CRYONICS

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Contents:

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EDITORIAL MATTERS

During most of the month of April Hugh Hixon and Mike Darwin will be away from Southern California. Both of them will be spending several weeks in Florida (wearing a Cryovita hat: see story below) and a week in Indiana touching base with the cryonics people back there and working intensively with Steve Bridge (the other Editor of CRYONICS) to revamp the ALCOR suspension paperwork.

What this means as far as our readers and members are concerned is that the magazine will be produced "ahead of time": in the case of the May issue almost six weeks earlier than usual. So, if you write letters and

don't see them appear in print, or if orders for back issues, literature or change of addresses seem to take a little longer please, bear with us. We are leaving a skeleton crew to handle administration and emergencies will be covered by the very competent and ever-ready ALCOR suspension team head by Jerry Leaf.

FLORIDA CAPABILITY EMERGING

In January a contract between Cryovita and the Cryonics Society of South Florida (CSSF) was executed to provide for the development of a "state of the art" capability with respect to perfusion in the South Florida area. To this end over $10,000 worth of equipment and supplies has been shipped to CSSF by Cryovita since February with almost another $10,000 worth slated for shipment in the next few months. This equipment augments an already significant physical capability which has been place for the last two years.

The Florida group has contracted for a complete capability and has purchased the full range of equipment and supplies necessary to do human perfusions to the standards now being employed in Southern California. When the equipment is fully deployed CSSF will have at its disposal a complete operating room with a heart lung machine and all necessary supporting instruments to carry out thoracic surgery for perfusion. They will also have a fully equipped laboratory for mixing perfusates, and doing blood gas determinations and laboratory analysis required to assess the adequacy of perfusion.

Following shipment of the balance of the required equipment Hugh Hixon and Mike Darwin will be traveling to Florida to spend several weeks training the local suspension team to handle the initial phases of cryonic suspension: resuscitation, medication and cooling. Current plans are for Cryovita personnel, directed by Jerry Leaf, to remain on-call for CSSF to provide for perfusion until such time as CSSF gains an independent surgical/perfusion capability. CSSF and Cryovita hope to work closely in the coming years to insure that CSSF achieves complete independence with respect to perfusion capability.

ALCOR EMERGENCY Urgent Instructions

A few hours after the March 4th ALCOR meeting adjourned the answering service paged Mike Darwin and informed him that an ALCOR member had called to say he was in the hospital and could we please call him back as soon as possible. A call was placed, the member was reached, and what was to develop into a real emergency began to unfold.

The member, who we'll call Mr. G here, had been signed up with ALCOR since 1977 and had cryonics arrangements for nearly twenty years. Mr. G who had previously been in perfect health, told us that he had driven to the hospital the preceding morning because of weakness in his legs, and then had developed pronounced left sided weakness and double vision. He was apprehensive and wanted to know if we could possibly come down the following day to make some changes in his cryonics arrangements. After assessing the situation, we asked if he would rather we come THEN, that evening, rather than take a chance on his being unable to communicate and sign things on the following day. It was obvious that Mr. G was at pains not to cause us to be "put out" or inconvenienced, but it was also obvious that he was worried about his condition: his physician told him that he might possibly have a brain tumor. Even though Mr. G felt fairly confident he would be able to handle matters in the morning (it was then nearly 8 pm on Sunday) he did finally ask if we could come out that evening.

Without further ado, Hugh Hixon and Mike Darwin loaded up the video camera, consulted with an attorney and shoved off for the hospital with the necessary paperwork. They arrived at 11:00 pm to be confronted by a somewhat hostile and less than cooperative staff, but with lots of reassurances and several firm demands from the patient, they were allowed to get the papers executed and film their execution (to establish competency and coherency on the part of Mr. G).

The following morning would find Mr. G in the Intensive Care Unit almost totally unable to move, and able to speak only with effort. At this point, per Mr. G's request, ALCOR contacted a relative who Mr. G wanted to question about overseeing his affairs while he was incapacitated. The relative met with both us (and toured our physical plant) and spoke with Mr. G. Mr. G repeatedly assured the relative of the long-standing nature of his cryonics arrangements and asked him to cooperate with ALCOR in the event cryonic suspension was necessary.

The following day, another relative called and indicated that cooperation might well not be forthcoming. There was a long series of questions about our legal status and about "whether or not we thought we could get away with 'this thing' if they (the relatives) took us to court?" The conversation ended with the rather astute observation by this relative that THEY COULD MOVE MR.G OUT OF THE STATE and so prevent his cryonic suspension. As they (rightly) pointed out, we had little power or authority to DO anything about Mr. G's whereabouts until AFTER he was dead.

When Mr. G became aware of this, he quite wisely named someone else as Power of Attorney and sought to limit his relatives' influence on his care or whereabouts. This was not a simple matter to achieve considering Mr. G's presence in the ICU. ALCOR acted to set up (in cooperation with the hospital and several off Mr. G's noncryonics friends) another filming/document execution session: this time conducted in the presence of the hospital notary and in the ICU!

With a cooperative Power of Attorney it then became possible for ALCOR to act in the event of deanimation. But it was a close call. In the following weeks ALCOR has had to spend an average of four or five hours a day just keeping

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things on track so that Mr. G gets good care and so that we are notified should his condition change or sudden deanimation occur. Without relatives to act for him (none have visited him since that second night in the hospital) ALCOR has had to step in and fill the gaps. Just riding herd on his medical care has been a major task; if there isn't someone there looking over the chart, seeing that you are being turned, suctioned and cared for, you stand a fair chance of being shunted off in the corner somewhere and forgotten. One of the first things that happened to Mr. G after he was moved from the ICU back to a regular nursing floor was that he developed pneumonia from aspirating saliva into his lungs (he is totally unable to swallow). This occurred because he required almost constant suctioning of these secretions, and the regular nursing staff was unable to give this kind of care (they have many other patients to take care of). So, his Power of Attorney and Mike Darwin arranged for him to have round the clock nursing care and MADE SURE that someone was there to prevent him from choking to death on his own secretions. ALCOR has also provided the extra TLC needed to make sure he has the little things he needs: a radio, telephone, contact with the outside world in the form of newspapers and so on.

As it turned out, Mr. G did not have a brain tumor, but rather appears to have had a stroke coupled with the onset of another chronic neurological disease. At this time he has been moved to a rehabilitation center a few

minutes away from ALCOR and he is being checked on and visited by ALCOR people on a daily basis WITHOUT FAIL. Mr. G's prognosis remains uncertain and while we are hopeful about his future and continue to provide him with encouragement and loving support, it is very hard to say if he will recover.

What we can say is that we have learned a number of very useful things from Mr. G's emergency. First and foremost is that preparation counts. If Mr. G's arrangements had not been largely in place, we would never have had a chance. As it was, just making the last minute changes which were necessary required a tremendous amount of effort and many sleepless nights.

We learned the importance of having an executed Physician's Affidavit. Initially, the Health Maintenance Organization (HMO) where Mr. G. was hospitalized at refused to cooperate with us. It was only AFTER we showed them the Physician's Affidavit which they had signed, that they changed their attitude. Still, it took nearly four days for the upper echelon administration to REALIZE what they had agreed to. In the end, it required considerable finesse on the part of Mike Darwin to work through a meeting with the head of the nursing department and the Hospital Administrator and come away with an agreement which basically said:

a) The hospital would start CPR and continue a "normal" code for at least twenty minutes.

b) The hospital would notify ALCOR of any change in the patient's condition and would allow us to "standby" with a rescue van in the parking lot if deanimation looked imminent.

c) The hospital would allow ALCOR personnel to move into the ICU or patient room, couple the patient to ALCOR rescue equipment and remove the patient from their facility.

d) No attempt would be made to "slow down" removal of the patient, and death certificates and transfer permits would be handled later, when time permitted.

e) The patient would be transferred to a "monitored" floor should his

vitals become unstable.

These arrangements required much negotiation and intense perseverance on the part of ALCOR personnel. Everyone functioned beautifully in the emergency and special thanks must go out to Hugh Hixon and Jerry Leaf who took on tremendous burdens of work to insure smooth operations throughout the time of crisis. Paul and Maureen Genteman must also we praised for the cooperation and support in making their home available as a base of operations should the need have arisen. It is now clear to us that this kind of effort is what is required to get someone frozen, whether it comes from ALCOR or some other concerned party.

It is interesting to note that even though Mr. G had a copy of our emergency instructions in his HMO file as well as a copy of his Physician's Affidavit, they had no intention of calling to notify ALCOR off Mr. G's hospitalization UNTIL HE DIED. They were unfamiliar with cryonics and had NO IDEA what was involved. As one nurse in administration put it: "Oh we get people willing their bodies to science in here from time to time. Almost invariably when they die and we call the number they've given us it's in the middle of the night and nobody knows what to do so they end up going to a mortuary." This same nurse said that prior to the orientation

we gave, she "probably wouldn't even have bothered to call if Mr. G had died unattended and a lot of time went by...because she knew it wouldn't do any good..."

Mr. G was VERY lucky in that he brought us into the loop while he was still able to. He was doubly lucky that he made that call because he was NOT wearing his ALCOR bracelet when he was admitted to the hospital. Thus, it is quite possible that he would have been buried or cremated before we ever even heard about his death. His Physician's Affidavit and emergency instructions were in his file at the HMO clinic (they never made it to the HMO hospital) and the physician who regularly saw Mr. G was no longer with the HMO! The hospital would simply never have known to call us had Mr. G come in unable to speak and act for himself.

The take home messages in this incident for other cryonicists are:

1) ALWAYS wear your ALCOR bracelet or necktag. If you can't speak for yourself, they may be able to speak for you.

2) Appoint someone you TRUST (preferably another cryonicist) as your Power of Attorney NOW while you are healthy and competent. (It bears pointing out that Mr. G was jogging 3 miles and doing 30 push-ups before lunch each day right up until the day he drove himself into the hospital for what he though was a minor problem.)

3) Make sure that there is someone who can and will act and act quickly to defend your interests and keep your cryonics arrangements on track if you live remote from ALCOR. At very least be sure that someone who is in close contact with you knows to notify ALCOR should you be hospitalized or deanimate.

4) If you have hostile or even questionably cooperative relatives make sure you NEVER list them anywhere as the people to contact in the event of an emergency. ALWAYS list someone you can be SURE will cooperate or list ALCOR as the people to call should be injured, fall ill or deanimate. Make sure your wallet or other personal effects do NOT contain the names or phone numbers of hostile or potentially hostile relatives.

We must become aware that when we are ill and unable to act for ourselves

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ALL of the traditional social structure revolves around relatives taking charge. At one point, we were even cut-off from visiting Mr. G because in the ICU only relatives are allowed to visit! Until legal death is pronounced, the cryonics organization has NO rights whatsoever. It behooves all of us to appoint some one to act for us, or we may find ourselves cut-off and in the hands of "family" who want only to bury or burn us.

MOLECULAR ENGINEERING: ARE THE BEGINNINGS JUST AROUND THE CORNER?

One of things which it is difficult if not impossible for noncryonicists to understand is HOW we will be revived. Or, more specifically, what physical technology will be used to achieve reanimation. Those of our readers who have been with us from the start are probably no strangers to the scenarios of Thomas Donaldson and Mike Darwin wherein "living systems" using synthetic or specially manufactured catalysts or "molecular machines" will effect repair on a cell by cell, molecule by molecule by molecule basis. Donaldson in particular has

written at some length in numerous articles in both LONG LIFE MAGAZINE and CRYONICS about the coming age of synthetic catalysis and its impact on cryonics.

For those of our readers NOT so familiar with Donaldson's previous work, a little review is probably in order. Basically, all of the work that gets done inside our cells is done my small machines, so-called molecular machines, which we commonly refer to as enzymes. These molecule size machines string amino acids together, break and make chemical bonds and generally carry out the business of metabolism, growth and development. They are in essence, the machines which build and maintain us. Until very recently we have had very little insight into how these tiny machines work. Certainly we have had no capability to do engineering on the level of molecules. All of our engineering efforts are carried out on a fairly coarse scale with NO precision at all with respect to the positioning of individual atoms. All of the machines we now have at our disposal are extremely coarse and crude compared to the ones operating in nature right inside our cells at this very moment.

Because we have no way to deal with atoms except as big blocks and coarse groups it is almost impossible to envision repairing individual cells and patching up individual ravaged memory molecules. All we can do right now is to move big hunks of tissue around or relatively big hunks of cell components and affect metabolism and repair only by the crudest means; by poisoning or stimulating one system or another (as with drugs). However, this will not always be the case. Soon we will have the capability to build our own molecular machines and to carry out engineering and repair at the level of the cell. Recently, mainstream science has been giving more and more attention to this idea. Science (233, 154 (1984)) carried an excellent review article entitled "Semisynthetic Enzymes Are New Catalysts" which boldly predicts:

> "More complicated procedures may involve combining the enzyme with an external reagent to produce a semisynthetic enzyme with different catalytic potential. The most complicated procedures may involve a complete redesign of the enzyme itself... Research has only just begun on such applications, but the results so far suggest that there is great potential for success and that it might be possible one day to find or make an enzyme to carry out nearly any reaction desired."

The article goes on to point out that a whole range of semisynthetic catalysts have been made, many of which outperform their natural cousins in many respects; such as rate of reaction, range of temperature activity, or yield of reaction product.

This work should be extremely encouraging to cryonicists because it is this kind of technology which will likely be required to revive us. Along these lines, we have received a very excellent manuscript from Eric Drexler of the L-5 Society dealing with just these developments in a very elegant and exciting way. We sincerely hope Mr. Drexler's manuscript sees print in the near future and that his designs will have the same powerful, positive effect they have had on us. This entire area of molecular engineering is one which we will be following and reporting on closely in the coming months and years.

NOW, FROM THE PEOPLE WHO BROUGHT YOU TALKING DOLPHINS, BROADCASTING EXTRATERRESTRIALS, AND SUDDEN DEATH FROM OVERPOPULATION: NUCLEAR WINTER

In this issue is an excellent article by Thomas Donaldson entitled "Oh What A Lovely War." The article is excellent because it cuts through waves of hype and emotionalism to come to grips with basic issues of common sense and personal responsibility. Shortly after the media hype on the Sagan, Ehrlich, Pollack report on "nuclear winter" began, this editor began to have doubts. Doubts about the veracity of the "data" and doubts about the strategy to be adopted in the face of that data. I felt quite strongly about writing something concerning those doubts, but was restrained, I believe wisely, by colleagues who felt CRYONICS should stick to its largely "apolitical" editorial policy. My colleagues were certainly right in urging ME not to write a critique of the report, largely because it would have lacked the balanced, careful reasoning present in Donaldson's commentary.

But, my colleagues were also wrong. Wrong in assuming that the issues of nuclear war and disarmament should be excluded from the pages of CRYONICS because they are "political." Like it or not these issues are ones which intimately affect our survival as individuals if not as a species. Those are just the kind of issues CRYONICS has dealt with and must continue to deal with whether they are political or not. We have avoided discussing most so-called political topics largely because we feel they are irrelevant to the big picture: just so much grunting of hogs which should be listened to for tone much more than for specific content. Unfortunately, the issues of nuclear war and disarmament cannot be dealt with in the same way. In particular, these issues cannot be dealt with lightly when statements and policy are shaped on the basis of scientific study and concrete facts. Such is the premise of the Pollack/Sagan report.

I must point out at the outset that I don't think there is anything "wrong" with nuclear weapons or that to make or use them (or threaten to use them) is an intrinsically immoral and criminal act. Indeed, it bears pointing out that in large measure our standard of living here in the U.S. has been shaped by the fact that we have not had to spend gigabucks on conventional defense strategies which are so much more costly in terms of lives and material. Nuclear weapons are scary because they are BIG and POWERFUL and DEADLY. But they are not out of

scale with the rest of our technological capability and in the future we will have things which will be even MORE DEADLY and MORE POWERFUL and MORE AWESOME. Just wishing, or labeling something as "evil" will not make it go away. If we wish to control awesome power and knowledge we must accept awesome responsibility.

All of the disarmament and freeze apologists want to make nuclear weapons go away. They want the personal fear and load of possible annihilation to vanish from their shoulders on the basis of "simple" solutions. But that cannot happen. New discoveries, new ventures, new territories always carry with them new risks and uncertainties. Imagine the situation if the colonists who fought their way across this continent had insisted on SAFETY and SECURITY as they extended their reach! It is a fact that nuclear weapons exist: a consequence of our growth in understanding of the world around us. It is also a fact that competing ideologies and government systems exist, and that they are not going to go away or be simply persuaded of some universal "correct" course of action. These things are with us, and will probably remain with us for the foreseeable future. It behooves all of us to take Donaldson's advice and STOP wringing our hands or idly wishing for a simple solution to the problem and get on with the business of learning to LIVE with nuclear bombs.

As much of a contradiction as that may seem, it is really only a slight variant of what we as cryonicists are already doing: living with the knowledge of the certain annihilation which awaits us in the form so-called natural death and taking responsibility to deal with it. --M.D.

OH WHAT A LOVELY WAR

by Thomas Donaldson

Although the report I discuss here does not concern either gerontology or cryobiology it does merit some attention in an immortalist publication. I am referring to the report by Sagan et al, (SCIENCE 222 (1983) 1283), and its sister by Paul Ehrlich et al, (SCIENCE 222 (1983) 1293), describing the effects of a large nuclear war on the climate and ecology of the Northern Hemisphere.

To summarize, Sagan and his co-conspirators assert that a nuclear war (their "reference war" involving 5,000 megatons of bombs, most above 1 megaton) would cause climactic disruption such that for a year afterward clouds would cover most of the earth, temperatures would fall as low as -20C, and plants would have difficulty growing because of the dark. Fallout would cover 50% of the land area. About 75% of the population of the Northern Hemisphere would survive the initial attack, to face these extreme climactic conditions afterwards. In the subsequent article Ehrlich, Stephen J. Gould, and others observe that these conditions would severely impact most life on earth (!).

This is actually wonderful news. Neither the temperatures nor the other conditions, are so severe that a prepared community could not cope. The one novel point of these claims is the idea that the community would need stored food for two years, together with seeds, breeding stock, and other equipment to restart agriculture afterwards. (Sensible planning for such a catastrophe,

though, should have already included such preparations). For instance there are many areas in the U.S., Canada, and Russia where the temperature falls to -20C right now. These conditions are survivable. In particular, with preparation, more than half the population of the U.S. would survive long term.

However, on reading these documents I somehow get a pronounced feeling that survivability just wasn't the message Sagan and his co-conspirators wanted to put out. Of course they aren't going to TELL us their message. In fact, nowhere in either of these documents do they actually state what CONCLUSIONS they wish us to draw from the claims they are making. They are being coy. I'm going to look at that and try to piece out what's really going on. After all, if they don't tell us their own conclusions, they can hardly object if we draw our own!

In the first place, the articles are actually, both of them, quite atrocious "snow jobs". If we read them we discover all sorts of facts and statistics, tables of megatonnage, tables about the characteristics of dust and smoke released by nuclear detonations, volcanic detonations, and fires. It is then ASSERTED that all these facts imply the climactic results described (and described fully, in charts and graphs). When we examine the article for any sort of substantiation of these claims, we find that the detailed simulations on which these charts and graphs are based are "in preparation", and the models used, and their validity, are discussed elsewhere. Not only that, but even some crucial "facts", such as the characteristics of dust created by nuclear explosions, are to be substantiated in this same work "in preparation" (their reference l5).

Fundamentally, anyone reading this and wanting to check the conclusions for themselves will have to do a great deal of work, and might simply have to wait until those parts which are "in preparation" become ACTUALLY PREPARED, which may take a long time, if ever. As they stand, these documents depend PURELY upon the trust of the reader for their effect. If we don't want to blindly believe Sagan et al, we're left completely up in the air. Nor is it even a simple matter of conclusions which are true or false; if we actually had a complete document (rather than a snow job) we would probably discover many more important qualifications.

This tactic reminds me powerfully of an old debating trick. By the time the opposition has DONE all the work needed to answer and clarify these papers, several years will have passed and the impact of any refutations or qualifications will be almost nil.

What exactly are these people trying to prove? What is the effect that they wish to create by these documents?

In the first place, everyone already knew that nuclear war would be an unparalleled catastrophe. Perhaps not so grave a catastrophe as a major asteroid impact on the earth, but still the greatest catastrophe to affect mankind within historical memory. Their conclusions are therefore not novel at all; when we come to discuss catastrophes, after all, it matters little whether 50% or 99.9% of the population dies, my own chances and those of my family and friends look pretty grim.

HERE IS A CLUE: there is, you see, another way of looking at the conclusions that they are drawing. After all, if a 5,000 megaton nuclear war would have these horrific effects, what they may have produced is a cogent argument that their "reference war" will simply never occur. This isn't to say that nuclear weapons will never be used in war, but simply that the war wouldn't be pressed so far. No one will HAVE a 5,000 megaton nuclear war. Period. However, on examining their article we discover about 5 lines, and two references, devoted to this crucial point. Sagan et al, allege that "nuclear war would be very difficult to control." They omit virtually all argument for this assertion, which they seem to feel has obvious verisimilitude for any

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reader to accept.

Their "reference war" is thus not just a matter of X megatons detonated. Their reference war is an ORGASMIC RELEASE. It is as if, starting from a condition of peace, with no previous warning or preparation by anybody, all of a sudden 5,000 megatons of bombs are detonated all over the Northern Hemisphere.

This picture represents more accurately the effects of an unprovoked surprise attack by flying saucers from Arcturus than it does the likely course of a nuclear war between existing Earth nations.

Even if we assume that no restraint is exercised (a very large assumption indeed, considering the horrific consequences of NOT exercising restraint), there are in fact at least two Northern Hemisphere nations which have made extensive preparations to ride out exactly this kind of attack. I am referring to Switzerland and Sweden. Both countries have very extensive civil defense preparations and stockpiling. They would probably not be target areas themselves. They will further have armies and governments in being afterwards, and be capable of repelling all bands of marauders from other, less provident countries after the attack.

However, for some reason they do not reveal, Sagan and Ehrlich do not choose to consider either the effects of any sort of restraint or the effects of extensive civil defense preparations. They are being coy and don't want to tell us what they are really trying to prove (probably they would assert, with injured innocence, that they weren't trying to prove

anything). HOWEVER, just from looking at their assumptions we can surmise that what they really want to prove (by RHETORIC rather than RATIONAL ARGUMENT) is that restraint is unlikely and civil defense impossible. Of course they haven't proven, or EVEN DISCUSSED, either of these propositions. They want to "prove" these "theses" by repeating them over and over in sly ways.

Where else is their argument going? In the first place, there's no inconsistency at all in making PRIVATE civil defense preparations and taking a political position in favor of total disarmament. After all, our ability to alter political trends is far behind our ability to affect our own fate. For some reason, people who simultaneously hold these two views are few and far between (except of course in Switzerland and Sweden). However, the whole thrust of debate in the U.S. tends towards arguments that these two opinions are POLAR OPPOSITES. That is the context into which Sagan, Gould and Ehrlich have delivered their documents, and they can hardly have been ignorant of it. I would therefore conclude that these gentlemen want to DISSUADE us from any sort of private action. They are trying to get us to follow their own political flags, in a condition of emotional and intellectual dependency upon them and their kind. People who feel helpless and unable to affect their own fate, off course, will happily follow any available demagogue.

Although such emotional states are not religious in the literal sense, they have much to do with the drives and conditions which also produce religion. Nuclear war involves death on a mass scale. It is the secular version of Armageddon, so much as to be a cliche. (Why is nuclear war so OBVIOUSLY impossible to restrain or limit? Well, who ever heard of a restrained Armageddon?) The implements of such war are evil and WE CAN ONLY ESCAPE EVIL BY RIDDING OURSELVES OF IT TOTALLY. Restraint is impossible. We cannot save ourselves by any private activities, we can only save ourselves by giving our souls over utterly to Christ. That is, if you happen to be pro-disarmament and ALSO believe in civil defense, you haven't given your soul over to the cause.

Not being already immortal, I can't really speak for other times; certainly there is enough in the history books about similar attitudes at other times to make me think that NOW isn't really any different. Many people now seem quite unable to see any alternative to behaving in public, politicized, and

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fundamentally symbolic ways. They go through life acting as if they could only express their opinions by a communal, religious demonstration. In particular they can't respond to the nuclear war problem other than in this way, even to save their lives. It's really quite symptomatic here that Sagan, Ehrlich, and Gould are media superstars. Let's suppose that their campaign is "successful" and gets lots of followers, even that it leads to total U.S. nuclear disarmament. In what way will their own personal prospects for survival be improved? China and the U.S.S.R. would then have their 5,000 megaton war, and an UNPREPARED United States would then be duly wiped out by the (presumed) climactic effects. Sagan and Ehrlich would, of course, bask in the public attention and receive large sums on lecture tours UNTIL that dismal event.

I am saying that these gentlemen are just as much caught up in cult thinking as those they are trying to ensnare.

Most readers known that some cryonicists actually own fallout shelters. Others have taken other measures. This isn't done in a belief that these measures will necessarily work, but only in the belief that they can significantly improve the odds. Our attitudes are much the same towards our own suspensions. Neither of these preparations is symbolic at

all. What we are specifically NOT doing, of course, is renouncing all private preparations and giving ourselves over to one or the other politico-religious cult movements against Death. People who do not think our way, including virtually all of the American intellectual class, will rage at our indifference to their charismatic cults. They even think that cryonics is just another one of the same kind, and will probably never understand the difference.

Could cryonics survive a major nuclear war? Of course that's what we really want to know.

Rather than accept their quite implausible scenario, I shall assume that extensive civil defense preparations do take place in SOME countries. If a country isn't a target, the major preparation it needs is storage of food and supplies. It will certainly be visible before the event just which countries are behaving in a provident fashion; so long as the American establishment continues its insane policy towards civil defense we should expect to leave the U.S. With food and supplies, a provident, nontarget country would keep its industrial capacity, hence its ability to produce liquid nitrogen. We might also have to buy our way in with our own supplies...which is only fair. Cost would be very high; on the other hand, so would be our motivation. Every other major war was preceded by a long period of extreme tension, so that we can expect time to get our affairs in order. Without a detailed contingency plan, no one can work out detailed costs or activities. It is clear however, what we would have to do, and also clear that we could probably do these things (although it would really hurt). Since (thankfully) we live in a time of relative peace, it may not even make sense to work out any more detailed plans.

LETTERS TO THE EDITORS

Dear Mike,

I have just finished reading the March 1984 issue of CRYONICS and feel that some comment is required, not so much about the content of the issue itself (which was as always excellent) as about some underlying assumptions both you and Jerry Leaf SEEM to be making. I feel that these assumptions need to be seen as assumptions rather than obvious truths, particularly because at SOME point we as cryonicists are simply going to have to abandon them.

In the March 1984 issue of CRYONICS, you have an article "What You Can Do--Part III"

and a second article, co-authored with Jerry Leaf, on cold agglutinins. Both of these articles are good, substantial pieces of work. I can't disagree with the facts and observations produced, and I agree that they SHOULD have been produced. It is the conclusions which disturb me.

Let's look at the "Cold Agglutinins" article. On pages 24-25 you have a discussion of transport protocols, in which basically you assert that "every patient requiring transport by commercial air carrier...should undergo total body washout with an appropriate intracellular type flush solution."

There is a sense in which you are quite correct. Every such patient SHOULD undergo total body washout. What bothers me about this statement is that this sense is exactly the same in which we might say everyone should be immortal. Given the condition of cryonics today, patients who are transported by commercial aircraft will have been so transported precisely BECAUSE no facilities were available for total body washout. If these facilities HAD BEEN available, the patients would have been perfused and

frozen. Your other transport protocol, of course, is likely to cost at least $50,000, again presenting a severe problem of a different kind.

You certainly don't have to be told about the conditions under which we all operate; you must already know that if a patient has to be transported by commercial air carrier, then washout just wasn't a viable option. The quoted statement bothers me because I don't know where you are "coming from" when you make it.

As you know, I've spent a lot of time and work advocating that those who live in a remote location plan as their PRIMARY strategy, to go to a cryonics center if they become terminally ill. I've also tried to work out ways to tell WHEN moving should commence. Now isn't really the place to discuss that strategy in detail. The point I do want to bring out, however, is that NOT EVERYONE WILL BE ABLE TO TAKE ADVANTAGE OF THAT STRATEGY.

For instance, I have myself had the opportunity to peruse the list of BACS suspension members. An absolute majority did not live in the Bay Area. Furthermore, I know very well that some important members of ALCOR also do not live in Orange County, such as the Chamberlains and a prominent cryobiologist whom I shall not name. I am talking about a large percentage of existing suspension members, and an even larger (but unknown) number of people who WOULD become suspension members if they felt that there would be any POINT (them not living in Orange County or the Bay Area).

Of course you and Jerry can correctly observe that I can solve my PERSONAL problem by relocating to California. As a comment on my own personal problem, that's entirely fair. It will cost a lot in many ways, but I particularly may soon find the cost acceptable.

However such a comment does not deal with the GENERAL problem at all. The GENERAL problem consists precisely of the fact that only a small proportion of people interested in cryonics will EVER be able to take up permanent residence in California. If you can only make cryonics attractive to those people who live in Orange County, California, then cryonics has little chance of growing significantly and a strong chance of someday being wiped out by a disaster LOCAL to Orange County.

What badly needs doing (yes, I know that many things in cryonics badly need doing!) is precisely to work out sensible things which can be done to improve the position and chances of people who ARE NOT near a trained perfusionist, who ARE NOT prepared to double their suspension costs to include the cost of transport, in short, people who are not going to relocate to California.

I'm not asking you to do this alone at all. What I do want is a shift in attitudes towards the work you are already doing. The problem facing MOST cryonicists is NOT like open heart surgery in a superbly equipped modern

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teaching hospital. The problem facing most cryonicists is much more like doing thoracic surgery in a PRISON CAMP, with surgical implements cadged from the camp kitchen. No one would claim that these conditions are ideal. A discussion of how surgery ideal SHOULD be performed has a lot of use; your article on agglutinins was a useful contribution. BUT these discussions omit most of the major problems the prison camp surgeon must face.

These sorts of problems aren't even irrelevant to cryonicists who happen to live in Orange County. It is just not true in present day conditions, that we can reasonably expect ideal treatment or conditions. Hospitals may not cooperate; county officials may not cooperate. They may well present the suspension team with the patient, lying in the morgue at 2 degrees centigrade, cold agglutinins and all. There may be only one

person available and that person untrained when the patient deanimates. You certainly know all this already, and have had to make compromises; you must have thought about what to do. Your thoughts are important and should be spread around in CRYONICS, to help the rest of us make our own hard choices.

The point of this letter is that intelligent, prepared prison camp surgeons ought still to do a lot better than people who are totally unprepared. Every prison camp surgeon must make compromises; what he needs is scientific work to help him make informed compromises. For instance, even if total body washout isn't possible, does it make more sense to try to drain out as much blood as possible before cooling or to leave the blood in the body? That may be easier to do than a total body washout (perhaps by gory and crude methods but still...). I note that methylprednisolone will also decrease cold agglutination. Would this suggest that much higher doses of Solu-Medrol will help someone who must be transported packed in ice? That also may be easier to arrange.

There are also more general questions. Undertakers and embalming equipment are widespread. Let us suppose, for the sake of discussion, that such equipment is the only kind available which can come anywhere close to doing a perfusion. At one time suspensions with this level of technology; you YOURSELF did such suspensions. Cryonics has now gone a lot farther, and no one would ask you to do a suspension with a Turner Porta-Boy IF other means were available. But knowing what you know now, do you have any constructive suggestions for dealing with the problems of someone who has nothing better than that? We are in a prison camp, not a teaching hospital. Would recommend that the patient simply be left to await rescue by Cryovita, or could the embalming machine be usefully employed?

THESE PROBLEMS ARE IMPORTANT. They are important because GROWTH in members and equipment is important, and the only effective way any group can grow is by starting with primitive facilities and working up to the more advanced. That is how you grew yourselves. Anyone who wants to grow will desperately want to know USEFUL things they can do with the limited, clumsy equipment they may have available. Do you really believe that you, Michael Darwin, would ever have become involved in cryonics if you had felt that facilities like those of Cryovita's were the minimum needed? Would you have even performed those crude suspensions from which we all learned so much? Not to mention, perhaps even saving a life. In fact it is unlikely that cryonics would have gotten off the ground at all unless you and others had decided to press forward, EVEN THOUGH the means you had were very crude. Most cryonicists are STILL in the situation you were in when you began in Indianapolis; they simply won't leave the ground at all unless they use crude means to start off.

I feel that this problem, of what to do in the prison camp, is crucial to the growth and future of cryonics. Certainly INDIVIDUALS can solve it by relocating, but that just isn't going to solve the general problem. I would like to see a lot more attention to it, especially in scientific and

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experimental work by major cryonics centers. High technology in cryonics ought not to consist just of knowledge of how to do a total body washout, it should ALSO consist off knowledge of HOW and WHETHER to usefully employ an embalming machine.

Thomas Donaldson
Canberra, Australia

Dear Thomas,

First of all I should point out that I did NOT co-author the cold agglutinins article with Jerry Leaf. Also, I had virtually no editorial or other input into that article and I did not even type it. It stands as Jerry's own work, free and clear from any opinions and/or prejudices I might have.

As regards the article: I do not share Jerry's degree of concern, and would point out, as you have, that suspensions remote from a facility (and even some CLOSE to a facility) do not always go down the primrose path. We do the best we can under those circumstances. Jerry can speak for himself about any points he was trying to make. Jerry and I differ on many points concerning perfusion procedures--usually his standards are much higher and less flexible than mine. As you point out, I herald back to the days when cryonics was little more than guerrilla theatre.

I was not trying to demoralize people in my article. I simply feel it necessary to point out that very few if ANY people are following the advice offered in your first two excellent articles. I know of at least two people trying to start their own cryonics society. One fellow is back East and one is in the Northwest. Neither of them has taken the time or had the good sense to SIGN UP THEMSELVES, and consequently I have given them little help and feel quite confident no one else will take them very seriously either. NO ONE has bought any water, or even had the sense to try and buy remote standby insurance when that was being offered. In short, I must conclude that most people out there just don't give a damn about doing ANYTHING much to improve their chances. Those that are signed up and live a long distance away can be divided into three groups: those that plan to retire to the vicinity of a cryonics society, those who have at least one or two closely associated "others" they can count on to GET THEM TO CRYONICS FACILITIES OR GET CRYONICS FACILITIES TO THEM, and those who are happy fools and who are buying nothing more than peace of mind with the bland assumption that "everything will work out all right" when the time comes.

Any way you figure it, MOST people out there just don't spend much time worrying about cryonics. Cryonics just isn't that real to them, and it just isn't something they care to be seriously inconvenienced about. This is sad, but it is what the evidence strongly suggests the situation is. I do NOT think this situation exists because people feel helpless or demoralized by isolation. I think it exists because most people, including most cryonicists, simply don't understand how IMPORTANT cryonics is, and how precious life is. This isn't something you or I can change easily with a stroke of the pen or a strike off the key.

As to relocating, I proposed it as the SIMPLER alternative to starting your own cryonics group because it is PASSIVE by comparison. No responsibility, no danger, no "hard-thinks" about water for injection, embalming pumps, cooperating morticians, what gauge needle to use or concentration of glycerol to perfuse. Just relocate and let someone else make the big, tough decisions.

The GENERAL PROBLEM is that people just don't give a damn enough to do anything.

In response to your prison camp analogy: the first edict of medicine is do no harm. If I needed thoracic surgery in a prison camp, chances are I'd figure on living a lot longer waiting to die of whatever was killing me rather than letting someone try a fix job with knives and forks. I MADE MY DECISION in Indiana several years ago. It was not easy or painless for me either, because I FAILED in Indiana. I did not have confidence that those around me could act and act effectively to GET ME FROZEN and to KEEP ME FROZEN. I could not see any way that my efforts would change that

situation. Even though it was a blow to my ego and a financial whipping of immense proportions, I got the hell out of there because I felt it was necessary. There are no GENERAL PROBLEMS of the kind you describe. Only lots of PERSONAL ones which MUST BE DEALT WITH INDIVIDUALLY. As YOU well know cryonics and life are hard, tough things. There are no easy choices if you REALLY want to survive long term. It just depends on HOW BADLY you want to survive and to WHAT DEGREE you think cryonics is a ticket to that survival.

I think you are sadly mistaken with your strategy of trying to predict "when to hop on plane and fly to your cryonics society." I say this based on my own personal experience and on my experience with literally hundreds of dying people: several of whom were/are cryonicists. You underestimate the complexity of the situation and you underestimate human optimism and capacity for self deception in the face of the unthinkable. Such a strategy may work well for YOU, but I do not believe it will work well for most cryonicists and what's more I think most of them KNOW THAT. Basically the flaws in your "get up and go approach" are that it uses highly uncertain criteria for WHEN to go, these criteria are subject to optimistic biasing on the part of the ill or dying individual and this scenario allows no room for any significant error in judgement. That's the real bad combination in my estimation.

If I had realized what a total mess cryonics was in in 1968 when I first heard of it, I would have walked away and probably never looked back. I got involved to the extent I did early on because I NAIVELY thought that the Cryonics Society of New York was PERFECTLY PREPARED to suspend me. When, at the tender age of 17 I ended up helping to suspend someone for the Cryonics Society of New York and I saw what a SLOPPY DISORGANIZED MESS things were in, I was shaken to the bone. The morning following MY first suspension this pioneer was vomiting his guts up in the toilet of a workingman's bar on Long Island. Not because I was unable to handle the physical aspects off perfusion, but because the enormity of realizing I was RESPONSIBLE had hit home for the first time. I realized then and there on that morning that there WAS NO gleaming cryonics society waiting to take care of me. There was only a mortician, a dirty embalming pump, and a few gallons of glycerol and Ringer's Solution waiting for me at the end of the line. UNLESS I DID SOMETHING ABOUT IT. If someone told me I could have solved those problems by MOVING, simply by MOVING then I would have MOVED. In fact, when I met the Chamberlains and saw them starting to solve those problems I packed up, left school, and MOVED. I've no regrets about that move or the one from Indiana and I consider that compared to the nightmare of effort required to start your own cryonics group I got off CHEAP! Had I known, at age 13, that I was in for all that, I am CERTAIN I would have walked away.

I think the bottom line is that those isolated cryonicists you speak off must at least manage to persuade a couple (or as a bare minimum ONE) other person into being a cryonicist. Not only had they better persuade them, but they had better make VERY SURE that at least one of those people will act and act aggressively to GET THEM FROZEN (by whatever means) when the time comes. Without at least that level of support, it is my honest opinion that a person's chances for getting suspended are very poor unless they've provisioned for a cryonicist to show up and act for them should the need arise. Even then...

There is SAFETY in community, in being close. Great safety. If you want my advice, create it or get to it. PERIOD. Neither road is going to be an easy one to travel. Whichever one a given individual picks, both ALCOR and I will be here to help with advice every step of the way: even

about embalming pumps. But don't expect people to beat a path to our door trying to start a cryonics society. Only three people responded to ALCOR's efforts to establish a cryonics coordinator program (as a prelude to establishing new groups) and two of those three people were not serious enough to sign up so that they could qualify for help. Until and if we see some signs of real interest in DOING something on the part of people remote from a cryonics organization, we are not going to redirect our efforts away from improving the state of the art, attracting more members locally and generally trying to put cryonics on a more credible and professional technical basis. I for one, have made my sacrifices and tough decisions so as not to end up being hacked on with kitchen utensils and embalming equipment. Others will have to decide for themselves what to do. I would simply point out that compared to starting your cryonics group (as you must now be painfully aware) moving is EASY. In any event, the first step is to decide to DO something, and that's a step neither one of us can be accused of failing to make. --MD

REPORT ON THE 20TH ANNUAL MEETING OF THE SOCIETY FOR CRYOBIOLOGY -- PART III

We continue our coverage of the 20th annual meeting of the Society with a review of advances in fundamental cryobiology. More on fundamental cryobiology as well as miscellaneous points of interest will be covered in the fourth and final part of our report in the next issue of CRYONICS.

FUNDAMENTAL CRYOBIOLOGY

Running concurrently with the organ cryopreservation symposium was a symposium on "Life at Low Water Activities." Water "activity" is a reflection of the effective amount of water present or, looked at another way, low water activities mean substantial dehydration. Dehydration is a direct consequence of freezing and also takes place in attempts to replace a substantial fraction of water with cryoprotective agent (CPA) for the purpose of allowing vitrification. Dehydration is thus of central importance in all phases of cryobiology, and understanding of its deleterious effects would presumably speed the day when we can all become immortal!

Five papers were presented in this symposium. The first was by G.W. Gould (Unilever Research Labs, Bedford, UK) who spoke about bacterial endospores. He presented a large array of proposed mechanisms by which these structures survive and control dehydration, but as yet there seems to be no consensus concerning which processes are critical and which are not.

J.G. Baust presented the next paper. Baust claimed that insects are the most advanced animals known to survive freezing under natural conditions (thereby ignoring mussels and frogs). Insects elaborate high concentrations of CPAs such as glycerol, sugars, and proteins to protect themselves against freezing injury (dehydration injury). Beyond this, though, it seemed not much

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*** TYPISTS NOTE: THE NEXT THREE PAGES CONTAINED PHOTOGRAPHS. THE FOLLOWING TEXT APPEARED WITH THE PHOTOS. ***

(PAGE 1)

THESE PHOTOGRAPHS ACCOMPANY THE ARTICLE "SIMPLE CRYOGENIC TECHNIQUES" WHICH APPEARS ON PAGE 19

Photo A (left) shows the ALCOR/Cryovita cryogenic pump assembly. The long

section of pipe to the left of the pump is used to conduct liquid nitrogen to smaller dewars during pumping operations. The ALCOR dual patient dewar is in back of the pump.

Photo B (right) illustrates the use of short pipe sections to facilitate lowering and raising the pump assembly in the dewar.

(PAGE 2)

Photo C (left) shows a Dwyer falling ball type flowmeter similar to the one used to monitor boil-off on ALCOR dewars.

Photo D (below) shows the monolithic lid of the ALCOR dual patient dewar with bicycle inner tube cemented in place with silicon caulk.

(PAGE 3)

Photo E (above) demonstrates application of the compression frame to the lid of the ALCOR dual patient dewar. Mounted on the compression frame is a flowmeter for monitoring evolved boil-off gas.

Photo F (right) shows the quick fill manifold with one transfer line disconnected and the second fill port blocked off so that the assembly can be used to fill the dewar with one LS-160 of liquid nitrogen.

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could be said.

The next paper was that of R.G. Wyn Jones (University College of North Wales), who reported that plant cells subjected to low water activities tend to nonspecifically accumulate solutes such as sodium chloride and other salts in their vacuoles to counterbalance extracellular dehydration and thus prevent volume loss. But the cytoplasm itself responds highly specifically accumulating only certain types of solute molecules which are non-toxic in molar levels. These solutes are known as "compatible solutes" and include betaine, proline, glycine, sorbitol, and many others. In addition to not interfering with normal biochemical functions in high concentrations, these compatible solutes seem to stabilize proteins and membranes against hypertonic salt and thermal denaturation. Although these agents might also be protective of our own cells, the problem in applying this new knowledge is that these solutes are quite obviously unable to cross cell membranes (or else they could not be accumulated by these plant cells). Perhaps some analogues of these solutes can be developed which would be able to enter animal cells and confer "frost hardiness."

R. Jaenicke (Universitat Regensburg, Germany) then discussed in greater detail the responses of proteins to low water activity. Halophilic ("salt-loving") microorganisms appear to have remodeled most of their cellular proteins to make them more compatible with high salt levels; this impressive feat of evolution clearly does not help us, since we cannot alter our protein structure. However, one apparent reason the proteins of "cold-loving" or psychrophilic organisms are more stable is that increasing hydrophobicity of the protein surface increases low temperature stability. This might be something we could mimic by binding certain molecules to the surfaces of key enzymes -- in fact, this could be why dimethyl sulfoxide seems to stabilize cells against low temperatures in the absence of freezing.

Felix Franks (Editor of "Cryo-Letters," in which journal he has published letters from R.C.W. Ettinger and Thomas Donaldson) closed out the

session. He gave a much-needed description of the concept of water activity and pointed out that water activity as such tells nothing about how the activity has been reduced, and that "how" makes all the difference in the world (e.g., reduction of water activity by salts versus "compatible solutes"). He also admonished the audience not to use the term "bound water" as there is really no such thing, only "perturbed water." Nothing practical seemed to emerge from Franks' remarks except that better theoretical modeling may one day help to guide more practical approaches to withstanding dehydration.

The session of Membrane Permeability and Structure had several papers of importance for fundamental cryobiology. Cell water permeability of granulocytes (Scheiwe and Korber, West Germany) and of a population of cells from human bone marrow (L.E. McGann et. al., Canada) was reported. This type of data is required for an understanding of cell shrinkage during freezing and cell "swelling" during thawing. R.S. Pearce and J.H.M. Willison (UK) found a specific relationship between freeze-thaw damage of wheat cells and the appearance of particle (protein) -free areas on the cell membranes which "appeared to be centers of membrane reorganization." This is a good clue to the nature of one molecular mechanism of freezing injury.

The session was closed by four papers from Peter L. Steponkus's lab at Cornell University. The first described measurements of apparent water permeability of plant cells at temperatures as low as -30 degrees centigrade. The second showed that plant protoplasts, which seem to be a very fruitful model, are injured at 0 degrees centigrade by most solutes at a concentration of 3 osmolal, whereas the "compatible solute" proline is not damaging until 4 osmolal levels are used. For cold-hardy protoplasts, the damaging osmolality

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for proline was 11 osmolal. Still greater resistance was found at subzero temperatures (-6 to -8 degrees centigrade) in unfrozen or frozen media. This latter result is of basic importance because theories of freezing injury which assume one given level of stress is going to be damaging regardless of the temperature at which it is experienced would be invalidated if, as in this system, one level of stress has effects that are significantly affected by temperature. (W.J. Armitage and N. Parmar of the MRC medical Cryobiology Group, UK, similarly reported in a later session that platelets were more tolerant of osmotic stress at lower temperatures). The third Steponkus paper (with W.J. Gordon-Kamm), again using plant protoplasts as a model, reported no effect of extracellular ice lying adjacent to the cell membrane but that glycerol induced both crystallization of membrane proteins and blistering of the cell membrane. Just what the implications of these deleterious effects of glycerol might be for mammalian systems is not at all clear.

The final paper showed that proline has the effect of allowing greater than usual membrane expansion during thawing. Explaining this will require a little background. Steponkus is well known for his concept of TSAI or tolerable surface area increment. When cells are frozen, they shrink. Cryomicroscopic observation of a cell at a temperature which will prove to be lethal upon thawing often does not reveal any obvious end-point associated with a certain critical increment of cell surface area. This paper (You-Liang Liu and P.L. Steponkus) now shows that proline raises TSAI for 50% of the protoplasts TSAI (sub 50) by 74% to 120% depending on the concentration of proline used to shrink the cells. This result was only seen in protoplasts shrunken in proline solutions; proline did not have to be present during volume expansion but only during volume contraction. Apparently proline prevents loss of membrane material during shrinkage,

allowing the cell to subsequently re-expand without running out of sufficient membrane material to cover the cell at its normal volume.

Also of fundamental cryobiological interest were several papers presented in Session 6 (Phagocytes and Platelet Preservation). T. Takahashi et. al. (Cryobiology Lab, Red Cross, USA) found that the seeming toxicity of cryoprotectants is affected by how the solution is prepared. If CPA is added to a salt solution, thereby keeping salt osmolality and molality roughly constant but diluting the salts relative to solution volume (molar concentration), the result is injury (in granulocytes): whereas, comparatively little injury is seen if the molar concentration of salts is held constant by replacing solution water with CPA. The explanation for this effect is not clear as even "low" concentration (2M glycerol) produced this effect. Takahashi et. al. also reported, in a separate paper, that osmotically stressed granulocytes release surface receptors into the medium. Presumably this release is a key part of the molecular mechanism of freezing injury for this type of cell. Finally, E. Richter, R.V. Versen, G. Matthes et. al. (East Germany) reported more evidence concerning the role of free radicals in freezing injury. They found that 0.2% benzylpenicillin was cryoprotective to platelets in the presence of iron; benzylpenicillin enhances anti-free radical enzyme activity.

Fundamental cryobiology surfaced again at the "Conversazione." John McGrath et. al. (Michigan State University) looked at the osmotic responses of artificial cells known as liposomes. Severe dehydration led to loss of lipid membrane material both to the inside and to the outside of these artificial cells. Liposomes put into hypotonic media swelled and "popped" open, resealed, swelled again, "popped" again, etc. This system should be very useful for basic cryobiological studies. S.J. Aggarwal, K.R. Diller, and C.R. Baxter (University

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of Texas) looked at the water permeability of human skin cells (keratinocytes). S. English and M.W. Scheiwe (West Germany) found two optimal cooling rates for human lymphocytes frozen with 15% dimethyl sulfoxide. M. Cosman et. al. (MIT) found that red blood cells, which normally will not freeze internally at cooling rates less than about 1200 degrees centigrade per minute, could be made to freeze internally at only 10 degrees centigrade per minute if freezing was initiated while the cells were supercooled by only 6 degrees centigrade. Supercooling obviously should be avoided at all costs. Similar results were found for human lymphocytes. D.E. Pegg presented theoretical justification for keeping salt concentration constant on a volume (or molar) basis in cryoprotectant solutions and went on to calculate the effect of freezing on red cell volume (however, the latter is really impossible with presently available data).

Arthur Rowe (Editor-in-Chief of the Journal "Cryobiology" and current president of the Society for Cryobiology) and Leslie Lenny found that red cells frozen rapidly either in the absence of cryoprotectant or in the presence of glycerol were stable for at least 15 years at either -196 degrees centigrade or, even more interestingly, at -165 degrees centigrade. The stability was based on hemolysis, metabolite levels, blood typing reactions, and in vivo survival after transfusion. This result is particular important to cryonics because of the length of storage, because of the inherent instability of rapidly frozen cells (making them susceptible to change with time), and because storage at -165 degrees centigrade was also examined. Recent data obtained with thawed human bodies suggest that temperatures in this range may be preferable to storage at liquid nitrogen temperature in order to avoid fracturing problems.

Incidentally, storage of red cells at -80 degrees centigrade in these experiments was only possible for 1 week to 6 months.

Peter Steponkus and Michael Dowgert (Cornell University) presented an amazing videotape on the freezing of plant protoplasts. The tape began with a protoplast rising like the sun as "Thus Spake Zarathustra" (the theme from "2001") rang triumphantly in the background. Then followed a set of incredibly direct visualizations of membrane behavior during cell contraction and expansion. Non-hardy (non-acclimated) protoplasts lost membrane material in the form of vesicles; their membranes actually became flaccid during contraction but then tightened up again as the material was lost. Of course. Re-expansion caused lysis owing to absence of sufficient membrane material. Hady (acclimated) protoplasts also lost material from the plane of the membrane, but the material remained attached to the membrane by stalks and was re-incorporated into the membranes during re-expansion. Impressively, the film showed an experiment which seemed to prove that the membrane area change and not the hypertonic conditions was the cause of the observed damage. By sucking the protoplasts into a micropipette it was possible to alter cell shape such that the protoplasts could lose volume while maintaining a constant surface area under hypertonic conditions. These protoplasts survived osmolalities far greater than would normally be tolerable without acclimation. It would be hard to imaging more convincing evidence for Steponkus's theories than the highly visible phenomena recorded on this videotape. And of course we cryonicists welcome any information such as this which shows that the actual lethal event of freezing and thawing takes place during thawing rather than during freezing.

Many exciting results were presented which show that cryobiology is on the move. Naturally, this can only be good for cryonicists. We will conclude our coverage of fundamental cryobiology in Part IV of our report.

SIMPLE CRYOGENIC TECHNIQUES *

by Mike Darwin (Federowicz) and Hugh Hixon

In any area of technical endeavor competence can be divided into two broad classes -- the theoretical and the practical. To achieve success both are required. Of the many textbooks which have been written on handling of cryogens and cryogenic systems, none has prepared us for, or even suggested the numerous small, practical problems which lie in wait for the practical cryonicist. In large part, this is because we are breaking new ground, and many of the troublesome situations we encounter will be unique to our particular situation. Because we lack large budgets for research and development, or even troubleshooting, we have had to develop solutions to problems on our own simply and economically. It is the purpose of the article to share some simple, rather unglamorous insights which have been of great benefit to us, and which may help others faced with similar problems.

MOVING LIQUID NITROGEN

One of the most frustrating problems confronting cryonicists has been a simple, economical way to rapidly move liquid nitrogen from one open-mouthed dewar to another. There are a number of situations where this is desirable: in the event of a patient transfer so that a dewar in service may be pumped down or leak checked, in the vent of a vacuum failure where rapid transfer of liquid and patients is required, or in the testing of prototypes of new dewars at the conclusion of a test run. Recovery of

liquid nitrogen is extremely important to small operations such as cryonics groups because of its expense -- 40 to 50 cents a liter. In the case of a dual patient storage tank, failure to recover nitrogen after a patient transfer would result in a loss of approximately #320 at a price of 40 cents a liter for nitrogen.

In the past, the only feasible way to achieve this kind of transfer was with a "bucket brigade." In other words by literally lowered a weighted metal bucket on a rope into the liquid and then "dipping" it out. This system has a number of drawbacks: it is unsafe and likely to result in burns, and it is terribly inefficient both in terms of time and nitrogen transfer losses due to heat leak and spillage. What we have needed for some time is a low cost, cryogenic pump which can be lowered into an open mouthed dewar and be used to rapidly evacuate its contents. In 1982, Frank Rothacker of the Bay Area Cryonics Society demonstrated a small, submersed-head centrifugal pump powered by a standard 1/2 horsepower motor which could continuously pump approximately 10 liters of liquid nitrogen per minute at a four foot head. The pump consisted of a motor, a shaft 4 ft. long and a 4 and 1/2 inch diecast Labwaco model P centrifugal pump purchased for $14.00. In this prototype model two 1/2" holes were drilled in the top of the pump housing to allow for the escape of nitrogen generated during pumping. One drawback to the Rothacker pump was its inability to be restarted if stopped during pumping, and the rapid icelocking of its bearings if the pump was exposed, even briefly, to the ambient atmosphere; the latter requiring the pump be dried by sitting overnight before reuse.

A few months after Frank's prototype, ALCOR and Cryovita set out to put our own cryogenic pumping system together. We were fortunate in that the first off the shelf pump we tested performed superbly and (for reasons not clear to us) did not exhibit any of the undesirable features present in the Rothacker prototype. We selected a standard sump pump used to move water from flooded basements. This type of pump, common in areas where the water table is near the surface, is designed to run for years under conditions of severe abuse and

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* The photographs which accompany this article appear in the center section of the magazine.

neglect. The model we used was a Lima Electric Co. #B155E0, 1/3rd horsepower, 1725 r.p.m., 5.6 amp. sump pump. The pump is a centrifugal type pump with a large perforated screen intake and a pump head of bronze with stainless steel impeller and shaft. The principal pump bearing (which is immersed in liquid nitrogen during operation) is a large oil impregnated bronze bearing. No attempt was made to remove oil from the bearing or bearing surfaces and to our surprise, even after prolonged submersion in liquid nitrogen with the pump off, the bearing did not freeze-up nor did the pump give any indication of hesitation on start-up. In order to make the pump suitable and safe for use in large upright cryogenic dewars (such as the dual patient whole-body unit which ALCOR owns) we had to build a frame to allow the pumphead to be lowered into the liquid without submerging the drive motor. We constructed a simple rectangular wooden frame to mount the pump in (see photos A and B) and bored a series of parallel 1" holes 4" apart down a 4-1/2' length of both sides of this support frame. These holes were to allow for the insertion of a length of 3/8" galvanized pipe to act as a support bar for the pump assembly on top of the dewar. With this arrangement, as the liquid level dropped, the pump

could be progressively lowered into the dewar (always keeping the motor above the liquid level) by simply threading another support rod in the set of holes above the ones then in used, and the removing the lower support rod and lowering the assembly until the support rod one "step" up was resting on the lip of the dewar. An alternative to this arrangement would have been to extend the shaft and the motor outside the dewar, safely above the liquid level. Owing to our limited engineering capabilities and a desire to preserve the pump in its current configuration for other uses, we decided to use the somewhat unorthodox strategy of raising and lowering the pump head out of the liquid. We cannot recommend this strategy to others.

For our plumbing assembly we used standard 1 1/4" electromechanical tubing conduit (EMT) which was taken to a muffler shop and bent to our specifications for a small fee. We replaced all flex wires on the pump with asbestos wrapped (high) temperature wiring which our tests disclosed would tolerate liquid nitrogen temperatures without cracking or splitting off, even if flexed. The on/off switch was placed on the top of the assembly where it was easily accessible, and was a watertight heavy duty switch for outdoor service. All exposed asbestos wiring was covered with flexible metal conduit. The plumbing for the system, excepting the bottom 36" which was likely to be under liquid nitrogen, was wrapped in 1/2" thick polyethylene foam pipe insulation which was in turn double-wrapped with heavy adhesive aluminum foil tape: the type commonly used for home gutter or muffler repair. This maneuver was carried out to prevent the condensation of liquid oxygen and nitrogen from room air on the plumbing which poses a serious fire hazard as well as a risk of burns to personnel handling the plumbing during pumping operations. A section of Volkswagen corrugated aluminum foil heater conduit (NOT the type with a plastic coating or lining) was used to make a flexible joint at the top of the plumbing assembly to accommodate another (straight) length of EMT tubing which acts as a fill line for another open mouthed dewar. The flexible and solid tubes are clamped together with common stainless steel automotive hose clamps.

This system, as it is currently configured can pump approximately 100 liters of liquid nitrogen per minute and can empty a dual patient cryogenic dewar such as the ones manufactured by MVE in under 10 minutes! The pump we are using has performed with extreme reliability and has been used on five occasions to transfer large volumes of liquid nitrogen. It tolerates shut down and restart with no problems and it can be exposed to ambient air for short periods (we haven't tried long periods) and restart without fail. As the sump pump was

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acquired used for about $50.00 our total expenditures for the system was about $100.00.

Several words of caution should be mentioned in the testing and use of such a pump. First and foremost, the integrity of the plumbing connections at liquid nitrogen temperature is CRITICAL. Early in our testing of this pump we carelessly forgot to check the status of our plumbing connections and nearly had the top connection which is directly adjacent to the on/off switch come loose. This would have exposed the operator, AND his assistant on the ground below to a 100 liter per minute stream of ultracold liquid nitrogen. Additionally, the standard EMT unions for joining sections of conduit do not always tolerate liquid nitrogen temperatures well. We have experienced several failures of the zinc alloy compression nuts which hold the conduit sections together. Apparently, as a result of differential contraction between the steel conduit tubing and the zinc nuts and fitting as well as the increased brittleness of the zinc at cryogenic temperatures, the compression nuts will crack completely through. So far this has only

occurred in the smaller sizes of EMT fittings. For others who may wish to construct such a pump for more continuous duty (such as in prototype testing) we would strongly recommend a different connecting system or the use of continuous lengths of EMT conduit, or accepting the weight penalty of threaded pipe. Where small prototypes or working dewars may need to be emptied, safety may be greatly increased by using a lower output pump. There is a definite trade-off here between convenience and speed. Handling the Alcor-Cryovita pump is definitely a two-man affair needing a high ceiling, while an improved low flow design could be handled by one person. On the other hand, emptying a large dewar with a low flow pump is a rather glacial affair after exposure to the performance of the massive Alcor-Cryovita pump. Both designs are top-heavy, due to the requirement for keeping the motor out of the liquid nitrogen. Pumps of both sizes have the nasty and unavoidable habit of "autopumping," as their plumbing is submerged in liquid nitrogen. This is most effectively dealt with by having all plumbing connections made and the outlet properly positioned before the pump is immersed. In any event, a variety of submersed-head centrifugal pumps seem to work for this application and total costs for even a high capacity system such as the one described here should be well under $300, a bargain when weighed against heavy nitrogen losses and risk to personnel experienced with the "bail out" method formerly in use.

EVALUATING DEWAR PERFORMANCE

Another frustrating problem which has confronted cryonicists since they first began caring for their own patients is knowing just how well a dewar is working at any given time. A coarse way of finding this out is to put a dewar in service and run it over a period of months, keeping a record of how many 160 liter containers (LS-160s) of liquid nitrogen it uses per month. Unfortunately, this technique can be used only to get a rough idea of the actual performance of the dewar because it does not account for losses encountered in transferring liquid nitrogen (such as boiloff due to cool down of plumbing and heat leak through uninsulated transfer lines during pumping) or for variations in the fullness of LS-160's being used for filling the dewar. Another technique is to weight the dewar at daily or weekly intervals and then convert pounds lost to liters lost. Obviously, this technique is only as accurate as the scale used to weigh the dewar, and if the dewar weighs 3,000 pounds, bathroom scales become a bit problematic. While it is true that load cells are available for such applications, they are expensive ($2,500 to $3,500) and inherent limitations in their sensitivity mean that a period of observation of at least a day, and

preferably several, are required to have any confidence in the accuracy of data generated in this way.

Another alternative, only infrequently used by the cryogenic industry, is to monitor the rate of generation of evolved boiloff gas. In our experience, if a good seal can be achieved, this is the most accurate, reliable, and certainly the fastest way to evaluate the performance of a dewar. We are currently using the Dwyer Instrument Co.'s Model VFB 66 falling ball flowmeter for boiloff monitoring on our dewars. This flowmeter consists of an acrylic housing (see photo C) with a black glass float. The flowmeter must be connected to the vent line of the dewar or, in the case of an open top dewar, a gas tight seal must be made which allows all of the evolved boiloff gases to be channeled past the flowmeter. In the case of the ALCOR dual patient dewar we were faced with a considerable problem in achieving this end. The dewar necktube is 25"

inside diameter and almost 30" outside diameter. The metal on the top of the necktube was uneven due to the presence of welds, and the stainless steel cover (to which the cork was attached) was of relatively light construction: (0.060") stainless. Achieving a good seal under those conditions presented a number of seemingly insurmountable problems. Finally, after much experimentation (and failure), a bicycle inner tube (without anti-slip ridges to prevent getting a good seal) was located of the right diameter (approximately 31"). This inner tube was then filled to 1 pound of pressure with air and heavily cemented to the dewar cover with silicone caulk (see photo D). The top of the necktube was then heavily greased with Dow-Corning silicone high vacuum grease, and the lid was compressed onto the top of the dewar with a wooden frame which was attached to the dewar by inserting hooks into the four handling lugs and tightening wings nuts (see photo E). The high compressibility of the bicycle inner tube, augmented by the vacuum grease, provides an excellent seal which allows for measurement of evolved boiloff gas.

The Dwyer flowmeters currently being used for this application are graduated from 1 to 10 liters per minute (LPM) air in .25 liter increments. Since nitrogen is slightly less dense than air (and consequently less viscous) a conversion from LPM air to LMP gaseous nitrogen is necessary:

Viscosity (CRC Tables): Air = 182.7 micropoise @ 18 C (measured value)
N = 173.9 " " " " (linear interpolation)

and, viscosity(N)/viscosity(air) = 0.95

Conversion of LPM evolved nitrogen gas to liters per day of liquid nitrogen boiloff may be achieved by:

N density(gas) = 0.00116 g/ml @ 70 F
" " (liq) = 0.804 " " -195.8 C (BP of LN @ 760 mm Hg press)

so that, density(gas)/density(liq) = 693.1

and, LN consumption(liters/day) = N flow rate (liter/min) x
1440 min/day / 693.1 x 0.95
= 2.19 x N flow rate(liters/min)

This system is an incredibly sensitive one and is capable of evaluating the status of a dewar on a minute by minute basis. We first observed this when we hardened the vacuum on a dewar which was still in service. Within a minute or two after the start of vacuum pumping, the flow rate of evolved boiloff gas dropped dramatically. This technique has obvious application in evaluating

dewars after transport, mechanical shock or damage, or during prototype testing where timely evaluation of vacuum integrity/ efficiency are required.

The use of the flow monitoring technique on open mouthed dewars does carry with it some risks. An assembly such as we have described should not be left in place on open neck dewars for more than a day or two at most without the provision of a rupture disc or an overpressure valve in the event of sudden vacuum failure. While restricting boiloff gas through a small orifice (such as a flowmeter) is acceptable for normal operation, sudden failure of the vacuum (due to a crack or puncture in the outer or inner cylinders) could result in explosion of the container due to

overpressure resulting from greatly increased boiloff. While the pressure increase due to restriction of the gas flow through a small orifice is relatively small, the large lid area of the wide-mouth dewar converts these small pressures to hundreds of pounds of upward force.

It is also important to provide a long enough path of good conductivity between the exit point for the boiloff gas through the lid, and the flowmeter, in order to warm the gas and prevent icing of the flowmeter and plugging of the vent. The latter can of course result in explosive rupture of the dewar.

One of the side benefits of this system has been the elimination of "ice pumping" (condensation and freezing of atmospheric water vapor) in the necktube of dual patient dewars. This has been a significant problem in the past and in one instance was indirectly responsible for loss of vacuum integrity in an MVE dewar and subsequent thawing of two patients who were being care for by relatives. In contrast to previous MVE dewars, the ALCOR dual patient dewar was manufactured with a monolithic lid and no fill line. All previous dewars of this type were made with a split cork and a stainless steel fill line. Ice pumping occurred not only around the circumference of the dewar, but along the split and especially at the fill line. We have eliminated the fill line not only for this reason, but because its low diameter (necessary to minimize its impact on boiloff) results in slow filling and increased transfer losses.

RAPID FILL SYSTEM

In lieu of a fill line we have constructed a filling manifold which allows for simultaneous emptying of two LS-160s. This cuts filling time down to about 25 minutes when two LS-160's are being added. This filling manifold consists of a galvanized pipe Tee and fittings for two cryogenic flex hoses connected to a length of EMT conduit bent into a hook which may be paced over the side of the dewar after the cork is remove (see photo F). After filling the manifold is removed and the cork is replaced. It is quite possible to use such a manifold for filling without removing the cork or resorting to a permanent fill line by simply boring a 1" hole in the cork and threading it to receive an appropriate gasketed plug. We prefer to remove the cover, and do so at weekly intervals anyway, in order to directly measure liquid level with a steel measuring tape. The use of a measuring tape is quite accurate provided a visual verification of the contact point of the tape with the liquid is used, as opposed to listening for the "sizzle point." Providing good light is available, it is possible to measure liquid level in an upright dewar using a measuring tape to at least a depth of 50" with 1/8" accuracy. This technique may also be used to assess daily/weekly boiloff in lieu of, or as a direct adjunct to, flow or weight measurement. In our experience this technique is observer sensitive and the same observer should ALWAYS log depth measurements during a given evaluation period.

END OF PART I OF SIMPLE CRYOGENIC TECHNIQUES

WHAT YOU CAN DO -- PART III -- PART II

by Mike Darwin (Federowicz)

Last month we cover the more general aspects of moving to Southern California -- all the essentials, food, sex, friends, jobs. . . . This month we're going to deal with the specifics.

As I've been at pains to point out, a lot of how California treats you will be dependent upon how you prepare to come here and what you expect. The latter is especially important. If you expect sunshine, endless blue skies, stardome, and easy life in a big house with a Jacuzzi you had better have a VERY GOOD IDEA OF HOW TO GET ALL THOSE THINGS as well as a way to change the weather. It does rain in Southern California (just like the song says) and unless you have a skill you will probably end up cleaning tables or slinging hamburgers in a McDonalds (I did BOTH of these things on my first, unsuccessful trip out here -- the McDonalds job represented an ADVANCEMENT). If you are in school now STAY IN SCHOOL. Unless you are in a seminary, STAY IN SCHOOL WHERE YOU ARE AT. The added load of moving to a colorful and exciting place like L.A. and getting involved in cryonics is NOT conducive to a quality higher education.

There are exceptions to this rule. If you are young and do not want to go to school or are unable to afford a university education living in Montana, then you should consider California as a high priority almost immediately. What many people don't realize is that California has an excellent educational system for those who are motivated and willing to work and it is almost FREE! In Indiana a higher education would have been a terribly costly affair (had I chosen to pursue it); here in California it is so inexpensive it is almost a crime not to have a Masters degree if you have the ability. The rube to all this is that you must be able to manage working and supporting yourself through school. This is no easy task and will require considerable mettle. If you've got willpower and no other options in your home state for higher education, then coming to California, working a year to qualify as a resident and going to school can be an excellent opportunity. *

For those who have exhausted other options and wish to try this approach, one way to make it through the first year or at least get on your feet is to look into a residence hotel. There are several of these operations in the L.A. area and basically what they offer is room and board in exchange for part-time employment of a sort. The accommodations aren't thrilling, but it is a low cost way to save money or get through school without spending all your time just working to make a living.

It should be pointed out that even "unskilled" people can make reasonable livings here and may exist in a fair amount of comfort. As I said earlier, it just depends on what you want out of life and on what you expect. Make sure you don't overvalue what L.A. has to offer or you may find yourself spending "just another shitty day in paradise" as the bumper stickers out here say.

If you do decide to come to Los Angeles and go to school out here then it would probably help to know a little bit about the university system. First, there are the big prestigious schools such as the University of California,

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* It is important to point out that most California Universities require a year of physical residence plus proof of a year's intent to move (such as a California driver's license, bank account, and so on). Thus, two years of residency is more like it.

Stanford, and so on. We will write these off pretty much up front unless you get a scholarship because the big name means big bucks. Then there are the state schools such as California State University at Los Angeles or California State University at Fullerton. Cal State Fullerton is of particular interest since it is located a scant 10 minutes away from ALCOR

by freeway and is also easily accessible by city streets. Cal State Fullerton is a good place to go to get a B.S. or an associate degree. It is not heavily oriented toward academia and is somewhat like an academic trade school -- a lot of teachers, electrical engineers, nurses, and so on get churned out. Definitely not the kind of place you want to go if you are considering a career in high energy physics or cryobiology. But then, if you are passionately interested in either of those things, you probably won't want much to do with a bunch of cryonicists anyway.

A final point about students and young people in general. In the past I have tended to try to dissuade young people from jumping into a move to Southern California. There has been something of an effort underway to "spare" tender youth from the ravages of a life in cryonics and shunt them all of to graduate programs in cryobiology or cell membrane biophysics in Augusta, Georgia or Cambridge, Massachussetts. This has been WRONG. There ARE some people who need to be shunted off to cryo or bio programs somewhere incredibly good and rarefied. but there are also people who don't want that. People too brash, unconcerned about their own welfare or otherwise anxious to do CRYONICS to take that kind of life. I guess I'm one of them. While I readily admit to having my share of regrets now, in looking back, there was simply no way that I could have or would have been able to leave cryonics alone for four years or six years or eight years or God forbid, the rest of my life. While I have a cryobiologist friend who sadly shakes his head at my academic ruin, the fact is, I sadly shake my head at HIS from time to time. I LIKE CRYONICS, and I feel it was what I was made to do. NOTE: I said CRYONICS here, not water chemistry, or cryobiology but CRYONICS. All those things are of use to cryonics and they urgently need to be done. But, then so does cryonics -- and it's a heck of a lot more fun!

So, what I'm trying to say, is that for some people, granted, a very few, cryonics is where it is at. Those folks know who they are and no amount of cajoling or sober advice will stop them from doing what their hearts, if not their head, tell them they have to do. I'm not sure that's an altogether bad thing. What is important is that these individuals realize that this is the case and that they prepare in some way to earn a living and keep ends meeting while they pursue the life of a "full time" cryonicist.

One good approach to combining those two things is to get skill or training in an area of work that leaves a lot of free time and provides a background that is useful. Being a Registered Nurse is a good suggestion -- even for men. It takes about 3 years to do, pays about $22,000, (starting) and only requires you to work three 12 hour days a week! I do something very similar -- I'm a dialysis technician, and while I don't make nearly as much as Registered Nurses (only about $15,000) I didn't have to go to school for three years either (a 6 month training program!). There are other variants on this theme such as becoming a Licensed Vocational Nurse which pays about $15,000 a year and only takes about 9 months to a year to complete. While none of these things pay spectacularly well, they DON'T CONSUME MUCH TIME OR ATTENTION EITHER. When you leave work, you leave work. This is rarely true with most other high paying, competitive professions. The list of such jobs could go on and on and obviously neither space nor time permits a comprehensive discussion. These examples may suggest approaches for the would-be full-time cryonicist which bear looking into.

A word or two should also be said about professionals interested in living and working in L.A. There are plenty of job opportunities here for almost every kind of professional. The big hump to get over is the question of making the

move and take the initial cut in pay and quality of life which may accompany starting a new job in a new city. Certainly if you are coming from Pawtucket you're in for a surprise in the housing department. Housing is expensive out here. Generally speaking, you can multiply by a factor of 3 -- so, if you have a house that sells for $50,000 in Pawtucket it will sell for $150,000 out here! Something to consider before putting up the For Sale sign. I have sometimes heard would-be California cryonicists complain about this situation and the problem of finding another job. In the case of the former it should be pointed out that WAGES are higher here and, as I found out myself, things generally balance out about even (excluding real estate!). One thing I can say with a great deal of confidence: for thsoe who have a skill, jobs are available and what it takes is a willingness to look and look hard and a commitment to moving here. Nothing comes easy and determination in building a new life is important. For some, it will be an easy decision, for they have little to lose, for others, not so easy. Everyone has to decide for themselves whether it's worth it or not.

Finally, we come to the folks who may be considering a move to California from outside the United States. This is a much more difficult proposition and one which I hope to hear some advice on from cryonicists who are going to or who are trying to do just that. For now, it is possible to give some highly specific pieces of advice.

First of all, it is almost impossible to get into the United States (if you are not a citizen) unless you meet one of the following criteria:

1) Have $75,000 to start a business and thus qualify for an investor's visa.

2) Come from a place you can (reasonably) claim you need political asylum from, such as El Salvador, Russia, Poland. . . . Coming from France is not going to cut it in the political asymlum department.

3) Marry a United States Citizen. This is almost a cottage industry in the U.S. right now, and it is quite possible to get reliably married and obtain your green card for about $3,000 to $4,000 depending on the quality of arrangements. Obviously 60-year old women (or men) don't present as credible a case if the proposed spouse is 20! *

4) Have some valuable skill and a company ready and willing to hire you. If you aren't Albert Einstein or a nurse, you're chances aren't good in this department.

5) Apply to emigrate under the "quota" from your country allowed in each year, and hope for the best. This is usually a waste of time, and it can really work against you if you later find someone to partake in a marriage of convenience.

All in all, immigrating to the U.S. isn't easy. I would go so far as to say it's extremely difficult. Anyone who thinks otherwise is in for a most unpleasant surprise. Immigration is also expensive. Aside from just getting here, it is highly recommended that you bring enough money for a car and a good

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* This may NOT be obvious. Arthur McCombs, who proofread this article, accused me of being a fascist, ageist pig because of this remark. Actually, I was just conveying the U.S. Immigration/Naturalization Department's attitudes toward such marriages. THEY are the fascist, ageist

pigs.

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immigration attorney, as well as enough to buy some time while getting settled in. Probably the lower end for coming here would be about $10,000! Not a trivial sum. One other word of advice to those in non-english speaking countries: Then U.S. is NOT enlightened as the rest of the world. We do not teach European languages in our schools here. We are real chauvinists about ENGLISH, even though we may appear to scarcely speak it ourselves. If you come here, you should speak English WELL. Unless you find employment in a community of your own people, you will not find employment in this country unless you speak English and speak it fluently. I should probably qualify that. It is possible to find employment -- if you like sweeping streets or cleaning tables. This is no exaggeration.

So, two rules for immigrating here -- 1) plenty of money, 2) be single so you can marry and get a green card. Certainly come and visit here FIRST before even thinking of moving. LIFE IS RADICALLY DIFFERENT HERE. People are more aggressive and more self centered in the U.S. than in most of Europe and the third world (true, those people kill each other on the battlefield with regularity, but in life they are so much more relaxed and charming). Compared to Europeans Americans spend a lot of time shouting at each other and stomping around in a rage about one thing or another. Also, the PACE is faster here. If you're from Australia or Germany you'll be amazed at the RUSH, RUSH, RUSH. While all of this may sound exciting on paper, it can grow to be quite wearing and irritating after awhile. I've seen some "foreigners" just grow more and more on edge with life here (after an initial good start) until they are bitter about everything and anxious for home. Test the waters first. Be sure you can live in a "disposable" society where people are perhaps a good deal less relaxed and personable than they are elsewhere.

On the flip side of immigrating here, it should be noted that this is a GOOD country to live in. Tremendous freedom, tremendous wealth. Many opportunities exist here which simply aren't available anywhere else. Cryonics itself is an example of such an opportunity. I was recently talking to an Italian journalist and he asked me which government agency controlled ALCOR. It was all I could do to convince him that we didn't require anyone's permission to do this. He sadly shook his head and said via his translator "in Italy this would not be so, this would never be allowed in Italy." So it is with much of life here. Schemes and dreams are everywhere here -- and many of them turn into reality. For almost anyone willing to work hard or even to work, a good life with much to recommend it is here. I guess I can sum it all up best by pointing out that I really like life here myself. I'm not a rabid patriot, but I know a good thing when I see it. Just judging from the number of people who are trying so hard to get in here, I gather that a lot of other people think so too.

One final word about coming here from outside the U.S. If you want to know what is required in detail I would strongly recommend obtaining a copy of "Immigrating to the U.S.A." by Dan P. Danilov, published by International Self Counsel Press, Limited, 1303 North Northgate Way, Seattle, Washington 98133, phone: (206) 522-8383. This book has ALL the basic information you'll need plus step by step instructions on how to fill out and file the mass of paperwork required for immigration -- regardless of WHAT approach you're using. ALCOR also maintains a list of immigration lawyers of varying degrees of competence and craftiness (priced accordingly) which is available upon request.

Now, for a few words about California and moving here -- San Francisco. I'd be the first to admit that L.A. isn't for everyone. But,

if not L.A. then certainly San Francisco. I'm a man peculiarly free of intense chauvinism affected by most who have fallen in love with Los Angeles. I guess that's 'cause I fell in love with San Francisco first. It is a city with a million

things to see and do. Physically, it is a jewel with a beautiful, rough hewn character. I can't walk its streets without feeling its romance and its rowdy, glorious past at every turn. There are also some cryonics people up there who are working hard to make their dreams a reality too. Anyone thinking of making a move to California should check out both cities and groups.

Still, in all fairness to L.A., I should also point out some of San Francisco's weaknesses. The first is the climate. It's bad enough up there (even in the summer) to sometimes make you wish you'd stayed in Anchorage. Rain, fog, freezing winds. . . ugh! It is also an expensive city, more so than L.A. by a long shot. Of course it should also be delicately pointed out that in concert with its wild past, San Francisco currently has a decidedly gay flavor. Some may find this intolerable. I know of one cryonicist who did nothing but complain about the "gay situation" and finally gave up (in part for other reasons) and moved back to the Rust Bowl. If you live in urban San Francisco you should be prepared for interesting times -- in a very Chinese sense.* Perhaps the most important thing to say about San Francisco is that it has a tremendous unity of character, unlike Los Angeles which is incredibly diverse in terms of climate and character. For San Francisco this unity is both a great strength and a great weakness.

So that's it. Probably not ALL you need to know about moving to California, but a start anyway. Write us if you want more general information or if you need help in some specific way. In any event, give these words some thought. If you've been thinking about it, longing for the sun, sitting there ready for a real change of pace or a little ADVENTURE. . . then DO IT! There's never going to be a better time!!

THE END (. . . OR THE BEGINNING)

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* This refers to the ancient Chinese curse: "May you live in interesting times."

*** TYPIST'S NOTE: IN THIS SPACE WAS A PICTURE OF AN MEDICAL EMERGENCY BRACELET. ***

WHAT'S WRONG WITH THIS PICTURE?

It's missing an arm. Which means that somewhere an ALCOR General Member or a BACS Suspension Member is walking around unprotected. Should an emergency occur and the member be unable to communicate THERE WILL BE NO WAY for anyone to know WHO to call.

Think about it. It your ALCOR or BACS bracelet is out of your picture now's the time to do something about it. Find it. Wear it!

If you are an ALCOR General Member and need to order a replacement or extra bracelet or necktag simply send us a check or money order for $8.00 and specify whether you want a bracelet or a necktag.

SCIENCE UPDATES by Thomas Donaldson

A TEST FOR RISK OF STROKE

As cryonicists it's very important for us to find out predictors of severe or fatal illness, since such information will tell us of our imminent suspension, therefore that preparations should start. We also want of course for these predictors to have as much accuracy as possible, since false alarms will put us to very great trouble and expense for no benefit.

A recent paper in LANCET (August 27, 1983, p. 479) by M.E. Stewart et al, presents results of a new blood test which may help to predict more precisely the risk of stroke or heart attack.

One event which doctors knew for a long time as suggesting a greatly increased risk of stroke is called a transient ischemic attack. These are simply episodes in which one particular brain region might suffer a pronounced fall in circulation, causing a temporary paralysis or blackout, which does however resolve leaving its victim very shaken but no worse off than before. Such episodes forecast a considerably increased risk of stroke. However like all predictors they promise nothing and many people who have them recover without later problems, so that we need a much more precise test.

Stewart et al report in their article that increased blood levels of one factor involved in clotting, beta-thromboglobulin (BTG), shows an increase of almost 50% in the blood of those people who have had one transient ischemic episode and who alter actually suffer a stroke. They took blood samples over a period of a year from 3 different groups: 43 normal elderly controls with no known circulatory problems, 27 elderly people who had already suffered an episode of transient ischemia, and 32 young controls. After a year, three of the high-risk subjects had actually suffered a heart attack or a stroke; fatal in two of them. Twelve other patients had suffered yet again another attack of transient ischemia. Among all of these patients levels of BTG were almost 50% higher than in the others.

Over the course of the year, levels of BTG tended to decrease in all subjects. This suggests some healing, although at the end of the year all patients who had had one transient ischemic episode had abnormally high levels of BTG.

A high proportion of patients who had suffered an episode of transient ischemia were taking drugs to prevent clotting, such as aspirin or dipyridamole. As it turned out, elevated levels of BTG bore no relation to whether or not patients were taking any drugs to prevent clotting. Stewart et al also tested for another blood factor, fibrinopeptide A, as a possible predictor, but it turned out that this chemical did not correlate with subsequent strokes or vascular problems.

Besides allowing prediction of risk of stroke a chemical test of

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this nature can also allow doctors to distinguish a class of patients on whom new drugs to prevent stroke can be tested. However in our terms as cryonicists improved prediction of the risk of stroke seems most important. In particular, the blood test involved does not seem complex or difficult.

WATER IS VERY SOLUBLE IN LN2

To some extent people such as the Editor of CRYONICS, who have much clincial experience with liquid nitrogen, might find this report a confirmation of something they have suspected for a long time. However it may still seem novel for almost all readers.

In NATURE (305 (1983) 412) three chemists at the University of Southampton in the UK have just reported their surprising discovery that water is highly soluble in liquid nitrogen and other cryogenic liquids such as liquid oxygen and liquid methane.

On grounds of theoretical chemistry scientists had previously thought that water would have comparatively low solubility in liquid nitrogen or oxygen (J.H. Hildebrandt et al THE SOLUBILITY OF NON-ELECTROLYTES). Theoretically, it seems that water should saturate a liquid nitrogen solution at only 1 billionth of a part per million. The three chemists, R. Rebiai, A.J. Rest, and R.G. Scurlock, report from their careful measurements of water solubility in cryogenic liquids that liquid nitrogen can contain as much as one part per million of dissolved water. They used infra-red spectroscopy to make this discovery, and of course a lot of the difficulty came from the need to carefully exclude contamination by atmospheric water vapor or other sources of water.

Readers will of course realize that water is just as solid as salt at these cryogenic temperatures. The authors point out considerable consequences flowing from this high solubility, particularly for longterm handling and storage of cryogenic liquids and biological specimens in cryogenic (cryonic!) storage. High solubility of water may lead to desiccation of any cells or organs stored for a long time directly in contact with liquid nitrogen. Furthermore, solubility of water will probably vary with pressure and temperature, so that water may come out of solution, depositing in the container. The authors of this paper also report some of their own experiences, particularly with liquid nitrogen. They found that LN exposed to the atmosphere contained considerable water. They also report that after exposure to air in open topped containers, LN will contain large amounts of a particulate matter which they strongly suggest may be crystals of ice.

I don't myself feel that desiccation after prolonged storage will be a likely problem to revival. What we can remove by dissolving in liquid nitrogen we can also put back. However this paper does increase understanding of the physical consequences of prolonged storage in liquid nitrogen.