Clinical studies suggest that deprenyl may retard the progression of Parkinson's disease, an effect that may be related to its monoamine oxidase (MAO) inhibiting properties. Deprenyl also protects against the neurodegenerative effects of the noradrenergic toxin DSP-4. In this study we investigated the role of MAO B inhibition in this protection. C57BL/6 mice were given DSP-4 (50 mg/kg i.p.) 1 h. 24 h or 4 days after the administration of deprenyl (10 mg/kg i.p.) or the selective MAO B inhibitor MDL 72974 (1.25 mg/kg), and then killed 1 week later for assay of hippocampal norepinephrine. The MAO B inhibiting effects of deprenyl or MDL 72974 were also determined after these same intervals of time. Deprenyl and MDL 72974 produced comparable degrees of enzyme inhibition 1 h (greater than 95%), 24 h (greater than 90%) or 4 days (greater than 70%) after their administration. Given 1 h before, deprenyl totally blocked the norepinephrine-depleting effects of DSP-4, but this protection declined sharply when 24 h or 4 days was allowed to elapse between deprenyl and DSP-4 administration. MDL 72974 failed to protect at any time point. In vitro, we detected no activity using DSP-4 as a substrate for MAO. These findings suggest that the ability of deprenyl to protect against DSP-4-induced neuronal degeneration may not depend on its MAO B inhibiting properties.

Jackson ML

Selenium: geochemical distribution and associations with human heart and cancer death rates and longevity in China and the United States.

Biol Trace Elem Res 1988 Jan-Apr;**15**: 13-21

The geochemistry of available soil Se varies enormously in different localities, and the corresponding amounts moving up through crops to food vary accordingly. In a belt extending from northeastern to south central China, the available soil Se was measured by human blood Se levels. Severe deficiency occurred at 8-26 ng/mL; subadequate amounts occurred in large areas with 32-83 ng/mL; adequate amounts of 200-300 ng/mL occurred in large cities; and toxic amounts of 3000-7800 ng/mL occurred in terrace areas where runoff from the uplands evaporated, and in certain other soils. Some heart deaths (Keshan Disease) occurred in children 1 to 10 yr of age in the most deficient areas, but were prevented by 230-900 micrograms/wk Se supplementation. One mg Se/wk was the adult dosage. In Se deficient areas, the life span of adults was lowered severely (35 to 45 yr), with heart muscle damage common at autopsy. Se and Zn deficiencies are apparently associated with stomach cancer. The geochemistry of Se in the USA is also highly variable, blood Se ranging from 100-350 ng/mL. Se data for individuals are limited; however, ischemic heart death correlated inversely with blood Se in 25 cities of 22 states ($r = -.70$; p less than .01). Counties of Wisconsin and Florida are highly variable in human heart death and cancer death rates, as are the 50 states, suggesting Se geographic variability.

Alcor News

Special Notice

Now that many of the countries in which there are Alcor Suspension Members are at war, the difficult issue of what we will do if one of our members becomes a casualty in the conflict has become very real. Most Alcor members are both young and male, and we know of several who are in the reserves or are on active duty at this time (some even anticipate transfer to the war theatre shortly).

If you are in the military or anticipate being called up for duty, we ask that you let us know as quickly as possible so that we can make appropriate queries. Also, please let us know to what extent you are interested in Alcor negotiating with the military on your behalf. Rest assured that unless specifically authorized by you to do so, your status as an Alcor member will be kept in the strictest of confidence as is our standard operating policy.

Alcor is in the process of contacting the United States Defense Department to determine what can be done in the event that one of our members becomes a casualty. And keep in mind that with today's complex, high tech warfare it is quite possible that even so-called "battlefield deaths" will reach hospital facilities before deanimating. We are going to do everything we can to try to recover and suspend members members deanimating under such conditions. While we are not optimistic (we understand the other pressing realities the military has to deal with at this time), we will try our best.

And, for what it's worth, there is no shortage of Alcor volunteers ready and willing to enter the war theatre to recover and transport any member in need, in the unlikely event we would be allowed to do so.

Finally, all of the staff here at Alcor wish to offer their support for the men and women who are fighting in the Persian Gulf. May this war end quickly and may each and every one of you return to us alive and well.

DHS Status Report

The Department of Health Services has decided to appeal Alcor's victory. That one sentence says it all. What this means is that now we go to the Appellate Court and the case gets reviewed. There is good news in this, and bad news in this. The good news is that our initial victory was very strong (see *Cryonics* November, 1990) and the odds of another win for us at the Appellate level are very good. This is doubly good news since a win for us at the Appellate level means the **judgment has the force of law** or is, in other words, precedent-setting.

The bad news is, of course, that in the interim we are still under the cloud of war, the appeal process will cost us **thousands** of dollars more (probable price tag about $10,000) and of course

there is always the possibility (albeit very small) that we could lose and be forced to go to the California Supreme Court.

We understand that if we win at the Appellate level, the DHS intends to go to the State Supreme Court.

In the meantime, the DHS is *still* refusing to issue VS-9's in an acceptable form (they insist on listing Alcor as a cemetery).

We have repeatedly tried to negotiate with the DHS. All to no avail. The most recent attempt was made shortly after we received word of the DHS' decision to appeal Judge Muñoz's decision. We were told in no uncertain terms that negotiation was out of the question. The DHS' David Mitchell informed Carlos that he felt it is the DHS' duty to pursue this litigation because they believe that Judge Muñoz was wrong—that in fact cryonics could not be legal without a law having been passed to allow it. We hereby give, without reservation or hesitation, the *Saddam Hussein of Cryonics* Award to David Mitchell and the California State Department of Health Services. Believe us when we say that if these people had SCUDs at their disposal they'd use them on us.

Once again, we'll keep you posted.

Upcoming Cryonics Media Coverage

Fortunately things have slacked off a bit in the media department long enough to give us a breather so we can get some work done. About the only media-related event worth mentioning is the *Cheers* episode, which none of us here has seen yet.

However, what's ahead is definitely worth talking about. Highest on the list is what's to be a forthcoming COVER story on Alcor and cryonics in the April issue of *Reason* magazine. We are particularly looking forward to this article for several reasons: 1) *Reason* is a quality magazine which reports on world and U.S. issues thoughtfully and well from a libertarian perspective; 2) the reporter doing the story (Jacob Sullum) appeared to do a thorough job of it, visiting our facilities, attending the Alcor Turkey Roast and requesting and apparently *reading* a mountain of material from us, and; 3) a disproportionate number of cryonicists are libertarian/objectivists types and the *Reason* market should be an extraordinarily good one for us.

Also ahead is a brief, but very well done article to appear in *OMNI* by science reporter, science fiction author, and Alcor member Charles Platt. This is a thoughtful and upbeat article on the psychology of becoming an Alcor Suspension Member.

Two science fiction books which have cryonics or suspended animation themes have also appeared (both in softcover). The first is Anne McCaffrey's *The Death of Sleep*, which deals with the effects of temporal/cultural displacement on a cryogenically suspended person in the distant future. The second is *The Worthing Saga*, by Orson Scott Card.

Finally, we've heard rumors about a movie under production entitled *The Rest of Daniel*. Reportedly this movie, which is being produced by and is also to star Mel Gibson, will be about an Air Force test pilot killed in an accident and cryonically suspended as a neuropatient, who is revived some decades later.

There is still no word on *Late For Dinner*, the Castlerock (*Stand By Me*, *Misery*, et al...) production for which Alcor and Cryovita did consulting. Presumably this movie will make the Spring release cycle.

Turkey Roast Report

The times they are a' changin'. Used to be the Turkey Roast would merit pages of coverage. Well, there's just too much happening these days for that. But that's not to say that it didn't go well. It went very well, with about 80 people attending. That's not quite as many as last year, but frankly I think it was more fun, and it seemed like there was more food (if that's possible), with the good stuff lasting longer. I was actually able to stuff myself on cream pies and disgustingly rich desserts for HOURS!

The best way to tell you about the Turkey Roast is just to show you a picture (which we'll do) and say that it was a great time with great food and we'll do it again next year. So if you missed it, you've got another chance coming up.

Photo: Elleda Wilson

Cryonicists converge at Saul Kent's house for the annual Turkey Roast.

Advertisements And Personals

The Alcor Life Extension Foundation *and* Cryonics *reserve the right to accept, reject, or edit ads at our own discretion and assume no responsibility for their content or the consequences of answering these advertisements. The rate is $10.00 per line per month (lines are approximately 90 columns wide). Tip-in rates per sheet are $90 (already printed and folded); or $180 (printed one side) or $270 (printed both sides), from camera-ready copy. Tip-in ads must be clearly identified as such.*

QUICK INSURANCE PROPOSALS. BILL ELSON, BROKER. 2100 FLEUR; DES MOINES, IA; (515) 282-4888; FAX (515) 224-0481.

FREE. LifeOwners Letter. Insurance savings. C. Hartman; 514 NW; Stuart, IA 50250. Phone/FAX (515) 523-1116. 75500,535. hghv51a. Many strong companies. Long-time cryonicist.

MARY NAPLES, CLU and BOB GILMORE – CRYONICS INSURANCE SPECIALISTS. New York Life Insurance Company; 4600 Bohannon Drive, Suite 100; Menlo Park, CA 94025. (800) 621-6677.

EXTROPY: Vaccine for Future Shock. #6 available, $3 per copy. Futurist philosophy, avoiding the heat death of the universe, neurocomputation, reviews of futurist and transhuman books, and much more. EXTROPY; c/o Max More; P.O. Box 77243, Los Angeles, CA 90007-0243.

Meeting Schedules

Alcor business meetings are usually held on the first Sunday of the month. Guests are welcome. Unless otherwise noted, meetings start at 1 PM. For meeting directions, or if you get lost, call Alcor at (714) 736-1703 and page the technician on call.

The **SUN, MAR 3** meeting will be at the home of:
Virginia Jacobs
29224 Indian Valley Road
Rolling Hills Estates, CA

Directions: Take the Harbor Freeway (US 110) south to Pacific Coast Highway (State 1) and get off going west. Go along Pacific Coast past the Torrance Municipal Airport to Hawthorne Blvd. Turn left (south) on Hawthorne and go up into the hills past the Peninsula Shopping Center (Silver Spur Rd.). Hawthorne takes a long curve around to the left. Indian Valley Road is a little over two miles beyond the Center, on the left. 29224 is about 0.2 mi up Indian Valley Rd., opposite Firthridge Rd.

The **SUN, APRIL 6** meeting will be held at the home of:
Marce & Walt Johnson
8081 Yorktown Avenue
Huntington Beach, CA

Directions: Take the San Diego Freeway (Interstate 405) to Beach Blvd. (Hwy 39) in Huntington Beach. Go south on Beach Blvd. approximately 4-5 miles to Yorktown Ave. Turn east (left) on Yorktown. 8081 is less than one block east, on the left (north) side of the street.

The *Alcor Cryonics Supper Club (Southern California)* is discontinued until further notice.

There is an Alcor chapter in the **San Francisco Bay area**. Its members are aggressively pursuing an improved rescue and suspension capability in that area. Meetings are generally held on the second Sunday of the month, at 4 PM. Meeting locations can be obtained by calling the chapter's Secretary, Carol Shaw, at (408) 730-5224.

The **SUN, FEB 10** meeting will be held at the home of:
Keith Henson and Arel Lucas
1794 Cardel Way
San Jose, CA

Directions: Take the 17 South (880) and get off going east on Camden. Stay on Camden as it turns south and go to Michon Dr. Turn right onto Michon and go to Harwood Rd. Turn left on Harwood and go south to Almaden Rd. (1st street on right). Turn right on Almaden and right again onto Elrose, then left onto Cardel. 1794 is near the end of the street, on the left.

The **SUN, MAR 10** meeting will be held at the home of:
Joe and Connie Tennant
1467 Don Ave.
Santa Clara, CA

Directions: Take the 82 (El Camino Real) through Santa Clara to Scott Blvd. Go north on Scott to Warburton (next street) and turn right on Warburton. Don Avenue is the first street on the left (Triton Museum on corner).

The **SUN, APRIL 14** meeting will be held at the home of:
Ralph Merkle and Carol Shaw
1134 Pimento Ave.
Sunnyvale, CA

Directions: Take US 85 through Sunnyvale and exit going East on Fremont to Mary. Go left on Mary to Ticonderoga. Go right on Ticonderoga to Pimento. Turn left on Pimento to 1134 Pimento Ave.

There two Alcor discussion groups in the **Greater New York area**. Details may be obtained by calling either Gerard Arthus, at (516) 474-2949, or Curtis Henderson, at (516) 589-4256.

The *New York Cryonics Discussion Group of Alcor* meets on the the third Saturday of each month at 6:30 PM, at 72nd Street Studios. The address is 131 West 72nd Street (New York), between Columbus and Broadway. Ask for the Alcor group. Subway stop: 72nd Street, on the 1, 2, or 3 trains.

Meeting dates: **February 16, March 16, April 20, May 18.**

The *Long Island Cryonics Discussion Group of Alcor* meets on the first Saturday of every month, at the home of Gerry Arthus. The address is: 10 Jefferson Blvd.; Port Jefferson Station, L.I., telephone (516) 474-2949.

Meeting dates: **March 2, April 6, May 4, June 1.**

There is a cryonics discussion group in the **Boston area**. Information may be obtained by contacting Eric Klien at (508) 663-5480 (work) or (508) 250-0820 (home). Tentative meeting date is December 30.

The **Houston area** has a discussion group on cryonics, life extension, and the high/low diet. Meetings are typically held the second Saturday of every month. For more information call Ravin Jain at 713-797-1076 or Rupert Hazle at 713-480-3309. Correspondence may be addressed to Rupert Hazle at 15107 McConn, Webster, TX 77598.

ALCOR LIFE EXTENSION FOUNDATION
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Riverside, CA 92503

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For information on cryonics call Alcor:
1-800-367-2228 (toll-free, non-members only) or 1-714-736-1703 (members).