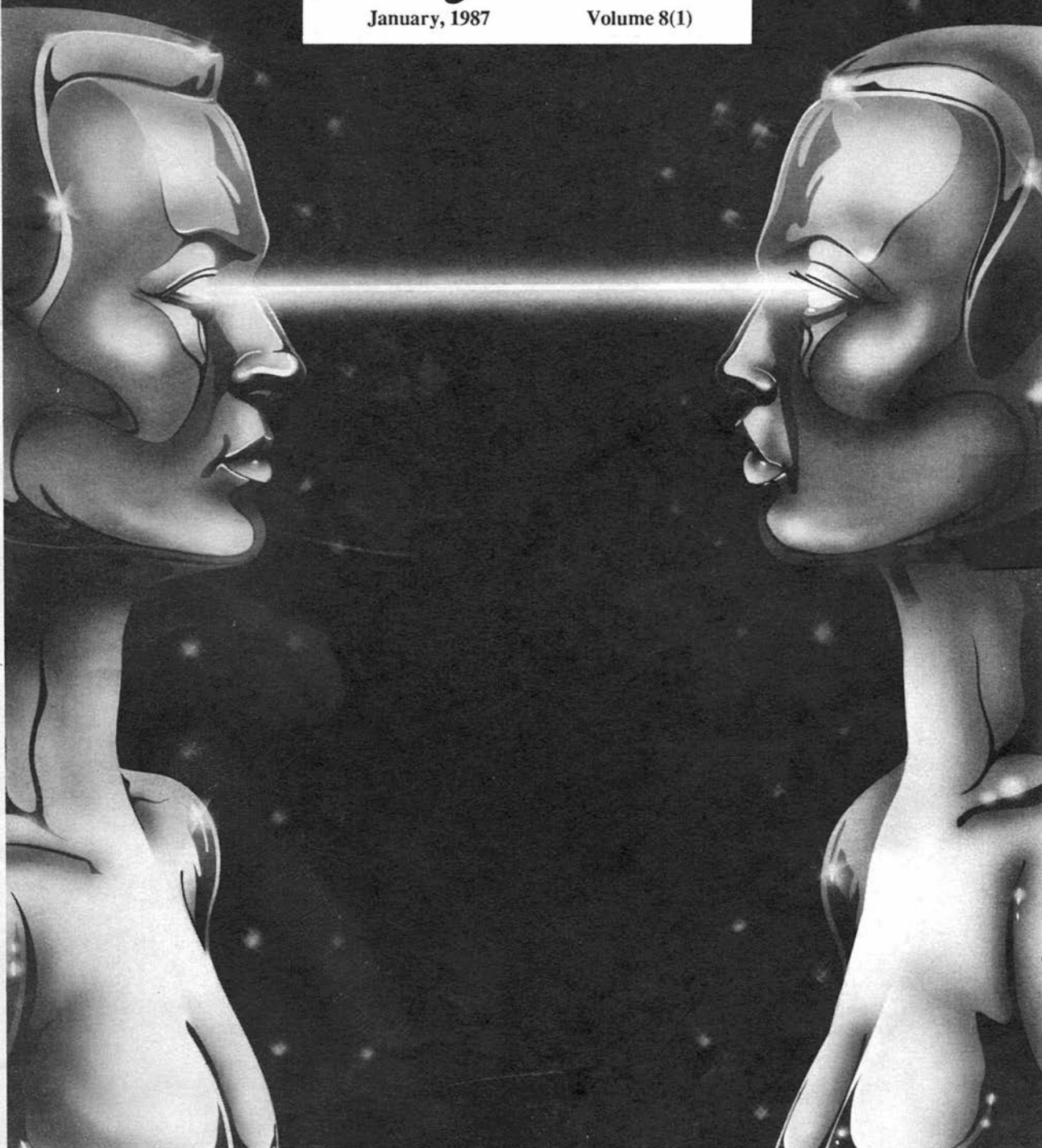


# Cryonics

January, 1987

Volume 8(1)



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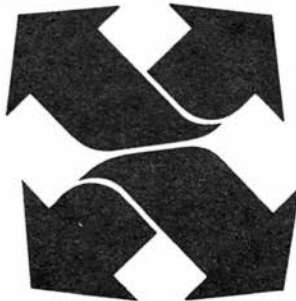
## SPECIAL BULLETIN

We have recently received information of critical importance to the future of cryonics and organ preservation which we wish to share with you. Our sources for this information must remain confidential at this time. It is normal procedure in the scientific community not to make any disclosure of a detailed nature about a major advance until a formal and complete disclosure has been made in a published paper. Within the limits of our responsibilities to our Biostasis Members, we are respecting this practice. Therefore, the level of detail in this disclosure to CRYONICS subscribers will necessarily be very limited.

We have information from a reliable source, whose credibility we assume responsibility for, that a critical milestone to achieving long-term banking of major organs has been achieved. Reportedly an investigator has succeeded at loading and unloading a number of mammalian kidneys with a vitrifiable concentration of cryoprotective agents, which allows vitrification, and the kidneys consistently survived. The work reportedly consisted of introducing a mixture of cryoprotective agents in a concentration of 7.5 molar (47% ) over a time of approximately two hours, holding the kidneys at that concentration at a temperature a few degrees **above** the freezing point of water, and then removing the agent and reimplanting the organ for evaluation in a "perfusor" animal. We understand that blood reperfusion of the kidney following this treatment was carried out for several hours and that renal blood flows, urine production, and a number of other measures of renal function were at control levels or nearly so (i.e., normal or near normal).

The significance of this achievement and its possible ramifications for cryonics are immense. In the past, the major barrier to successful organ preservation by vitrification or freezing has been the direct, cellular toxicity of the cryoprotective agent(s) and osmotic (water shift) injury associated with their introduction and removal. In order to greatly reduce or inhibit ice formation, it is necessary to replace a huge fraction of the the water in an organ with chemicals that will not freeze. Instead of freezing, these agents bind water and form a glassy material that does not have the highly organized (and disruptive) structure of a crystal. Unfortunately, such agents are toxic, and their introduction and removal can also critically disturb the water balance of tissues. The majority of recent work in this area has thus focused on reducing or eliminating the toxicity of cryoprotective agents, as well as developing protocols for introducing and removing them without causing injury. These barriers have now been overcome, at least for the mammalian kidney.

There are, however, other problems or potential problems which still stand in the way of clinical application of this technology. A 7.5M concentration of agent will still freeze -- unless very high pressure is applied -- pressure in the range of 20,000 to 25,000 psi. While organs have been shown to tolerate such pressures for brief periods (especially in the presence of cryoprotectives -- the CPA's act as "baroprotectors"), it is unclear whether the time course over which survival is now achievable at high pressures will be compatible with achievable cooling and warming times.



A more serious problem is the one of "devitrification" or freezing during the rewarming phase. When a vitrified organ containing only 7.5M CPA is rewarmed from its storage temperature, it will freeze. Reapplication of high pressure reduces the extent of freezing but is not able to completely inhibit it. Consequently, rewarming must proceed very rapidly -- so rapidly that freezing does not have time to get started and progress. With a 7.5M solution, we calculate that rewarming rates in the range of 800°C to 1000°C per minute will be required! Such rewarming must, of course, be highly controllable and must not cause hot spots. A number of emerging technologies offer possibilities for achieving this. What is not clear, however, is whether the relatively poor and unstable glass which a vitrified organ is composed of can take such a rapid rate of rewarming without shattering or cracking.

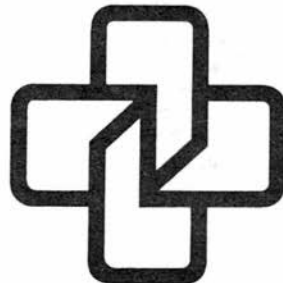
Another potential problem is thermal shock. Cells can sometimes be injured by simply cooling them rapidly (or warming them rapidly) even if no freezing or intolerably high temperatures occur. Anyone who has owned a tropical aquarium will appreciate the sensitivity of living things to sudden shifts in temperature. This kind of injury upon cooling, in the absence of freezing, is called thermal shock. Currently it is necessary to very rapidly cool and rewarm organs to be vitrified and this very rapid cooling and rewarming, even in the absence of ice formation, may lead to injury.

We include this discussion of caveats so that you can put the breakthrough advance of introducing and removing cryoprotectant into perspective. It is a solution to a huge part of the problem, but a number of challenging problems remain to be resolved.

What does this mean for cryonics? Obviously it means renewed reason for optimism about better preservation techniques being available for those of us who live another 5 or 10 or 15 years. It also means increased incentive to begin research to apply vitrification or very high CPA concentration freezing (i.e., freezing where only small, nondamaging amounts of ice are formed) to the brain. In short, it provides a focus for our research efforts and a potential clear path to follow for development of true suspended animation.

Despite the tremendous impetus clinically successful organ preservation will provide, it does not solve our primary problem: viable preservation of the brain. Since the medical and social establishment have not and **will not** appreciate the significance of brain cryopreservation, they will not be working to apply vitrification to the brain. That will be up to us to do.

There is also the broader issue of access to this technology. This first, major step toward successful organ cryopreservation was not made in a laboratory controlled by or operated for the benefit of cryonicists. Thus, it is unlikely that when vitrification techniques are licensed, cryonicists will have access to them. This would be a very serious situation. Inability to use this technology in promotion of cryonics and for raising the capital required to implement it would **cut us off from access**. It might well mean decades of being constrained to use far more damaging conventional freezing techniques. This would be a disaster.



The solution to these problems is beyond the scope

of this preliminary report. However, discussion and planning is underway to address these problems. ALCOR Biostasis members will be kept advised of progress in these and other sensitive areas via special means.



## EDITORIAL MATTERS

Due to the holiday season and the incredible press of business (see article above) we were very late going to press. We wish to advise you that our schedule may slip a little over the next few months. Progress on the new facility has been very rapid and the building is virtually complete as of this writing. Thus, we will be very preoccupied with construction (a significant part of which we will be doing ourselves) and the massive task of actually moving. There will be a magazine out every month -- but it may not always be on time. Please bear with us.

If you want to help with the move or construction, call us at (714)738-5569. Even if you are a distance away, you can help. Those of you who write for CRYONICS can help by trying to swamp us with material, preferably on disk (Call Hugh Hixon to get our disk translation capabilities), so that we can use it immediately, without re-entry. It is hard for us to get "writing time" now, and we would like to develop a backlog of varied and interesting pieces. We can especially use thoughtful feature articles. If you've done something extraordinary such as making local arrangements with an ambulance company or mortuary for rescue/shipping let us hear about it. If you've philosophical pieces, humorous observations, or just general thoughts on some aspect of cryonics to pass along, now's the time we can use it most. Please, help take the load off of us where you can.

And, finally, please, **please** be patient with us when you call or write. There are bound to be screw-ups in making the move. If you don't get something you ordered or asked for, keep after us. It may take awhile. For those of you who call to talk or get news, be advised that we may be a little short with you or be unable to talk at length. Things are hopping and we're going to be pretty focused on the details in the next few months. Try to understand. Once we're moved in, we should be even better able to serve you!

## ARE WE THERE YET?

By Mike Darwin

These days, when the phone rings at ALCOR I can always anticipate the first or the last question I'll be asked:

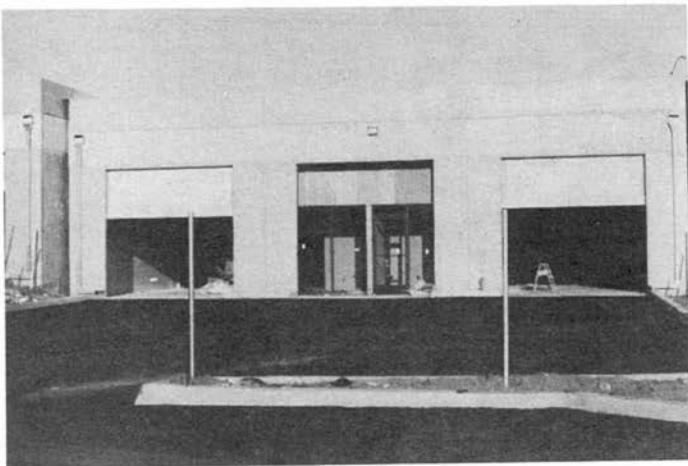
"Are you moving yet? When will you be in the new facility?"

I feel a little like the father of a family of 87 on a cross-country trip! I wish I knew the answer to the question of when we'll be moved in. It's hard to fault the developer, because progress has been fairly steady. One advantage we've had in being on the site day in and day out is an appreciation for how much bureaucratic bungling can slow things down. A few days ago the developer had to paint a test panel on one of the buildings so that city officials could come out and inspect the color and decide if it met with their approval! We could go on and on... At least we're not in the developer's shoes. He has eight other buildings like ours!

While we've given up trying to predict exactly when we'll be in, we have the following to offer as a seat of the pants schedule. We offer it also as a indication of how much work WE have yet to do **after** we take possession of the building.

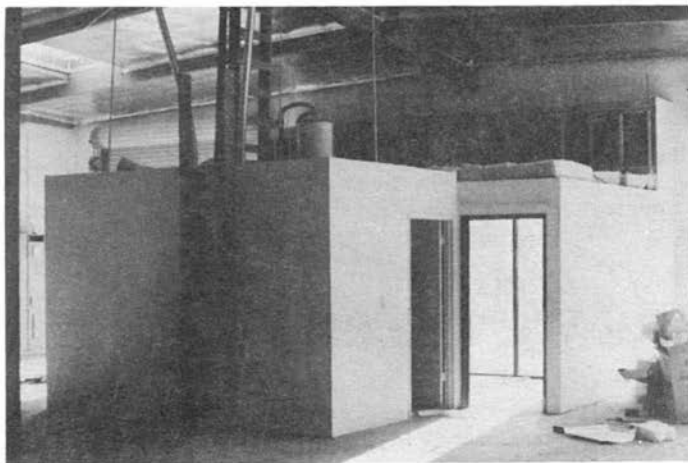
## WHAT'S BEEN DONE?

The building is up and basically complete including exterior and interior painting, curbing, asphalt paving, trash enclosures, and landscape sprinkler system (see photos). The roof is on, the framing, dry wall, and painting of the offices is complete. The glass has been installed, as well as the roll-up steel doors and the interior plumbing. The only additional interior work which needs to be done is carpeting in the offices.



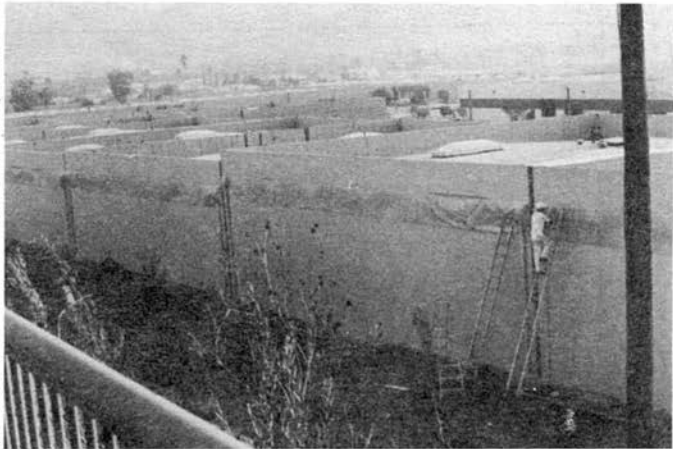
## WHAT'S YET TO BE DONE?

Connecting the electrical service is the major remaining task. Normally, this would be about a week's work. However, connecting the electrical services will



take more time than usual. Since the job has slipped nearly 2 months from the scheduled completion date, new contracts had to be arranged for the electrical work since the previous contractor had a scheduling conflict with another job.

The building is supposed to be ready for final inspection by the city on December 12. Basically, they look "done" to us now — so we think we're past the worst of it.



Once we take possession of the building we'll have to start with our own interior construction. Mike Darwin is letting contracts for various aspects of the job now: framing, drywall, and electrical work. We plan to do a lot of the work ourselves, but, given our time constraints and lease pressure, we simply must rely on professionals for most of the work. And it's going to be a BIG job. We intend to completely subdivide the building, including construction of a full height, heavy load-bearing second story for about 2/3 to 3/4 of the available square footage of the building. There will be over 6,000 square feet of drywall to put into place, and a staggering amount of wiring and plumbing. We plan to have large numbers of overload outlets, plumbing for oxygen and nitrous oxide, and built-in state-of-the-art track-type overhead operating room lights.

We estimate that completion of the subdivision will take about four to six weeks — and that's going at it hammer and tongs! If we're moved in by the end of March we'll be doing good!

So, be patient with us. By cryonics standards this is a massive undertaking, with a price tag well into the six-figure range. Anyone who has ever seen ALCOR and Cryovita's facilities will appreciate the staggering job just MOVING is going to be.

Besides, according to Mike Darwin, we're right on schedule. He has a rule of thumb in cryonics (which probably could profitably be applied to other areas of life as well): "Figure out every detail of a project and every possible cost associated with it. Calculate the time required to completion and add a 20% "slop" figure for both time and cost. Then, double the amount of time and increase the cost by 30% and you've arrived at a meaningful figure!"

We're right on schedule...

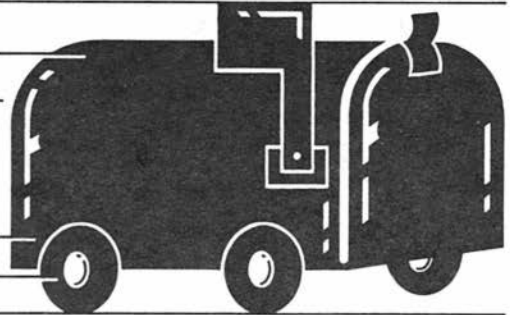
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*Letters to The  
Editors*

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To Brian Wouk, et al.

I was filing away some recent ALCOR literature when Brian's article caught my eye.

You have a strange notion of truth.

I have been a Science fiction fan for 25 years, a computer specialist for 20 years. I am quite familiar with science and technology.

I have long been aware of the inevitability to extend lives indefinitely. (And other, deeper changes in our existence.) Knowing human beings, these things will be done, since they can be done.

I have long suspected that living more than 50-100 years is probably a bad idea, and wondered if I would have the guts to say No. Fortunately, I have a while to decide.

It's basically a philosophical and moral issue. Science merely informs the discussion, rather than deciding it. It's been explored fairly thoroughly in SF over the years.

It's incredible that you would use this as an example of "hypertext" information systems failing to facilitate communication. GIGO. There is little evidence in your article that you were carrying on a true dialog with Nancy Lucas. A dialog requires a receptivity, an open mind. It seems you entered the interaction with your mind made up, you left it still sure of the Truth, and you gained nothing more than frustration and the knowledge that some people are awfully strange.

How sad.

Sincerely yours,  
Keith Davidson  
Brookline, MA



Dear ALCOR:

I first heard about cryonics in 1972, when I read Ettinger's book, **Man Into Superman**. It was impressive, but other than Heinlein's novel, **The Door Into Summer**, there was nothing else to read. Then a few years ago I bought Saul Kent's **The Life Extension Revolution**. It was because I had read the cryonics section of that book that I watched the Oprah Winfree show in October, 1965 -- which led to subscribing to CRYONICS and buying products from the Life Extension Foundation.

The point of this ramble is that you never know which will be the critical step to awaken (or reawaken) a person's interest in cryonics. If Mike Darwin had not been on that show, I would not be writing this letter. Although I am not a suspension member, due to good health and poor finances, I intend to become one after finishing my dissertation for a Ph.D. in Economics at the University of Chicago.

Good luck with your new facility.

Jim Cunningham  
Chicago, IL

## LONGEVITY?

By Mike Darwin

One of the reasons we've been covering OMNI-related topics recently is that OMNI "proprietors" Bob Guccione and Kathy Keeton have expressed a personal interest in life extension and have even started a small monthly newsletter called **LONGEVITY** to explore advances in gerontology, nanotechnology, suspended animation and healthcare which may result in longer, healthier lives.

The first information ALCOR had about **LONGEVITY** and the Guccione/Keeton connection was when Susan Ellis (the editor of **LONGEVITY**) walked up to the ALCOR table at the Life Extension Breakthrough Conference and asked to interview Mike Darwin.

The interview went OK, but Ellis seemed a little out of her element and a little disorganized. She didn't seem exactly clear on what the details of **LONGEVITY** were to be and she didn't have a "handle" on what she was trying to do. She didn't seem to have much passion about it. She did, however, promise to send us a copy of the first issue and to keep us in mind for potential stories in the future -- although she was at pains to point out that cryonics per se was a little more **radical** a topic than they had a mind to cover.

The next contact we had was when Ellis showed up at the Lake Tahoe Life Extension Festival to stump for **LONGEVITY**. Her performance there was unimpressive and she seemed disorganized. As was predictable in the face of such performance (no flyers, no galleys, no advertising, no nothing -- except a poor quality photocopy of the ad for **LONGEVITY** which subsequently appeared in OMNI) she got a rather skeptical welcome. She did, however, pass out photocopied flyers inviting people to obtain a free copy of the first issue. We filled one out and sent it in. So did a number of other people. We never got our free

inaugural issue. Nor did either of the two other people we talked to who sent in a coupon. More to the point, they had agreed to send Saul Kent a galley. Saul didn't get one either: no galley, and no newsletter.

There is also something else worth noting. Susan Ellis, representing **OMNI**, was at the Breakthrough Conference and it is no secret in the gerontological community that the Life Extension Foundation (LEF) is providing more seed money, and probably more money **period**, for lifespan extension gerontological research than anyone else in the world: **past or present!** What's worth noting about all this is that in a "special issue dedicated to life extension" **not one word was mentioned about the Life Extension Foundation!** In **OMNI's** profile of important people working to make life extension happen, Saul Kent and the Life Extension Foundation are never mentioned. What's even more amazing is that in the premiere issue of **LONGEVITY** they report on work going at Walford's lab at UCLA to evaluate a fetal thymus extract which may radically extend lifespan, a project conceived of and funded by the LIFE EXTENSION FOUNDATION, and there is no mention of LEF!

In our opinion, this is no accident. It's censorship. Needless to say **LONGEVITY** and **LIFE EXTENSION REPORT** (the latter the newsletter of the LEF) are trying to reach the same market and provide the same service and no doubt Guccione and Keeton have their own rows to hoe in the garden of life everlasting. How convenient not to acknowledge even the existence of the competition -- despite the fact that the competition is the leading force in life extension gerontology today in providing seed money for **really innovative, interventive** gerontological programs.

This stinks.

Now, what about **LONGEVITY** itself? What is it like and should you subscribe? Well, if the first issue is any indication, our advice is save your money, folks. We finally got a copy of the first issue in a roundabout way via Roy Walford -- who **was** promptly sent a copy -- he's on their scientific advisory board. What's in it?

It opens with an attack on Pearson and Shaw. Now there are plenty of good reasons to attack Pearson and Shaw and there is plenty wrong with the kind of misleading and distortive quoting of the scientific literature and vacuous hypothesizing that they've engaged in. But **LONGEVITY** isn't interested in serious criticism -- this is surface dismissal of them, and for all the wrong reasons: how they look and their advocacy of nutrients and drugs to help protect people with addictions (like smoking or overeating) who cannot or will not give them up. Many serious and subtle issues are swept under a rug of smug and superfluous verbiage. This is basically the kind of stuff you can get by writing into the DEAR DOCTOR column of your local newspaper. **LONGEVITY** is written for someone with an IQ of about 90 and it doesn't even have the peppy

**OMNI**

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# LONGEVITY

VOL. I NO. 1 A PRACTICAL GUIDE TO THE ART AND SCIENCE OF STAYING YOUNG OCTOBER 1986

verve of the **READER'S DIGEST** copy it comes closest to emulating.

Elsewhere in the issue we're told about Einstein's brain having more cells in critical areas and that "through hard mental exertion better brains are built." The former is speculative and controversial research at best and are we supposed to find the latter exciting news? There's also a lengthy review of antiaging and rejuvenating skin creams by some dermatologists with little gems of evaluation like: "Even though I have not seen their scientific studies, I would always give them the benefit of the doubt. They are a straightforward company."

The final article is a penny dreadful kind of piece on the feasibility of memory transfer by Lorraine Larrison. The late Tom Rainbow did it a thousand times better in **ISAAC ASIMOV'S SCIENCE FICTION MAGAZINE**. How can these people pontificate about **memory transfer** and then have the nerve to tell us cryonicists with straight faces that "the whole notion of cryonics is too radical for detailed exposition in **LONGEVITY...**"

Give us a break! If you really want to know what's happening in life extension research subscribe to **LIFE EXTENSION REPORT** or **CLAUSTROPHOBIA**. If you're really serious about tackling the technical details, subscribe to **MECHANISMS OF AGING AND DEVELOPMENT**. "MAD MAGAZINE", as it is affectionately abbreviated, is a scientific journal available in most medical school or university libraries.

So what's the bottom line on **LONGEVITY**? Buy the **NATIONAL ENQUIRER** instead. Their health/longevity reporting is better and the rest of the paper is a lot better written than **LONGEVITY** at its best. If you're going to read pap, it might as well be entertaining pap. I've been tempted to call **LONGEVITY** the **CALIGULA** of life extension -- but the fact is, it isn't nearly as visually interesting even if it is every bit as vapid.

## THE AWFUL TRUTH: THE TRAGEDY OF ARCHIE LEACH\*

By Mike Darwin

"Grant felt the pressure of time too. "I doubt if I have more than 70,000 hours left," he said about 8 years ago, "and I'm not about to waste any of them." That was one reason he turned down a \$5 million offer to write his memoirs, but there was another. "If you write your memoirs," he said, "you've got to expose other people, and I hope to get out of this world as peacefully as possible, without embarrassing them -- or me." He felt less charitable toward scientists; he announced that they had let him down. "I never worried about death when I was younger," he said, "because I assumed that science would take care of the problem before I would have to deal with it." No such luck. Not long before the end, he murmured "I'm

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\* For those unfamiliar with the film career of Cary Grant, **THE AWFUL TRUTH** was the title of one of Grant's first three films which helped to launch and establish his stardom.

sorry." So are we all.

Cary Grant, quoted in the December  
15 issue of PEOPLE magazine.

Cary Grant. The urbane, witty actor who always managed to emerge from every scrape smiling and with girl in tow is dead at the age of 82. No glamorous exit this time. Nausea, chills, unconsciousness, and death in a place as unromantic and forgettable as Davenport, Iowa. Cary Grant figured it just about right: Eight years is almost exactly 70,000 hours. 70,080 to be precise.

How did Cary Grant spend the last eight years of his life? Living quietly, working mornings (he was on the board of a number of major corporations and was the principal spokesman for Faberge), going to Dodger games, Hollywood Park (the horse race track), swimming, resting, and watching TV with his wife.



Cary Grant had a lot of nerve.

Just what did this guy have in mind, anyway? Just who the hell did he think he was to sit on his ass and bitterly gripe that the scientists "had let him down?" How much investigating did this man do? Did he ever pick up the telephone or walk into a public library and even bother to ask what was going on? Forget about cryonics, did this guy even exert the effort to investigate the state of gerontological research? Did he ever ask himself what the effect would have been if someone of his stature had made a public commitment to support major research aimed at halting or even reversing aging? Did he ever bother to take the few hours that it would have required to consider the possibilities of increased funding for suspended animation research? Finally, did he ever think about cryonics? With a \$35,000 or \$100,000 price tag what did he have to lose?

The outrage, the ultimate outrage is that Cary Grant died leaving an estate conservatively estimated at \$40 million. These days you can usually double or triple the estimated figure for the very rich since everybody who's anybody has Swiss, Cayman, and other "contingency" accounts which don't show up on the formal balance sheets. That's more money than is spent on interventive gerontological research in any 10-year period to date. It's also more money than has been spent on vitrification and suspended animation research since Ettinger wrote **THE PROSPECT OF IMMORTALITY** in 1964 by **several orders of magnitude**.

It's hard to have sympathy for somebody that stupid or that lazy (take your pick as to which). Real hard. We generally feel it wise to speak kindly of the dead or not speak of them at all. After all, they're not around to defend themselves. But this is too much. There's an important message in this for a lot of other people out there:

Wake up. Get in focus. Pick up the phone. What good is \$40 million or \$100 million if you're dead? If you want to go on living indefinitely you had better do something about it. How many other people are out there like Cary

Grant? What about you? The pity, the sick, ugly pity of it all is that if Cary Grant had supported basic research in suspended animation there would very possibly be **workable, reversible cryopreservation techniques for the brain available right now** (see article on vitrification advances elsewhere in this issue). In our estimation, if Cary Grant had made a major commitment in funding and/or public support to cryobiological research eight years ago when he came up with his all too accurate estimate of 70,080 hours of life remaining to him, he would probably be viably waiting in suspended animation today. But he didn't.

Cary Grant, despite your incredible charm, your appealing good looks, your uncommon business sense, your staggering wealth, your seeming awareness of the preciousness of life, and your desire for biological immortality, it is really hard to feel anything but rage and disgust at your death. Your wonderful talents, impressive as they were, were not enough. Your incredible wealth is now meaningless in the face of your death. These things were simply not enough.

But then, who are we addressing these remarks to anyway? Cary Grant is dead; he can't hear us. The question is, can you?



## Dear Friends Of The Future...

By David S. Pizer

I'd like to design a letter to the people of the future to put in my capsule. I suppose it should be brief, yet it should be interesting and compelling enough to make the people of the future want to unfreeze and restore me. But what is the best approach to take? Here goes...

Dear People of the Future:

You don't know me yet. I'm a very nice person. I know once you meet me you will be glad....

No, that approach doesn't usually work in life now, so why would it work any better in the future. It would be better if someone else said nice things about me.

Dear People of the Future:

We are writing to introduce you to our friend David Pizer. He is a very nice person. We know once you meet him you will like him a lot.

Sincerely,  
Ronald Reagan  
Pope John Paul II  
Bob Geldof  
Bob Hope  
Sister Theresa  
M. Ghandi Jr.  
Coretta King  
Princess Diana



No, the people of the future probably won't remember any of the above. Well, maybe they'll know Bob Geldof, but what if he gets unfrozen first and tells them he never knew me? Too much risk. Maybe I should try begging. It usually works with my wife.

Dear Honorable People of the Future:

I know you are wonderful, good, considerate, moral, honorable people who will quickly unfreeze me, as that will show just how good you really are. Please, please please do it now.

Thank you, thank you, thank you.

Sincerely depending on your goodness,

Dave

Sounds good, but might be a little too ..... Hmmmm, maybe the mystery approach.

Dear Mystery-Loving Friends of the Future:

I know you are waiting to know the answers to the questions:

Does God exist?  
What is the meaning of life?  
Is the universe finite?

For the answers to these and other questions, you may unfreeze me. You see, before I died, I was entrusted with these secrets and many others...

No, this might not work. What if they already know the answers? I need a sure-fire gimmick. I know this always works.

Dear Deepest Friends of the Future;

I love you. I adore, cherish, idolize, admire, and relish you. I am anxiously awaiting my unfreezing, so I can show you how much you mean to me.

Love,  
Davey

Now that looks good on the surface. What if they don't fall for it? I mean, I probably would like the people of the future, but future-people may all love each other and have no need for additional love from the likes of me. I need something better and shorter. Maybe, too, since honesty is the best policy, it still will be in the future. Hey, I've got it, short and to the point.

Dear friends of the future:

**HELP!**

Thank you, yours truly,

David



## THE QUESTION COLUMN

By Mike Darwin

I recently found out about your organization and am writing as you suggest, to tell you what I thought of the material you sent... I am a capitalist and I could never participate in a nonprofit organization. I am very surprized to see you spouting the likes of Ayn Rand in one breath and asking for donations with the next. I could never deal with an organization of such unscrupulous people and I am surprized you find the public naive enough to allow you to continue to exist while advocating such obviously incompatible ideals.

Until a large, stable **profit making** corporation becomes involved in the cryonics field, it (cryonics) will have no chance of success.

R. G.  
Los Angeles

Your letter and comments indicate a number of misunderstandings about ALCOR, and, we believe, about the world in general. We'll start with the generalities and go on to the specifics.

First of all, ALCOR is not a nonprofit organization in any meaningful sense. Strictly, to be nonprofit means to not receive return or benefit from one's investment of money, time and/or effort. ALCOR has as its objective the indefinite extension of its members' lives. We have a history of aggressive action on behalf of our members and our track record of progress and accomplishment speaks for itself.

But there are several wider issues raised by your comments which need addressing. First of all, we are champions of value given for value received, but we are wise enough to realize that there needs to be some play in the system. One of the big problems with cryonics is getting people educated enough about it to want to pay for it. Acting as a clearinghouse for information and disseminating information freely can be a tremendous benefit to everyone. This is particularly true in areas where money may not be the most useful way to measure value.

One of the things that bothers us most about your letter is the implication that money is the only way to measure value. We don't have anything against money, and we agree that it is a wonderful economic tool. But let's not forget that that is all it is: a tool, a representational system for something more important: values. Try eating a bar of gold or having a stimulating conversation with a stack of \$100 bills. Don't confuse the medium with the message.

ALCOR is an organization of people **working productively** together to achieve a common goal. Not suprisingly we have evolved means and mechanisms for compensating each other for value given. For a whole host of reasons a decision was made to use primarily nonmonetary mechanisms. Why?

First, because of the law. So-called for-profit organizations must pay taxes and expose themselves to predation by governments. They are also forced to conform to a set of organizational restrictions which make stability and quality leadership difficult. In short, they must be strictly democratic -- something which ALCOR is not. The structure of for-profit corporations is fraught with problems, and as anyone who has ever been a stockholder in a major corporation can attest, the stability and responsiveness of such structures is not generally good. Indeed, in sharp contrast to your implication, it has been our observation that generally the larger a stock corporation gets, the more bureaucratic and inefficiently run it becomes, and any notion of accountability to its stockholders, financial or otherwise, is rendered highly theoretical. The management of many of the largest corporations is terrible -- precisely because values have gotten lost in the shuffle for money. When a corporation gets large enough it is owned by "everyone" and thus by no one and is operated by hired help whose interests are not at stake on the basis of day-to-day decision making -- or any decision making, for that matter.

Another legal reason is that for-profit corporations cannot take possession of human remains under the Uniform Anatomical Gift Act, which ALCOR is using to accept patients. We also wish to avoid the potential legal complications which could arise from money changing hands **for a profit** in connection with the transfer of human remains. While we have no ethical or legal problems with



people paying for or selling bodies or body parts, the law and current biomedical ethics do not reflect our values, and if we wish to continue to exist, we must be mindful of the law, since they have more guns than we do.

Second, the primary purpose of ALCOR is not to make money. It is to save our lives. Stock and other financially for-profit institutions are organized around the ultimate objective of accumulation of capital. This is fine if one's goal is simply to make money, but often a desire to make money can conflict with other, more important goals. The patient care aspect of cryonics is a very long term one by contemporary standards. Many investments in research and patient care are unlikely to yield any commercially valuable results for a long time to come. Stock corporations, with their strong emphasis on quarterly profits have not traditionally served as good vehicles for truly long term ventures like cryonics. It is important to remember that in the business world, a 5- to 10-year period without a return on investment is considered a **very** long period of time — even in venture capital companies.

We are not saying that there are not exceptions to these generalizations, but they are just that, exceptions. Nor are we saying that there is no place for for-profit entities in cryonics. There is, and several such companies exist. For-profit companies have an important role in cryonics now, and we think that role will grow. By way of example, we would like to point out that many of the leading hospitals and medical centers in this country are "nonprofit". In the early days of medicine most of hospital care was custodial and relatively straightforward, since there really wasn't much medicine could do for most illness. As medical sophistication has increased there has been an explosion of professions and technical disciplines related to medicine. Most hospitals have adapted by arranging to have many of their key technical and medical specialty services provided to them by for-profit companies and physicians, all of whom make a good profit. It has been the experience of the directors of ALCOR that nonprofit health care institutions who act as overseers

of patient care and who take responsibility for uniting and governing commercial medical services, deliver superior medical care. By contrast we have had much first hand experience with large commercial health maintenance organizations (HMOs) and found them sadly lacking (with one or two exceptions) in delivering consistent, broad spectrum, high quality care.

But we wish to emphasize that we do not feel it appropriate to entrust ourselves to an organization whose primary standard of value is quarterly profit/loss statements. A patient care cryonics organization may have to engage in many radical, financially unprofitable activities for decades or longer, maybe even much longer. The founders of ALCOR, as well as its current officers and directors, felt very strongly that the structure of ALCOR should reflect this strong commitment to getting the job done, regardless of direct financial benefit or loss.

Let me address your comments about asking for contributions. As we've been at pains to point out throughout this essay, there are more standards to



measure value by than money. Sometimes, when projects are very long term, or very large, or undervalued by the rest of the economy, it is difficult or even impossible to tie value to money. Andrew Carnegie established public access libraries because he had benefited from a free flow of information and felt that he could benefit further by sharing that opportunity with others. He was right. Since Carnegie, many, many other people have contributed to the general availability of knowledge and information through libraries and by benefiting the community at large, have benefitted themselves as well. A contribution is a way of supporting a value you want to see propagated which may not be readily commercializable. Families are a good example of this. In our society, most adults believe children are a value worth supporting at all costs, but virtually no one makes a profit by raising a family. It is the common way of contributing to the future. Our only difference with this is we hope to contribute to the future ourselves.

As to the some of the specifics. Ayn Rand never decried voluntary giving, nor did she advocate money as the only means for measuring value. In fact, Rand felt that the needs of many "unprofitable" undertakings could and should be met by voluntary giving. She is on record as having believed that the issue of charity (which is quite distinct and more extreme than contributing to **your** cryonics organization) was an affair between the giver and the recipient and there was nothing wrong with charitable acts, so long as they were free of fraud or coercion.

It should also be noted that many nonprofit organizations generate huge amounts of revenue. St. Vincent's Hospital, a nonprofit medical center in your city (Los Angeles) generated surplus revenues last year in the tens of millions of dollars! St. Vincent's is one of the top 10 hospitals in the United States and has been a consistent leader in both cardiovascular and renal medicine. In fact, it is one of the best kidney transplant centers in the world. It is, in short, an efficient, well-run organization which is administered by people very concerned about its balance sheet -- even though it is "nonprofit". The American Red Cross is another example. The Red Cross is largely responsible for developing the blood freezing technique in widespread use throughout the world today. Its workers pioneers in developing blood fractionation techniques, and the blood cell separating and washing equipment they perfected has now become the standard of the industry. The Red Cross generates millions of dollars of revenue for itself by licensing such techniques and equipment to for-profit concerns.

Why this seemingly contradictory situation? Often because for-profit stock companies have had a dismal history of recognizing the marketability of ideas early on in their conception, and for being unable or unwilling to shoulder the incredible expense of their development. How many commercial companies or stockholders have lined up to invest in cryonics -- particularly in the early days of agonizingly slow progress? How many of the johnny-come-latelys will use the dollars to be made from cryonics with good sense or with responsibility and care for patients?

We think there is plenty of evidence that we have the proper organizational structure with ALCOR. Only the most shortsighted person would perceive ALCOR as a truly nonprofit organization in any philosophical sense, and only the most naive would make the mistake of thinking that many other contemporary nonprofit organizations have failed **to return values to their members, clients, or patients in close relation to what they have contributed.** (Believe me, there

isn't a successful organization in existence which doesn't find ways to compensate its supporters in reasonably precise ratio to their "contributions".)

Finally, we wish to address the issue of a "large, stable (cryonics) corporations" being required for success. There's an interesting paradox there: how does any large stable corporation get to be large and stable? By being small and competent first. We think ALCOR is both.

## **CRYO '86: A REVIEW OF THE ANNUAL SOCIETY FOR CRYOBIOLOGY MEETING**



### **Conclusion**

Yes, Virginia, there really are scientists who freeze living things for a living and who care about developing better freezing techniques and understanding freezing injury: these scientists are called cryobiologists. If not for such scientists and for their studies, there would be little basis for cryonics.

Although the scientific basis for cryonics has already been firmly established, it is still reasonable to maintain an interest in mainstream cryobiology, for many reasons. For one thing, findings from cryobiologists may lead us in new directions or may help us to improve our current freezing techniques. For another, some major breakthrough, such as the successful cryopreservation of a mature mammalian organ, might improve our credibility considerably. Finally, more detailed understanding of the molecular basis of injury will help us better ascertain the magnitude of the damage which must be repaired if we are to survive our cryonic journeys into tomorrow. Let's face it: With something as important as our lives hanging in the balance, it makes sense to pay attention to anything that might tip that balance one way or the other.

The most efficient way to keep up with the field, given limited manpower for scanning all the relevant literature, is to read reports on cryobiology meetings and papers. The annual meeting of the Society for Cryobiology in 1986 was held in Augusta, Georgia in June and was reviewed in part in the September issue. This report will conclude our coverage, with reports on the last six sessions (Nos. 5-10). The coverage will be organized by session within the meeting.

### **DEFENSE STRATEGIES AGAINST HYPOXIA AND HYPOTHERMIA (SESSION 5)**

This session was organized and moderated by Dr. James Southard, of the University of Wisconsin at Madison Medical Center. The session began with a

paper by Daniel Lynch of Cornell University, who argued that plants may meet the challenges of low temperature in part by rearrangements of membrane lipid side chains, a strategy too subtle to have attracted attention previously. Although not directly helpful to us now, this work will certainly help us to eventually understand how freezing affects membranes, and that may well be of vital importance to us in the long run.

J.R. Hazel of Arizona State University echoed Lynch's perspective, but his focus was on poikilothermic animals such as frogs, insects, and rainbow trout, which show lipid remodeling similar to that of plants. Some of the enzymes that control the remodeling are known. He pointed out that "high concentrations of...cryoprotectants...may be found in freezing intolerant...species," which means that that cryoprotectants alone do not explain the fate of such species and implies that additional factors such as lipid rearrangement may be critical.

J.S. Willis went up the evolutionary scale to hibernating mammals, and took the position that a key difference between hibernators and non-hibernators is that hibernators can maintain activities such as cation pumping while they are cold, thus preventing cell swelling. This was stated almost as a challenge to the next speaker, Paul Hochachka (University of British Columbia), who has found that creatures which survive prolonged anoxia (such as turtles) do so in part by reducing membrane permeability to cations, thus eliminating the need to pump the cations around and thereby conserving energy. It seems, however, that there is really no conflict. Willis has looked at lowered temperatures, not lowered oxygen, while Hochachka has looked at lowered oxygen, not lowered temperature: an apple is not an orange. Both strategies are valid and worth knowing about.

## THE CORNEA: SPECIAL CONSIDERATIONS FOR ITS CRYO-PRESERVATION (SESSION 6)

Michael Taylor, of the Medical Research Council Medical Cryobiology Group (Cambridge, England) organized this session, and opened it with a review of the known facts of cornea cryopreservation. He made several worthwhile points, including the following: 1) Preservation of corneas, like preservation of blood vessels and organs, requires not only cellular survival but also intact cell-cell connections and attachment of the endothelial cell layer to underlying structures; 2) Corneas do better when frozen in air rather than liquid. (Could this be an argument for gas perfusion of organs prior to freezing?); 3) Preliminary evidence suggested that corneal injury could be ascribed to cryoprotectant and salt concentration during freezing rather than to damage from ice, but further studies are checking this conclusion more closely.

W.J. Armitage's paper was entitled **Feasibility of Corneal Vitrification**. He treated human corneas with the "VS1" solution successfully used by Rall and Fahy to vitrify mouse embryos and by Takihashi et al. to vitrify human monocytes. A solution half as concentrated as VS1 (50% VS1) was tolerated at room temperature, but 90% VS1 was only consistently tolerated at -5°C for no more than 15 minutes, and full strength VS1 was not consistently tolerated at any condition studied. These results are compatible with results observed in other systems and indicate that vitrification of corneas might be feasible but will require considerably more work.

William Bourne's following paper, on the other hand, identified a possible shortcut. Amazingly, he found that human corneas would withstand exposure to

90% glycerol and, as a result, could be successfully vitrified. The corneal endothelium was not perfectly preserved (vacuoles were present) but the quality of preservation might be good enough for clinical application, and can surely be improved by lowering the glycerol concentration.

## **PRESERVATION OF ORGANS AND TISSUES (SESSION 7)**

This session was moderated by S. Randolph May (Southeastern Burn Research Institute, Augusta, GA). The lead talk was by Dr. James Southard (University of Wisconsin Medical Center), who reviewed the current status of hypothermic liver preservation and recent advances in his lab which may improve liver preservation soon. Southard's associate, Jan A. Wahlberg, described recent experiments on hypothermic pancreas preservation in which a new preservation solution was shown to block cellular swelling. This allowed five of eight pancreases to survive 72 hours of preservation, in contrast to the 6-8 hours now available clinically. Swelling was blocked with 100 mM  $K^+$  lactobionate and 30 mM raffinose. The ATP resynthesis facilitators adenosine (5 mM) and allopurinol (1 mM) were probably also important ingredients of the new perfusate.

W.W. Tomford (Massachusetts General Hospital) described the then current state of cartilage cryopreservation, and S.R. May (Southeastern Burn Research Institute) did the same for skin cryopreservation. Frank Guttman and his associates at the Montreal Children's Hospital found that intestine could be frozen to  $-40^{\circ}C$  for 24 hours, regardless of donor age from fetus (day 19-20 of gestation) to at least 4 days after birth. Mayfield's group at the University of Wisconsin reported new work on kidney "rescue" (brief blood perfusion of 3-day preserved kidneys allows them to survive another 3 days of preservation), showing some of the biochemical changes caused by "rescue". McAnulty's group (also at the University of Wisconsin) reported better kidney preservation using adenine + ribose + phosphate instead of adenosine and phosphate. James Southard reported that his group found that human and dog kidneys possess huge amounts of superoxide dismutase (SOD) and low amounts of the free radical generator enzyme xanthine oxidase, and that putting SOD and allopurinol into the circulation immediately after transplanting a preserved dog kidney had no beneficial effect on renal function. The conclusion: "...oxygen free-radical damage in dog and human tissue (kidney and liver) may not be a major factor in a loss of renal function after preservation."

## **PRESERVATION OF ORGANS AND TISSUES, CONTINUED (SESSION 8)**

The second half of this session was moderated by Dr. Harvey Bank of the University of South Carolina at Charleston, and took place on Friday, the last day of the meeting. Ray Rajotte and co-workers reported that cryopreserved Islets of Langerhans from dogs are not only as effective as fresh islets, but they are actually better because the freezing removes a great deal of unwanted exocrine tissue from the graft. Rajotte and DeGroot also reported that slow thawing of islets is better than rapid thawing if the islets are frozen slowly to  $-75^{\circ}C$  before plunging into  $LN_2$ . It is not generally known why slow thawing is sometimes superior to rapid thawing, but this phenomenon is a valuable clue to unknown mechanisms of freezing injury.

Z.H. Chang and co-workers (Cryobiological Engineering Laboratory, Shanghai, China) submitted an abstract reporting that for (presumably human) skin, the optimal glycerol concentration was 80% and the optimal DMSO concentration was 40%! Both of these agents gave 95% Trypan Blue exclusion (some would say 95% "survival" or "viability"). These results show that another human tissue (in addition to the cornea) appears to tolerate concentrations of cryoprotectant that are in the range required for vitrification.

## **CRYOPRESERVATION OF BLOOD CELLS (SESSION 9)**

Session 9 was moderated by Greg Fahy, of the Transplantation Laboratory of the American Red Cross. The first paper was by Peter Mazur and Ken Cole (Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee), and was one of the most important and meaty papers presented at the meeting. A few words of introduction are in order.

Mazur has for the past few years been attempting to explain the kind of freezing injury that takes place at low cooling rates — which is exactly the kind of injury which is relevant to cryonics. He has reached the conclusion that, for systems which have a high cell density (in particular, for packed red blood cells and perhaps embryos, which are both better models of human tissue than dilute cell suspensions), much of the injury is due either directly or indirectly to exposure to elevated salt concentrations. Mechanical damage from ice dominated only if concentrations of cryoprotectant are used (7%, or about 1 Molar) which are much less than those employed in cryonics procedures. However, the higher the packing density of cells, the more the injury. This implies that as ice forms and causes cells to pack together, additional injury will be caused by extra packing.

Mazur's current experiments were designed to investigate the interaction between salt-induced injury and packing-induced injury by varying those factors at subzero temperatures in the absence of any ice. Glycerol was present in the same concentrations as would be present during freezing.

What Mazur and Cole found was that when packed cells were exposed to elevated salt/glycerol concentrations, 80% were killed, whereas exposure of a dilute cell suspension to the same conditions killed only 5% of the cells. This is not good news for us, but interestingly much of the injury must have taken place during dilution back to normal concentrations because cells exposed to high concentrations for long periods survived better than cells exposed for shorter periods. The lower the temperature, the longer it took for survival to improve with time. The main implication is that organized tissues should survive best when the cryoprotectant concentration is relatively high and the cooling rate is relatively slow. For readers of CRYONICS, it may be recalled that the microscopic appearance of frozen-thawed humans, which are cooled very slowly, is consistent with the prediction that very slow cooling can avoid much of the stress of freezing densely-packed cells.

## **INSECT COLD HARDINESS: CONCEPTS AND CONJECTURE (SESSION 10)**

The last session of the meeting was organized and moderated by John Baust

(Institute of Low Temperature Biology, University of Houston). Baust's contribution led the session.

Baust pointed out several complications of insect freezing tolerance and tried to indicate where old dogmas need to be replaced by careful experimentation. Since cryonicists may have important things to learn from insects, we can thank Baust for helping this field clean up its act.

J.S. Bale (University of Leeds, United Kingdom) followed with a similar blast. He showed that many insects die when they are exposed to low temperatures even when they are not frozen. This is devastating news to the many insect cryobiologists who have assumed for years, without experimental testing, that freezing-intolerant insects survive in nature by supercooling. Bale went on to discuss new experimental approaches and the implications of his work for the field of cold hardiness and even for "the cryopreservation of biological materials in the unfrozen state", but perhaps the most impressive take-home message for us is the overall backwardness of current research on insect cryobiology.

The final paper of the session was given by Richard E. Lee, Jr. and colleagues (Miami University, Ohio) and was of relevance to bridging the gap between Bale's findings and mammalian cryobiology. Lee et al. found that, as reported by Bale, his nasty little creatures (the flesh fly, Sarcophaga crassipalpis) died at  $-10^{\circ}\text{C}$  even though they did not freeze until  $-20^{\circ}\text{C}$ . But if the bugs were held at  $0^{\circ}\text{C}$  for a while before going to  $-10^{\circ}\text{C}$ , they survived. The reason? At  $0^{\circ}\text{C}$ , glycerol levels build up rapidly, and these levels correlate with survival at  $-10^{\circ}\text{C}$ . As the authors conclude, "this response suggests a novel role for glycerol in protecting insects against injury due to cold shock or chilling injury".

## AFTERTHOUGHTS

There are some neat things going on in the area of fundamental cryobiology which are bringing us closer to an understanding of freezing injury at last. In most cases, these are things that could and should have been done 10-15 years ago, but which had to wait until now due to the lack of any serious national commitment to cryobiology. To give another example of what is NOT happening in this field, and which may again have to wait 10-15 years for any significant movement, it is necessary only to point out that there was NOT A SINGLE PAPER DEVOTED TO ORGAN CRYOPRESERVATION IN THE ENTIRE MEETING! This despite the fact that the meeting was hosted in Augusta, home of long-time organ cryopreserver Armand Karow, who has written/edited two books on organ cryopreservation and who is known to be continuing studies in this field. David Pegy seemed more interested in red blood cells and theories of cell shrinkage than in organ cryopreservation this year, and Greg Fahy mentioned no work with whole organs either, despite his presentation last year concerning his new perfusion system. This lack of emphasis on organs is worrisome, since organ preservation is the area of greatest relevance to cryonics. There weren't even any papers on vertebrate freezing tolerance, also of great relevance to us, and the insect papers were throw-aways as far as applicable insights for us are concerned.

What's the lesson from this lack of progress in our areas of interest? The same one we are forced to acknowledge every year: if we want the work to be

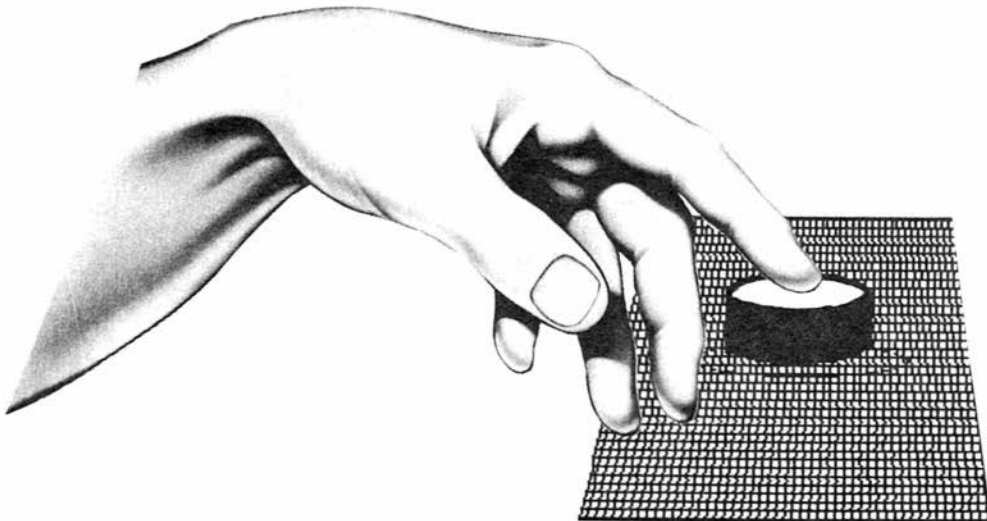
done, we're going to have to do it (or control it -- which means pay for it) ourselves. Only cryonicists have both the will and the talent to do what must be done. It is up to every cryonicist to help provide the resources necessary to let cryonics researchers create the results we all need to ensure our safe passage into the future.

## JUST PRESS A BUTTON-- AND IT'S ALL DONE!

### Thomas Donaldson Reviews David F. Noble's FORCES OF PRODUCTION: A SOCIAL HISTORY OF INDUSTRIAL AUTOMATION

Many people probably recognize the event. You will notice two groups of people, locked in heated debate over some issue, political or philosophical. You listen for a while. Gradually you notice that what they are arguing about seems less and less like the "right" issue, the terms of the debate are wrong and both sides seem unable to break away from them. They seem determined to prove their "yes" or "no" answers when what is really needed is a new approach.

I have had this feeling about the issue of AI for many years. David Noble has just published a very interesting history of numerical machine control which puts the entire debate about AI into a new setting. In particular, it gives useful **empirical content** to ideas too often discussed as abstract ideals. Furthermore, it may show us some of the causes of the current loss of American industrial dominance. And finally, it tells us about "nanotechnology", a much more complex idea than it might seem. For all these reasons, readers of CRYONICS might be interested in this book.





Let me start off, though, by saying that I think the book does have some glaring faults. Its major fault is that Noble is a Marxist. He believes not just that class struggle is an important historical force (I believe that too, it doesn't take more than open eyes to see that) but that capitalistic competition has no role in technological change. In places Noble is a quite vulgar Marxist. At the same time, he is an **intelligent** Marxist, so that he really does have something to say. That's why I think the book is worth reading, even though it may set your teeth on edge at times.

The most important part of the book, of course, is not just the thesis but the proof of that thesis. Noble has some good arguments that his interpretation of history is the correct one, including many direct quotes and other historical evidence from the original participants. This mass of evidence is very impressive and I can't do justice to it in a short review. For the sake of my review, I'll summarize the thesis as follows:

Numerical control (and automation generally) were introduced into American industry by a management which specifically wanted to take control of production of individual machine parts away from the workers. That is, to take away from them any opportunity for judgment and skill. In doing so, they specifically refused technologies which let individual workers amplify and improve their own production and did not take away opportunities for judgment and skill. The growth of numerical machine tools was assisted by scientists from MIT in particular. The picture of such machines was of devices which would be programmed not by the machinists on the floor, but by programmers with no skill in machinist work. Rather than produce machines which would ultimately refer back to an operator's judgment the hope was to produce machines which preempted it.

This brief statement doesn't really do justice to the ideas Noble draws from it. For what Noble is really talking about is the whole picture of Artificial Intelligence. This is of machines which won't just respond to and amplify our own abilities to control the world, but which will go off and do it ALL themselves. All we have to do (to caricature the viewpoint) is to press a button, and our desires will be satisfied.

This is not an issue about computerization or our ability to make programs. It's an issue about the kinds of programs we make. Noble has a good way of pointing this up. He says: let's suppose that an engineer makes a machine for his best friend. He brings it in, sets it up, and announces that he has made it so simple that even an idiot can operate it. And I've made it, he says, **especially** for you! What exactly is this friend to think? Perhaps such a gift would call the friendship into question. But there is another way to go. What kind of machine would the engineer make if he made it **for himself**?

Now if we try to program our machines so that they make all the needed decisions themselves, we quickly find ourselves cast into a bottomless pit. What we want of our factories is not just cars but GOOD cars. (Oh, you mean you want me not just to make you a car but to make you a GOOD car?). In that simple word "good" lies tremendous depths of judgment which are not simple at all. We find ourselves dealing with immense theoretical problems. In fact, ultimately we can't possibly make a machine which will solve that problem for us. We must go back and tell the machine what it is we want, what is GOOD (for us) and what is bad. And that will change with time, our moods, many things.

Furthermore we mustn't let our class prejudices infringe. Machinists and people on the shop floor DO need to use their judgment. The parts, the machines, are never cut and dried. They can't be. That's exactly why it's proven so hard to make manufacturing completely automatic. Every time we try it, we bump up against yet another case in which some human being must MAKE A JUDGMENT. Such judgments aren't just difficult programming problems, they are matters of VALUE: what is good, here, now, this instant. judgment is everywhere. It is an elitist and class prejudice to assume that people doing low status jobs don't also have to exercise judgment to do their job well.

I believe that this issue, of whether to try to make machines which make all the judgments themselves, or alternatively to make machines which constantly refer back to us for our choices, is really the crux of computerization. This is the issue which needs talking over. The American intellectual class has spent 15 years in sterile debate over Artificial Intelligence, when what we really ought to be discussing is Artificial Judgment.

An attempt to make machines capable of making OUR choices for us plummets us into profound problems of self knowledge and understanding of the world. (It's easy to make machines which will make THEIR OWN choices for themselves. This was done years ago, with the first machine imitating a paramecium. You don't like this? Oh, you mean you want machines to make NONTRIVIAL choices for themselves?). If we attempt to solve these problems, we'll find ourselves generating vast realms of theory. In fact, the quest is endless, since we will never REALLY know what we want. A potential for endless theories, of course, is very attractive to many academic theorists.

But the most fundamental issue in trying to make machines capable of judgment is **trust**. If we ask someone else to make value judgments for ourselves, we must trust them. The labor-management conflicts in American heavy industry made replacement of workers a high priority to management. (Ah, but then we must trust the devices with which we replace these workers!) Furthermore, the American military looked on automatic machines for industrial machining as ideal for reasons of security. And so, an academic interest in profound and abstract problems, a military interest in taking as many people as possible out of production of military goods, and a management interest in getting rid of distrusted workers, all came together to produce a certain STYLE of automation.

There were other styles possible. In the early days of Numerical Control, some engineers had other proposals. Noble discusses these in a very interesting chapter, "The Road Not Taken". The road which WAS taken involved complex machines programmed by people far from the shop floor, using large computers. The road which was not taken consisted of attempts to make numerically controlled machines programmable by the machinists on the shop floor. One significant attempt was due to Albert Gallatin Thomas, who made a machine whose operator could reprogram it in 30 minutes right in the shop. Another such engineer was F.P. Caruthers, who produced a machine, the **Specialmatic**, especially for versatile operation by small job shops. These machines never sold well in the United States, where the last thing many manufacturers wanted was a machine which gave control to the workers.

The U.S. Air Force funded the large MIT project in Numerical Control which led to the "modern" form of numerical control. This project produced a programming language, APT, and machines to use it. The result won't surprise



libertarians. At the completion of this project, almost everyone not associated with it (which means, everyone not in the Air Force or MIT!) declared it overly complex and clumsy. The machines, once installed on shop floors, met an environment far more hostile than ever before. High temperatures, dust, extreme vibration, all tended to make the machines misbehave. Ultimately the Air Force had to fund aerospace companies to install these machines, they wouldn't do so on their own. The technology looked far too risky. To reprogram these machines needed a large computer. You had to send away to program the machine, which took 4 times longer and cost 5 times more than for the machines programmable on the shop floor. Even to fix an error on the tape involved a large bureaucracy.

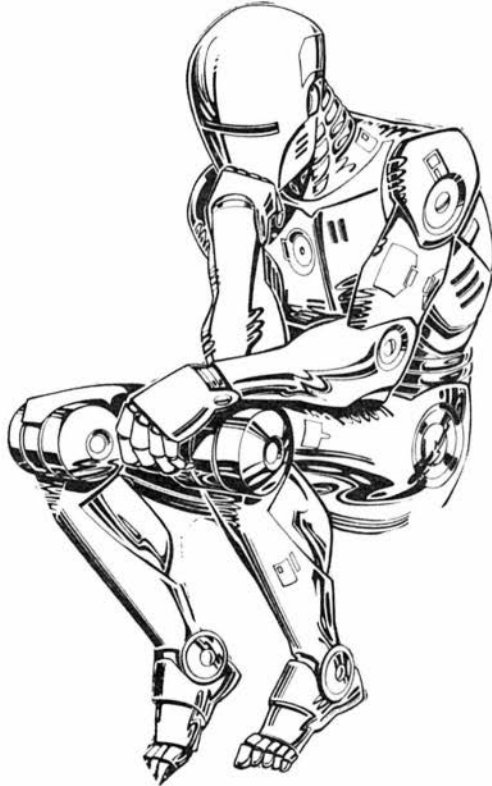
One very surprising fact is that the "industrial robots" (the Unimate and the Versatron) which started to become famous about 10 years ago are programmed exactly as were these older attempts at numerical control like the Specialmatic.

As history, Noble describes the spread of this form of numerical control throughout American industry. His Marxism makes him disbelieve in the role of competition and the market in causing these changes. An economist, of course, would argue that technologies are introduced or not introduced because of what they mean for efficiency of the industry in which they spread. An economist would say that those industries which did not adopt the most efficient technology would lose out.

Noble does correctly point out all the many political factors, like military state subsidy, which brought about the present form of numerical control in the United States. But we need only look throughout the Midwest, at the devastation of American heavy industry after adopting this technology, to see that Noble's story vindicates the entire economist, free market position. For the United States is not the world. The Japanese in fact took over the other form of automation, small scale and programmable **on the shop floor**. Fujitsu Fanuc is one of the largest maker of machine tools in the world now. The U.S. is a net importer of electronic machine tools. Japan uses more Unimations than does the U.S. (because the Unimation isn't programmed the same way?).

I have also heard it argued by proponents of "artificial intelligence" that the technology is inevitable because it will outcompete its rivals. Whether that is so or not depends on what is meant by "artificial intelligence". It was exactly this cry, that the new MIT technology of machine control MUST take over, that its proponents used to urge its adoption. It is certainly true that more efficient technologies do outcompete less efficient ones. We need only look at the state of American heavy industry to verify that this is true. But exactly which technology do you mean?

We can generalize from this history. It is discussing an issue very close to us, the issue of just exactly what kind of world we'll live in 200 years from now. That we can make molecular-scale machines is beyond question. That we can make very tiny cellular-scale computers is equally beyond question. That they will solve all our problems for us, without constant guidance and input AT EVERY STEP, that is OUT OF THE QUESTION. Judgment is everywhere, even on a cellular scale.



\* \* \* \* \*

### The Ordeal

We were gripped between two worlds,  
one stuck in eternal death,  
the other struggling for immortality.  
We felt, at times, powerless to overcome.  
We suffered, at time, the worst of both.

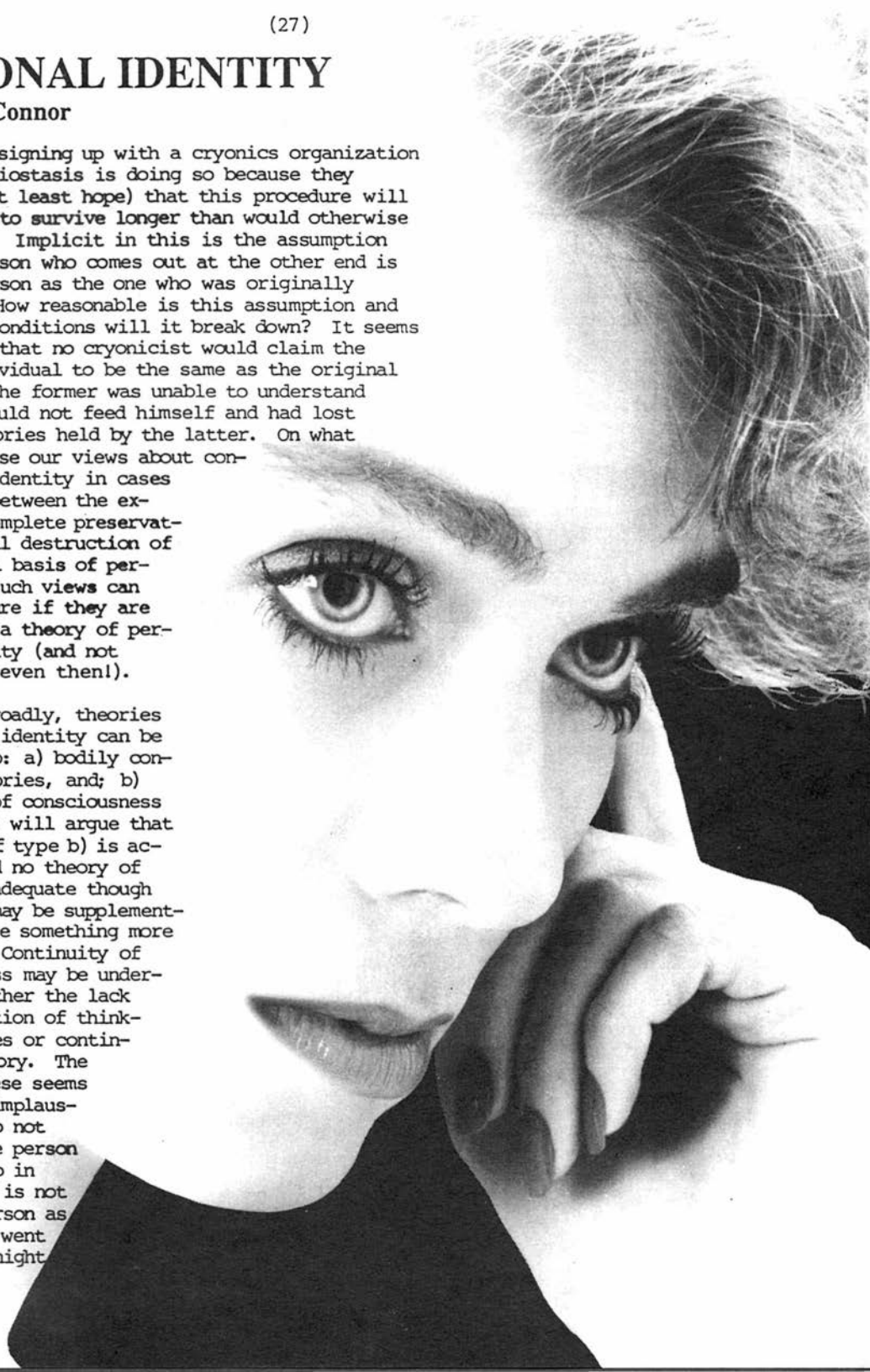
-Dave Pizer

# PERSONAL IDENTITY

By Max O'Connor

Anyone signing up with a cryonics organization to undergo biostasis is doing so because they expect (or at least hope) that this procedure will enable them to survive longer than would otherwise be the case. Implicit in this is the assumption that the person who comes out at the other end is the same person as the one who was originally suspended. How reasonable is this assumption and under what conditions will it break down? It seems safe to say that no cryonicist would claim the revived individual to be the same as the original patient if the former was unable to understand language, could not feed himself and had lost all the memories held by the latter. On what are we to base our views about continuity of identity in cases which fall between the extremes of complete preservation and total destruction of the material basis of personality? Such views can only be secure if they are defended by a theory of personal identity (and not necessarily even then!).

Very broadly, theories of personal identity can be divided into: a) bodily continuity theories, and; b) continuity of consciousness theories. I will argue that no theory of type b) is acceptable and no theory of type a) is adequate though the latter may be supplemented to produce something more promising. Continuity of consciousness may be understood as either the lack of interruption of thinking processes or continuity of memory. The first of these seems thoroughly implausible. We do not say that the person who wakes up in the morning is not the same person as the one who went to bed the night



before; we do not say that the patient awaking from the dreamless sleep of anaesthesia is someone other than the patient who was anaesthetized. If an individual's body is unchanged, their memories and characteristic ways of thinking and behaving are unchanged, we do not feel tempted to say that the person is different simply because of a temporary interruption in thinking processes, be they conscious or subconscious.

There are also strong reasons to think that continuity of memory cannot be a sufficient criterion of identity. Against this view (first clearly developed by the 17th century philosopher John Locke) have been brought a number of objections, one of which is so well known that it is simply referred to as "The Brave Officer Paradox" without any need for further explanation. Thomas Reid, an early opponent of Locke's theory, presented the following objection: "Suppose a brave officer to have been flogged when a boy at school for robbing an orchard, to have taken a standard from the enemy in his first campaign, and to have been made a general in advanced life." The officer remembers being flogged as a boy, and the general remembers capturing the standard when he was an officer but doesn't remember being beaten as a boy. By the memory criterion the general is the same person as the officer, and the officer is the same person as the boy, but the boy is not the same person as the general. A is B and B is C, but A is not C. The memory criterion, at least in this form, produces a contradiction. For reasons of space I will take this as a conclusive argument and won't go into the other objections that could be raised to the theory. Nor will I examine more sophisticated variants of Locke's view such as those propounded by Quinton and Grice, for these have other problems; in any case, all memory theories fall foul of Butler's point that memory criterion theories of personal identity must be circular, since the notion of memory presupposes that of personal identity (a memory is always a particular **person's** memory rather than simply being a piece of information about the past). As Objectivists would say, such theories commit the Fallacy of the Stolen Concept.

There are probably 57 varieties of bodily continuity theories. The least plausible of these is the view that identifies personality with the continuity of the whole body. If this were the case then we would not be the same person from moment to moment as cells are anabolized or catabolized, and we would not be the same person as our bodies changed over time. If this theory is softened so that slow and gradual changes are allowed it fares little better. Is it at all plausible to say that the person who has had a leg amputated is not the same person as was lying there before the operation? The modern philosopher most identified with this kind of view is Bernard Williams. Studying William's approach is instructive as it reveals both why that type of view can be attractive and where it goes wrong.

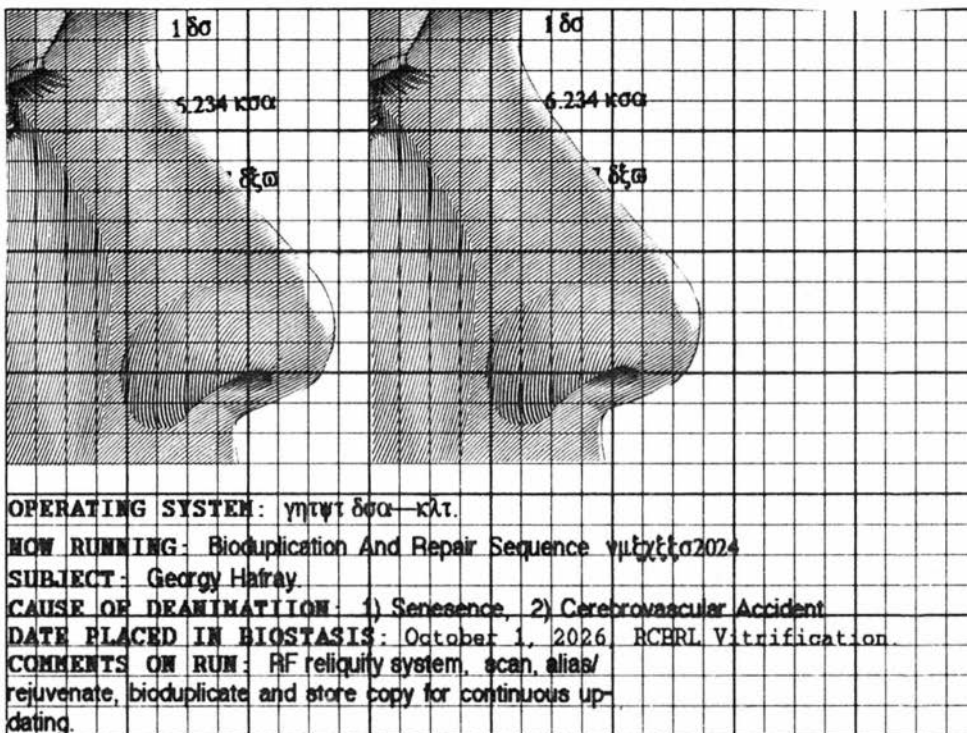


It can be attractive because it seems to solve a lot of problems; in fact what it does is to **ignore** the problems by not being subtle enough to cope with them. It goes wrong by confusing **criteria** of identity with identity itself. (To clarify what I intend by distinguishing criteria from the constitution of identity imagine seeing someone walking towards you who appears to be your friend. You think "Ah, here comes John", but on further investigation it turns out not to be John but just someone who looks very much like him. Normally the criterion of appearance allows you to identify someone but it is not an infallible guide. This is the case because what **constitutes** identity is not the same as the **criteria** or means of recognizing identity. With this in mind it should be clear that identity cannot **consist** in continuity of the brain either. But neither can the brain serve as the ultimate **criterion** of identity. We can imagine the sudden destruction or removal of a certain amount of brain tissue without a loss of identity (in fact this **does** happen).

To some extent what constitutes a reasonable criterion of personal identity (again as distinct from identity itself) will depend on our level of scientific knowledge. At one time a whole body criterion would be perfectly reasonable — reasonable in the sense that it was the best available. Many cultures have believed the "soul" to be located in the heart or the stomach and it was only the accumulation of knowledge which made clear that the brain was a better prospect for the seat of the personality. Now, in the 1980's, a strong case can be made for saying that personality, at least **in principle**, is not to be located in our particular biological-neural structures. Certainly it is at present and always has been, but at some future time, perhaps the information content of our neural structures could be encoded and run on a different medium than its current wet and slippery biological medium. As a first approximation then, we can say that the correct (and probably ultimate) criterion of personal identity is the **information content** presently encoded in our brains. We are software, not hardware. Even if we can settle on information content as the **criterion** of identity no suggestion has yet been advanced as to what actually **constitutes** personal identity. There are certain bizarre possibilities -- which should concern cryonicists -- which make this further investigation of great importance.

The idea of the duplication of body or brain bothers some cryonicists. They fear that the duplicate is not **really** the same as the original. Such an attitude, if mistaken, will be a trait inimical to survival in the long run because superprotection of an individual will almost certainly fail after some time (say a few thousand years) whereas storing multiple back-up copies of oneself (if this should be possible) provides much more security. If you have thousands of copies of yourself stored at various locations around the solar system or the galaxy, one of which will be activated should the presently active individual be destroyed, statistically you will have an excellent chance of an extremely long lifespan. Some people will be happy with the following scenario: as a precaution against destruction, you store multiple back-up copies of yourself. These are continuously updated by a transmission of new memories, behavior patterns acquired, etc. One day the body that you get around in is totally destroyed and the transmission of information ceases. Instantly one of the copies is activated — **you** are activated in a different place. It is just as though you had had been transported instantly from one place to another.

Viewed externally, the new individual is identical to the old one; they act the same, think the same, remember the same things and so on. From the internal point of view it is just as though you had suddenly moved from one place to



another and you are not concerned at all; you are glad to be alive. But what if the duplicates are updated not continuously but, say, every week? Now the individuals existing before and after the accident are not identical in all respects — the new individual does not have the last week of memories possessed by the original. Well, this would no doubt be annoying and disturbing but no more annoying or disturbing than it would be for one of us to receive a knock on the head and permanently lose our memories of the last week. Subjectively what would be the difference? None. The only objective difference is our change in spatial position and this seems to matter not at all. In fact the length of time between updates is irrelevant in itself for it comes to just the same as a memory loss to anyone existing in 1986. A loss of memory is annoying and inconvenient but it isn't the end of us.

All this seems to follow if it is accepted that personal identity consists of an information conformation running on hardware. A simple interruption in cognitive processes or a spatial relocation seems to provide no reason for doubting continuity of identity. This is reassuring because anyone frozen by present techniques is going to suffer extensive physiological damage and an enormous amount of repair or replacement of parts (while at the same time preserving information content) will be necessary. If someone claims that the type of changes discussed above **do** destroy personal identity they had better give good reasons for such an assertion.

Someone who finds themselves in agreement so far may yet come to experience difficulties after consideration of even more bizarre cases. Suppose that you are duplicated but both the original and the duplicate remain after the process.



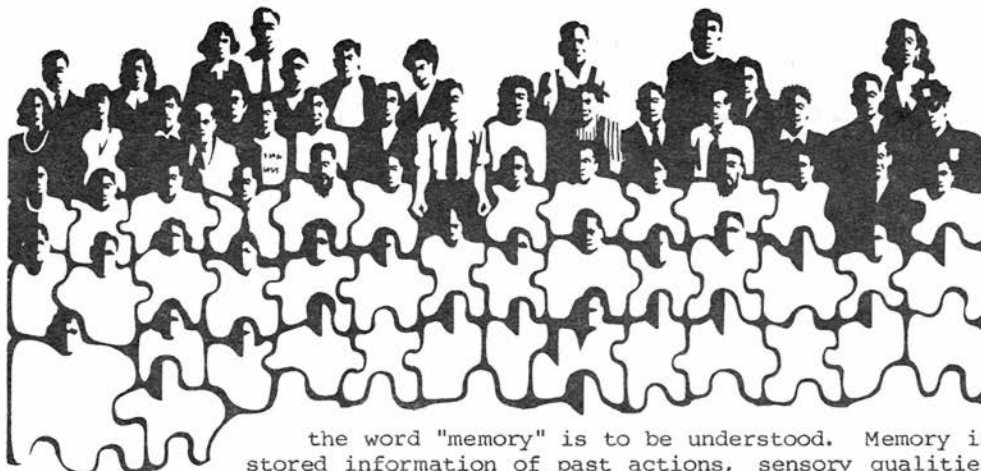
Now, are they both you, neither you, or is one of them you? If this happened to me this is what I would say? This is what **which** I would say? Well, both since they will think alike; after all I'm consistent and don't change my mind from moment to moment without good cause! If I was the original I would claim to be me, and if I was the duplicate I would also claim to be me. In fact both would be correct since neither is in a privileged position -- the considerations adduced above show that spatial location is irrelevant. So both of these people are me -- the me who is writing this, but the two people are not each other. How can they both be me but not be each other? Well why not? A parent can have two offspring; the offspring have the same relation to the parent but do not have that same relation to each other. The logic of identity can be tricky but that trickiness doesn't mean that something has gone wrong.

Our language was not designed to deal with such outlandish possibilities. We have a choice: we can say that sometimes personal identity is a very flexible concept, or we can say that the concept breaks down at a certain point (which doesn't invalidate its use before that point) and that then we must substitute another concept -- the concept of survival. Perhaps instead of saying that we are identical to both the later individuals, we should say that we have survived in them. This might sound more satisfactory in other cases too. I have said that the two later individuals (with frightening originality I'll call them X and Y) are both me but they are not each other. Obviously they cannot be numerically the same. Suppose that shortly after the duplication X is destroyed. I have just said that X was not the same person as Y so does this mean that X has ceased to exist? There may be no clear answer if the concept of personal identity is used, but we can still say that X has survived (in large part) in Y. We can then also say that while the present me had been surviving in two people (or two bodies) I continue to survive in only one body.

Many people will still be unhappy with all of this. If they were to be destroyed in ten seconds, even if they knew that a duplicate had been made a few seconds ago, they would still feel that they were about to be destroyed. But the only sense in which this is true is in the sense that their present material "vehicle" is about to be destroyed. If the criterion of our identity is information, one is simply **wrong** to fear destruction. The mistake is understandable since at present destruction of our present vehicle **does** mean destruction of our personal identity. Perhaps in a society where duplication is common people will forget their prejudices and cease to worry.

So far the discussion has been based on the criterion of identity that I suggested as most plausible, and no proposals have been made as to what it is that actually constitutes personal identity. Such proposals are necessary since there will often be cases where information originally encoded in a particular brain has been preserved and transmitted to a new medium -- but not **all** of it. On what basis are we to decide how much loss of information matters or which parts of the information are crucial and which dispensable? This matter is of obvious importance for cryonicists since it is possible, despite the present state of knowledge suggesting that memory is not stored in a single small location, that some information could be irretrievably lost.

First I will put forward a view of what it is that constitutes personal identity, then see what consequences this has, and finally offer reasons to accept this view. Anybody can proffer a theory of this kind but, unless some objective reasons can be found to support it, it is nothing more than a subjective opinion. As a preliminary, I want to make explicit the way in which



the word "memory" is to be understood. Memory is stored information of past actions, sensory qualities (sights, sounds, etc.), and goals. It does not include learned responses and skills. The latter is also information gained from past experience but is not included under the term "memory" in this discussion (which is, I think, the normal usage).

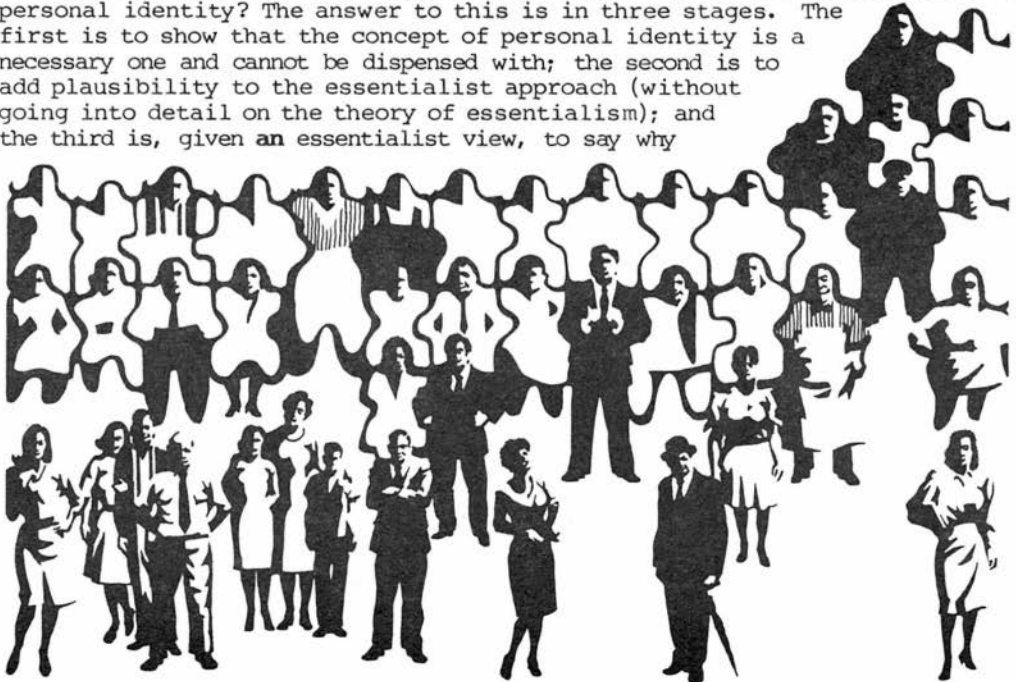
Personality is constituted by an individual's basic values, goals, and reactions, and by his general view of reality -- whether these are fully explicit or merely implicit in the individual's behavior -- as they are instantiated (put into action) in that individual's life. In order to be able to concretize these general statements I will take the example of someone who accepts the general tenets of Ayn Rand's philosophy of Objectivism, since this is very well defined and many readers will be familiar with it. When I say that an individual's personal identity is constituted by his view of reality and his basic values, goals, and the reactions that result from these, I don't mean that everyone who shared Objectivist principles would have the same personal identity. A personal identity is these principles as instantiated in a particular series of actions, a particular life that is lived. The very same principles will be instantiated in many different lives to produce different personal identities or personalities. Individuals can also share the same principles on a conscious level while having some different premises (or different interpretations of the same premises) on a subconscious level. Further I wish to assert that personal identity is constituted **only** by those values, goals, and views of reality that are not morally neutral or do not have neutral implications for one's ethics. Included in personal identity are (at least some) memories of how that conception of reality and those values and goals have been displayed in the past by the individual who wishes to trace into the past these characteristics.

This view is at least initially plausible because it can give a satisfactory answer to the insistent question: "Why should one's actions be directed towards one's future self rather than to someone else?" The answer must be: because we want our own values promoted and we are the one best able to do it. If one had no conception of reality and no goals then one does not have an interest in directing one's actions toward **any** person. It seems certain that we must want our values promoted, after all, that is **why** they are our values. The best way to promote one's values is to promote them through one's own survival since the only individual over which one has direct control is oneself.

It is a consequence of the theory presented here that not all of one's characteristics are part of one's personal identity. That one is fond of rice pudding, or prefers orange to brown, or enjoys Beethoven's Eighth Symphony to his Second, is no part of one's personal identity. I think this is both initially plausible and defensible in a stricter philosophical sense. Its initial plausibility derives from the fact that our particular likes and dislikes can and do change over very short periods of time, but we don't think that this means we are a different person. The stricter philosophical defense flows from an Aristotelian view of essentialism in definition and individuation. An essence is that element (or set of elements) of a whole on which all the other elements depend. For example, the essence of a particular human being (from a biological perspective) is located in that person's DNA. It is their genetic material that makes them the person they are biologically. Cuts, injuries, losses of bodily parts due to accidents, or other contingent, externally caused changes in bodily structure, are not essential. To fully defend the theory of personal identity presented here would require a more extensive explanation of essentialism than there is room for here.

The essence of a personality, of a person, is not any particular action he takes, any particular thought or memory he has, but is that on which all these particulars (actions, thoughts, memories) depend — his view of reality and his fundamental values. It is these that set the context for all of his particular actions and thoughts. Following Rand and Branden, I would suggest that the connection between these fundamentals and the particulars is mediated by a person's psycho-epistemology. A psycho-epistemology is the characteristic method of functioning of a person's mind. For example, one may have a rational or a whim-dominated psycho-epistemology depending on whether one's thinking is dominated by rational principles or by the demands of one's whims.

How secure against objections or alternative conceptions is this theory of personal identity? The answer to this is in three stages. The first is to show that the concept of personal identity is a necessary one and cannot be dispensed with; the second is to add plausibility to the essentialist approach (without going into detail on the theory of essentialism); and the third is, given an essentialist view, to say why



my essentialist theory is likely to be the correct one. Firstly then, one cannot claim that there is no such thing as personal identity, that "personal identity is a myth", for **who** is making such a statement and **to whom** is it being made? If there is no person to make the assertion and no one to hear it, how can it be made at all? Statements and arguments do not exist *sui generis*; the concept of an argument or a statement is logically dependent on the concept of a person -- a person who formulates and asserts the argument. To suggest otherwise is to commit the Fallacy of the Stolen Concept.

The second stage of defense is to provide support for any essentialist view of personal identity. The denial of essentialism comes down to the denial of identity with the fundamental problem inherent in such a position as just explained. Why is this? The alternative to essentialism is to say that identity is constituted by the entire collection of attributes of the individual. But as I have already noted the collection of attributes and relations between attributes comprising an individual is continually changing. This fallacious "complete collection of attributes" view has been around for a very long time -- at least since Heraclitus taught that you can't step in the same river twice. It is self-refuting since it makes individuation and identification of entities impossible. Nothing can be identified if nothing remains the same thing through any period of time. If "There is nothing permanent except change" there are no entities, so there are no people, so there are no people making arguments that there is nothing but change.

The third part of the defense is to show why my view of the essence is the correct one; that is, why the essence is constituted by an individual's conception of reality and his fundamental values. Why can't we isolate some other element of the whole as the essence? It is vital to note at this point that an essence is not only that element of the whole on which the other elements depend but also that element which explains the other elements. It seems clear that an individual's conception of reality and his fundamental values organizes and directs his life and sets the context within which his life proceeds. What other element of the individual could plausibly be said to do that?

The style of presentation of the views expressed above suggests that I am much more confident of their validity than is actually the case. There is a need for more detail to be given to the theory -- especially to provide determinate guidelines for difficult borderline cases. The first part of this article suggests that the criteria rather than the constitution of identity is sufficient to decide a great many difficult cases, but that will not always suffice. Duplication alone may not present any great problems, but what about loss of fidelity -- with or without duplication? My analysis suggests that the loss of certain types of information is irrelevant -- it has no bearing on the continuation of identity. The matter is quite different for the loss of essential information. This doesn't mean that there is anything wrong with the theory (for any theory must suffer the same problematic borderline cases), but it does suggest the need for more fully worked out details. To the extent that the theory is found to be plausible, it should be encouraging for anyone considering undergoing biostasis, for it suggests that a considerable amount of (non-essential) information can be lost without the suspended individual ceasing to be you. That there is a discontinuity in one's consciousness seems not to be of any consequence.

# SCIENCE UPDATE

by Thomas Donaldson

## PROGRESS ON THE RHYTHM FRONT

Everyone recognizes that people pass through puberty and all other developmental events at standardized ages. This fact requires explanation. How does the body of a 65 year old man know that he is 65 rather than 15? The explanation once found may bear very closely on aging itself.

Nor can a simple explanation of "wearing out" work well here. Why then do different animals, with similar metabolic rates, show varying lifespans? Humans, for instance, have **twice** the lifespan of chimpanzees. One general explanation is that we have within us **clocks** which count the passing days and years. We do in fact carry within us at least one and possibly more internal clocks. These clocks may either tell the 65 year old that he's 65 directly, or else turn off repair at an earlier time which manifests itself at age 65. In any case, the **metabolic clocks** with which our bodies judge time ought to interest immortalists considerably.

Recently several different papers have brought forward new information about these clocks. Perhaps in some unspecified way this information bears on aging too. We report it here.

One of the most important developments about clocking behavior is that genetic studies of **fruit flies** have identified a gene which deals with timekeeping. The location on one fruit fly chromosome is called the PER locus (for "period"). Geneticists now know three different abnormal genes which can appear at that location. PER-1 flies will have an abnormally long clock period. When left to themselves they will spontaneously adopt behavior rhythms (activity and quiescence) of a longer period than those of normal flies. PER-s flies will have an abnormally short period. Finally PER-0 flies will show no period at all.

This chromosome location, of course, probably isn't the only location which affects clocking. In fact, since we are interested in development this location probably does **not** control development. The PER-0 flies pupate and develop into adult flies at normal times in their lifespan. If their bodies had no way of judging when to pupate they could not become adults. It follows that studies of the PER mutants won't tell us anything directly about aging.

However it remains a big step to trace out at least one gene relating to clocking. The insights discovered ought to help us discover the other genes.

Geneticists have identified the location on fruit fly chromosomes of these PER genes. In **NATURE** (320, 185 (1986)) F.R. Jackson and others report their studies of the **protein** coded for by these genes and speculations about how this protein may control clocking in the flies. Biochemical studies of these genes have broken their DNA sequence into several different parts. They have also found out the protein sequences for which they code. Jackson and his coworkers report their results in the **NATURE** paper.

It turns out that the protein involved should contain about 1000 amino

acids. Biochemically, there is one location on this protein which should involve it with **cyclic AMP** (an internal cell messenger chemical). There are other locations which should allow attachment of sugars. Both of these facts are highly suggestive of the role this protein may play in clocking. Furthermore, we can now alter these sites to produce **new** mutants. The results may tell us a good deal about the mechanism of clocking as controlled by this protein. Efforts to identify the protein itself, rather than just the directions for making it, will probably soon commence and be successful.

A second paper on clocking deals with rhythms in human beings. It may turn out that we have one less internal clock than previously believed. Studies of clock genes in human beings are currently out of the question. The only way to study clock rhythms in humans is currently to observe their behavior. This involves isolating a group of people from all external clues about time. These people will then adopt rhythms due to their own internal clock.

This work has led to a hypothesis of at least **two** major clocks within human beings. One clock controls body temperature rhythms. The other controls the sleep-wake cycle. The evidence that different clocks control these cycles comes not from genetic data but from actual observation. It often happens, in fact, that the temperature rhythm will adopt a cycle of 25 hours while the sleep cycle lengthens to 30 hours. Clearly the same clock can't determine these two rhythms.

Unfortunately for those who want clean data and theory, J. Zulley and S.S. Campbell recently reanalyzed the human data on rhythms. The results don't distinguish between sleep and temperature rhythms quite so clearly as we might want. The main problem is that people with different sleep and temperature rhythms (on scrutiny) show a tendency to take NAPS. By coincidence, these naps turn out to be exactly at the temperature minimum, even if this is no longer the proper time for sleeping according to the sleep rhythm (J. Zulley and S.S. Campbell (**HUMAN NEUROBIOLOGY**, 4, 123 (1985))).

It still seems true that these results suggest some kind of separation between two clocks. For one thing, do people whose rhythms are disrupted in this way **normally** take naps in the middle of their day? It also seems likely that there are more than two clocks controlling our sense of time. Zulley and Campbell may have only reduced the number of clocks by one, at most. The progress in their work consists of realization that we must be more careful, in future work, to define just how we measure sleep cycles.

Zulley and Campbell raise questions about our understanding of sleep rhythms. A third paper in **SCIENCE** (231, 735 (1986)) by H.W. Kort and others, on **anatomy** presents substantial evidence that current beliefs about the **pineal gland** are wrong. The pineal gland plays an undefined role in our rhythm system. In particular, the pineal gland may somehow cause all our different clocks to synchronize on the night-day cycle whenever it exists.

Reptiles have pineal glands clearly related directly to **eyes**. They sit just under the top of the brain and respond directly to light. Just like eyes, reptilian pineals are derived from **nerve tissue**. They send nerve connections to other parts of the reptile's brain. What is most surprising is that only now, in 1986, evidence has come forward that mammalian pineal glands also come from nerve cells.

H.W. Kort and his co-workers from the Justus-Liebig University in Giessen, West Germany, used antibodies to trace out connections between the pineal and other parts of the brain in hamsters. They found clear evidence of nerve connections between the pineal and other brain areas.

Up to now anatomists believed that our pineal glands mainly functioned by making melatonin. This melatonin would then pass through the blood stream to other body regions. Discovery of direct connections between our pineal and other brain parts raises strong doubts about this picture. Furthermore, it also tells us that our picture of the **function** of the pineal needs revision. The pineal may play a much larger role in clocking behavior than we believed before. As yet this role still needs clarification.

**JANUARY - FEBRUARY 1987 MEETING CALENDAR**

ALCOR meetings are usually held on the first Sunday of the month. Guests are welcome. Unless otherwise noted, meetings start at 1:00 PM. For meeting directions, or if you get lost, call ALCOR at (714) 738-5569 and page the technician on call.

**ALCOR**

**ALCOR LIFE EXTENSION FOUNDATION**

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FULLERTON, CALIFORNIA 92635  
(714) 738-5569

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The JANUARY meeting will be at the home of:

(SUN, 4 JAN 1987)            Allen J. Lopp  
                                 13354 Veracruz St.  
                                 Cerritos, CA

**DIRECTIONS:** Take the Artesia Freeway (State 91) to Cerritos (Between the San Gabriel Freeway (I-605) and the Santa Ana Freeway (I-5)), and get off at Carmenita Road going north. Veracruz is the third street on the left after 183rd St. 13354 is on the southwest corner of Carmenita and Veracruz. You may park on Veracruz or in the lot of the Thrifty Drugstore on the opposite side of Carmenita.

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The FEBRUARY meeting will be at the home of:

(SUN, 1 FEB, 1987)            Virginia Jacobs  
                                 29224 Indian Valley Road  
                                 Rolling Hills Estates, CA

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

**Alcor Life Extension Foundation  
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Riverside, CA 92503**

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