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Excerpt:
"The First Immortal,"
a cryonics novel by James Halperin

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LETTERS TO THE EDITOR

Plenty of people receive *Cryonics Magazine*, but how many actually *read* it anymore?

I'm not sure. Only on rare occasions does *Cryonics* receive correspondence. I could interpret this as a general feeling of satisfaction from subscribers, or I could call it "post-literate apathy." At one time or another I've been *tempted* to publish something really outrageous and inappropriate, just to see how many of you are paying attention.

Before we reach that point, however, I'd be interested in hearing your opinions about my first year as editor of this magazine. Would you like to see me continue with my efforts to bring in more contributors from outside Alcor? How do you feel about the various columns? Do you enjoy the usual mixture of articles, or would you prefer something more focused? What have I done that you like, what have I done that you *don't* like, and what haven't I done that you *would* like? Write me a letter or send me email. Make your voice heard, and help me put (or maintain) *Cryonics Magazine* on the right track.

And please don't forget to keep those articles coming.

Thanks!

>To: brian@alcor.org

I wanted to comment on the article in *Cryonics* about the suspension of Mr. Cannon *[3rd Qtr '97 — ed.]* because ever since I read *Man into Superman* 8 years ago I've been thinking about psychology-related issues in regard to cryonics and transhumanism, and wondering why there's not more discussion of them. (Of course, I've been in Japan for the past four years, so I'm completely out of touch...)

My comment is that a cryonics era will require a new type of psychology, and even now, people in order to accept or live with cryonics need one as well — that is to say, a completely different way of people thinking about their role in life and what it means to be human. I get the impression that most cryonics advocates think it's merely a matter of convincing people that life is worth living and that the technology is at hand, but I disagree. People for the past million years have been conditioned to look at their life in terms of limits or stages. I don't know if there is a term for the psychology of how people perceive the future, but I think few people are able to "see" or "feel" more than ten or twenty years into the future (and that's pushing it). The further off from one's current life stage, the more disassociated the future feels. That's why young people feel immortal, because the future, in the sense of "70 years from now" is inconceivable to them. Likewise, a person in his 80s faces two scenarios: one, the stages of life have "successfully" conditioned him to accept death (almost as a matter of behavioural conditioning), or two, suddenly he feels panic and depression. People, however, have been conditioned for thousands of years to compensate by imagining (or believing in) a spiritual immortality (*i.e.* denial of death).

Now, preparing people (in particular, our children) to think in more extropian terms, we need to create a new life span psychology. I haven't formulated it yet, but obviously, it would have to involve a first and second life. The first (pre-cryonics) life we must see as a stage of development, a fetal stage, in which we learn to choose between life and death, and define the value of life and our dreams of the future. The second would be a transitional (post-freezer era, era of nano-technology) one in which the struggle for truly indefinite extension begins and the conflict between humanity and transhumanity will ensue (issue of identity). A third and final stage would occur when man makes the change into Ettinger's superman; no doubt though, that era too will be faced with countless problems.

I think many immortalists, for example, at one stage or another will suffer from varying forms of doubt and depression. Counselors will probably have to teach them how to find purpose by envisioning a "creative evolution" and determining how they will use new technologies to reshape themselves and find a new purpose and enjoyment in life. I imagine, for example, a world in which people will be entertained by very lucid virtual realities. A person might purchase a program which will make him feel like he's in 20th century NY, and even perceive having a human body again. He could choose between full awareness (awareness that he's living in the future and acting out a fantasy), semi-awareness, or time-limited amnesia. People who still had a human frame of mind would be living in the past, and psychologists would have to help them define themselves in terms of the future so individuals could continue to grow and evolve and face the final fight, the so called "Omega Point" which might raise a sense of anxiety and futility in some or antipathy and opposition in others.

Of course, that's rather far off. For the time being, people need a new way of seeing and defining themselves. One element in this is a firm belief that the solution to all of Man's questions are within human grasp and just a matter of time away. A second element is that states of mind are temporary and we must be careful not to let decisions of the moment hinder our future. A third is that change is a part of life, and in terms of hundreds of years (let alone thousands or millions) we must have new perceptions of the limits of change, since comparatively speaking, as humans we're used to the image of time standing still, due to our limited lifespan. (Sure, the change from 40 years ago until now may seem like a lot, but in the big picture, a person from the future wouldn't see much of a difference even in a 200 year period.)

Next, we need a new life span psychology, emerging from three questions:

1) As cryonicists, how should we view the purpose of our current life and its meaning in the long-term picture? (Must be individually answered.)

2) In terms of aspirations and anxieties, how far down the road should our time/life paradigm be (*i.e.* how far into the future should we think on a daily basis — live for the moment, plan for the near future, think in perspectives of the first life only, but do a bit of planning for the future, or contemplate as far as omega point... etc. etc.)?

3) Given infinitely extended life, how should we redefine our purposes in life, and how should we prepare for the future and redefine ourselves?

Another important point is the role the family will play in the future. At present we are conditioned to believe in our children as an effort to "perpetuate the species," keep a bit of us alive, even sit in as our successors and replacements. John Bradshaw made a fortune on his PBS family series, and that was only dealing with problems caused by one or two living generations. Now imagine a few hundred generations, and great-great-great grandpa who was dead for a few hundred years, coming back for dinner (great idea for a short story: autocratic grandpa thawed out from suspension, yapping away at dinner and fighting with the young ones, while they blame him for all their genetic problems and intergenerational dysfunctionality). I think the role the family will play, and the way our traditional roles and definitions of family, will also have to be considered, but sometimes I see a notable absence of the concept of future generation families in cryonics. Another point, then (come to think of it) would be the effect of individuals thawed out, happy to be brought back, only to find out that their loved one or a child or grandchild opted not to be frozen. How would a transitional immortal deal with the idea of permanant loss and would he or she face anger, guilt or even survivor's guilt? And also, prior to thawing, wouldn't a cryonaut have to be conditioned to understand and prepare for the challenges and obstacles in reassimilation? Or let's put it like this: are there a few people who've opted for freezing who are likely to suffer either from future

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How Do I Tell Mom and Dad?

by Brian Shock

Life Scenario:

You've just received your membership bracelet from a cryonics organization. You proudly chain this life-saving jewelry to your wrist. . . only to realize that someone might actually see *it.*

You haven't told anyone close to you about your cryonics arrangements, but now you have no choice. You invite your parents out to dinner at a fine restaurant (one with waiters; not Taco Bell or Jack-in-the-Box), and at the most propitious moment possible (probably between the main course and dessert), you display your bracelet and announce that someday a group of a friendly, dedicated, upstanding people will freeze you down to the boiling point of liquid nitrogen.

Your parents:

a) gasp in horror
b) scream at you incoherently
c) burst into tears
d) throw their wine in your face
e) disinherit you on the spot
f) all or most of the above.

All cryonicists have to think about how relatives and friends will react to news of their cryonics arrangements. Although the decision to make such arrangements is ultimately yours, the cooperation of people around you will affect the quality of your eventual cryonic suspension. Sooner or later, you have to take the plunge and find out how they feel about this.

You probably noticed that the above scenario omitted numerous reactions. Your parents could question you about the feasibility of cryonics. They could shrug and admit that what you do to yourself is your own business. They could even congratulate you on your courage and pioneering spirit, then ask how *they* might sign up as well.

There's no need to cover these latter possibilities. If your parents react with practical or intellectual questions, you're in good shape. Most people become involved with cryonics for practical or intellectual reasons anyway; you may or may not convince such wonderful parents (two of which belong to me) that they should make cryonics arrangements for themselves, but at worst you will wind up with a mild philosophical disagreement.

The painful scenarios always end in powerful torrents of emotion.

I've seen this happen again and again. Enthusiastic young cryonicists discover, to their astonishment and regret, that loved ones want to bully them out of their cryonics arrangements. Even if this hasn't happened to you yet, the possibility never quite vanishes. While you can't really win these arguments (because they're not arguments — they're someone's brutal attempts at imposing his or her will on you), there are ways to survive them.

First, you need to recognize the form and nature of these emotional haymakers. Keep in mind that a family member or friend can phrase almost any question about cryonics in either an intellectual or emotional fashion; to weather an emotional attack, you must first *recognize* it as such. Is the other person raising his voice? Is he crying? Is he making eye contact? As obvious as these clues may seem, acknowledging the other person's emotions provides you with a vital defense. Try to remember that, underneath any emotional exterior, there may be pain, anxiety, or other feelings that have nothing to do with you.

You may encounter some of the following statements:

1) *"You're going against religion (or God, Jesus, etc.)"* — It seems as though I mention the intellectual answer to this accusation in every issue of *Cryonics*. I won't bore you with my reasoning again, primarily because there is rarely any point to giving an intellectual answer for an emotional question. When made in an emotional fashion, this statement about religion means, "I feel most comfortable with old thinking habits and social customs about death, but your plans make me feel very *un*comfortable."

2) *"You're being taken in by a con game"* — You may feel tempted to answer, "No, I'm not, because. . ." Don't fall into this trap; in the end, you and your tormenter will end up bickering like children ("Yes, it is!" "No, it isn't!" "It is!" "It isn't!" "Is!" "Isn't!"). This statement about "con games" raises a basic question of trust. The person who argues through such statements may have experienced fundamental disappointments in his life, or he may have disappointed others. By questioning *your* judgment, he could be expressing lack of confidence in his *own*.

Before you join a cryonics organization, assure yourself that you trust it. You may not know if cryonics will work, but you can reasonably confirm to yourself that a cryonics organization will act dependably and ethically.

3) *"This is too morbid"* — In other words, "all thoughts of death terrify me." Fear of death is natural; as with all fears or anxieties, it becomes pathological only when it paralyzes. To some degree, anyone with such a profound fear suffers from an emotional illness. Try to remain sensitive to this person's weakness.

Privately, remember that society does *not* frown on pre-arrangements with conventional funeral parlors. (Some people even applaud the personal responsibility of such pre-arrangements!) Even non-cryonicists can acknowledge that membership in a cryonics organization is little different from a pre-arranged funeral.

4) *"You must be mentally ill to want this"* — In many cases, this is simply an intense restatement of *"This is too morbid."* (We should take care not to over-interpret another's suspicion of your mental illness; he may or *may not* be hinting at his *own* potential emotional instability.) However, you may also hear this type of reaction in life-and-death situations, where people resist any "abnormal" measures taken during the dying process. I am aware of at least one case where an Alcor member was accused of mental illness by his family after he attempted to make cryonics arrangements for a terminally ill parent.

Particularly in long-term illnesses, patients and families may become enured to the idea of death, accepting it as a blessing, and even feeling disappointment if it doesn't come. In extreme cases — such as with Holocaust survivor, psychologist, and author, Elizabeth Kübler-Ross — an individual may come to "identify" with death, not dissimilarly to the way hostages may identify with their captors. Such individuals would consider cryonics an interference with the "last, best experience of their lives."

5) *"Why don't you want to be buried with your family?"* — I must confess a certain amount of confusion about this particular argument, though I *have* heard it used with some frequency. To the non-religious outsider such as myself, it sounds as though someone believes in a special "sanctity" about the decay of corpses.

Clearly, most people do not let their imaginations stray into the post-burial process of deterioration. I suspect that statements about being "buried together" reflect a very primitive belief that the method of interment in this world will affect life in the "next" world. Even today, many Judeo-Christian sects hold that the dead will someday be resurrected, literally *from their graves*. Burial with family members would then seem the best method of ensuring that you keep your family together in the afterlife.

On the other hand, perhaps families buried together merely offer a more convenient memorial location for their descendants.

6) *"Why are you so selfish?"* — We can break this simple statement down into several motivating sub-statements.

a) *"Why don't you leave this money to your family?"* — The speaker considers you selfish because you won't leave money to your family. Or will you? I cannot think of a single cryonicist who did *not* consider his family's financial security before making cryonics arrangements. This need be nothing more than enlightened self interest; a deprived family might try to obtain the funds you set aside for your suspension.

As with many of these other arguments, look to the speaker's motivations for accusing you of greed. What does *he* want?

b) *"Why do* you *in particular deserve to live?"* — Why are you so selfish as to believe that you should live when others die every day? Perhaps the person who uses such a statement doesn't care about you as much as you might have thought. Many people are amazed to discover that their parents are normal human beings, who may actually resent their children's youth and potential.

Beyond this, someone might be expressing a cryptic belief that cryonics *will* work. ("Why should *you* live, when others I value have died?") This person might feel that you are somehow devaluing or insulting the dead by daring to live. He might also feel regret or guilt that others did not have the option of cryonics.

c) *"Why do you want to embarrass your family by doing something so different?"* — You are selfish because your actions may embarrass your family. This is obviously your family's problem and not yours. If they attempt to make you feel guilty about your cryonics arrangements, ask yourself why they feel that their standing in the community is so fragile.

If anyone accuses you of selfishness, remember that emotional health always begins with valuing yourself. Recognizing the similarity of oneself to others is a basic trait of all primates (monkey see, monkey do). As especially imaginative ape-descendants, we have developed this behavior into a profound empathy. An inability to place a high value on ourselves limits our ability to place a high value on others.

Now that we have inoculated ourselves against some basic emotional arguments from relatives, how do we take a more active role in dealing with them?

First, remain calm. The strategy behind any emotional argument is to strip you of your objectivity and inspire an equally emotional reaction. Remember that no one wins a shouting match. Today's rage can be tomorrow's guilt; I know of many families who have raised the exploitation of guilt to an art form.

Next, think carefully before you offer rational arguments to another's emotional tirades. How many times have you managed to persuade someone lost in the throes of anger or sadness? Often, your best action is to politely excuse yourself from the room. Let the strong emotions exhaust themselves, and try to start a discussion later, when everyone has relaxed.

Finally, give other people time to deal with your interest in cryonics. Don't push them, don't badger them, don't seek out painful confrontations. If your relatives and friends truly care about you, they will eventually come to accept your choices. You may have to do your part as well, and learn to accept *their* choice to reject cryonics.

Of course, these methods will not work on everyone. Relatives with deep religious beliefs may shun you. Those with undiagnosed anxiety disorders may find you too horrible to bear. Those who only tolerate you may use your cryonics arrangements as an excuse to condemn you.

Try to breathe deeply, relax, and get on with your life. You'll survive. That's why you signed up in the first place.

Novel Excerpt:

The First Immortal

by James L. Halperin

November 5, 1982

Ben sat at his office desk during a rare lull in his work schedule; no patients in the waiting room, no appointments for the next 20 minutes, no follow-up calls needing to be made right then. He finally had a moment to think, and what he thought was: Ben, that was dumb, dumb, dumb! He was damned lucky he hadn't died on that airplane.

Seven days had passed. Ben felt much better; still a bit sluggish, but okay. He intended to resume his walking that evening, covering shorter distances at a slower pace.

First he dialed his son's number, and got the answering machine, as he had for each of the last five days.

He waited for the beep. "Gary, it's me again. You out of town or just don't feel like talking to me? Can't say as I'd blame you, but some forces of nature won't be subdued, and I'm one of them. By the way, I happened to notice some of your paintings in a gallery on Newbury Street. Had no idea paintings could be that expensive unless the artist was dead. Or is that why you haven't called me back? Anyway, a woman of obvious good taste was admiring the big green one with the hummingbirds and that incredible sunset. I told her she'd better put her name on it. Didn't mention you were my son, of course. She finally did put down a deposit on it. You know how persuasive I can be. Anyway, you might as well call me back, or you'll have to listen to these messages every goddam day for the rest of your life. Well, bye for now."

He dropped the receiver into the cradle and stared at the oak wall in front of him. Damn! He wondered if Gary was really out, or sitting home listening to that?

Needing to fill the time with something, anything, possessing some semblance of productivity, Ben looked through a pile of papers. He found the note he'd written to himself after returning from Mack's burial, and called Arizona directory assistance.

The Phoenix Life Extension Foundation had a listed phone number. He reached David Perez, the membership administrator. Perez was an articulate fellow and quite personable. It surprised Ben to learn that the place was indeed a cryonics facility. A mild disappointment.

"You're like that company in Sacramento I read about a few years ago?" Ben asked.

"Same concept, better execution," Perez laughed. "You're referring to California Cryonics Limited, I assume."

"Sounds right."

"They made some serious mistakes, but we think their concepts were sound. Think of them as the Titanic; think of us as the Queen Elizabeth II."

"An apt analogy, I hope. Talk to me."

"Over time," Perez began, "scientific progress has allowed people to live longer. Already we estimate that medical science is adding almost two months to the average life expectancy of each American every year. Eventually science will discover a way for humans to have an indefinite lifespan. It's a matter of 'when,' not 'if.' But few if any people alive today are likely to reach that point before being overcome either by disease or calamity. So for those of us who don't make it to that time, the only way to survive is to have ourselves frozen after we die. At ultra-low temperatures, all metabolic change virtually ceases. Theoretically, a person's body could be preserved indefinitely."

Ben remembered his conversation with Epstein a dozen years earlier, and felt a sudden chill. Even if it were legitimate, he couldn't see anyone voluntarily submitting to such a thing.

What if you were actually aware of being frozen—with no hope of escape? He imagined himself lying in a block of ice, unable to move for decades, or centuries, but still alive. Even the hellish bowels of that Jap ship had been a better prospect, he decided. As bad as that was, the journey had been finite. Being frozen alive, trapped in an icy coffin, guaranteed no such redemption.

"People let you put their bodies on ice?" he asked.

"We use liquid nitrogen, actually," Perez explained. "And people don't just let us, they pay us to do it! We have over a dozen people in suspension now, and 56 others signed up, including me. Which makes us the largest cryonics facility in the world."

The largest in the world? Ben thought. If cryonics was really viable, after being available for 20 years, why hadn't more people signed up? It couldn't have just been the money; any possibility of another chance at life should have been priceless to a dying person.

"Of course," Perez continued, almost as if he'd read Ben's mind, "nobody's ever been revived, and there's no proof any of us will ever be; it's purely theoretical. Neither the science nor the requisite technology exists yet. Cryonics is a statement of hope that humankind will ultimately achieve both."

Or maybe more like an affidavit of insanity, Ben thought. He figured he might as well listen, though. "When I was younger, much younger," he prompted, "I used to think we'd be able to stop the aging process during my lifetime. Thought I might live forever."

"Still might, you know. We don't make promises, of course, but since everyone's going to die anyway, you wouldn't have much to lose by being frozen, would you? Anyone who's buried or cremated will never be revived, but if you're frozen quickly enough at the point of death, before all the information in your brain's lost, well, who knows what science will be able to do in 50 or 100 or 500 years?"

It was nutty, but at least Perez didn't seem to be lying about anything—so far. "What happens to your soul when you're on ice?"

"People always ask us that," Perez said. "Nobody knows if there's really a soul separate and apart from the body. But I gather from your question that you're a religious man, so let's assume you have such a soul. And let's say your suspension lasts even 500 years. That's a long time for a body, but if a soul's eternal, it's probably not too much to expect it to find its way home."

"Interesting. Weird, but interesting."

"And in the eyes of God, half a millennium would be insignificant, wouldn't it? We can't be sure, but I'd assume your soul won't mind cooling its heels for a lousy 500 years." Perez chuckled, the sincere laugh of a man who believed in his own product.

"You're one helluva salesman," Ben granted. "You don't have to answer this if you don't want, but how much money will they pay you if you sign me up?"

"Just my salary. Nobody here gets commission. We're non-profit."

"Really?"

"Yes, sir." Again Perez's tone conveyed the eloquence of truth.

"Back in World War II," Ben said, "the army used to have a serious problem with parachutes. About one percent of 'em failed to open. Now one percent doesn't sound like much, unless you happen to be one of the unlucky fellas who got the wrong ones. But they finally solved the problem; got the defect rate down to zero."

We don't make promises, of course, but since everyone's going to die anyway, you wouldn't have much to lose by being frozen, would you?

James L. Halperin is a rare-coin dealer, investor, part-time novelist, and cryonics activist. *The First Immortal*, his second novel, will be published by Ballantine in hardcover during January 1998, and is now in development as a Hallmark/CBS miniseries. Jim intends to donate all book royalties, after expenses, to various health and education-related charities, including cryonics.

"How?" Perez asked.

"Simple. They made all the parachute packers and inspectors take monthly jumps, using parachutes selected at random from those they'd worked on themselves."

"Exactly! And our basic philosophy is very similar to theirs. What we do here is for our own benefit as much as yours. Maybe we're a little more trusting than the army, but not much. Remember how I told you I'm one of the 56 people signed up?"

"So you did."

"In fact, 'the Phoenix' won't hire anyone who doesn't plan to take the exact same journey our members sign up for. What's more, I make about a third as much here as I did at my last job selling real estate. I work here because I want to help assure my own journey into the future, and my family's, too."

"Well that's somewhat reassuring. And you refer to your organization as *the Phoenix*?" Ben added. "Of Phoenix, Arizona. Was your location an accident, or intentional?"

Perez laughed. "We chose Phoenix because it's one of the least likely places in the United States to have an earthquake, or any other natural disaster for that matter. Purely a coincidence, but an interesting one, don't you think?"

"Very."

"Of course, once we decided to locate here, it seemed so perfect to refer to ourselves as 'the Phoenix.'"

"A fitting name," Ben allowed, picturing the great bird rising from the ashes.

"I tend to think of us as a lifeboat to the future," Perez replied, a metaphor Ben appreciated more than he could have realized. "But whatever image works best for you. If you'd like to learn more, I'll be happy to send you our information package."

A leaky lifeboat to the future may be lunacy, Ben decided, but feeding his body to the fauna was even crazier. He gave Perez his address.

June 2, 1988

Sirens blaring, the ambulance tore through Boston Common, rushing Dr. Benjamin Smith to New England Medical Center. Startled motorists pulled to one side as the three-year-old Ford transport van sped through traffic lights and over-wide turns. Then, with only barest hesitation, the drivers returned to traffic and their own daily concerns.

Both ambulance attendants wheeled him through the emergency entrance toward intensive care. One of them whispered to a nurse, "Looks like myocardial infarction. Probably massive."

Ben wondered if they realized he could hear them. He'd treated many terminal patients himself, and had long sympathized with the helplessness felt by those who were dying or debilitated from illness. Their minds often became incapacitated along with their bodies. Inability to comprehend their predicament, Ben had always imagined, might be as much blessing as curse.

He understood that such loss of faculty was caused not only by physiological circumstance, but also by feelings of helplessness and loss of control. And now, feeling that helpless himself, he found his frustration worse than he could have anticipated or understood. He tried to focus on an internal pinpoint that was little more than hope. He knew his mind was clouded; he could barely remember his previous decisions, and creative thought was a struggle. Yet he'd methodically patterned a plan of action into his brain over the past five years:

I will show no ambivalence toward the freezer.

Now, even as his mind faltered and he questioned his own ability to judge, even as his reasons for embracing cryonics faded like a city disappearing into afternoon fog, he reminded himself that although he could no longer see its edifices, they were still there. Thus he knew he must appear resolute. There was precious little else he could do for himself. He would just have to hope that his own preparations were adequate, and entrust his destiny to others.

A nurse looked down at his face. "Oh my God! Dr. Smith." She didn't know him personally, but almost every nurse at the hospital would have recognized him. She ran alongside them. "It's gonna be okay. We'll take care of you, sir."

Before surrendering consciousness, Ben managed to whisper the three important words he'd long planned to say if he ever found himself in this situation: "Call Toby Fiske."

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Dr. Tobias Fiske arrived 40 minutes later, just in time to watch his friend open his eyes. Ben lay flat on an ICU bed, attached to monitors, hooked to an IV unit, breathing oxygen through a mask. Toby realized that Ben's body would be helpless, virtually immobile, but his mind might still be lucid.

"Hey, stranger. How you feelin'?"

Looking up, Ben licked his lips. "I'm not gonna make it, am I?" he gasped.

Toby stood for several seconds, wrestling with himself for the right vocal timbre, the proper facial expression. “Doesn’t look good.”

“How long?”

“Without a transplant, a few hours. At most.”

“What *about* a transplant?” Ben asked.

“Nothing suitable available. Odds of finding anything in time are less than one percent.” Toby had to look away from Ben while speaking these words.

“Oh.”

“Ben, your daughters are here—all of them. Right outside.”

“Gary?” Ben asked.

“Not yet.”

“Okay. In a minute.” Ben closed his eyes. “See my bracelet?” he whispered.

Toby nodded.

“Call the number.” Ben was breathing hard now, obviously straining to force out everything he needed to say. “But don’t get in... trouble for me. Promise, Toby. I’m asking you... as my doctor, not my friend.”

“I promise.”

“Couldn’t love you more... if you were... my brother.”

Toby wondered if Ben understood that to him their kinship extended far beyond brotherhood. Throughout his adolescence and even adulthood, his feelings of disenfranchisement—feelings he now attributed to his parents’ blind devotion to religion and lack of devotion to each other—had left him open to a sort of quasi-scientific thinking far beneath his intellectual potential. Without his friend’s guidance, Toby knew he would never have pursued a career in medicine. He might’ve wound up writing horoscopes for a second-market newspaper. Or joined the Moonies, for God’s sake.

“See my bracelet?” he whispered.

Toby nodded.

“Call the number.”

But he simply answered, “I know,” squeezed Ben’s hand, slipped the bracelet off his wrist, and walked to the door.

Outside, now in tears, Toby told Rebecca, Maxine, and Jan, “Ben wants to see you.” He hugged Maxine. “His heart’s barely pumping. Probably only an hour or two before it gives out completely. And he knows it.” Then he trudged down the hall to the doctor’s phone and placed a call to the number on Ben’s bracelet.

An operator answered on the first ring. “Phoenix. Emergency response.”

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Of Ben’s three daughters, Maxine was the physician, so the others now looked to her with uncustomary deference. Max would know best how to mask her sorrow. There would be plenty of time to mourn later; she’d want her father’s final moments to be as pleasant as possible.

“You comfortable, Daddy?” she asked, stroking his right hand. Ben figured she must have looked at his chart, and knew he could no longer feel his left. “Any pain?”

“Yes, plenty. But nothing hurts,” he said, forcing a half-smile, dreading the freezer, now imagining claustrophobia beyond toleration. He felt terribly weak, too.

No one knew what to say.

Max forced herself to break the silence. “Remember when you took us all to the Grand Canyon? Must’ve been 1962, wasn’t it?”

Ben smiled.

“Of course we could never fly anywhere, like normal families,” Rebecca said.

“I still can’t believe we did that,” Jan laughed. “All six of us in that Cadillac with those foot-tall tail fins blocking the view. No station wagon for us! Five straight days there, and five straight days back. It’s amazing we didn’t kill each other.”

“And some of those motor lodges were so seedy,” Max added. “I can only imagine what caused those stains on the bedspreads. You and Mom in one room, and the four of us sharing another. Rebecca and I usually slept on the floor.”

“Yeah,” Jan said, “so you could talk and tell dirty jokes all night while Gary and I tried to sleep. God, I hated that.”

“Those trips you used to make us take,” Rebecca said, “y’know, Dad, I tell my friends about them sometimes, and they’re jealous. They say stuff like, ‘My parents never took us along on their vacations. They’d just ship us off to Grandma’s.’ And I’d always tell them they were the lucky ones. But that’s—that’s not how I really felt, not a bit.” She was gasping now, trying hard not to cry. “Of all the things about growing up in our family, those summer vacations are what I remember best. They were like getting to live a separate lifetime; an extra year each year. I swear I remember as much of those vacations as I can of the years separating them."

"Dad," Max asked, "you want to see your grandkids? I could ask a friend to pick them up and drive them here."

Ben tried to shake his head. Tears formed. The last time they saw him would become one of their strongest memories. It couldn't be like this. Grampas, he decided, should only be recalled in a grin.

"No," he whispered slowly, haltingly, "I want 'em to remember me playing soccer with 'em, or taking them... to the zoo. Not lying here with a tube up my nose." He gasped for air; caught his breath. "But you make sure they know I love them. Tell those kids... my last thoughts... were about them, all of 'em, and my last hours were happy... because I was thinking about them."

Rebecca began to cry. Jan looked away, her own eyes welling. But dear Max had forced herself to hold her emotions in check, like a sagging dam whose purpose was to give the town below a few extra hours to evacuate before the impending flood.

"Is... Gary coming?" Ben asked.

"Yes. I'm sure of it," Rebecca said. "He loves you, Dad. He'd be here now if he knew. I left a message on his answering machine, and called Vose Galleries, too. He's supposed to approve the layout today for his one-man show next month. They'll tell him as soon as he shows up, and he'll come on the run."

Picturing his son trying to run on that shortened left leg, he thought: more like on the reel. And that was probably Ben's fault, too.

He whispered, "If he doesn't get here in time, say goodbye for me. Just tell him how proud I am of him. He really made something of himself." Despite me or in spite of me? Ben wondered.

"He sure did," Rebecca said.

"In spite, I think," Ben whispered.

After about half an hour, Toby walked into the room. "Sorry to interrupt. The technicians from the Phoenix just arrived. They wanted me to make sure Ben knew."

"Already?" Ben murmured. "Better talk to you in private."

Max said, "We'll be in the hall, Dad."

***

"How'd they get here so fast?" Ben asked.

"They're not from Arizona," Toby heard himself explain, as if this were a normal frigging conversation, for God's sake. Like he was maybe explaining a standard medical procedure; a goddam triple bypass or something. Christ. "The Phoenix has two scientists traveling around the country training paramedics. They have teams on call in about 20 cities. Your team owns an ambulance company in Rhode Island. You're their fourth cryonics job. Last one was in Warwick, seven months ago."

"They can work here?"

"Yeah. They're licensed in Massachusetts, and cleared for this hospital. I checked. Guess they figured Boston being so close...." Then Toby paused a moment, and finally said it: "Cryonics? Jesus, Ben. Your daughters know?"

"No. Couldn't figure out how to tell 'em... Or you."

"What were you afraid of? That we'd think you lost your mind or something?"

"Well... yeah." Ben was trying to smile. "Don't you... think that?"

Toby hesitated. "Out of your mind? No. Gullible? Maybe..." He paused again. "You really s'pose they'll ever revive you?"

"I doubt it." Ben chuckled weakly. "But you... never know."

"Those three cryonic technicians seem like believers. One of them explained a bit of the procedure to me."

"Good."

"Ben, you sure about this?"

"Yes... positive."

"Okay, I'll help," Toby said. After all, Ben was his best friend! Risk to his professional ass? To hell with it. What was an ass worth if you were ashamed it was yours? "But look, if we let your disease take its natural course, oxygen flow to your brain'll diminish. And that's a problem. You'll start losing brain tissue long before your heart stops."

Toby realized that he had said all this almost as if it were expected, the most natural thing in the world. Yet the secondary consequences were obvious enough.

"I know that." Now Ben seemed concerned that Toby might be moving too quickly, like a sinner who discovers God then donates every last possession to the church.

"So what do I do?" Toby asked.

"Do it by the book. Don't jeopardize... your license."

"I can give you morphine."

"That'll put me... in respiratory arrest."

"Probably." Hopefully.

"I'm not... in any pain."

"I know. I was just saying that if you were.... Think about it, Ben. Maybe you're in severe pain and haven't told me."

"Don't do it. You could get... in trouble."

"Only if I get caught."

"Isn't worth the risk." Ben gasped for air. "Besides... you have to look after Alice for me." Deep

But Toby refused to play judge. Some people spent $100,000 on their own goddam funeral, didn't they? Or left their money to some televangelist, looking to buy a place in heaven.

breath. "Can't do that... from prison."

A joke, Toby realized. No doctor had actually gone to jail for helping a terminal patient die. But both knew doctors who'd lost their licenses for it.

Toby laughed quietly. "Okay, Ben. Whatever you say." He turned to go.

"Cryonics is a longshot. Don't risk your career... for a longshot."

Toby did not turn back, nor did he answer. He wasn't sure how his voice would sound right then.

***

Max had been talking to Harvey Bacon, the chief cryonic technician. She was sure that her own expression was now a portrait of her disbelief and disgust.

"You can go back in," Toby said.

"Did you know about this?" she asked.

"No. I just found out. Like you."

"Incredible," she muttered, going back inside. To Max, cryonics was a fraud, a waste of money. And worse, it deprived living people of healthy, lifesaving organs that might otherwise have been donated. How could her father have fallen for this scam? He used to be such a realist.

***

But Toby refused to play judge. Some people spent $100,000 on their own goddam funeral, didn't they? Or left their money to some televangelist, looking to buy a place in heaven. Maybe cryonics would actually work. Who the hell could know? Ben had always been smart, even prescient, so maybe he was right again.

***

Jan and Rebecca followed Max into the ICU.

Rebecca's reservations were quite different from her sister's: What would she tell Katie and George? Was their grandfather dead or in limbo? They'd want to know what had happened to his soul. She knew damn well he'd never be revived, but he wouldn't be at rest either—at least not in *their* minds. They'd never be able to let go of him. How could he have done this to them?

***

Financial problems had beset Noah and Jan's law partnership. Their practice now consisted almost exclusively of personal injury cases, which required large capital outlay against uncertain outcome. No meaningful settlements had been forthcoming, while competition in that field had intensified. They both seemed to be working much harder even as they fell farther into debt; starving hamsters on a relentless treadmill.

And just four days ago Jan had learned that she was pregnant with their third child, a fact she hadn't yet revealed to anyone. Noah would not be pleased with the news. What would happen to all of her father's money? she wondered. Jan felt guilty for thinking it, but the thoughts still came: Was he going to keep it? He couldn't spend it where he was going, but they sure could use it. He'd never try to take it with him, would he? Damn! Noah had been right, as usual. She should've helped her father prepare his will.

"You're gonna be *frozen?*" Max was saying to Ben, obviously trying to keep a sympathetic tone to her voice. "Why didn't you *tell* us, Dad?"

"Knew you'd... try to... talk me out of it," he whispered. "But... I had to... do it.... Needed to know... there's a chance... my death... might not be... permanent. Any chance."

Jan could feel her own fingernails biting into her palm. "You can't be serious."

Rebecca glared at her. Whoops. Jan said nothing more.

"I'm sorry," Ben said.

All three women began to cry

Maybe cryonics would actually work. Who the hell could know? Ben had always been smart, even prescient, so maybe he was right again.

again.

"I never wanted to hurt you. Any of you. I'm so sorry. I didn't... think..."

Suddenly monitor alarms were going off. Then Ben's right hand lurched toward his chest.

"Oh my God," Max gasped, running out of the room, calling after Toby. "Another infarction. Come quick!"

***

Now Ben's discomfort and anxiety had vanished. He felt himself hovering near the ceiling, as if floating atop a swimming pool filled with a thickly saline emulsion. Below him, with wires and tubes attached, was a comatose body. His body. People strode about it resolutely, but he detected little energy emanating from the body itself. He thought he saw it—me? he wondered dazedly—still breathing, just barely. Now Toby was barking instructions at the nurse, who ran out to fetch something. Then Toby asked Rebecca and Jan to wait outside. "But I might need you, Max, so stay right here, just in case."

Max nodded.

"In fact," Toby said moments later, "maybe you'd better go get a crash cart, just in case."

She nodded again, and rushed out to find a nurse.

Now they were alone, just Toby and Ben, and Toby seemed to be at the cusp of decision; Ben could almost feel his friend's mind at work.

"I hope you really want this," Toby whispered. His hands were trembling as he carefully removed a syringe from his pocket and covertly injected the contents into the port on the IV pouch. "Goodbye, Ben. You *will* be missed."

Even with his mind shutting down, Ben understood. *Morphine*.

Toby called Harvey Bacon and the rest of the Phoenix team inside. "His heart stopped beating. I'm calling him at 1:14 p.m. Proceed."

Approaching footsteps resounded from the hall. Bacon turned toward the door just as Toby was sneaking the empty syringe into his pocket. Bacon's eyes rested briefly on the motion of Toby's hand. Then Max returned to the room pushing a crash cart.

"We won't need that now," Toby said to her quietly. "Ben's gone."

Max watched the cryonics team set to its task, as though she'd been expelled as a participant in her own life. Her face appeared shocked, saddened, emotionally repulsed, but professionally fascinated. Her eyes were simply following the activity of the team working over her father, as if her emotions had little meaning, and all she could do was watch.

Then suddenly in darkness, Ben heard voices. Gary?

Ben felt himself rushing through a long tunnel, utterly serene and content. He saw a beautiful white light in the distance, and felt gladdened, eager to join with this loving light. The experience was nothing like his short-lived resignation to death in 1943; this time he welcomed it. The light beckoned him closer; he raced to meet it, no longer missing earthly existence or human flesh. He was not his parents' child or even his children's father; he was himself alone. At last.

He couldn't yet see his wife, but somehow knew she was there, inside the light, waiting to welcome him for all eternity. Soon they would be rejoined. Forever. As the light grew nearer, the voices from earth became faint, disconnected, and ultimately irrelevant.

***

Out of breath, Gary hobbled into the ICU and saw Toby's morose expression. "I'm too late, aren't I?"

"I'm sorry."

"Damn. Damn it all!"

Three cryonic technicians were coupling Ben to a heart-lung resuscitator and a mechanical cardiopulmonary support device. Both machines were activated, and Ben's circulation resumed. He began to breathe.

Oxygen and other nutrients would soon rekindle part of his brain.

"I order you to stop this immediately," Max shouted. The three technicians, apparently used to such interference, ignored her.

"Sorry, Max," Toby said. "Ben made an anatomical donation, willed his body to the Phoenix. I have no legal authority on the disposition of Ben's remains, even if I disagreed with his wishes. Which I don't."

"But we're his family," Rebecca

"I order you to stop this immediately," Max shouted. The three technicians, apparently used to such interference, ignored her.

said.

"So am I," Toby answered.

"Gary," Jan said, "can't we do something? They're gonna freeze him, for Chrissake!"

"Why are they doing that?" Gary asked, looking at Toby.

"It's what he wanted. Cryonic suspension. He thought someday we might have the science to cure and revive him. He knew it was a longshot, but it was *his* life, wasn't it?"

Gary nodded. He thought about his own years in medical school, his internship and residency and practice: precious time wasted trying to please his father instead of himself; a mistake he would never make again, nor wish on anyone else. That's right, it was the man's own life, and even in death, he alone should decide what to do with it.

The cryonic technicians administered various medications: Nimodipine, a slow calcium channel blocker to help reverse ischemia. Heparin, an anticoagulant to aid circulation. And a tonic of free radical inhibitors and other medications to minimize future ischemic brain damage. They began packing the body in ice.

"According to the technicians," Toby explained to Gary, "every ten-degree drop in Celsius temperature cuts metabolic demand in half, which slows the loss of neurons."

Gary watched intently, saying nothing. The technicians hovered over Ben, exchanging clipped phrases. Gary felt an unfamiliar emotion surface. He didn't recognize it until, to his astonishment, he found himself fighting an impulse to raise his arm in salute.

***

Ben felt something tugging him back through the tunnel, away from the light, down from the ceiling. A powerful force, irresistible.

It made him angry.

He'd seen his darling Marge's face, and was at the verge of melding with the light surrounding her. Yet now he was back inside his body, sentient but unable to move regardless of exertion, aware of his breathing, feeling the pulse of the heart-lung machine through his arteries, and experiencing all other earthly pain, fear, and grief.

Damn! Must be alive again. How long had he been dead? Minutes? Days? Years?

He heard his daughters' voices clearly, and Toby's, and Gary's. He wished he could tell them to send him back.

They argued his fate as if he no longer existed.

They were prepping him for the freezer, he realized. He must have been gone only moments. But they were right about one thing, he decided: He *didn't* exist.

They were talking too fast, or perhaps his mind was operating at a reduced pace. His body felt simultaneously frozen and aflame. He expended no effort; even his breathing was performed by device. Thus the pain was endurable; real yet somehow apart from significance.

But dread overwhelmed him.

As long as he was alive, suicide was still an option. But once he was an ice-cube, he couldn't will himself to die, now could he? Why hadn't he thought of that before?

The technicians began surgery. Ben was aware of them cutting the femoral vessels in his groin. They attached a blood pump, membrane oxygenator, and some kind of heat exchanger he'd never seen before. As Ben's brain cooled, everything around him seemed to move with increasing velocity. By the time his body temperature had fallen to 90 degrees Fahrenheit, he was a snail surrounded by hyperactive hummingbirds.

Oh God, tell them to stop!

The cryonic technicians were now preparing Ben for the plane trip to the storage facility in Phoenix Arizona where he knew he would receive cryoprotective perfusion to minimize freezing injury to cells, and eventually be cooled to minus 196°C. First they would have to replace his blood with an organ preservation solution. Then they would place his body, packed in ice, into a shipping container for perhaps its final flight.

A sense of panic overtook him. Was he trapped here for generations with no possible escape? Had he made the ultimate mistake? Would he become like a Kafka character, paralyzed until the end of time?

Ben felt a scream surging from the core of himself; all the worse because he knew he could never give it voice. Perhaps it would quiver on the edge of his throat forever.

Then, like a rheostat diminishing the flow of current, his brain activity decelerated to below the critical level, the optic nerve concurrently deprived of blood flow. He experienced what seemed a brilliant, transcendent moment of astonishing lucidity, a moment isotropic with respect to time; an instant or an eternity.

For reasons unknown and unimportant to him, he recalled the words of Jean-Paul Sartre: *And I opened my heart to the benign indifference of the universe.* All at once Ben understood the wisdom of those words as no living man ever could.

The rheostat slipped into the range just a kiss above darkness.

Ben felt himself rising once again; to the ceiling, into the tunnel, and on into the light. The light. The Light! The promising, the beckoning, the all-encompassing, beautiful Light.

March 15, 1991

[Editor's Note: In the years following Ben's suspension, some of his relatives bring a series of lawsuits with the ultimate goal of raiding his Trust Fund. As part of their strategy, they try to discredit cryonics and have Ben removed from suspension.]

The afternoon deposition took place in Webster's office; an accommodation to the expert witness who had flown in from New York City. There were no conference rooms available in the District Attorney's building, and Banks and Smith's modest facility would have required at least an hour's cab ride, while Fialkow, Webster, Barnes & Zeeve was barely two miles from Logan Airport.

Even so, had the request come from Noah Banks, Webster would have told the man to go screw himself. But Brandon Butters was a different story. The DA's office was a bridge no intelligent lawyer would wish to burn.

Webster thumbed through the expert report as he questioned its author. A stenographer tapped quietly at her small machine. Also in attendance were Brandon Butters, Noah Banks, and Tobias Fiske, all of whom had learned to keep conversation with the opposing side to a minimum. Toby studied his copy of the report and reviewed copious notes on a yellow pad of lined paper.

"Please state your name, age, occupation, and credentials for the record," Webster began.

"Dr. Brett Wong. 49. I'm a molecular biologist, with a BA from Yale, and an M.D.Ph.D. from UCLA. I now conduct research, while teaching at Columbia University. I've been a full professor for the past six years."

"You state in your expert report that Ben Smith can never be brought back to life under any conceivable circumstances. Is that still your contention?"

Wong folded both hands into his lap. "Yes, that's correct."

"As I read this, I see you believe that at liquid-nitrogen temperature, ice damage so corrupts cells as to render them permanently nonviable."

"Yes. In many cases."

"Not all?"

"No. Not even most. But far more than a critical amount."

"Dr. Wong, could you please describe, in the simplest terms possible, what happens to a typical human cell when it is so frozen?"

As the witness spoke, Toby wrote furiously on his notepad.

"Certainly," Wong answered. "Most cells are about 90 percent water. At minus 196 degrees Celsius, water will expand by roughly 10 percent. It also crystallizes, which in some cases may actually puncture the cell membranes. That effect, however, is relatively rare. What does happen, almost uniformly, is that ice squeezes and disrupts the ions and proteins of tissue, occasionally forcing them into shrinking pockets of residual unfrozen water. And sometimes the fabric of a cell itself becomes crushed into tiny spaces among the ice crystals."

"But many types of human cells have been frozen successfully, haven't they?"

"Yes."

"And isn't human blood frozen routinely?"

"Certainly. But unlike most of our cells, red blood cells contain no nuclei. A percentage of the other blood cells, such as lymphocytes, die in the process. But even so, frozen blood, once thawed, is functional. That wouldn't necessarily be the case with other organs."

"I see." Webster accepted a note from Toby, and read it. "But Dr. Fiske tells me that lengths of intestine have been frozen in liquid nitrogen, thawed, and worked afterward."

"True. But an organ is not a living animal."

Toby tore another page from his notepad, and handed it to Webster.

"What about worms and other simple organisms that have been frozen and thawed without apparent harm?" the lawyer asked. "Wouldn't those be considered animals?"

"Well, those are much less complex than mammals, obviously."

"Aren't human embryos and sperm often frozen, then stored for later use?"

"Yes. But long before any mammal is viable outside the womb, it becomes too fragile to survive that kind of damage. Its cells become interdependent, and even small disruptions in the balance will kill the organism."

"And I suppose the human brain is more delicate still?"

"More delicate? Depends on your definition of the word," Wong answered. "Certainly brain cells are larger than other cells, and will not normally self-repair or regenerate.

Besides, human neurons don't grow or divide. Therefore, I believe the loss of each brain cell would be more devastating than the loss of any other type of cell."

Webster read another note from Toby: "Could scientists build a system to set out modified micro-organisms that might guide the neurons and glial cells toward their own repair or regeneration?"

You can't resurrect a cow from hamburger."

"No. That's impossible."

"Impossible?" Webster read, "Can't bacteria and viruses do things at least that complex?"

"Well, yes. But in my opinion, human beings are simply not capable of achieving that level of technology."

"In your opinion. I see. Please tell us what is likely to happen to this patient's frozen cells once they're thawed."

"With the cryopreservation techniques that were used on Dr. Smith, I'd estimate about six percent of the cells would be completely dead upon thawing. Of the remaining cells, if they survived long enough, most would eventually revert to their former condition, but a certain percentage wouldn't."

"What percentage?"

"No one's sure. A small percentage, I suspect. Maybe only a fraction of one percent. But as I said, a mammalian system can tolerate the corruption of only an infinitesimal portion of its cells."

Toby handed Webster another note.

"Tell me, Dr. Wong, how strong is your neurology background?"

Wong smiled; flattened an eyebrow. "Strong enough. I teach a course in neurobiology."

"Then you must know most neurologists believe information in the brain is stored in many places, with a high degree of redundancy."

"Yes, that's the current theory."

Webster grabbed another sheet from Toby. "A stroke often wipes out an entire section of the brain, which can have devastating consequences. But if you lost, say, seven percent of your brain cells, spread evenly throughout your brain, it might not be catastrophic. Maybe not even noticeable, correct?"

"Possibly." Wong audibly swallowed. "But we're not just talking about losing cells. We're talking about damage to living cells that would alter their function and disrupt every system in the body."

Webster read: "Suppose technology would enable us to remove defective cells, keeping only the healthy ones. Wouldn't that give other cells time to regenerate?"

"Nobody knows," Wong answered. His eyes roamed the room.

"Then it's conceivable, right?"

"Unlikely, but possible, I suppose."

"Dr. Wong, is this cell damage we've been talking about reversible by today's science?"

"Certainly not."

"What about tomorrow's science?"

"It seems dubious."

Webster leaned forward. "Dubious? But not impossible?"

"In my opinion: impossible. You can't resurrect a cow from hamburger."

Webster read another note from Toby: "Especially if it's been cooked. Or eaten by worms."

The witness laughed. Then he scrunched his mouth and shook his head—an indulgent parent scanning a child's second-rate report card.

"Tell me, Dr. Wong," Webster asked. "Couldn't you *clone* a cow from the living cells in fresh, raw hamburger? Theoretically, I mean."

"Almost anything's possible in theory. But remember, our DNA modifies as we mature. Besides, too much free-radical damage occurs over the years, even if the organism seems healthy. Therefore most of my colleagues and I believe that scientists will never be able to clone an adult mammal."

"Especially if it's been cooked. Or eaten by worms."

"Never? Not even a century from now?"

"No. Not even a thousand centuries from now. I'm afraid that's all just science fiction, Mr. Webster."

Tape Transcript:

"Freeze-Wait-Reanimate"

transcribed by Brian Shock

While browsing a Wisconsin library's archives, Alcor member Steve Van Sickle (whose regular column appears later in this issue) discovered an audio tape entitled "Freeze-Wait-Reanimate." Part of a Pacifica Tape Library educational series, this 1973 program featured interviews with various Cryonics Society of New York members. We know little about the origins of the program except that its producer was Jan McNeedo, with technical assistance by David Rapkin and music by James Ursay. (My apologies for any misspelled names.)

Aside from my interest in cryonics history, I found this program fascinating because it presented both a sharp contrast and disquieting similarity between cryonicists of 1973 and 1997. The transcription has been edited for clarity and divided into two parts. I have tried to preserve a sense of the unnecessarily artsy 1970's sound effects and audio-montage cutting. -- *ed.*

Part One

(The blowing of chill winds.)

Saul Kent: I had never been too happy about the fact that I was going to die.

Gillian Cummings: He died at 42; they said it was a heart attack. They don't know. He had no history of heart trouble. He'd just had his annual check-up — two days earlier, as a matter of fact, from his doctor he was given a clean bill of health. Died watching a baseball game.

Curtis Henderson: Dying is not the problem — staying alive is.

Saul Kent: There may be methods in the future where you could grow an identical genetic brain.

Gillian Cummings: My father's last words were: "Don't freeze me," and then bonk, he's out. I would have had him frozen anyway. He didn't ask my permission to die.

(Chill winds blowing even more loudly)

Saul Kent, Secretary, CryoSpan Corporation: I first got interested in 1964 when I read Robert Ettinger's book, "The Prospect of Immortality." One of the principles that cryonics is based upon is that death is not an absolute thing, it's a process. We're talking about a critical stage in the process. The person has been pronounced dead by, I presume, a physician, or more than one physician who had been involved. But what we're saying is that this person is in many cases very close to being alive and 99% of the cells in the body may still be alive. It's just a matter of a condition which medical science at this point does not know how to treat. Now, if the physician knew one more fact, he might be able to bring that person back to life. The key variable of course is time, in that we have lack of knowledge. And what cryonics is an attempt to do, is if the person cannot wait until the future...you know, we bring that person into the future.

Curtis Henderson, president, CryoSpan Corporation: We are preserving, now, biological materials like sperm, skin, and bone and some organs, and storing them at liquid nitrogen temperature, and bringing them back and using them. In other words, they do come back to life. If you want to say they were ever dead.

You can now preserve biological material. Now, all a human being is is biological material. It's true, if you do the whole body, it's a lot more complicated. You've got a lot more different kinds of tissue, and that complicates the thing. Aside from that fact that it's one big lump, it isn't like blood or sperm where you can get at it easily. But basically that's what the whole idea is, it's just preserving a body by the best means we have available now, that has worked demonstrably on other biological material.

Assuming that you've stored your body and it is preserved in reasonably good condition, what are the chances are the future of it being brought back? That is something that is almost impossible to calculate. It simply depends upon the assumption that science will continue to progress, and that the assumption that when they do have the ability to bring you back, that they even want to.

Gillian Cummings, Vice President, CryoSpan Corporation: I'd always known about cryonics. But I got into it — actually got into it — the hard way when my father died.

Of course I knew about Professor Ettinger. I'd seen him on tv shows and all the rest of it. His was the only name I could think of, so I called him in Michigan, and he gave me the name of Curtis Henderson, who was the president of the cryonic society here in New York, and was also the president of CryoSpan Corporation, which is actually the operating arm of the Cryonics Society of New York. That is the organization that actually gets in there, rolls up its sleeves, and does the freezing. This facility that we're in is the CryoSpan facility.

I had my father frozen simply for the present state of the art. The present state of the art is simply to preserve the bodies. I simply could not go on with my own normal existence thinking of my father decomposing in the ground. Now, for the present, cryonics can promise only perfect preservation. For the future, of course, no one knows. There's always that hope on the horizon that he may be brought back. But that was not the primary reason I got into it. I got into it simply to keep him preserved.

The most famous experiment was done by a Dr. Suda in Japan, which you may have read about. He was working with cats' brains. That really is not exactly parallel to this situation because, first he took a brain-reading of the cat's brain while the cat was alive, and he removed the brain. I say it is not really comparable to this situation [cryonics] because I believe the cat was alive when he removed the brain, so we're dealing with a different situation. But after he removed the brain, he perfused it with the same sort of solution we use, took the brain down to liquid nitrogen temperature which is -315 degrees Fahrenheit. That's the reason it's used; it's so cold that all cellular action is stopped. There's no biological action that can take place at that temperature, it is so low. Now he kept this cat's brain frozen for, I believe, close to a year, and then revived it. When he revived it, he took a brain-reading of this brain and got almost exactly the identical tracing that he had when it was in the cat. Naturally he didn't put the brain back in the cat, but that was the most encouraging thing we've had so far.

I believe mouse embryos were frozen and brought back, and they grew up to be normal mice. So experiments are being done, but as Henderson likes to say, if there would only be some large-scale program, something comparable, let's say, to the space program, where real research is being done with real money — the dirty word, money — behind it. Frankly, there's no reason why, as much progress couldn't be made in this as in the space program. I mean, Kennedy said, "We're going to put a man on the Moon in ten years." People thought he was out of his mind. But you put the money behind it, put the effort behind it, put the energy behind it, and the man was on the Moon.

(Electronic chirps and twitters, much like the background music in the film "Forbidden Planet")

Kent: The ideal situation according to what we know now, would be [if] a person were dying in a hospi-

Saul Kent, circa 1970

tal, and there would be a team of doctors, or technicians that were capable of handling it, there. As soon as the person's heart stopped, he would be put on an artificial life support system. He would be maintained on this system until the point was reached where the doctors decided that the damage is not repairable, and then at this point you would add to the system a heat exchanger, whereby the body temperature would start to be lowered.

See, what would happen is, in the life-support system, the blood passes out through a system which oxygenates it and adds nutrients and it goes back into the body. You can add to the system a heat exchanger which it will also pass through, and the blood temperature will be lowered. So you would start this, and at this point you would begin to add a certain portion of a special chemical cryoprotective solution which would involve a base substance such as Ringer's Solution or plasma and one or two chemicals which protect against freezing damage. One of these is glycerol. Another is DMSO.

This is the base for the chemicals. This would be circulated within the artificial system, and would gradually replace the blood, and this also would be chilled. So you'd have the temperature being lowered from the inside by an increasingly cryoprotective solution. Also, according to what we believe now, you would add increasing amounts of cryoprotectant, as the temperature lowered and as you went further into the perfusion. Then you would start to cool from the outside as well. At the time you had completed the perfusion — the blood was out of the body and the solution was in — and you had reached a temperature say several degrees below zero centigrade, you would then stop. You would have to stop the machine earlier, actually, but you would stop that phase of the treatment. The next thing would be to pack it [the patient] in regular ice and keep it there for a certain amount of time. The next stage is into dry ice, which is far colder, and the final stage would be in liquid nitrogen. Liquid nitrogen storage would be indefinite.

If we have a patient who has been cooled immediately, then he has a longer period of time before irreversible damage sets in. First of all, by irreversible, we mean irreversible by today's standards. That which is judged to be irreversible today may not be judged to be irreversible tomorrow. By tomorrow, I may mean a hundred or a thousand years from now, in which incredible things will certainly be done. Second of all, even in terms of today's definition of irreversible damage, we have a gap in knowledge. Most doctors that you talk to will tell you that there's four or five minutes after which irreversible damage sets in. This is based on a long history of very sound medical practice. This is simply that when doctors have attempted to resuscitate patients after four or five minutes without oxygen going to the brain, they have either failed, or they have been able to and there has been brain damage. So therefore they assumed — and this was a rational assumption — that the brain could not survive after this four-minute period. But you see, recent evidence, which most doctors are not aware of, and which they hopefully will be in the near future, indicates that this isn't necessarily so. Rather than being especially susceptible to damage, the brain is in fact perhaps the hardiest of organs.

A fellow named Hossman and his associates at the Max Planck Institute in Germany performed a very interesting experiment a couple years ago. He took cat brains and he put them in a situation at normal temperature, without oxygen, without blood circulation. He was then able to revive these brains after more than an hour. Apparently a most serious problem is that there is a separation of water from the cell solution when ice crystals are formed, and the remaining solute is toxic to the cell.

A third problem is that there is shock caused by the change of state from water to ice. And a fourth problem would be that there are greater problems in thawing than in freezing. This is rather optimistic for our situation, because we're not even presuming to thaw anybody for a long, long time. But there are all sorts of problems associated with thawing. It's believed commonly that you have to thaw very quickly. This is generally believed by cryobiologists. On the other hand, freezing is believed to be best when it's relatively slow.

(Water dripping in an echo chamber, followed by electronic chirps, rising to a thundering crescendo.)

Henderson: There are other liquified gases that are as cold or colder, perhaps— you can get liquefied oxygen, liquefied helium, liquefied argon, liquefied hydrogen. First of all, nitrogen is the cheapest, and it's the most plentiful. Second, it's relatively safe; it's not inflammable. Last, it's non toxic. You're immersed in gaseous nitrogen all of your life, walking around; air is 4/5's nitrogen. So I would say that it's basically because it's inert and it's harmless to tissue. So is helium for that matter, but helium costs about a hundred times as much. It's a lot colder, and that's the main advantage.

(An electronic version of chill winds)

Cummings: It's a holding station, of sorts. It's a holding station for the future. Actually, legally, what you need in order to store any biological specimen, and a body preserved in this way, and when I say preserved in this way. . .

The first step in preserving a body is perfusing it with a glycerol solution. That is, taking the blood out, perfusing it with a glycerol ringer's solution to protect the body against freezing damage. That is done first, and then the body is cooled until it reaches liquid nitrogen temperature. Otherwise, the freezing process itself could cause a great deal of damage. So it is perfused and then frozen in liquid nitrogen. Liquid nitrogen is in the capsule. Which, by the way, is self contained and needs no electricity. We're right beside it, and as you see and hear, it's perfectly quiet. It's just looking at us as we're standing here looking at it.

(Cummings, in the distance.)

That is actually a museum piece. It was the, it's a model of, well, actually it was supposed to work but it never did. It was supposed to be the first capsule. That was made by a man named E. Francis Hope in Arizona. All the people who were not frozen here in this facility were frozen by E. Francis Hope before he went out of business in Phoenix, Arizona. The main thing wrong with this thing — well, there were actually several things wrong with it. It didn't always work. Second, it had to be completely sealed, which had quite a few disadvantages. First, you could not check on the body inside. That's part of the inner seal, leaning against that wall. That's another part of the seal on the back. You were always in danger of losing your vacuum, and you needed a vacuum pump, which depended on electricity and that was the main failing of the thing. If we had something like this working here, you'd hear it thumping and bumping in the background. With all the power failures, that would be the last thing anybody would want. So there was always a problem with those. When they got into this new type capsule, all those problems at least were solved.

Gillian Cummings, circa 1973
(Outlook, Aug. 1973)

All other biological specimens are there in the small capsule, right beside it. It contains placenta, two babies, which technically are biological specimens. This same sort of tank is used to contain sperm: human sperm, bull sperm, whatever. They are biological specimens. Skin is a biological specimen: hearts, lungs, etc. The transplant industry, if you can call it that, that's growing up now is using all sorts of organs. Each of these are perfused with glycerol and are stored in liquid nitrogen in exactly the same way that we use here. Therefore, having a body in this way, is simply an extension of that. It's just a big biological specimen. The reason it's here is that biological specimens, by nature really of the presence of liquid nitrogen, means that by law it must be in an industrially zoned area.

(Cummings, again distant.)

It's...this building. Nice, cheerful, red-brick building. . . at least to me it seems that way. The backdrop of the Moon, an actual photograph of the Moon takes up the entire back wall. The reason it's here is that the capsule that holds the frozen bodies (one of them happens to be my father, and he's in there with another man) stands upright, vertical, and sort of gives the impression of being something about the space program. If you stand on that sort-of platform halfway around it, you can actually take the lids off the capsule and look in. This supporting platform that I just described looks sort of like the LEM: the lunar landing module.

We're going to need some gloves. It's cold up there.

Male Interviewer (probably David Rapkin, listed for technical assistance in this program): We're climbing up on the platform which encircles the tube-shaped tank, in which — how many bodies are stored in this tank?

Cummings: There are two.

Male Interviewer: They're upright, I assume, then.

Female Interviewer (probably Jan McNeedo, the program's producer): What is the reason for having two people instead of one in this tank?

Cummings: Well, it's simply the most practical way to freeze people. Two can fit in one; it's relatively small. As a matter of fact, if someone brings up the idea of space, why take up so much room with all these frozen people instead of burying them? They're actually consuming less of the Earth's surface, if freezing would become more generalized. You're taking up far less space putting two in a capsule this size than burying two people. [Otherwise] you're using up a lot more space.

The lid of this capsule is made in two parts. Actually the capsule itself is, in effect, a large — 8 or 9 feet tall — self-contained Thermos bottle. It works the same way. That's if a vacuum is maintained. The top of this thing is made in two parts, with handles that you take off half at a time.

(Noise of something being opened.)

I'm lifting — or trying to lift — the first half.

There we go. . .

Male Interviewer: Those fumes we're looking at are liquid nitrogen?

Cummings: [Talking about the dewar lid] It sort of looks like the cork of a Thermos bottle cut in half, the two halves of this thing on the inside. That's the insulation.

Because the liquid nitrogen is so cold, you're actually seeing the vapor cloud that forms when this very cold liquid nitrogen hits the normal air temperature in this room. If you breathe into it, it won't do you any harm — it'll just create more vapor. So the idea is to take a deep breath before you look in.

On this side you actually see the tops of two mens' heads. On this side you see my father. On the other side you see the other man who's considerably shorter. You have to move down a little bit more.

Female Interviewer: Are they in a container?

Cummings: No, they're wrapped in aluminum foil. And the reason they're in aluminum foil is simply for modesty's sake. It doesn't really need it because by the time the body goes into the capsule it has already reached liquid nitrogen temperature.

[According to a private explanation from Curtis Henderson, CSNY wrapped its patients in aluminum foil simply because it "looked good." —BRS]

Female Interviewer: There seems to be a cannister here.

Cummings: The cannister contains the placenta. There's also a second cannister just like that underneath. There are actually two placentas in there, one in each cannister. They are to be frozen and used in future youth extension experiments that some doctor in Massachusetts has planned.

The idea there is that little old ladies who wish to become young ladies have gone to clinics and spent quite a lot of money on one of the more exotic treatments, injecting the placenta of young animals into them. Some serum is made of the placenta and injected into them. For some time it seems that youth has been restored, but then the body rejects.

As I understand it, the reason that youth is not maintained in these people is simply because their own bodies reject the placenta because it's foreign matter. Now the idea is that, if, when you're born, your own placenta can be saved for you, then in old age a serum can be made of your own placenta. Because it is yours, your body will not reject it. Naturally we'll have to wait sixty or seventy years to try it out, until one of these people get old enough, because I think the oldest is about two years old right now.

Male Interviewer: Kind of not much to see, actually.

Cummings: Would you like me to take that covering off my father's face? We won't see too much again because of this fog.

(Presumably the noise of tearing aluminum foil.)

Male Interviewer: Lifting the tin foil off the top of the. . . patient.

Cummings: Actually the skin tone is perfectly natural. It's really an amazing thing.

Female Interviewer: He looks perfectly preserved in every respect.

Cummings: That is the whole idea of being frozen. For the present.

Male Interviewer: There looks to be no decomposition whatsoever.

Cummings: No, there is none. That is the whole idea.

Male Interviewer: How long has your father been in this tank?

Curtis Henderson, circa 1970

Cummings: Almost two years. I don't think you or I or Jan would want to look into a coffin of someone who had been buried for two years, no matter how well the undertakers today say, "Well, you know, we're going to keep him preserved with this formaldehyde," or whatever they pump in. I don't think anyone would want to open a coffin after two years.

(Noise, probably aluminum foil again)

Male Interviewer: How do you feel when you see your father's face?

Cummings: Marvelous. Absolutely marvelous, that I've done this. . . and I can come in and see him. That was really the main reason. I'm a filmmaker by profession and my home is actually California. What I'm doing here, I've been asking myself over and over again. I just got involved with more and more things with cryonics, and now I'm the vice president of the cryonics society here in New York. There's one project I know that keeps me here, and the main reason that I really got into this thing so deeply is pursuing that same thing. How I do feel? I'm trying to describe an indescribable feeling. A feeling of elation.

The man is dead. I know he's dead, and I probably would've been a basket case if I hadn't done this, just thinking of him decomposing. But there he is, and I feel so marvelous that he does have this chance. No matter how remote it is, it's still there on the horizon. I just felt compelled to give up everything and just go around spreading the "Cold Gospel."

I don't actually foresee this being widespread because of moral objections. I think cowardice is another, because people don't want to flaunt convention. This is something unconventional. But I do think that there are quite a few other people who might very conceivably feel the same way I do — have the same sort of real, genuine, heartfelt, bone-marrow feelings of goodness and rightness for having done this — if they only knew that we existed and that this service existed.

That technically is what we are: we are a service. This is not something you can hard-sell like soap, which is why we don't go into the moral objections if you have any. Fine, this is not for you, this is for someone who feels this is the way. Again, pursuant to spreading the "Cold Gospel," I made a film on the transfer of my father, taking him from the dry-ice box. (We skipped the stage when you're in dry ice for some time to cool you to dry-ice temperature, and then you go into liquid nitrogen, gradually [cooling] to liquid nitrogen temperature.) But I made a film about it to show people that there is nothing at all frightening about this thing. People may envision going into a cold storage room, seeing bodies hanging on meat hooks. I don't know what they think when they think of freezing bodies, of cryonics. But I made the films to show people how unfrightening — how prosaic — it is, and to let them know exactly what it looks like. It was no dummies, no simulation — it was the real thing. That's been on quite a few TV shows. Probably the most watched was the David Frost Show. No pun intended, that's his name.

Female Interviewer: Shall we put the lid back on?

(Noise that sounds like friction on a cork or on styrofoam — squeaking.)

Cummings: (sounding distracted) You never know, because it sounds like something out of Dracula's castle.

End of Part One

Look for Part Two
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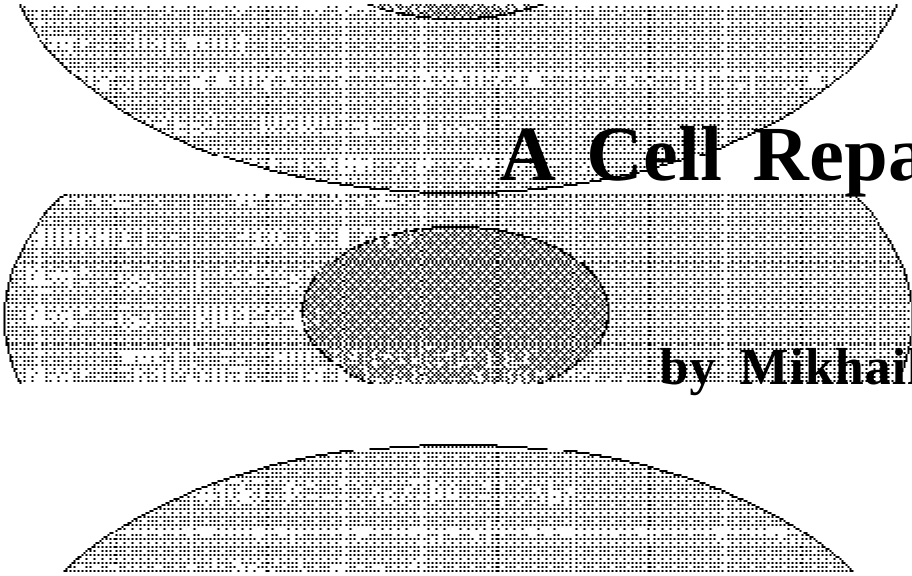

A Cell Repair Algorithm

by Mikhail V. Soloviev

1. Off-Board Repair Scenarios

This article details an approach to "off-board repair" [1,2] for the reanimation of cryonically suspended patients. The variations described below will serve as a brief introduction.

"Off-board repair" (meaning that repair devices are located outside the patient's body) was suggested by Robert Ettinger in his pioneering cryonics book, *The Prospect of Immortality* [3]. Later, Eric Drexler's conception of repair by "assemblers" or molecular robots (i.e. "on-board"—inside the body) became more popular [4]. The interest in off-board repair was stimulated again by the works of Ralph Merkle [1,2].

2. New Scenarios for Brain Repair

For this article, we will only examine repair of the brain. The complete human body has about 100 times the mass of the brain, and so body repair might take roughly 100 times as long. Or, if we did not wish to increase repair time, we would have to increase the *number* of repair devices, decrease their *size*, or increase their *speed*.

In this particular treatment, the brain is split into approximately 1,000 (10^3) sections before repair begins. The sections are then repaired in parallel, one repair device per section. The repair device consists of an atomic or molecular scanner, the repair computer, and an atomic or molecular assembler.

In general the scenarios for section repair look as follows:

(1a) A section of the frozen brain is scanned to define the location and type of all atoms within. During scanning, the scanned atoms are removed from the section (exposing the next layer of atoms), and data describing their types and coordinates are sent to the repair computer.

(1b) The same as above but the location and types of macromolecules (e.g. proteins) are defined by some type of molecular scanner. After a molecular (several atoms in depth) layer is scanned it is differentially removed—molecules and parts of molecules (consisting of 10-100 atoms) of different form and size (depending on their atomic composition) are separated from the layer by some ablating device (mechanical, ionic, optical, acoustical) and removed.

(2) The repair computer processes the data to determine an electronic image of the section as it would be in a healthy state.

(3a) The atomic assembler rebuilds the section from atoms, using the electronic image of the restored section. The atomic assembler can be the same device as the scanner, but functioning in a reverse process — depositing atoms instead of removing them.

(3b) The same as above but using a molecular assembler that rebuilds the section from molecules, simply placing them in the necessary locations — thus there is no need to join atoms by covalent bonds. These molecules can be synthesized *in vitro* by methods similar to current ones used in gene engineering — *i.e.* outside the repair device, in an aqueous solution at 37°C — and then frozen and transported to the repair device (a more detailed description is given in [2]). Molecular placement can be performed by some "nano-arm" device (e.g. an AFM-like device, similar to an AFM coupled with a protein molecule, proposed by Drexler [5]) .

Atomic scanning can be performed by an array of tiny scanning-tunelling microscopes (STMs) or similar devices. An element of the array can be an entire STM (needle and motors), or only an STM-needle. In the latter case, movement of a large STM-platform (as proposed in [6]) provides STM positioning.

Molecular scanning can be performed by an array of tiny atomic force microscopes (AFMs) or a near-field optical microscope (NFOM) [7]. Moreover, some modification of current electron microscopy techniques [8] could be used for molecular scanning (possibly eliminating the need for nanotechnology). One possible molecular scanning method, based on a future AFM technique, is analyzed in Appendix 1.

Surface ablation can be effected by the microscope itself or by other methods: mechanical ablation, sublimation in vacuum, ionic irradiation, or a combination of these techniques. Ionic irradiation is currently used in electron microscopy [8], and it provides differential removal depending on the atomic or molecular compositon of the specimen.

The cell repair algorithm will work the same way for inferring cell structure from the protein pattern, whether the data was acquired by atomic or molecular scanning. However, the algorithm will differ for protein pattern recognition. In the case of atomic scanning, the protein pattern will be inferred from the cell's atomic pattern, while for molecular scanning it will be derived from relief maps of cell section surfaces. Here we will analyze only the repair algorithm for data obtained by atomic scanning.

3. Brain Cells by Numbers

It is difficult to estimate the volume of brain cells because neural cells and associated structures have complex forms and vary greatly in size (axons of human neurons can be longer than 1 m [9]; diameters of the neuron body vary from 5 to 100 mcm [10]). If we assume that the average linear size of a neuron is about 20 mcm and that it has a cubic shape (20x20x20 mcm), then its volume is about 10^4 mcm^3. By various estimates the brain contains from about 10^{11} to 10^{12} neurons and ten times more cells of other types (i.e. up to 10^{13} cells altogether) [2,9]. If we divide brain volume (1000 cm^3 or 10^{15} mcm^3) by these values, we obtain a range of 10^2-10^4 mcm^3 for the average volume of a brain cell. For further calculations we take the latter value as a reasonable assumption; this means that the average brain cell contains 10^{15} atoms (the number of atoms in the brain (10^{26}) divided by 10^{11}).

If brain volume is 1000 cm^3, then the weight of brain protein is 70 grams (calculated using data from [2]). Using this value, data about the atomic composition of proteins (in weight percents) from [11] (other additional data taken from [6]), we can project the following table (amu is the atomic mass unit = 1.66 x 10^{-27} kg).

Using all these data we can calculate the number of atoms in the brain's proteins: about $6 \cdot 10^{24}$ (6% of all brain atoms), and the average weight of an atom in brain protein: 7.12 amu.

Table 1. Atomic composition of proteins in brain (in body)

Atom	Weight (amu)	Atomic %	Weight %
H	1.0	50.1 (60.6)	7
C	12.0	31.6 (10.7)	53
O	16.0	9.9 (25.7)	22
N	14.0	8.2 (2.4)	16
S	32.1	0.3 (0.1)	2

The molecular weight of a typical protein is 50,000 amu [2]. A protein molecule consists of about 7000 atoms (many proteins consists of more than one protein chain, but this fact changes little in our reasoning, and we will treat a protein as a single unit). The average weight of an amino acid molecule (proteins are chains of such molecules) is 120 amu [12]; it consists of about 17 atoms. For convenience hereafter we will use "protein" to mean "protein molecule" and "amino acid" similarly for "amino acid molecule."

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Thus the brain contains about 10^{21} proteins and about 3.5 x 10^{23} amino acids. The average brain cell (10^{-11} part of the brain) has 10^{10} proteins and 3.5 x 10^{12} amino acids.

All amino acids contain at least one nitrogen (N) atom and many have more than one. The number of N atoms in a cell is 2.4 x 10^{13} (derived from Table 1) — about 10 times greater than the number of amino acids. We can use these facts for an amino acid recognition algorithm: we may start the search/recognition process from the location of an N atom. Also, we can easily identify the first and the last amino acid in a protein (their structure differs from that of internal amino acids). This latter fact allows us to perform the protein recognition in the following way: we find the first amino acid of a protein, then trace all of its amino acids along the covalent bonds between their atoms (we can recognize a covalent bond by the distance between atoms). Thus, we can recognize the protein irrespective of its spatial orientation or 3-dimentional structure (though we may need more information about this if some sort of damage has broken the covalent bonds).

Some other useful facts: there are 20 types of amino acids in proteins; a eukaryotic cell contains about 3000 different types of proteins [13].

4. Outline of Cell Repair Algorithm

We assume the following is known before the repair process begins: (a) the atomic pattern (the coordinates and types of all 10^{15} cell atoms); (b) the genome (the sequence of nucleotides in the DNA) of the patient to be reanimated; (c) the composition and number of small molecules (water, salts, acids, regulatory molecules, etc) which are necessary for the cell to function; (d) every detail of cell structure and function.

Let us further assume that to repair a cell we need only know the protein pattern (or cell skeleton), *i.e.* the location and type of all cell proteins (i.e. repair requires inference of the cell structure from the protein pattern, which should be possible if we know every detail of cell structure and function). Since we also know the genome, the protein pattern gives us the image of the genome state (which genes work and which do not). In general, the protein pattern defines the structure of all cell elements (or organelles: nucleus, membranes, etc), though this assumption is not critical — we can discard it and, using the same algorithm, define the location of nucleotides, lipids etc (but while we retain it for further development, this additional information can be used for verification of the cell structure inferred from the protein pattern).

The algorithm itself consists of the following steps:

(1) defining the cell's amino acid pattern (*i.e.* the type, position, and orientation of all amino acids), using information about the cell's atomic pattern;

(2) defining the cell's protein pattern, using information about the amino acids found in step (2) (steps (1) and (2) can be combined — see below);

(3) inference of cell structure from the protein pattern obtained in step (2).

The patterns can be derived through pattern recognition algorithms, and inference of cell structure can be achieved through scene analysis. Neural net computers (and hence algorithms of self-learning) could be used to realize both objectives. An alternative approach would be logic programming by a version of problem-oriented parallel Prolog (a language of logic programming). Processors in the repair computer, then, might be problem-oriented parallel Prolog processors.

Cryonic suspension does not destroy amino acids. Recognition of proteins, on the other hand, implies their repair, at least indirectly. This is true both for image recognition methods with neural processors, and for logic programming. In the latter, tracing the amino acid skeleton of a protein would give us the protein's linear structure, which in turn would define its three-dimensional structure. We thus should be able to reconstruct the protein correctly, even if its three-dimensional structure is damaged significantly. The inference of cell structure also implies its repair, and should be feasible even in case of severe cryopreservation damage. However, a great deal of research work will be needed to develop the appropriate inference and repair methods.

5. Estimate of Repair Time and the Number of Processors

To make such an estimate, we must try to imagine the possible outline of a repair program written in Prolog (see Appendix 2 for details), qualitatively projecting its complexity. Of course, this program is far from being a reality; many details are omitted.

We can describe how the program works as follows:

(1) The program takes an atom, N,

from the list of atoms, NN, determined by STM or AFM and stored in the memory of the repair computer. The program tries to prove that this atom belongs to the first amino acid of a protein; if it fails, it tests the next atom, N+1, etc., until it succeeds in finding the beginning of a protein. The program then hypothesizes that this amino acid belongs to the first type of proteins, and it tries to prove this by analysis of the amino acid chain composing a protein, checking the atomic environment of each element in the chain. If this test fails, the program goes on to test for the next type of protein, etc., until the type of a protein is identified. After recognition of a protein is completed, the program takes the next atom, N+1, and repeats the above steps. The result of this work is a list describing the type, orientation, and location of all cell proteins (in this algorithm, amino acid pattern recognition is performed as a part of protein pattern recognition).

(2) The program then tries to infer the (repaired) structure of cell organelles from the protein pattern, assuming an organelle is a protein (sub)pattern. Of course, the description of the inference predicates must be elaborated (to accomplish this, we should know the precise structure of each cell organelle). The research for this task (the inference and repair of cell structure from the protein pattern/cell skeleton) could be initiated with current technology (analytically or by simulation).

The execution of such a program should be performed by a special problem-oriented (for cell repair) parallel Prolog processor. (This has yet to be designed; however, ordinary Prolog processors have existed since the 1980s [14].) The basic (built-in) predicates (equivalents of "command," "operator," or "procedure" in a Prolog program) would be executed in one step by this processor. Parallel processing would allow proof (execution) of several predicates simultaneously. In most cases we don't need to recogize all elements (atoms, amino acids) to recognize the whole object.

Assume we need 10 steps to decide (by a built-in predicate) whether an atom, N, belongs to the first amino acid of protein. Therefore, to scan the list of NN (2.4 x 10^{13} atoms) we need approximately 10^{14} steps.

Assume that there are about 5000 types of proteins. Though they each have an average of 500 amino acids, we assume that it is sufficient to analyze 50 amino acids to recognize the protein (*i.e.* on average the first 50 amino acids define the type of protein). There are 20 types of amino acids; their average size is 17 atoms.

Also assume that on average we need to analyze 50% of the alternatives at each level (the algorothm could be optimized to decrease this ratio), and the recognition of one amino acid is performed in parallel by a single step (*i.e.* about 100 (20/217/2) steps are executed simultaneously). Thus we need less than 10^5 (5000/250/2) steps to recognize one protein, and less than 10^{15} steps to recognize all 10^{10} proteins in the cell.

To estimate the complexity of recognition and repair of the cell structure (*i.e.* membrane, nucleus, and other organelles) we must know the number of organelle types and their "average complexity," the number and complexity of predicates necessary to describe the organelle's protein pattern. Additional biological research and probably computational experiments are needed for exact estimates. If we now assume 10^5 steps are enough for each protein to be "built" in an organelle (this seems a safe upper bound) , then we need about 10^{15} steps to infer the whole cell structure. If we reason another way, 10^{15} steps would correspond to the following: there are (on average) 10^5 organelle types in the cell, 10^5 organelles of each type, and 10^5 steps needed to infer one organelle.

Thus, we might effect cell repair in 10^{15} steps, or about one operation per atom in the cell.

We don't need information about all the atoms in the cell (or about all types of atoms) to begin recognition and repair — information about several tens of atomic layers is enough. Further, we don't need to store information about all cell amino acids and all cell proteins. Demands on memory storage will come from parallel processing of several cells (see below). Nevertheless, in my intuitive estimation, 10^{10}-10^{12} bytes of memory per processor could be enough.

At the end of the next decade it is expected that processor speed will reach the order of 10^{12} operations per second [15]. Let us set the the total requirement of repair time we would like to achieve at 10^7 seconds, or about four months. In this length of time, one processor can repair 10^4 cells, *i.e.* it can guide 10^4 sequential repair operations involving an STM or AFM, each of which takes 10^{15} steps. Each of the 1000 repair devices used in parallel would contain 10^4 processors. To repair the entire brain, we would need 10^7 processors.

Taking these numbers into account, it seems possible that we will have the necessary computing power before the year 2020.

Appendix 1. Scenario for AFM-based Molecular Scanning

For this scenario, we assume that a reasonable time for brain repair is 10^7 s (about 4 months).

The brain is split into sections before repair begins. Brain volume is about 10x10x10 cm and contains about 10^{26} atoms [6]. If the number of sections is 1000, then the section size in atoms is about $10^{23}=10^{26}/10^3$. If each section is 100x100x0.1 mm, then the section dimensions in atoms are about ($4.64x10^{8}$) x (4.64×10^8) x (4.64×10^5) (which totals to 10^{23} atoms).

The molecular scanner is an array of tiny AFMs. (Each AFM consists of a needle and 3 motors to position the needle). Possibly the AFM is the most appopiate device to study the fine structure of biological objects, both living and frozen; its current resolution for solid state matter is about the same as the STM's: 0.1-0.2 nm (i.e. an AFM also can be used for atomic scanning). AFMs work on the following principle: a tiny needle is pushed against the surface of some sample, and then is moved across this surface, maintaining a constant force between needle and surface. Vertical coordinates of the needle are recorded at the given AFM position over the surface, producing a surface relief map. We assume that resolution of 1 nm (about 5 atoms) is enough to recognize proteins from data describing a set of surface reliefs. If the size of each AFM is about 100x100 mcm (*cf.* that the linear size of a present micro-STM is about 1 mm [16]) and a layer 1 nm in depth is removed after each surface scanning, then the AFM must make 10^8 scans a second to scan its part of a section (100x100x100 mcm) in 10^7 seconds. By comparison, the linear dimensions of a present-day micro-STM are about one mm (1000 mcm) and its scanning speed is about 10^6 per second [16]. (We assume that the surface ablation is executed concurrently with the scanning, though the two operations could be sequential.) The area of the AFM array is equal to that of a section (100x100 mm), thus each repair device contains 10^6 AFMs. The work of the AFM is controlled by a repair computer.

Appendix 2. Example of Cell Repair Program

The program is written in Prolog, a computer language used for logic programming. It does not decribe how to carry out a task, but rather, simply *describes* the task. This task description is enough for Prolog to decide how to try to complete the task using its internal mechanisms (or rules) of logical inference. A Prolog program consists of clauses, predicates connected by the logical connectives: "and", "or", and/or "implication" (in the Prolog notation, written ",", ";", and ":-"). As a rule, "or" alternatives are written as several clauses with the identical left part. A predicate specifies some relation between its arguments (attributes, objects); in the Prolog notation these arguments are written in parentheses after the predicate name.

For example, the sentence:

A family is a husband and a wife or a husband and a wife and a child.

in Prolog this is written:

```
family(X,Y) :- husband(X), wife(Y).
family(X,Y,Z) :- husband(X), wife(Y),
child(Z).
```

where the arguments (here they may be regarded as variables) X, Y, Z may be persons' names (the object identifiers): Mark, Jane, Alex, etc.

Comments: (see Diagram 1)

(1) Variables: N — Structured variable containing data about the location of an atom, N. NN — list of N. P — structured variable containing data about type, location, and orientation of a protein. P contains (as its subpart) the cursor to the atom currently processed. Using this cursor, a built-in predicate (such as bondC) can get data about the atomic environment (types and locations of atoms) of the current atom. MemA — structured variable (like "frame") containing data about a membrane component. [] — empty list. [N|NN] — means the separation of a list to its first element and the rest of the list.

(2) Predicates: cell — the goal predicate of the program (the execution of a Prolog program begins from the proof of the goal predicate). It gets the protein pattern from the list of N atoms, and then infers the structure of cell organelles (by the organelle predicates: nucleus, membrane, etc) from the protein pattern, using the general plan (skeleton, frame) of organelle structure. membrane — an organelle predicate, describing an abstract memrane as a set of relations (in the form of a network or a graph) between membrane components. memA — an abstract membrane component, decribed as two proteins: kinase and lipase, with the distance between

Diagram 1: Cell Repair Program

```
cell :- protein_pattern(NN,PP), nucleus(PP), ..., membrane(PP).

membrane(PP) :- memA(PP,MemA), ... .

memA(PP,MemA) :- dlt(kinase,lipase,10,PP,MemA).

protein_pattern([],[]).

protein_pattern([N|NN],[P|PP]) :- amino1st(N), protein(P), protein_pattern(NN,PP).

protein(P) :- kinase(P).
...
protein(P) :- lipase(P).

kinase(P) :- ..., ala(P), gly(P), ... .
...
lipase(P) :- ..., gly(P), ala(P), ... .

ala(P) :- bondN(P), bondC(P), (bondC(P); bondCO(P)).
...
gly(P) :- bondN(P), bondC(P), bondCO(P).
```

them less than 10 (this condition is checked by the predicate dlt — distance less than); data about memA is written into MemA. protein_pattern — scans NN, checks whether the current N belongs to the amino acid that is the first amino acid in protein (predicate amino1st); if it does not, then protein_pattern tests the next N. When it recognizes the protein, its gets data about the type, location, orientation (P), and adds these data to PP. This form of predicate record generates the recursion to scan NN and to form PP. protein — defines all types of proteins. kinase, lipase — define the linear structure of some abstract proteins. ala, gly — define the structure of internal amino acids: alanine, glycin. bondN, bondC, bondCO — check the type of next covalently bonded atom in the atomic chain composing the amino acid/protein skeleton, using data about the atomic environment of the current atom (gotten using the cursor in P).

The functioning of the program is described in the main body of the article.

Acknowledgement

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Why Aren't They Signing up?

by Steven B. Harris, MD

The following text was taken from CryoNet message #8776, 13 Nov. 1997. It is reprinted here by permission of the author.

Although in theory it's a good idea to ask people who don't sign up for cryonics why they didn't do it, in practice the information is about as likely to generate real psychological reasons as asking people "why" they didn't take their blood pressure pills, wear their seat-belts, or keep their dental or doctor appointments. What are they going to tell you? The real "reasons" why people deal (or fail to deal) rationally with pain and risk, and with life-and-death decisions, are generally too deep to get at, through a questionnaire. Good luck.

After more than a decade with the cryonics movement (and more than a decade of being signed up myself) I've come to some of my own subjective conclusions about why people do or don't sign up. You can take them for what they are worth. Some of this I've said before on the net long ago, but I'll charitably repeat it for those who've missed it. You're all entitled to my opinions, after all.

The first thing I think it's important to realize is that most people *don't* fail to sign up for cryonic suspension because they think it won't work, or can't work. On the contrary, the reason most people don't sign up is because they are afraid it *will* work, and leave them after resurrection stranded as loners or social outcasts (the Frankenstein penalty). In order to get past that fear, people need to be anesthetized to the social consequences of radical time travel, in some way.

Ways in which this happens differ from person to person. It seems to me that people who sign up for cryonic suspension broadly fall into two categories, according to how they deal with the idea of irreversible radical future time travel:

Type I: The technogeeks. I don't mean to disparage this group too much, since I probably fit here most closely myself. Technogeek people are lone wolves, almost always men, who for one reason or another don't feel a great affinity or connection with their society anyway. Their opinions are generally radical, and their IQ usually high (although their EQ or emotional intelligence is often low). Often they work in technical fields. If they work in social fields they have some other reason for already being disconnected or alienated from society (ie, gay men or women). The idea of radical time travel to the far future simply does not terrify them. They generally report being avid SF readers, and report deciding to sign up instantly as soon as they heard that cryonics was financially feasible.

Not being very sensitive, technogeek people usually have no idea why everyone does not sign up for cryonics, and they usually end up thinking the reasons have to do with some theoretical argument in physics or nanotechnology, or some failure of marketing. "Gee," one hears these people say, "we should be able to get thousands of new members if only we do the following simple thing: . . ." These people are suckers for others who claim to have the simple answer. Trying to convince them that the problem is far more complicated usually goes nowhere, because they simply lack the emotional equipment to understand why most people don't *want* to travel into the future without their postcranial corpori, or their social milieus.

Type I cryonicists and their families (who are Type II) include most of the early cryonicists in the movement, up to the beginning of the "logarthmic phase" or exponential growth in the cryonics movement, from 1986-1993, or so.

Type II: We've looked at Type I cryonicists. Type II cryonicists are simply everybody else who signs up. For the average non-technogeek person, the idea of traveling into the future where society and human relationships are radically different, is terrifying. As is the physical idea of having the cryonics operation done on one's body (for neurosuspension, add more apprehension). In order to get past these basic fears, most people (the type II people) require two assurances before they sign up: 1) That a large fraction of their social relationships survive with them. This requires close contact and a number of personal relationships with other cryonicists, over a long period of time. 2) That the cryonics operation be done on them by people they know, and who they have established a kind of doctor-patient relationship with. Radical medical technology is scary, and you don't want it done on you by strangers or screw-ups. Preferably, you'd like to know the medical high priests involved, and have confidence in their technical skills.

Since one or both of these factors must be present (in some measure or another), growth of cryonics by Type II membership requires regular cryonics meetings and social activities, as well as a highly competent suspension team which has some charisma, and is highly visible in cryonics activities. If both of these factors are present, the idea of cryonics spreads through local and close social contact exponentially like a disease (technically: meme), though not a very infectious disease (ie, more like HIV than the flu virus). Interrupt this process, however, and exponential growth disappears, to be replaced by the linear background noise of continuing Type I/technogeek signups, which are always with us. This happened in 1993, when the ejection of Mike Darwin and other key personnel from Alcor, and the movement of Alcor physically to Arizona, caused a split in the cryonics membership which caused both factions to fall below the critical mass of technical skills and social relationships necessary to sustain log growth.

What do I see in the future of cryonics? It seems inevitable that eventually, in some place, after a slow accumulation of Type I signups and their families, the critical mass of relationships and skills will allow for log growth of cryonics to continue locally once again. I do not know when this will happen. Much depends on negotiations now taking place between factions of cryonicists. It may happen in 2 years or 20, but it will happen.

How important is continuing research in this scheme? Fairly important, but only in the context above. If suspended animation is achieved, don't look for a huge signup to follow; for reasons explained above, we probably won't see much extra growth at all. But that doesn't mean we don't need to do the research.

Steven B. Harris, MD is a board-certified internist and gerontologist, as well as a long-time cryonicist and accomplished writer. Dr. Harris has advised on numerous cases of human biopreservation and has participated in canine deep hypothermia experiments performed by 21st Century Medicine, Inc.

"GEEZ, I'M NOT A PUBLIC RELATIONS TYPE!"

Four public relations activities *every* cryonicist can do to save his life and help the cryonics movement.

by Marty Nemko

Your future survival may depend as much on broad support for cryonics as on cryotechnology. That support will yield more members, improving Alcor's financial security and, in turn, the probability of your reanimation. It will also pave the way for support of cryonics-friendly initiatives such as right-to-die and funding for research on cryosuspension and reanimation.

Unfortunately, public relations is extraordinarily labor-intensive. It cannot be left to a few people. We all must consider doing our bit. Next time you think about watching a sitcom or cleaning out the basement, ask yourself if a little cryonics PR might be a better use of your time.

But you say, "I'm the opposite of a PR-type." Most cryonicists are. Yet there is much that each of us can do:

1. GET SKILLED AT OVERCOMING KEY OBJECTIONS TO CRYONICS.

Whether you're being interviewed in the media, or simply talking with friends or relatives, you will be affecting people's opinions of cryonics — for better or for worse. Key will be how you address the inevitable objections: it won't work, it's selfish, it ignores the soul, why isn't everyone doing it, it's environmentally problematic, the money could be better spent, *etc.* Try to respond (gently but confidently) with something like, "I understand why you would feel that way. I used to think that too, but. . ." and then give your explanation. That sort of understanding approach will often help to gain converts or at least turn antagonists into neutrals.

I am a radio talk show host and frequent guest on KGO's Ronn Owens Show (talking about career and education coaching, not cryonics) so I have a lot of experience responding to objections. Here is how I would answer the most common objections to cryonics:

"It won' work."

Currently, you're absolutely right. But think of the amazing progress we have made in medical science. 100 years ago, it would be unthinkable that we could clone a sheep, yet today we can. Currently, we can't repair aged or cancerous cells, but perhaps in 100-200 years we can. We know that if, when we die, we *don't* get frozen, we will rot and have *no* chance of coming back to live *ever*. If, however, we do get frozen, there is at least *some* chance of our being revived. And, at minimum, when I am dying, I will have some peace of mind knowing that at least there is a *chance* I will come back. That reduces my fear of dying.

"It's a scam by the cryonics companies."

Fact is, they are operating at a loss. Most of the employees are volunteers, and the salaried people make under $20,000 a year. We do it because we believe in it.

"It's selfish."

To spend some money to get a chance to return to life in a future century seems far less profligate than the huge sums of money that people spend to stay alive in a coma or when they are pain-wracked with cancer, and certainly the huge sums people spend to buy palatial homes.

"It's environmentally problematic."

The degree of overpopulation that would accrue is tiny compared with the impact of non-use of birth control in third-world countries. The average number of children parented per cryonicist is less than 1. That does a far greater environmental good than someone with 3 or more children who doesn't get frozen upon his death.

"It's unnatural. It's ungodly."

No one says it's ungodly when an emergency medical technician performs CPR to save someone whose heart has stopped, even though that essentially brings the person back from the dead. Cryonics is the same thing. We freeze a person until such time as we can resuscitate him.

"It ignores the soul."

We freeze the body, not the soul. If you believe in a soul, you don't believe it can be frozen like a piece of meat, do you?

2. CALL NEWSPAPERS, RADIO AND TV STATIONS.

I used to be scared to do that, but I've found that it's much easier than I thought.

When the switchboard operator answers, say, "I have a science story idea. Who should I pitch it to?" Then, when you get to speak with the reporter, propose a feature on cryonics in which you and/or cryonics cognoscenti are interviewed. The media are particularly interested in trend pieces, so a good way to pitch it is, "There has been a real increase in the number of people who are electing to be frozen upon their deaths in the hopes of being reanimated when medical science advances enough to rejuvenate them. And these aren't crackpots. They're primarily computer programmers, scientists, and the like. I'm one of them. Would you like to do a story on the increased interest in cryonics?" Or if you're shy, simply offer to refer the person to some cryonists who are less shy. Even if you do want to be interviewed, editors usually need to interview multiple people for a story. You might consider such experienced interviewees as Steve Bridge, Ralph Merkle, Charles Platt, Brian Wowk, Jim Yount, or even myself, Marty Nemko. *[Alcor can supply serious callers with contact information for these individuals. — ed.]*

3. WRITE ARTICLES FOR LOCAL MEDIA SUCH AS, "WHY YOU SHOULD BE FROZEN."

You may be surprised to know that it is quite easy to get published in newspapers — perhaps not in the flagship newspaper of your city, but certainly in community publications.

4. DO INTERNET POSTINGS ABOUT CRYONICS ON NON-CRYONICS SITES.

This is an easy way to expose our ideas to many thousands of people. The possibilities are endless: health-related listservs, science-related chat rooms, etc.

If you need additional help in your public relations efforts, Alcor is glad to help any way it can. Call 1-800-367-2228, or e-mail brian@alcor.org. Though your projects may not *immediately* create an avalanche of publicity, reaching even one or two potential cryonicists can have an enormous impact on the future of cryonics.

Marty Nemko is an Oakland career counselor and hosts a radio show, "Work with Marty Nemko" on KALW-FM 91.7 San Francisco, 11 a.m-noon.

ALCOR MEMBER PROFILE

Katie Kars Friedman

Profile Editor: Russell Cheney

For the new year, *Cryonics Magazine* would like to present a new column: Alcor Member Profiles. Each quarter, one Alcor member will be selected for a brief personal interview. We hope to introduce the Alcor membership and the *Cryonics Magazine* reading community to a wider view of itself, by communicating membership background, beliefs, and ideas. Alcor has hundreds of fascinating members who may not now be widely known in the cryonics community. We hope that the Profile column will provide a relatively easy, informal means to give some of these people the broader attention they deserve.

Why three names: Kars is my maiden name; I wish to keep my family remembered.

Date joined Alcor: 1989

Place of birth: Kansas City, Missouri

City and state of current residence: Las Vegas, Nevada

Date of birth: 12/12/18

Job(s) / volunteer work: Formerly hospital volunteer; now nutrition and self-help for friends and family.

Marital status: Married

Children: None

Educational background: KC Junior College, two years.

Height: 5’ 1”; I don’t have far to fall!

Best feature: Like to help people.

Worst feature: Can’t tolerate intolerance.

Favorite author: Dr. Andrew Whil on alternative medicine.

Favorite books: Non-fiction health books.

Book you are currently reading: *A Cure for Cancer*; I usually read magazines.

Favorite non-cryonics magazine: *Let’s Live* and *Life Extension* health magazines.

Favorite movie: “The Way We Were”; also, Paul Newman movies.

Favorite TV show: “Frasier!” Also, “Law and Order.”

Favorite music: Classical, Also, Gershwin

Favorite artist: Renoir; he does fat women so well.

Greatest adventure: Europe just after WW II. I needed to get from Paris to England to collect money owed me, to return to the US. At the English Channel my boat left before my train arrived. I spent the night in a hotel with a bombed-out roof. The next evening in Liverpool it took three porters to carry all my luggage, and I had no money to pay them, and I couldn't understand a word with their English accent. I stayed the night in a good Samaritan's wife's house, and gave them some canned goods as a thanks! I finally was paid and did get back to the US.

Religion: Cryonics.

Most-prized possession: My privacy.

Most-prized possession you've arranged to have upon reanimation: None, because there's nothing I ever want to see again.

Personal philosophy: I want to feel I'm in charge of my own destiny.

Short-term goal: Help others; keep up with health research for others and for myself, including diabetes for my sister, and my brother, who is on oxygen, and smart pills and other new research for the brain.

Long-term goal: At 78, can you have a long-term goal? If so, it's my research.

Immediate goal upon reanimation: I'd like to have my body and intelligence redesigned.

Longer-term goal(s) after reanimation: Although it's hard to plan without knowing details, something in the health field, perhaps become a nutritionist or doctor.

Achievement for which you are most proud: That I'm at this age and still have a useful energetic attitude. Plus success stories with people I've helped.

Favorite subject in school: English; I wrote a book of poetry.

Least-liked subject: Math.

Pet(s): Previously for 13 years, my Himalayan cat.

Greatest fear: A snafu in my suspension.

Happiest memory: Going to Europe.

Secret ambition / fantasy: To get suspended properly.

First choice to share your dewar: Whoever wants to go; Jerry Searcy, Linda and Fred Chamberlain.

Personal strengths: Enthusiasm.

Personal weaknesses: Energy.

First became interested in life extension: Before 1989 read about it, or saw it on TV.

Reason: To have a chance in the future; I don't believe in reincarnation or an afterlife.

Who was most instrumental in your sign-up: Carlos Mondragon.

Most effective thing you do to promote your own longevity (other than being an Alcor member): Very strict diet. Feed my mind and body. Lots of supplements. Green drinks, organic food. Silver colloidal spray. Rarely meats. Swim three times a week. Used to play tennis, but had to stop that after the neck injury; walk every day.

Least: Inhale car exhaust.

Cryonics idol(s) and why: Saul Kent. An innovator and he gets things done.

Why are you a cryonicist: I'm in cryonics because it gives me a comfort zone. Because this way, I don't have to think about death in the same way I did before.

What advice would you have for other cryonicists: Most are smarter than I am; what advice could I give? Be aware of life style; the longer you're around, the better the chances that research will catch up to you.

On Rereading *The Immortalist*

by Thomas Donaldson, Ph.D.

Alan Harrington died not long ago, to the accompaniment of encomia by various people. Coincidentally, a book-search company finally turned up a copy of *The Immortalist* for me to buy (I had read it long ago, but did not own a copy). It was even a first edition, dated 1969. I bought that copy and read it once more, to see how Harrington looked to me after all this time.

The Immortalist starts with a ringing denunciation: "Death is an imposition of the human race, and no longer acceptable." Despite this bold stance, Harrington never joined any cryonics society. His reasons, described in one chapter of the book, amount to strong skepticism about whether or not cryonics would work. Even so, this book is not all that strong on the science surrounding cryonics and life extension. Harrington gives this subject only one chapter, which is filled with recent (1967) news about transplants, and the suggestion by Dr. Robert White (who had just finished transplanting a dog's head) that *head* transplants might someday become common. All that aside, Harrington did acknowledge very clearly that the road to defeating death went through medical science.

Yet science isn't the only issue here. Most of *The Immortalist* deals with how so many people hide from themselves their desire for immortality, how that desire keeps showing itself despite their efforts, and finally, speculations about the experience of such immortality (which he defines as agelessness, not freedom from destruction in other ways). Harrington has some perceptive points on those issues. He argues that most human beings' belief in the inevitability of death has twisted them into pathological states. He uses most of his book to describe how this happens, in detail.

In one set of chapters, he analyzes both the notion of evil and the notion of a devil (Satan) as signs of our wish for immortality. To commit evil acts often leads to much fame, and thus a kind of immortality. Not only that, but all the myths in Christian, Muslim, and even Greek mythology say that evildoers may be punished *but also become immortal*. (How else could their punishment last forever?) Religions may also designate some acts as sinful, even though they damage no one; such acts consist fundamentally of a wish for the immortality that gods or God have denied to us. In one chapter, "Satan as Our Standard Bearer," Harrington makes this issue very clear: God created us to die, and thus God must be considered our *enemy*. All the theologians and philosophers who argue that "death is good" are indeed doing God's work.

Explicit desires for immortality have been denigrated by philosophers and authorities of many stripes. Such desires are labeled signs of hubris (pride so great that the gods will strike it down), and show a lack of wisdom or a lack of understanding about God's magnificent plan. Life and death are so closely linked that one cannot happen without the other. . . and so on, and so on. (Harrington gives us many quotes from such thinkers and their hangers-on.)

One line of his thinking, which takes up several chapters, discusses how our striving for *real* immortality has been diverted into a striving against one another for notice of our achievements. That notice, implicitly, goes into newspapers and history books, and so provides the one form of immortality against which most Western philosophers and theologians do not argue. Harrington finds several different styles we use in accomplishing this goal. One is to become a Master of our Universe, dominating everyone around us. Another is to withdraw into groups, hoping that the actions of our group will give all its members the desired immortality. However, such strivings taken to extremes may lead ultimately to cruelty and evil. When a dominator encounters resistance, he responds with more and more cruel retribution. When groups compete, they try to damage each other as a means to establish their greater legitimacy. Another response consists simply of using alcohol, LSD, or other drugs to lose one's sense of self completely — to "die" while remaining alive.

Not one of these strategies will ultimately produce the immortality we all consciously or unconsciously seek. The dominator eventually finds himself facing death, to the joy of those he enslaved. Anyone who tries to bury his individuality in a group must still deal with the reality of death as an individual. Drugs, tantric practices, or any of the other ways to forget one's self eventually fail. Put simply, all these ways of striving for false immortality inflict people with types of mental illness that are not seen as such only because they are almost universal. Given the possibility of immortality through advances in medicine (visible and occasionally discussed aloud, even in 1969), Harrington urges us to abandon these false immortalities and strive as best we can for *real* immortality.

Finally, Harrington speculates on how the foreknowledge of an indefinitely long and healthy life span might transform us. (His version of immortalism assumes that fatal accidents will continue.) Much philosophy would simply disappear, since its proponents focused on reconciling us with death rather than urging us to work against it. Any theology claiming that God meant us to die would disappear. Much art and literature would disappear also, for similar reasons. If we no longer strove against one another for various types of false immortality, cruelty and evil would diminish. Even though Harrington cannot accept cryonics, suspended animation comes into his views, as a way in which we might live one life, sleep for a hundred years, and then awaken for another life. (When I read this, I wondered why Harrington thought such sleeps were necessary. Perhaps he considered them analogous to our nightly sleep.) Failure would become impossible if we had no limit in time — we could always try again. Nor would we have to spend our lives on a career we chose in youth, when we possessed comparatively little knowledge of the world.

Are Harrington's ideas scientifically accurate? Does a belief in the inevitability of death cause the pathologies he detailed? We may have to attain immortality ourselves before we know the answers. Nevertheless, Harrington's openness in analyzing his own feelings about death still deserves respect, and may someday be seen as truly pioneering work. But even though Harrington often states his desire for immortality and constantly explains why everyone should have the right to live without the axe of death hanging over their heads, he himself fails to grasp his only available option for reaching this goal: cryonics. We might note this as an example of what a sense of death's inevitability may have done to so many.

Letters to the Editor
Cont. from page 3

culture shock or even turn out to be old farts stuck in the past?

Last but not least (in fact, most important) is yet another psychology-related matter: ***cyberphobia*** and the fear of life, and how humanity can be gradually conditioned to overcome these. Cyberphobia serves as the greatest threat to our dreams and goals. Is it possible that a future society might decide to thaw us out without reviving us? The only way to prevent this is to ensure that there are future generations to propogate our ideas (not just hope one day they miraculously become mainstream.)

I guess these are just a few matters that I personally like to contemplate and that perhaps all cryonicists at one point will. I hope if discussion has not begun, more psychology-related issues (including that of depression, suicide, and other emotionally/life span related manners) will be discussed.

Sincerely,

EDO (Edward Landsberg)
shakehip@aol.com

Death at the Edge of Forever: The Story of a Child

by R. Michael Perry, Ph.D.

Longtime immortalists may remember *The Cryonicist,* a little trifold newsletter published by Patrick Dewey between November 1977 and October 1980 (just 15 issues, with #9 and #10 combined into one). Most issues were on fairly light subjects, but #11, October 1979, was devoted entirely to one grim article by Art Quaife entitled, "Cryonic Interment Patients Abandoned." The article opened by recounting efforts on the part of certain cryonics patients' relatives to arrange a transfer of their frozen loved ones to Art's organization, Trans Time. The patients were stored at Robert Nelson's facility, an underground vault at the Oakwood Memorial Park Cemetery in Chatsworth, California. The relatives had reason to suspect all was not well here — and rightly so. The article reported the sad news that all Chatsworth patients had thawed.

Some of the Chatsworth patients' relatives sued Nelson and won large awards for damages. Cryonics received a bad name from which it only slowly recovered. Worst of all, nine human beings lost a chance for a life beyond the brief span that nature allotted them. The horror of Chatsworth cannot be undone, but it can and does inspire us to avoid such tragedies in the future. We can help to keep this goal in the minds of ourselves and others by remembering the casualties of Chatsworth.

For this column, I want to focus on one of these casualties, a little girl stricken with a terminal illness, whose father made a heroic — if futile — effort to save her through cryonics.

In July 1971, Genevieve de la Poterie*, a French Canadian girl with an engaging smile and large brown eyes, was nearing her eighth birthday. Unfortunately, little Genevieve had been diagnosed with a Wilms' tumor and metastasized cancer. With one of Genevieve's kidneys removed and the other diseased, the Montreal hospital treating her had decided there was nothing more they could do but wait for the end.

Genevieve's father, however, had seen a TV program on cryonics. At one point during the program there appeared an emergency van with "Cryonics Society of Michigan" showing on the side. This led Mr. del la Poterie to Robert Ettinger in Detroit, and Ettinger in turn put him in touch with Robert Nelson of the Santa Monica-based Cryonics Society of California (CSC). With the little girl's condition so precarious, Nelson and a mortician quickly packed perfusion gear and flew to Montreal. (Their gear, primitive by our standards, included standard mortuary equipment and bottles of DMSO, which was used then as a cryoprotectant.)

Somehow the child lingered on, and her father decided to seek treatment in Los Angeles. Sympathetic cryonicists there — among them Fred and Linda Chamberlain, Marce Johnson, Holly Martin, and Paul Porcasi — helped coordinate Genevieve's hospitalization. The medical picture brightened considerably. . . for the moment. Doctors concluded that Genevieve might be saved through dialysis and eventually, a kidney transplant. In early August, with dialysis established, Genevieve's one remaining kidney was removed, and the wait began for a suitable donor. In early September the little girl visited Disneyland, courtesy of Nelson, and a dinner was held afterward in her honor, at which she "sparkled despite her difficulties." Genevieve then returned to Montreal.

There she continued to improve, and even returned to school briefly. But her cancer was still present, and

* Pronounced, approximately, *Zhanh-vyev du la Poh-TRAY.*

by the following January her condition was once again grave. Genevieve and her parents, Guy and Pierrette, returned to Los Angeles. On January 25, 1972, Genevieve de la Poterie finally succumbed to her illness and was suspended by CSC. *The Outlook* (now *The Immortalist*) reported, “We mourn the present loss of this plucky child, but we share with her courageous parents the hope that one day she will be with them again, alive and whole.”

Genevieve’s freezing, at least, was a hopeful step in that direction. A cryonics patient must not merely be frozen, however, but must also be *kept* frozen. Today we recognize the need for pre-arranged funding to cover the cost of continued, indefinite maintenance. This means that several tens of thousands of dollars must be set aside and invested, so that the ongoing income from these investments can pay for liquid nitrogen, storage space, and other necessities. In 1972, few people understood the need for this strategy; cryonics patients relatives were generally expected to provide funds for maintenance on a year-by-year basis.

Genevieve at Disneyland, September 1971. [*The Outlook*, Jan 1973].

Little Genevieve’s parents were not wealthy. They probably did not have tens of thousands of dollars for funding (though of course no one required it of them at the time), and by all indications, they could not even afford a cryogenic capsule in which to store their daughter. Only through luck did a capsule become available.

Steven Mandell had been frozen in 1968 by the Cryonics Society of New York. Four years later, Mandell’s mother, Pauline, was feeling the pinch of the maintenance costs at the New York facility and looking for a cheaper accommodation, which Nelson offered. Steven Mandell’s capsule was transferred to CSC about the time Genevieve was frozen. It was an old, horizontal model, manufactured by Cryocare Equipment Corporation in Phoenix, and similar in basic design to the capsule used for the suspension of James Bedford in 1967. Nelson happily accepted capsule and occupant, but before depositing them in his Chatsworth crypt, he added *two* other patients.

Ettinger with the Michigan van. [*Immortality*, Aug-Sep 1970.]

“Adding patients” was not easy. First the capsule had to be emptied of all (or nearly all) its liquid nitrogen, risking the patient inside. An expert welder then had to use a torch to cut off one end of the capsule, then weld it back with an airtight seal when the insertions were complete. The capsule could then be refilled with liquid nitrogen. (Far safer procedures are now used for patient transfers involving today’s more advanced containers.) Besides Genevieve de la Poterie, Mildred Harris also joined Steven Mandell in this capsule. (Mrs. Harris had been frozen in September 1970 by CSC but maintained on dry ice since, bizarrely, in a specially constructed box with an observation window. This was also stored at the Chatsworth crypt during its use.) The Mandell capsule, now holding *three* patients, was finally consigned to Nelson’s Chatsworth crypt where, in theory, it would then be periodically replenished with liquid nitrogen.

Sadly, this did not occur. Although exact details are wanting, evidence suggests that the capsule was adequately maintained with liquid nitrogen for only about two years.

“Cryonic interment” — what you had to look forward to if you were frozen by CSC — was a far cry from today’s practice of cryonic stor-

age. The crypt at Chatsworth was a a concrete-lined underground chamber, about 20 feet long, 10 feet wide, and 12 feet deep. The steel-paneled, flat roof projected only inches above the surrounding turf; a large hatch provided entrance and also lighting to guide your steps down a vertical ladder to the floor below. The hatch was large enough in fact that a capsule could be lowered through it. To facilitate servicing with liquid nitrogen, the vault was set close to a passing street, only inches separating the nearest of the 10-foot sides from the curb.

Primitive though it was, the crypt might have been successful, had it received careful attendance. Unfortunately, under the ministrations of Robert Nelson, this was not to be.

On occasion, Nelson would exaggerate his resources and capabilities. In a 1969 newletter, for instance, he makes glowing (if fuzzy) claims about the "world's first cryotorium," just completed by CSC. Good evidence suggests suggests this "cryotorium" consisted of four frozen patients crammed into a single capsule, similar to the later situation with Genevieve (though of course this was not reported). Dishonesty tends to breed secrecy, and by all accounts, Nelson was highly secretive.

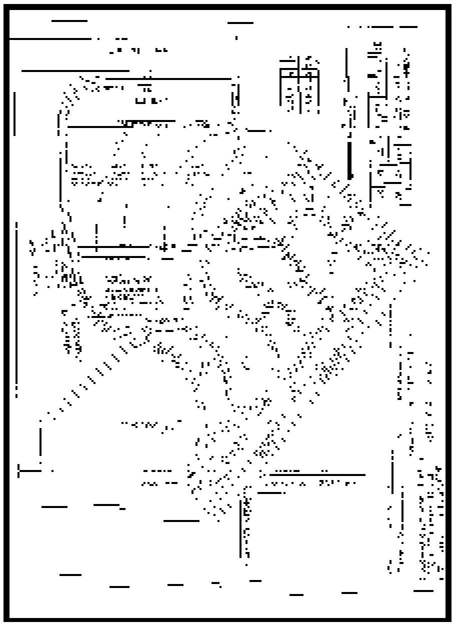
Some of Nelson's secrecy probably involved that first four-patient capsule. Cemetery records establish that the capsule was placed in the Chatsworth crypt on May 15, 1970. (Prior to this, it was maintained in a mortuary, probably with some success.) Nelson, in his 1983 court testimony, claimed he maintained the capsule for a year and a half after placement in the vault, or until about November 1971, when, lacking funds and finding relatives unwilling to pay, he stopped adding liquid nitrogen. The capsule, with its four decomposing bodies, was simply abandoned where it was. For years this was a very tightly guarded secret, as was any reliable information about things at the crypt.

Meanwhile Genevieve de la Poterie was frozen and sent to the same grim resting place.

According to a 1990 interview with Nelson, the Mandell capsule containing Genevieve malfunctioned while Nelson was away on a five-day business trip. (He had depended on a cemetery official to keep watch over it.) Like most cryogenic units, this capsule's construction was similar to the familiar, double-walled thermos, with the space between the walls evacuated to minimize heat flow. In this case, the vacuum had developed a leak; air had to be pumped back out, or the loss of insulation would cause nitrogen to boil away rapidly.

On Nelson's previous instructions, cemetery officials moved the capsule to a "maintenance area" where the vacuum pump could be applied and monitored. After one day of this, Nelson received a call telling him that the pump had broken down but had been fixed. When he returned to Chatsworth four days later, he found that the pump had *not* been fixed. All of the capsule's

The three in one capsule (top to bottom):
Steven Mandell, Mildred Harris, Genevieve de la Poterie.
[Credits: Mandell, *Cryonics Reports* Sep 1968; Harris, *Immortality* Winter 1971; de la Poterie, *The Outlook* Aug 1971.]



Location of crypt in the Oakwood Memorial Park cemetery.

liquid nitrogen had long since evaporated, and the patients had thawed.

"I fell to the ground and I cried," Nelson said. "God, that little girl — That finished me right there. It felt like the worst failure in the world. How do I tell this man? [Guy de la Poterie]"

At this point, Nelson said, he resigned the CSC presidency, which he had held since the organization was founded nearly 8 years before. Written records establish that this resignation occurred October 11, 1974, helping to date the other events.

Nelson claimed that he subsequently did *not* terminate the suspensions of the three Mandell capsule patients, but instead had their capsule refilled with liquid nitrogen and its vacuum pump repaired. Nelson then made a trip to Iowa to confer with the sons of Mildred Harris. The Harrises decided to continue their mother's suspension, despite what had happened. Nelson continued on to Canada and met with Guy de la Poterie, who apparently was reassured that his daughter's suspension had not permanently ended.

The next few years are more of a mystery. Nelson, despite his resignation as president of CSC, continued to operate the Chatsworth facility. (Its actual affairs were handled by CSC's sister organization, Cryonic Interment, Inc., and then by another company, General Fluidics.) Nelson claimed, however, that his cryonics patients' relatives either could not or would not make continuing payments for liquid nitrogen. Because of this — and because of another vacuum pump failure — he finally had to "terminate" the three suspensions.

Nelson's claim of non-payment was later disputed. Terry and Dennis, the two sons of Mildred Harris, insisted that Nelson had promised the *perpetual* care of their mother, in exchange for their contributions totalling over $20,000. Nelson himself admitted, in court testimony, that he hadn't informed them about terminating their mother's suspension. The court sided with the Harrises, who were awarded the lion's share of over $900,000 in damages (of which $400,000 was actually collected, none of it from Nelson).

By May 1979, all of the Chatsworth suspensions (nine altogether) had terminated. Little Genevieve de la Poterie's body had been disinterred from the capsule and buried. Guy de la Poterie did not join the suit against Nelson, apparently accepting that the loss of Genevieve was not due to any malfeasance.

The loss of people who might have been saved is a bitter one. Once again though, we have to learn what we can from these failures. We must always be on our guard for people who offer cryonics services but whose operation, in one way or another, for one reason or another, does not live up to expectations. Far bigger disasters than Chatsworth are possible. As cryonics grows more popular, the danger only increases.

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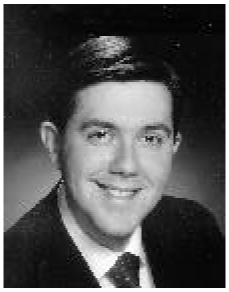

Growing Things

by Stephen J. Van Sickle

Press reports are notoriously unrealiable. I should know: my father has been in the news business for thirty years. Nevertheless, I am going to lead off with a couple of items that I haven't yet been able to confirm in academic publications, simply because they are so intriguing. If anyone can find more, please let me know. Remember, any and all contributions welcome. Just email me at sjvan@csd.uwm.edu.

Headless Frog Clone?

On Oct 19, 1997 scientists at Bath University in the United Kingdom revealed to the *Sunday Times* that they had successfully created headless frog embryos. By genetically modifying an embryo to suppress the development of its head, the scientists in effect created an "organ sack" producing tissues that may be useful for organ transplants. Though the application to revival of neurosuspension patients is obvious, the difficulties in growing an embryo *sans* central nervous system are enormous, since the brain regulates much of the body's function. If confirmed, this is definitely an interesting first step.

http://www.wired.com/news/news/technology/story/7873.html

Artificial Womb

Of course, the second step is *growing* the embryo. Another press report is of an advance at Juntendo University by Professor Yoshinori Kuwabara, published in the *Journal of the Japan Medical Association*. His team has succeeded in incubating goat fetuses in an artificial womb for the final three weeks of their development. "We're aiming eventually to use the technology for human fetuses but it will take maybe 10 years." The primary goal is use with premature infants rather than totally artificial growth. I will likely confirm this, since Dr. Kuwabara has been working towards this for some time. See Unno N, et al. "Development of an artificial placenta: survival of isolated goat fetuses for three weeks with umbilical arteriovenous extracorporeal membrane oxygenation." *Artif Organs.* 1993 Dec 1; 17(12): 996-1003.

Successful Gene Therapy

Dr. Jeffrey Isner of St. Elizabeth's Medical Center in Boston announced at the annual meeting of the American Heart Association the use of gene therapy to grow blood vessels in clinical trials. The treatment was tested on 20 leg atherosclerosis patients who were facing amputation. The therapy, called *therapeutic angiogenesis*, involves injecting a gene for the production of VEGF, or *vascular endothelial growth factor*, directly into the leg muscles "where it instructs existing blood vessel cells to regenerate new blood vessels." Improvements in blood flow were demonstrated in 16 of the 20 patients. There is hope the therapy will be useful for coronary artheriosclerosis and stroke.

http://www.healthreport.com/Digest/IMAGES/gene.htm

New Nanotechnology Center

The University of Toronto, with a private contribution of $5 million from the Toronto research firm Energenius, will open a new research facility devoted to "making quantum-level microelectronics devices by moving single atoms with a probe." This is the first facility of its kind in North America. *Science*, Vol. 277, 19 September, 1997.

DNA Sensor Uses Gold Nanoparticles

Researchers at Northwestern University in Evanston, Illinois have made a DNA sensor from a web of DNA and gold particles. The DNA strands bind to matching sequences, while the electronic properties of the gold change color. This detection system could result in easy, cheap screening for infectious disease and biological warfare agents. Even more importantly, the team feels this is a proof of principle for a new method of using DNA to self-assemble nanoparticles into complex devices. See *Science*, Vol. 277, August 1997, page 1036 and page 1078.

Stupid Liquid Nitrogen Tricks

And we thought it was just for keeping things cold. Carlos A. Ordonez and his team at the University of North Texas in Denton are trying to develop a liquid nitrogen-powered vehicle. Their prototype, called the CoolN2Car, can travel 15 miles at 20 miles per hour on 48 gallons of liquid nitrogen. This is hardly practical, but the group feels that recent improvements in the efficiency of liquid nitrogen production, combined with an improved motor, will make this fuel economically competitive with gasoline. Since liquid nitrogen is extracted from air and pollutants are removed in the process, the cars can actually improve air quality. And unlike electric cars, air conditioning is not a problem. *Science News*, Vol. 152, August 23, 1997, page 119.

Supernormal Eyesight?

I never did buy those x-ray glasses from the back of my comic books, but something even better may be coming soon. David R. Williams of the University of Rochester has been applying the technology of adaptive optics to the human eye. Adaptive optics, developed for laser weapons and used extensively in astronomical observations, involves the use of "rubber" mirrors and lenses that change shape to correct for distortions from the atmosphere. Dr. Williams has used this technique to correct for distortions in the eye to produce the most detailed images of the retina ever, with individual cells clearly visible. Interestingly, this also seems to work in reverse, giving the retina an undistorted view of the world. In tests, people with normal eyesight have had up to a sixfold improvement in sensitivity to contrast and the ability to see fine lines invisible to the naked eye. "Subjectively, when you look through the device, the world looks sharper," says Dr. Williams. "My dream is to some day sculpt a contact lens into just the right shape." These techniques may also radically improve current surgical procedures used to correct vision. See *Science News*, Vol. 152, November 15, 1997, page 313.

REVIEW: NONFICTION

Stuff: The Materials the World is Made of

by Ivan Amato, Basic Books 1997

Reviewed by Thomas Donaldson, PhD

Ivan Amato writes popularizations of various sciences. This book, with such a blunt title (one reviewer admires Amato just for getting his publisher to use the word *Stuff*) discusses *materials science*. Why does materials science relate to cryonics? Because it is one of the many streams of work in nanotechnology*; anyone damaged by cryonic suspension (such as *you*) will need some form of nanotechnological repair.

* That is, "nanotechnology" taken literally, as technology capable of dealing with matter on nanoscales, *not* "Nanotechnology" (capital "N") with the specialized Drexlerian meaning some have attached to it.

Amato's book *is* a bit uneven, mainly because he begins with a summary of our use of materials from Paleolithic times onward. Amato is not a historian; for early periods, he uses secondary sources and so probably fumbles the details. But as he nears the modern era he gets better and better. At one time, not so long ago, we had metallurgists and metallurgy societies, polymer chemists and societies for plastics, ceramicists working with ceramics, and various other groups working on different materials. Only in the 1950's did anyone realize the need for a separate discipline, "materials science," which would bring together the chemists, physicists, biochemists, and others working with all these different kinds of *stuff*.

Amato describes what materials research has done in many fields, with much more detail than possible in this review. Materials scientists learned how to control the silicon from which the chips in our computer are made. They learned how to make metal alloys and other substances capable of withstanding higher and higher temperatures in the engines of rockets and aircraft. Materials scientists' research led to carbon fibers (now gradually becoming part of our everyday lives in such things as tennis rackets) and glass fibers (slowly replacing electrical wires for long-distance communication). Materials scientists appear all over, from medicine (glues to replace sutures, artificial bones which our bodies will not reject) to attempts at taming nuclear fusion (materials resistant to neutrons and high temperatures). Even practical high temperature superconductors came from materials science research.

We have only seen the beginning of such research, Amato explains, and he goes on to mention directions in the future of material science. Here at last we see nanotechnology, such as the dendrimers of Donald Tomalia or the connecting molecules of Samuel Stupp. Both substances were invented not for themselves but as means to construct materials on a molecular scale. (Amato devotes one section of his book to the use of the Scanning-Tunneling Microscopes to modify surfaces and place atoms.)

Amato includes detailed interviews with materials scientists involved in three new developments: synthetic diamonds, mimicking biological materials, and "smart" materials.

Synthetic diamonds: Work goes on now to find out how to lay down diamond surfaces on other objects and make diamond semiconductors (a significant improvement on silicon semiconductors). As an interesting sidelight, William G. Eversole (in 1952) invented the basic process to do this, forming diamond from carbon vapors rather than creating it by very high pressure. Since then, materials scientists have addressed themselves to the problem of increasing the output of diamond created by this method.

Mimicking biological materials : Researchers are working to achieve the same kinds of chemical synthesis accomplished by living things. For example, sea shells consist of carefully structured calcium carbonate *organized* in different ways at different locations; duplicating this effect with other materials — as with an alloy changing its crystalline and elemental composition at designed locations — would give us better versions of familiar materials. One day we may even learn how to grow steel just as we now grow semiconductors (or by other better means!), allowing us to achieve metal with the careful structuring we see in biological materials.

"Smart" materials: Some scientists currently envision materials which have some ability to heal damage or inform users that they have been damaged, similar to what we see in our bones and skin. We are only on the edge of this dream: bone and skin form *systems*, not just ordered collections of crystals or polymers. Those systems endow living tissues with an ability to heal themselves and report injury (and other events) far better than any currently imagined "smart" material.

Amato has not come close to exhausting the potential of these subjects. His book manages to evoke a sense of wonder about what has been and will be achieved in materials science. If you want to read about one of the *other* avenues of nanotechnology, *Stuff* should interest you. It is knowledge of this kind, ideas for making ever more complex materials (such as in nano-devices), that will give us tools to revive those damaged by cryonic suspension.

Poster art by Tim Hubley

Alcor Third Annual Cryonics Conference

April 3 - April 5, 1998 Scottsdale/Phoenix, Arizona

Featuring...

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Please make check payable to **Alcor Foundation**. Your check is your receipt

Please pick up your tickets at the conference. *Thank You!*

Watch for future program developments as Alcor's Third Annual Cryonics Conference approaches.

PROGRAM

Friday, April 3, 1998

7:00-8:00 pm	registration, reception	
8:00-10:00 pm	welcome: Merkle Mode Desert Contest	
	Gregory Benford (tbc)	"Cryonics in Science Fiction"

Saturday, April 4, 1998

9:00-9:30 am	Introduction	
9:30-10:30 am	Fred & Linda Chamberlain	"Alcor Research Update"
10:30-11:00 am	break	
11:00-12:00	Ralph Merkle	"Nanotechnology Update and Molecular Repair of the Brain"
12:00-12:15	break	
12:15-1:30 pm	awards luncheon	
1:30-2:30 pm	Marvin Minsky (tbc)	
2:30-3:00 pm	break	
3:00-4:00 pm	panel	"What's in It for Me?"
4:00-4:30 pm	break	
4:30-5:30	Michael Cloud	"How to Make the Idea of Cryonics Infectious"
5:30-700 pm	break	
7:00-7:30 pm	reception with no host bar	
7:30-11:00 pm	banquet and fund raiser	
	Bart Kosko (tbc)	

Sunday, April 5, 1998

8:45-9:30 am	Bus to Alcor Facility	
9:30-11:15 am	Alcor Tour and Sign-up Party	
11:15-11:45 am	Bus returns to Conference Site	
11:45 am-1:15 pm	lunch break	
1:15-2:15 pm	Paul Segall and Hal Sternberg	
2:15-2:45 pm	break	
2:45-3:15 pm	Dave Pizer	"A Retirement Community and Safe Storage"
3:15-3:30 pm	break	
3:30-4:30 pm	Robert Ettinger	
4:30-5:00 pm	wrap-up	

Alcor Headquarters Training Session Scheduled for Alcor CryoTransport Technicians

With the cost of airfare, have you worried you couldn't afford to attend both Alcor's Third Cryonics Conference and An ACT training class?

Join us in Scottsdale in April. Attend the training class on May 31 through April 2, and then stay for the Conference on April 3-5. ***Save Time! Save Money!***

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Have you been unable to attend other scheduled training classes in your area, but need to recertify by next June?

Come join our class in Scottsdale!

When: March 31- April 2
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For More Information:
Contact Linda Chamberlain,
CryoTransport Manager
800-367-2228 or
linda@alcor.org

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Current CPR card is a prerequisite.

If you had the pleasure of attending Extro 3 (August 9-10, San Jose, CA), you may have heard Eric Drexler's speech on "Conservatism" at the banquet on Saturday night. For those of you who didn't, Dr. Drexler offered some simple yet cogent reasoning: Since medical science continues to advance, a "conservative" thinker does *not* assume that any current medical condition will remain permanently incurable. When faced with death from aging or illness, such an individual would "conserve" himself in the best manner available, until technology offered suitable treatments. [Please forgive the clumsy paraphrasing, Eric. --ed.] So compelling did Dr. Drexler find this reasoning, he announced publicly that he had made this type of conservative arrangement for himself.

But then most of you probably already guessed that Eric Drexler, author of *Engines of Creation*, was an Alcor suspension member.

The next day of Extro 3, after a panel featuring Artificial Intelligence theorist Marvin Minsky, Dr. Drexler again made a speech: "I have long wondered how I would explain the absence of the head of my dissertation committee to people in the future. Now, I won't have to do so." He then presented Dr. Minsky with a new Alcor bracelet and necktag set, officially initiating him as an Alcor suspension member.

If other brilliant minds like Drexler and Minsky choose cryonics, shouldn't *you*?
Sign up with the cryonics organization of your choice today!

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