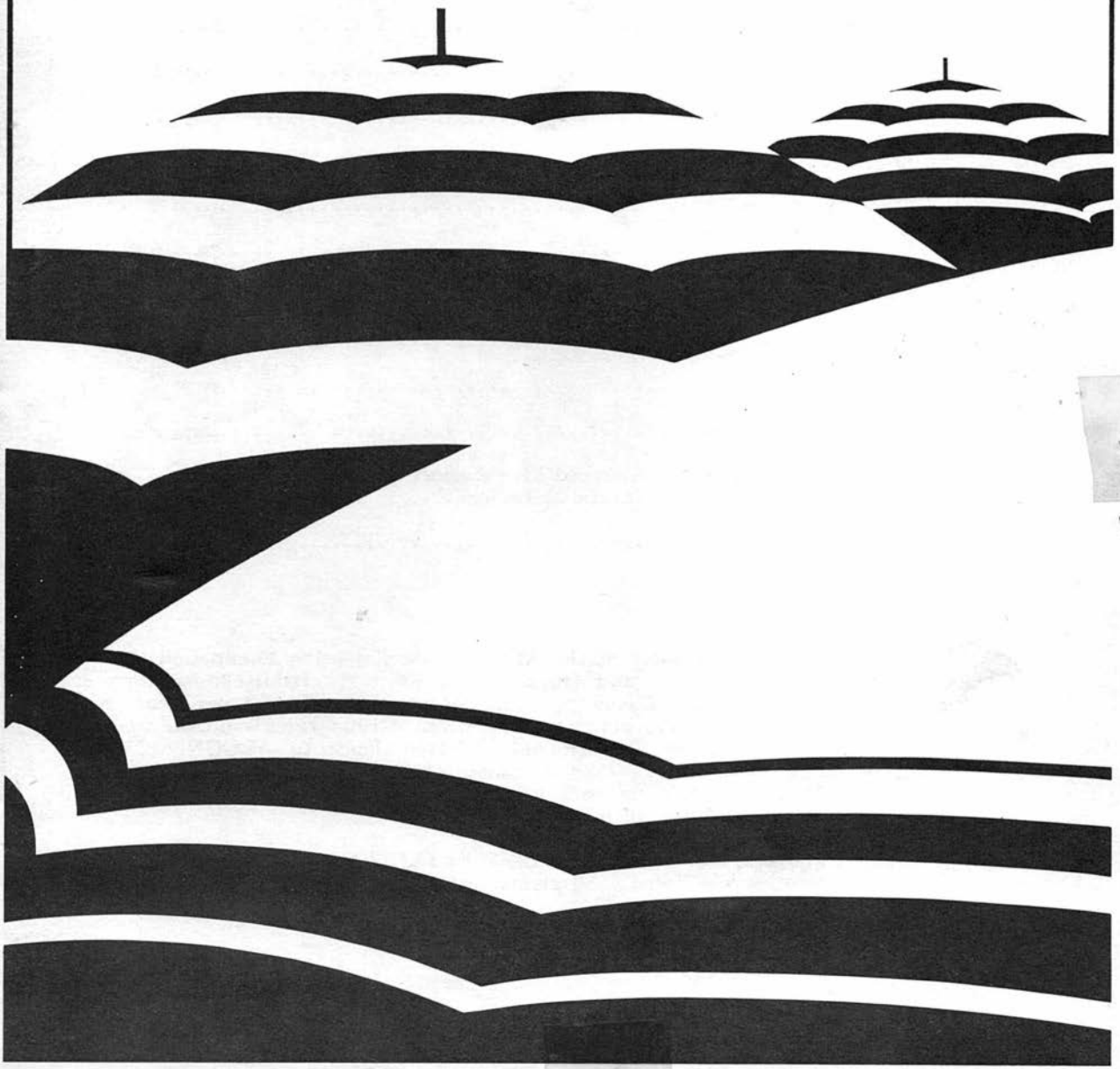
Cryonics

March, 1987 Volume 8(3)



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EDITORIAL MATTERS

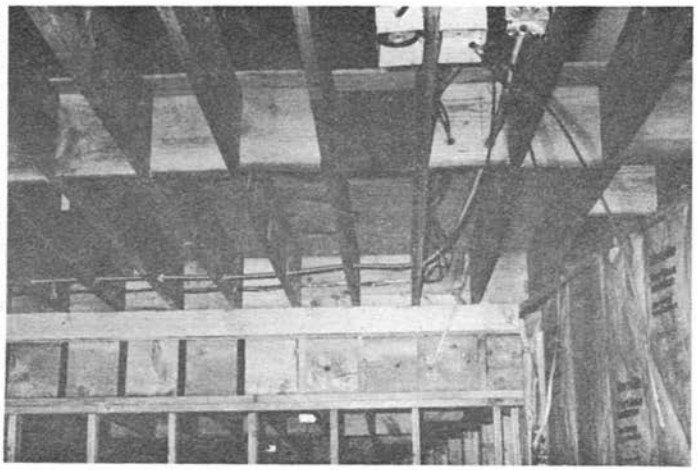
THE MOVE IS ON

We are now operating out of the new facility. The new address is:

ALCOR Life Extension Foundation
12327 Doherty St.
Riverside, CA 92503
Tel: (714) 736-1703

Our toll-free number for information requests from outside California remains 800-367-2228. **Our old telephone number, (714) 738-5569, will remain active, with call-forwarding to the new number until after we issue new bracelets.** All other details of our Emergency Notification System remain the same.

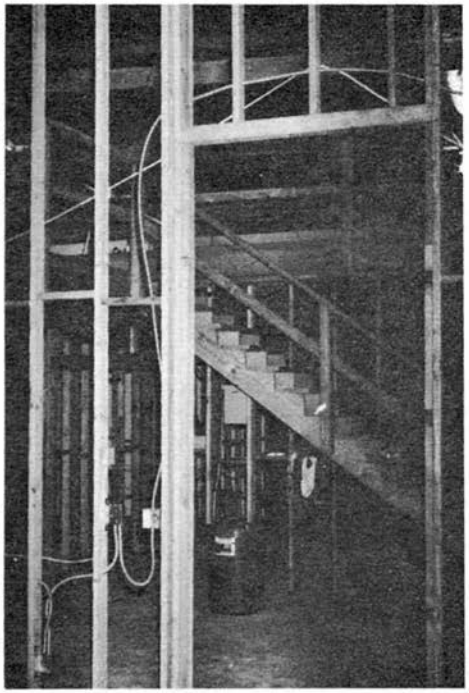
Construction at the new ALCOR facility is now essentially complete excepting the installation of the shower. We have included a few pictures which show some of the framing work after it was completed. The building is now completely subdivided, a full second story is in place, and the loft, staff eating/conference area, and kitchenette are up and running. We anticipate that the move into the facility will be completed by the end of February. After we are



The 9 1/2 foot ceiling of the new Operating Room

settled into place we'll give you a visual tour of our new quarters in the pages of CRYONICS.

For those who wish to see the new facility in three dimensions instead of two, the April meeting will be held here. A formal Dedication will be held in late May, with invitations to Suspension Members and special guests only. We are planning an Open House sometime in May or June.



The stairs to the loft, through the 10 foot high door to the patient storage bay.

...AND NOW, CRYONICS FICTION

This month we bring you something a bit different from our usual fare in CRYONICS: cryonics fiction. In the April, 1986 issue of CRYONICS we asked for a more varied range of submissions. In particular we asked for some good fiction on cryonics/immortalist themes. Dave Pizer was the first to respond, with several pieces we have printed.

We've now received enough good fiction material to begin running short stories (and hopefully longer pieces too) on a regular basis.

We think stories and other works of "cryonics fiction" are important. Probably just as important as anything else we could print. To many of our readers who know the editors of CRYONICS that statement may come as a surprise. We've been told we have a reputation for a hard hitting, no-nonsense, reality anchored, "hard-core" approach to cryonics. We'd be the first to admit that that is our intention. And part of being committed to those things is to realize that fiction provides a unique opportunity to explore reality and to teach about it.

Over and over again we've heard science fiction fans and the public in general cringe with revulsion at the mention of biological immortality and/or cryonics. The reason they give is that, "In such and such a story it resulted in horrible consequences...stagnation, torture, inflexibility, inhumanity..." After awhile you begin to realize that these people are actually giving **fiction** stories the same degree of weight and credibility that they would give accounts of real life events.

People do this because stories are very powerful things to human beings. They are how we best learn, absorb, and communicate information. A dry fact alone often means almost nothing. Instruct a small child not to run into the street and it's nearly meaningless. Show him a small animal that is crushed or injured from an automobile and it becomes palpable and real. Stories are the

richest part of our lives -- they relate facts to reality in an easily comprehensible way. Almost all the highly successful philosophers and teachers (past and present) have been successful to the degree they were able to tell a good tale. From the **Sermon On The Mount** to **The Fountainhead**, values have traditionally been best communicated by stories.

CRYONICS has evolved greatly from the simple "insiders" newsletter it was when it began years ago. We are now reaching a wider audience than ever before and we have an urgent need to communicate to people what our values are, what a successful **cryonics based** strategy for coping with life is all about. There are an endless number of facets to explore in achieving this end. This month we are pleased to bring you the first of these in the form of a short story from ALCOR member Cameron Rockwell entitled "California Sunrise". There will be more from the pen of Mr. Rockwell and his writing partner and wife Leigh Rockwell in the coming months. We hope you enjoy these tales as much as we have.

WHAT A MONTH!...

The title above says it all. The core people at ALCOR continue to be buried in a frenzy of activity. Our progress is impressive (putting all modesty aside) but brings with it incredible work and responsibility. You folks out there must think we're crazy or looking for sympathy when we moan about our workload. We are neither, but we know it's important for us to tell you what's going on so you can be realistic about what to expect from us for the next few months.

The move into the new facility is underway and is every bit of the immense task we expected. Tens of thousands of pounds of equipment and supplies have been loaded and moved. Much of this gear is fragile analytical equipment and small supplies which needed to be unloaded from shelves and packed into boxes. The sorting and decision making tasks are thus enormous. Stuff which isn't of daily use needs to be packed up and put into storage and equipment and supplies which are used on a daily basis need to be made accessible. We are finding ourselves in much the same position as a novice craftsman who has looked in a catalog and bought himself a set of tools on the basis of theoretical insight. What he quickly finds **in practice** is that he really needs to carry around with him at any one time maybe 20% of what he bought!

Also, the move is physically and organizationally grueling. We have to move a 10,000 pound patient storage vault (Having it on a trailer makes moving it only **relatively** easy.), a 2,000 pound electron microscope, several walls of wooden and metal cabinetry, and literally thousands of pounds of other supplies. And during all of this we have to be careful to preserve both a basic administrative capability and, of course, our ability to respond in the event of an emergency. We hope to keep our suspension readiness "down time" to a day or less. This takes coordination and planning.

On top of all of this, a tremendous amount of work needs to be done at the new facility — much of it work that couldn't have been done until now — in the midst of the move. Since we are moving in right on the heels of the contractors, we have not installed wall cabinets and other semipermanent fixtures until now. And these fixtures have to be in place before we move (since we can't take shelving down here and unload essential supplies until shelving at the new facility is in place). This means dealing with vendors who don't deliver on time, deliver damaged goods, or are otherwise unreliable. In short, it's been a coordination nightmare.

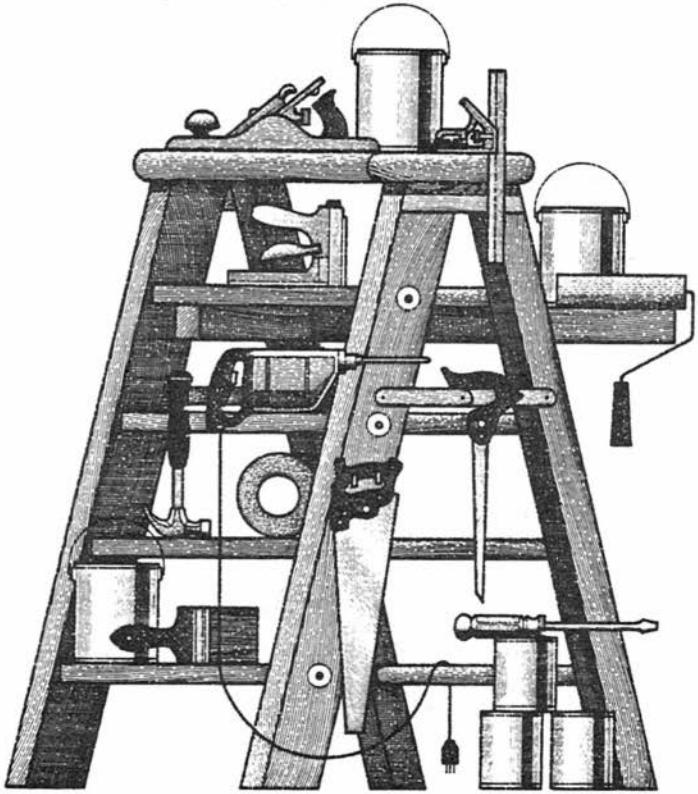
Finally, several of our Suspension Members are critically or seriously ill and have required intensive follow-up and support (see article below). This alone could be a full-time job for two people.

None of the above takes into account handling the bookkeeping, filling orders, managing the phone, and relating to people on a one-on-one basis in answering questions about cryonics and about signing up and putting out CRYONICS magazine (all of which are also full-time jobs).

What this means to you, our Suspension Members and Associate Members is that nonemergency services are likely to be slow in coming and a little rocky over the next several months. As we told one rather astonished caller who wanted a response to some material he had sent us recently: "We can't possibly do anything for you right now unless you are dying or dead!" It's just that simple.

We'll continue to make every effort to get CRYONICS out once a month, but we won't commit to **when.** If we have to, we'll skip an issue and extend everyone's subscription by a month.

Finally, this brings up the issue of workload. While we expect things to slack off a bit after the move is completed, the workload is still enormous. We are trying to shift some of the workload to others of our members who are remote from us, and we now have several field agents following up leads which come into us in the form of information requests. We are already using local personnel to just about the maximum extent possible. What we need is a larger number of competent people in this



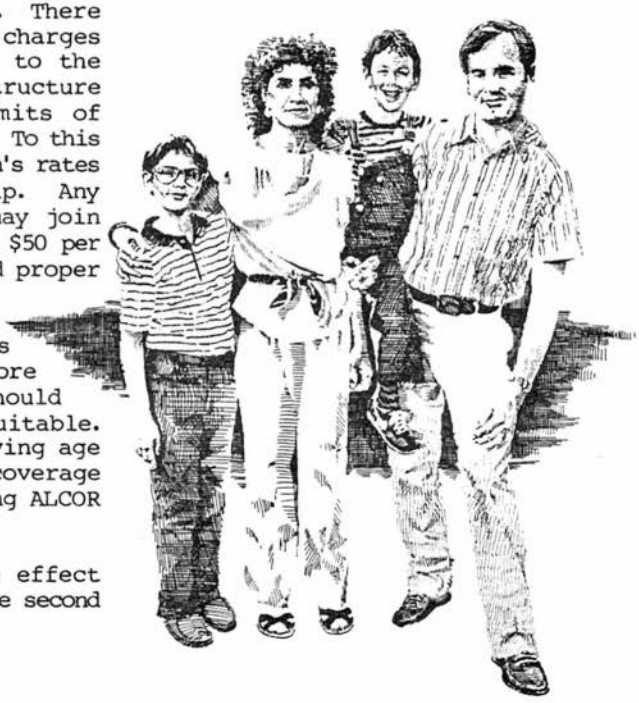
geographical area. If any of you have been giving thought to relocating to the Riverside area, now's the time to do it.

CRYONICS ON THE FAMILY PLAN

As it is, cryonics coverage with ALCOR is a real bargain. Our base rate is only $200 per year for the first family member and $100 per year for each additional family member. Students are automatically 1/2 rate. For the quality of emergency response services rendered (and the relatively small number of people currently signed up) this is a bargain. Nevertheless, it can be very hard for folks with large families. For a struggling young family with several small children the cost can be prohibitive! Those $100 bills start adding up real fast. When you take into account that children have a comparatively low risk of dying, some people are simply leaving the children uncovered. But others, and by far the majority of people with this problem who we've encountered, will not sign up unless the whole family can afford to.

We think we now have a solution to this problem. For years we've wanted very badly to make cryonics coverage (dues) depend directly upon the age of the member at enrollment — exactly like life insurance. This is really the only fair system, since someone who joins ALCOR at age 20 and pays dues for the next 56 years is hardly in the same boat as someone who waits until the last minute and joins a few years or even 6 months before dying! Unfortunately, due to the bureaucrats we can't do that. Making dues depend upon age constitutes selling **insurance** and there are all kinds of rules, regulations, and requirements which pertain and which must be satisfied. So, as usual, everybody has to suffer.

But there are alternatives. There are no restrictions on reducing charges for children or students, and to the extent we can make our dues structure more equitable within the limits of government requirements we will. To this end, we are now offering children's rates for ALCOR Suspension Membership. Any person under 15 years of age may join ALCOR as a Suspension Member for $50 per year (with parental consent and proper insurance coverage).



This should make cryonics coverage for the whole family more accessible than ever. And it should make our rate structure more equitable. So, until a person reaches driving age (Where our risks in providing coverage take a sharp increase!), joining ALCOR just got a lot less expensive.

These new rates will take effect beginning with the billing for the second quarter of 1987.

CATCH-22

In October of 1986 an elderly ALCOR Suspension Member requiring nursing home care relocated from Florida to Riverside, California, a few miles from the location of the new ALCOR facility. A few weeks ago her condition began to sharply deteriorate and at the time of this writing her suspension seems only weeks or months away.

A great amount of the pressure we've been feeling lately has been as a result of this member's illness combined with trying to maintain readiness in the face of our move. As is invariably the case in such circumstances, we've learned a lot.

The first thing we learned was that finding a cooperative nursing home that is suitable isn't easy. It takes time, patience, and a little bit of luck. The second thing we've had reinforced (this isn't really news to us, but it has been made more real) is the extent to which cryonics is at loggerheads with how the rest of world operates. The story which follows should help to illustrate this and point out the direction we need to find ourselves moving in.

This patient, whom I'll call Ruth, has been physically and mentally debilitated for nearly three years. She does not have Alzheimer's disease, but does suffer from Organic Brain Syndrome (OBS) due to multiple small strokes which has rendered her "demented" and occasionally combative. Despite the fact that Ruth's mental "processing equipment" doesn't always run well, she is still able to communicate, respond appropriately in some situations, recognize her son, and remember past events. There is plenty of reason for optimism that despite her difficulties, she is still largely intact and salvageable as a person. But she is not able to be at home. Because she has a feeding tube, the cost for skilled nursing care in a home environment would be over $100,000 per year! That means that Ruth has to remain in a nursing home.

Recently Ruth's son left for a brief vacation and Mike Darwin was asked to look in on her while he was away. As was predictable in such a situation, no sooner was Ruth's son on the plane than Ruth took a decided turn for the worse. She began running a fever, refusing food (which necessitated the feeding tube) and she became lethargic. It was apparent that deanimation was a real and growing possibility. The situation is a far more complex one than we have space for here, but suffice it to say that the patient's condition was such that it would have made sense to have an apnea monitor (to signal when respiration stops or becomes irregular) or cardiac monitor put on the patient. In some nursing

homes patients are checked only every 2 hours, and the quality of skilled help in such facilities is often not high. It would be easy for Ruth to "slip through the crack" and have a cardiac arrest which went unnoticed for several hours or even longer.

Would the nursing home allow ALCOR to place an apnea monitor on the patient? No. That would require a physician's order. So, we contacted the physician and he explained that state regulations prohibit such monitoring in a non-acute setting and he will not write the order (we do a little checking and find out that this true). So here we are, we have a patient that everyone agrees is at risk of dying, but whom we cannot monitor. In short, it's perfectly alright to die, as long as no one sees it happening!

Ruth's physician ordered antibiotics over the phone and did not even come out to see her. Indeed, he hadn't seen Ruth in nearly a month. (By law he is required only to see the patient once a month, come hell or high water, and his month wasn't up yet!) Needless to say, he didn't order any blood work or other tests to find out exactly what might be the matter with Ruth. After all, this is a nursing home, and these people are only waiting around to die and the less money they consume the better, right?

Of course, there is a more humane way to interpret such behavior. For the average patient under such conditions, dragging life out is no big favor and a waste of resources to boot! It's more humane to just get it over with. But we are cryonicists, and whether or not her son makes a decision to **treat** Ruth or not, there are plenty of reasons why we want to know what's going on. Logistical reasons, medical reasons, **good** reasons.

When Ruth's course of antibiotics was over, it was over. There was never any blood work drawn to see if she had an elevated white count and whether or not it was going **down** in response to antibiotics. There was no chest X-ray. There was no nothing. As cryonicists we need to know if Ruth is getting better or getting worse. **When** is she likely to deanimate? Should her son take her out of the nursing home and take her home to deanimate so we can be free of the red tape and be able to put an apnea monitor on her? At $16.00 an hour for nursing care times 24 hours a day, we need information to make an informed decision.

So we called in another physician who is also a cryonicist. However, this physician does not practice within "X" number of miles from this nursing home and regulations require...

In short, it has been a nightmarish exercise in frustration and anxiety. An exercise complicated by the fact that the nursing home was recently bought out by a large multistate corporation with bureaucratic procedures and policies of its own!

If we make a false move and withdraw Ruth from the nursing home it could be weeks before we find another facility to take her. Bedspace in decent nursing homes is at a premium and the waiting list is lengthy. Additionally, the nursing home would probably consider removing an ill patient from their facility to a home environment as pulling out "Against Medical Advice" (AMA). Leaving AMA usually means you can't re-enter that facility again. And whether you're home or in the hospital, the bedspace has to be paid for if it's to be retained — to the tune of about $2,000 per month!

Catch-22.

We have explored a number of solutions to this problem, sought good legal advice and proceeded carefully. But it should be made clear that there are no

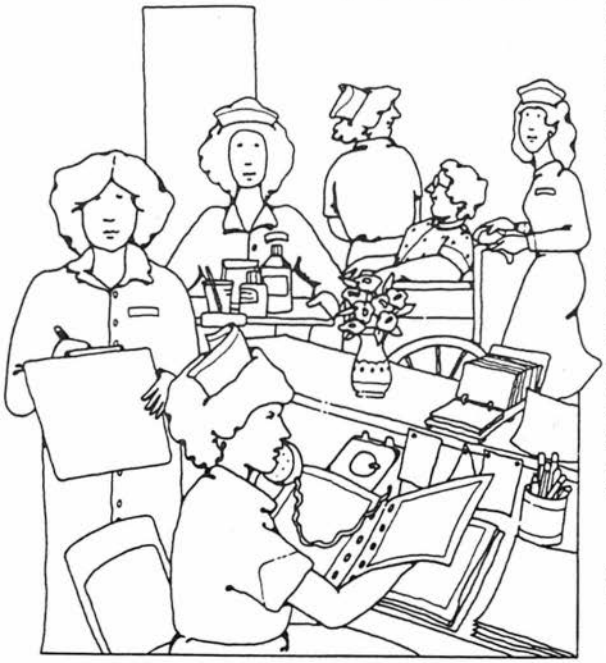
really easy or straightforward solutions in sight. This is a problem which will crop up again and again.

It has been proposed that we get our own nursing home. Ultimately, this is the most attractive solution. But it is a solution with a rat's nest of problems too. The nursing home business is fiercely competitive and tightly regulated. Most small, independent homes have long since vanished or are severely restricted in the type of patients they can take. Most medium-sized homes and many of the larger ones are being bought up by big corporate healthcare chains such as National Medical Enterprises, Care West, and Humana.

Cryonics certainly isn't large enough to justify such a facility solely on the basis of potential cryonics patients, and that means having to take in other patients from the community at large to keep the doors open and meet regulatory requirements. Economically, it will be a tough way to go, although a possible one, provided making a profit isn't on the list of necessities in operating such a place (just breaking even under such circumstances would be enough of a task!).

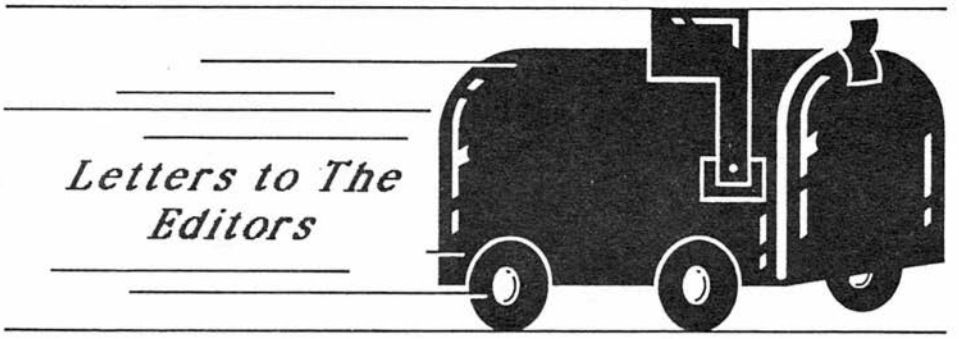
However, all this leaves aside the really BIG problem in operating a cryonics nursing home: the problem of **conflict of interest.** In the eyes of the world and the medical community at large, the cryonics organization stands to "gain" when the patient "dies". Add into that paranoid initial bias our desire not to suffer the ravages of extensive brain injury from multiple small strokes, Alzheimer's disease, and so on, and you have a real potential mess on your hands.

Nevertheless, it is clear that if we are stuck with the existing arrangement of using commercially available nursing homes, our needs will not be met. We will be shabbily treated, regarded as kooks, and subjected to gruesome extensions of our "lives" which will only serve to rob us of our identities. Right now the situation is unbearable. As cryonics grows and as our biopreservation technology improves (and our confidence in cryonics increases) it will become intolerable.



Currently ALCOR has three Members who now require nursing home care or are likely to require it soon. What we need to do is to start planning now. Getting a cryonics extended care facility will be a big project. It will take some clever maneuvering, some smart thinking, and some luck. It will be risky and it will require real finesse to pull off.

This has to be done. We simply don't have any other realistic alternatives.



To the Editors:

I would like to file a mild complaint about a tangential point in Thomas Donaldson's article, "Neural Archaeology" (**CRYONICS**, Feb '87). He writes that:

> "Not many years ago cryonics experienced a very positive event. Someone from outside cryonics (Eric Drexler) came to understand our ideas on cellular repair and their importance. I think they are important, and I think Eric has done a service in both spreading them around and tying together all the thinking people have done, both in the electronics industry and in biology, about 'nanotechnology'."

To begin with, I'd like to thank Thomas for his appreciation of my efforts to inform people about the prospects for nanotechnology and cell repair systems. I agree that cryonicist's early ideas on repair — including Thomas Donaldson's — were important, essentially correct, and well in advance of thinking in the medical and biological communities. My grumble is that of a researcher longing for a bit more care in descriptions of his work.

Why? Well, someone who hasn't followed the development of ideas in the field might misread the first sentence quoted above as saying, "What Eric Drexler has to say about cell repair is just a restatement of what he heard from others." This would be inaccurate. Through my failure to read everything in the world, I remained ignorant of cryonicist's ideas on repair until I had my own. The idea of nanotechnology led to cell repair, which led to the conclusion that cryonics made sense ("Why, it's not a crazy dream after all!"), which led to the basement of MIT's science library and a copy of Ettinger's **The Prospect of Immortality**, where I found his early suggestion that molecular-level cell repair might someday be possible.

The idea of cell repair systems that I've been spreading, though, goes substantially beyond anything that seems to have been published previously. It starts with a description of how to build molecular-scale computers and machinery, continues with a demonstration that repair machines can reach, examine, and repair cell structures, and wraps up with an estimate of the time, volume, and power requirements for a thorough repair process. What went on before was on the right track, but this is several stops down the line -- and that's why it created excitement when the cryonics community learned about it.

The novel part of these ideas flows from their basis in nanotechnology. But the second sentence quoted above could be misread (again, by someone unfamiliar with the development of ideas in the field) as saying, "What Eric has

to say about what he has termed 'nanotechnology' is a restatement of ideas he picked up from electronics and biology." This would also be inaccurate. Progress in electronic miniaturization was certainly an inspiration for thinking small, and molecular biology, properly viewed, provided a whole series of proofs-of-concept for me to build on, but so far as I know, what I've called "nanotechnology" just wasn't being discussed.

Now, "nanotechnology" -- if we mean something that will yield nanocomputers, replicating assemblers, cell repair systems, and so forth -- means more than just "the technology of things less than a micron across." The latter definition would include all of synthetic chemistry and biotechnology, and much of coating technology besides. Even extending semiconductor processing down to the nanometer scale would merely give us superchips (nothing to sneeze at, but not real nanotechnology). What I stuck this label on might be called "assembler technology," or "technology based on a general ability to structure matter to complex, atomic specifications," but these are unwieldy terms.

It seems that no one had previously explained how one might build an assembler and how one might operate, paying attention to such basic matters as forming chemical bonds and working reliably in the face of thermal noise. Back in 1959, Richard Feynman had casually suggested the possibility of something assembler-like, but he left it at that; I learned of this when I went to dig up references for my 1981 paper in the **Proceedings of the National Academy of Sciences.** And, naturally enough, no one had previously explored and explained what this novel assembler-based technology could **do,** which is why it seemed necessary to write **Engines of Creation.** If any reader knows of a serious anticipation of these ideas, I'd like to see a reference. If nanotechnology — that is, **real** nanotechnology -- were an old idea, it probably wouldn't be causing such a stir. And that completes my formal grumble.

Sincerely yours,
K. Eric Drexler
Visiting Scholar
Stanford University

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"The superior man knows what is right. The inferior man knows what will sell."

— Confucious

"There is but one safe way to avoid making mistakes; to do nothing, or, at least, to avoid doing something new. The unknown lends an insecure foothold and venturing out into it one can hope for no more than that possible failure will be an honorable one."

— Sir Isaac Newton

The above quotes were provided by ALCOR Associate Member Alvin Steinberg

Making A Virtue Of Necessity:
Speculation On The Origins Of Some Current Attitudes on Death And Dying

By Arel Lucas and H. Keith Henson

ur-defense (ur"de-fens') [Ger. **ur-**, ultimate, transcendent + **defense**] a belief essential to the psychological integrity of the individual. Such beliefs include faith in personal survival, in religious, philosophic, or scientific systems, and in human succorance.

— Dorland's Illustrated Medical Dictionary, 26th Ed.

As Brian Wowk reported on the **Omni** debate in the December CRYONICS, many people have extremely fixed opinions on the subject of death and dying. Their internal mental stability is too threatened by the topic to listen to a new point of view. They are "memeoids*" in that their belief is likely to kill them.

Unfortunately, these beliefs infest a major fraction of the population. If we could understand "where they are coming from," perhaps we could formulate a more effective approach to reaching them, or at least know which approaches are unlikely to work. As psychologist Wilhelm Reich once wrote, it is necessary to understand the truth of the opposition. The '60s saw a resurgence of some ancient beliefs and one of us, (Arel) is very much a graduate of those times.

This former flower child (Arel) took up with those very evils of the '60s and went head-on into science and technology. In the maelstrom of change her former beliefs lost all influence over her, but she can still remember when it would have been a waste of time to talk to her about cryonics.

When talking face to face with people, and not over a computer net, you can see rejection and defensive posture immediately. The body stiffens a little, the chin recedes slightly into the neck, the eyes leave your face and look usually down at first. If you continue the conversation, your partner in dialogue will not look at you when you are speaking, except very briefly. Eye contact will become an attention-getting device, an "I have something to say" look. They will look at you while delivering a point, and you may notice that the

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*from meme -- a replicating information pattern influencing behavior

casual tone of your conversation has dropped, and you are a target rather than a conversational partner. This is a sign that you have backed this person against their philosophical wall. At that point they have erected a psychological fort and are busy thinking up and hurling missiles.

What do people say when they feel this defensive, when a subject comes too close to their hard-won adjustments to mortality? You've seen some of the most extreme reactions in Wowk's article, but since cryonics is not the only innovative or controversial subject we've discussed with people, we've done some categorizing of the types of responses we've found to subjects ranging from space colonies to cryonics.

See if these fit what you find as well:

1. The technical question (often the first line of defense). "It'll never work." For cryonicists, this response or question usually takes some form of "They'll never be able to fix the damage" or "Aren't you afraid you'll thaw out?" If the cryonicist successfully answers this question -- with explanations of economic solutions, science, techniques, lack of other options, etc. — the second line of defense usually crops up...

2. The next question is usually economic. "It costs too much." Whether it's space colonies, cell repair machines, or cryonics, the cost always comes up. It's an easy question to answer for us, because most of us are cryonicists by virtue of the insurance companies. Then people will argue that your relatives should get your cryonics nest egg, or that it should be spent for the public good.

3. "Why would anybody want to wake us in the future?" is often the next question. Or they turn it into a statement: "I wouldn't want to come back in the future."

Most permutations of this response stem from phioutphobia, fear of the future. Our circle of friends is optimistic — we don't tolerate gloom & doom types, but this is not the norm. If they aren't fundamentalists who are looking for Armageddon, they are liberals afraid of overpopulation, pollution, or nuclear war. If these don't depopulate the planet, the survivors will become mutated, greedy, slavish human forms. Some visionaries of the '60s (limits to growth types) were so overwhelmed by their limited and fearful prophecies that they gave in to exaggeration and scare tactics, infecting an entire generation.* Since then, children have been taught a dogma of the greed and shortsightedness of governments and corporations, and the flawed nature of human beings.

Given an assumption of scarce resources and basically evil human beings, no wonder people express ideas like those we've heard: frightening visions of thawed zombies, slaves, or victims of sadistic torture; a future in which people are revived only to partake in a nasty, brutish existence. While we can point out that the technology required to revive us will make us rich, people who are this pessimistic about the future won't hear what you say unless and until their

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* We think bad news spreads better than good among humans for reasons rooted in our evolution. While it is useful to know about berries ripening in the next valley, it is IMPERATIVE to know about the grizzly bear that is guarding them.

visions of the future change. Expressing optimism about the future and how we are working to improve it is probably the only positive thing that can be done here, especially since people who fear the future have often turned to belief systems which place value in things "not of this life."

4. Personal belief system defenses usually come next, unless they are so strongly held and so specific about death and dying that they are the first defense. They usually sound like, "But death is part of the Natural Order!" or "What if God doesn't want us to do this?" or "My spirit is going to go on to new things, and I don't want to tie my soul to this bleak planet." Nancy Lucas (no relation of ours!) expressed this kind of view on the **Omni** network.

The "death is part of the Natural Order" argument is one which few cryonicists are equipped to understand, and that's where Arel's experience of being a former believer comes in handy. Most of the people you meet who are not Christians (or some other religion which believes in an afterlife) are believers in some kind of Cosmic Consciousness. For those of you who are not into it, the argument on which this faith depends goes somewhat like this: We are conscious (hard to disagree with). Nothing else arises **"de novo"** so consciousness must come into us. Before it does, it must exist outside us in the universe. Voila! There must be some mysterious consciousness resource base (limited like everything else).

The flaw in the chain of reasoning which supports such a baroque philosophy lies right at the root. Properties (and consciousness is a property) **can** arise seemingly from nowhere.

Personally, and only after reading a considerable amount of Marvin Minsky's work, we have come to understand consciousness as an emergent phenomenon. That is, it emerges from a large society of simple mental agents, each too simple to be considered conscious by itself. Minsky uses an excellent analogy to describe the phenomenon of emergence. Consider a box constructed from six boards. By itself, each board has no property of confinement -- a mouse could simply walk away from any one of them. But if the six boards are arranged in a way where each of them blocks escape in one direction, a new property emerges which can indeed hold a mouse.

Everyday human experience with consciousness involves plan and purpose, so by extension the mysterious "external" consciousness source must have some plan and purpose. Once you have bought into this particular line of reasoning, it becomes your task to understand Cosmic Consciousness as best you can and fit yourself into its scheme. Many believers feel that we have something like a piece of universal consciousness lent to us at birth, which we must give back when we die -- thus enriching with our experience the "Cosmic Whole." If you don't give it back, the cosmic librarian may come after you! Librarian or no, many people believe that there is some "grand adventure" after death ranging from debriefing by some cosmic intelligence to joining an ocean of cosmic love and/or intelligence. Such believers are reluctant to jeopardize their chance at the grand adventure for a mere possibility of prolonging a life they may feel is drab in comparison to what comes after. What, after all, happens to the "soul"

or "consciousness" when the brain which once housed it is suspended in liquid nitrogen? It can't join the party, can it? Is it lost in a gray limbo?

A symptom of this belief system is the corollary that if we are part of the Cosmic Whole we have access to all the wisdom and experience ever gained by all the "enlightened souls." Mystical techniques, meditation, reincarnation, Rosicrucian beliefs, astrology, the Tarot: all of these have their place as part of an attempt by human beings to access the Great Knowledge Source. If consciousness and intelligence have always been and always will be what they are, then progress in science is only a myth. Such people usually distrust science and technology. They do not understand the scientific method, cannot conceive of inventions before about 1860 as belonging in the category of "technology" (such as fire, horse collars, forks, etc.), and are likely to express sympathy with pseudoscientific beliefs. Technical arguments (such as you might use to answer the "It can't be done" defense) are usually lost on them, so you may find that you might as well save your breath when you run into serious believers in UFOs, ancient astronauts, or astrology, to name a few.

If you want to know more about the "death memes" which spread during the seventies, look at the works of Elizabeth Kubler-Ross. A visionary of the '60s, she wrote books, gave seminars, and lectured on the quintessence of what cosmic consciousness believers will say about death. In working with people in nursing homes and hospitals, and relatives of the dying, she discovered (surprise, surprise!) that people were upset about dying, felt guilty and helpless, and were unable to cope with the concept of death. Since she regarded short lives as inevitable (most people still do), she set about to find ways to make people feel better about dying. Her scheme ran: Death is part of the natural order. Death and decay are a necessary part of the cycle of life. Death is a process in which new life is created. No new life can come into existence without death. The dying person thus creates new life. So, whether people believe in an afterlife or not, they are part of a wonderful, miraculous scheme in which death begets life and life goes on above and beyond the dying person, but with his/her acquiescence and help. Talk about making a virtue of necessity!

There is no room in this scheme for evolution as understood by scientists.

"Evolution" becomes a purposeful process which has made no "mistakes." There is no understanding that some bad effects (from our point of view) such as short lives might have come about as side effects of traits which helped our genes survive (sickle-cell anemia is such an effect; the Hayflick limit on cell division may be a defense against cancer.) There is no room, either, as Nancy Lucas so clearly stated, for a human arrogance which seeks to change the "natural order."

Some people hold these beliefs loosely, only because nothing better has come along. If you suspect that someone you want to discuss cryonics with is not a True Believer, you might gently probe their beliefs. "Do you really believe in a Cosmic Intelligence which has decreed short lifespans?" If the answer is a vigorous "Yes," you will probably get nowhere by further discussion. If the answer is something like, "Well, I don't know," there might be a chance to infect your friend with memes about a hopeful future and cryonics as a way to get there.

A word of warning is in order. Many people feel that the only justification for ethical systems is the existence of an external, universal law which they feel must be coupled with an external, universal Something. They also may have tied their personal feelings of security, worth, or purpose to such a Something. Fitting in new ideas on this topic can be painful and difficult.

People's lives can be seriously upset if you cause them to reconsider their belief systems. The reason the cosmic consciousness mental patterns, along with the "life after death" variety, are so tenacious is that they have long been very helpful symbionts. Until cryonics came along, belief in one of these made the continual awareness of mortality, and the grief from losing those close to you, more bearable. It is only with the advent of cryonics that these beliefs had any downside. Without this advance, and the technology that will support it, there would be no point in even trying to upset peoples' belief systems.

If the personal belief system defense emerges, you know you have reached your conversational partner's philosophical wall. There is no use pushing any further. OK, you might say, but if it's no use talking with someone who has these beliefs, then what happened to Arel? Why is she now a cryonicist?

First, it took around 6 years. If there is some special person you want to convince, start by realizing it is likely to take a long time (hopefully less than their remaining life!). Arel's process started with finding out that a person she greatly respected — in this case Dr. Timothy Leary — didn't share her assumptions. Over the years, she continued to meet people who were intelligent and flexible, and who quietly disagreed with her belief system. When we met in 1979, she still considered herself to be a mystic.

Arel now believes that human beings were not crafted for some cosmic purpose. She regards people as a rather amazing product of a set of processes which conform to what we anthropomorphically call "natural laws." It's a sometimes frightening and lonely point of view which, compared to her former belief in being part of something grand and sweeping, may seem rather poverty-stricken. Your friend may not wish to lose such a belief. Your best bet here may be simply to let him or her know where you stand personally. You may be able to convey a feeling that life without a belief in life-after-death or the cosmic librarian can be rich in hope. Or, if you personally have reconciled a

belief in life-after-death or cosmic consciousness with cryonics, you may be able to say how you did it.

Thanks to organizations like ALCOR such a life is not lonely. Cryonicists — far from being arrogant and selfish as some might expect -- turn out to be some of the most caring people we've ever run into. In our experience, cryonicists are warm, compassionate people whose purpose in banding together is to extend life — not only of fellow cryonicists, but, through experimentation, research, understanding — of all human beings, and by extension of all life we value.

With the vast majority of people, the best we can do is reinforce whatever positive, optimistic feelings they have, give them hope about the future and themselves, help them build a sense of self-worth. Perhaps they will eventually be more open to arguments in favor of cryonics. In the meantime, we can look for people who already have character traits (to use an old-fashioned term) which may predispose them to cryonics, including:

* A strong sense of self-worth.

* Optimism about the future.

* Enough understanding of the directions of science and technology to listen to arguments in favor of cell repair machines.

* Lack of a strong belief system which excludes human action toward life extension.

Aside from our contacts, ordinary market surveys might turn up groups loaded with such prospects. As a pioneering band, we must learn that not everybody has ears for us, and pounding people with what we think are perfectly good reasons simply doesn't work (and frustrates us). Your friends and relatives whose ears perk up and whose eyes show interest when the topic comes up are candidates for further discussion.

Disturbing peoples' beliefs that are tied up with their adjustment to their mortality is terribly upsetting, and if carried too far, counterproductive. It is hard to get feedback on exposing people to the concepts because the time between exposing someone to cryonics concepts and their taking action is usually years. It is still worth it. Even if we don't get many favorable responses, we can say we tried. Considering the number of years we may have to contemplate the success or failure of our efforts, we need to make an attempt to save the lives of those around us.

* * * * * * * * * * * * * * *

"The lame man who keeps to the right road outstrips the runner who takes the wrong one. Nay, it is obvious that the more active and swift the latter is the further he will go astray."

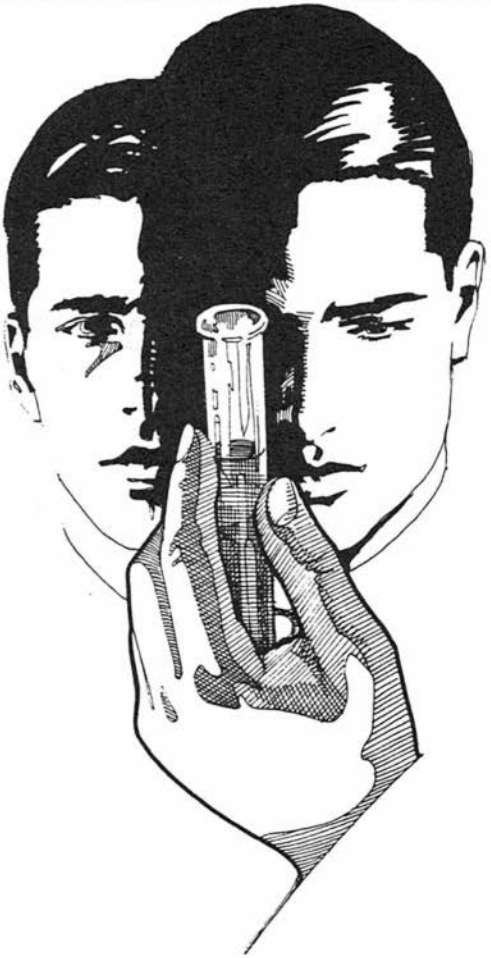
— Francis Bacon

Thomas Donaldson Reviews TEST TUBE BABIES: A HISTORY OF THE ARTIFICIAL IMPREGNATION OF HUMAN BEINGS

by Herman Rohleder, M.D., Panurge Press, 1934

This is not a book I expect many readers of CRYONICS to read, or even to easily **obtain.** However it was so interesting for what it has to say about changes in **mores** over the last 50 years that I thought readers would like to hear about it, its author, and his opinions.

Herman Rohleder was a German physician and psychiatrist active before the Second World War. At the time of publication of the book, Rohleder's principal claim to fame was a massive psychiatric/medical tome on masturbation, which passed through many editions. I have not read his book on masturbation. I heard about his book **TEST TUBE BABIES** by an oblique reference in a medical article. The book, the title, and the time of publication sounded so interesting that I wanted to actually see the book itself. After some searching by the local librarian, we found a copy in the library of the University of California at Hayward (probably the only one in California) and I've now read it.



The most notable thing about the book **is** the choice of title. It seems that in Rohleder's time doctors were going through much the same kind of crisis of ethics as they are now going through with our own "test tube babies". I personally believe that there's far more continuity in our history than the media wants to admit. We do NOT live in a time of especially rapid change, or a time in which morals are being **especially** called into question (they have always been called into question!). It's quite clear from Rohleder that the term "test tube baby" is far older than people think. Artificial insemination must have caused a ruckus, in its day.

Rohleder's history is very interesting, although obviously not by a professional historian. Rohleder finds references to attempts at artificial insemination as far back as Arab sources dated 1322 AD. The Italian Spallanzani made the

first serious scientific attempt at artificial fertilization. He artificially inseminated a female dog in 1780. Only 19 years after that, an English physician, John Hunter, helped a hypospadic husband (who could not inseminate his wife due to a malformation) by injecting the husband's semen into his wife's vagina. After that followed a long silence, until 67 years later an American, Marion Sims, had one successful artificial insemination. Literature on the subject grew, but it was one nobody wanted to talk about and almost all authorities opposed.

You will note that the discussion here deals only with artificial insemination as a way to treat infertility of the **husband.** The idea of using it to help any woman, married or not, bear a child has nowhere been raised.

Rohleder also has a long section describing technique. This is laughable. Rohleder believed (contrary to all animal evidence of his day) that insemination must take place just after the woman has had an orgasm. He also believed (apparently in common with everyone of his day who had thought about the subject) that only **doctors** were qualified to undertake

insemination. This meant that the doctor must wait in the next room while the couple copulates and then rush in immediately to inject semen.

In Rohleder's time even artificial insemination by the husband was frowned on (Rohleder quotes authorities frowning on it). The idea of insemination by someone who is not the husband met even more vigorous disapproval. That was a highly indelicate suggestion! To quote Rohleder:

"What husband or wife, no matter how intense their longing for an heir, will consent to the injection of strange semen? Thank God that most people still have that much tact, decency, and moral feeling." (p.168)

Some people even disputed the legality of children born after insemination **by the husband.** Rohleder reveals himself to be a radical: he believes that even insemination by a man not the husband can be morally undertaken, under the most stringent restrictions, of course:

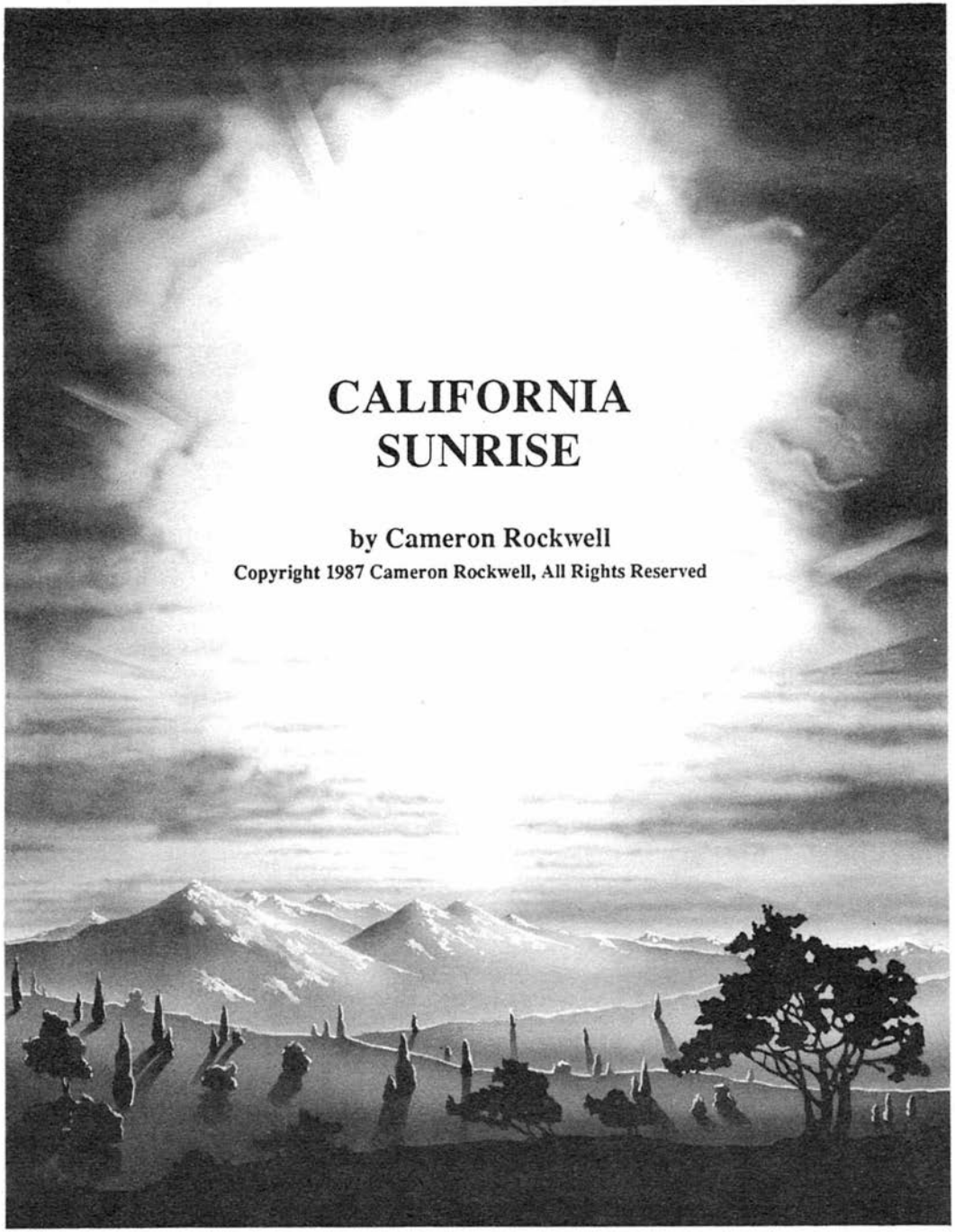
"I would undertake this step only where the sterility had engendered grave psychic disturbances and dangerous depressive states which threatened to become severe and incurable psychoses, or to eventuate in suicide or at least divorce." (p.172)

Needless to say, this battle of morals was fought and won long before most readers of CRYONICS were even born. Rohleder's book makes clear how much our ideas have changed after 60 years. Perhaps the most interesting fact is that this battle was not over biotechnology as such. Artificial insemination of animals became an established technique in the 19th century, even if not used so widely as now because of lack of refrigeration. It was the **human** application of the idea which caused so much furor. Now, so long afterwards, we have difficulty understanding how so many people could have opposed it.

I believe that the reason for this opposition lay in the fact that it questioned "decent" standards of behavior about something which people did not want to talk about. Today, cryonics isn't just a set of **ideas.** We propose to behave differently on matters which are very emotionally charged. Cryonics is a violation of contemporary funeral customs; indeed, it violates contemporary ideas of "respect" for the dead. Relatives wish to bury or cremate their deceased; they wish to inherit from them. Their sense of the rightness of such conduct is reinforced by everyone around them. They cannot feel settled in their minds unless they do these things. Into this scene come cryonicists, who announce that all of these hallowed customs constitute simple murder, and inheritance is simple greed.

Cryonicists are in the position of an Indian group seeking to abolish suttee. To many Indians of 100 years ago, suttee wasn't "just" a custom. It was the only **decent** way to memorialize a man's death. Tell them differently and they won't listen. They feel it in their bones.

We see around us much evidence that even central ideas (like artificial insemination by an outside donor) can change with time. There isn't really any doubt that people will eventually come round to cryonics. The only real question is how long they will take, and how many people they will cremate before that time.


CALIFORNIA
SUNRISE
by Cameron Rockwell
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The aged gravekeeper was nervous. At first he thought it was the dark, grey sky — the cold, whipping wind that foretold another storm. When it was like this, the hills covered with stony reminders of the dead seemed to fill him with a pointless uneasiness.

Then he noticed the tall young man, motionless behind the iron fence at the other side of the cemetery. An unblinking, penetrating quality of the eyes gave the old gravekeeper a feeling that invisible hands were reaching out for him, and he shuddered. It was four-thirty and would soon be dark. No use waiting till five, he thought; time to lock up and leave. As the gravekeeper drove away, he saw the young man walking rapidly into the night toward the more affluent residential districts.

"You're not going to do this to my daughter, Ray!" The heavy woman in a shapeless dress leaned on the polished surface of her dining room table, fingers curled like talons helplessly clawing at the smooth surface. "It's indecent! It's obscene! It makes me sick to even think about it!" she rasped. "I'll stop you, no matter what it takes! I'm an important woman in this town!" Her narrowed eyes and stony nose matched the hissing tone of her voice. Stopping, seemingly at a loss for words, she glared up at the young man. Her labored breathing filled the room.

Ray leaned even further forward from the opposite side of the table. Eyes needling downward exploring the pudgy little woman's face, he said, "The grave may be right for you, but you're not going to shove it down Barbara's throat!" His voice had an angry, cold deepness, like the growling of a blizzard's wind passing through thick groves of trees. "You didn't want the marriage," he said. "Now you don't want this, but it's not going to change a thing!"

Ray's face softened into a broad, bitter smile that had no humor in it. "Picture yourself the way she is!" he suddenly threw at her. "Then see your corpse lying in a casket! Do you really like that picture? Perhaps that's what you deserve!" The bulky woman began to tremble. His expression becoming serious, reflective, Ray turned abruptly and left; the house shook as he closed the door. Barbara's mother reached, choking, for the telephone, and dialed the number of her attorney.

"It's time to go, Barbara," Ray said gently, as he pulled a chair up beside her bed. "You won't need much. The plane leaves in an hour!" Although his voice was was calm, controlled, Ray struggled deep within himself not to think of the lonely years ahead. He reached out and stroked her hair softly. There was so little time left!

"What's my mother going to do?" Barbara asked, her weakened voice wavering for a moment. "She's always fought me tooth and nail on this!" Her dark eyes smiling and burning with determination, despite the pallor that surrounded them, Barbara still looked as determined as when she had first broached the subject with her parents and stood her ground, three years before she and Ray had met.

"Your mother will try to stop it," Ray said. "That's why we have to hurry. When the doctors admitted treatment was useless... advised it be stopped, your mother finally realized it actually might happen. That's when she began talking to her minister and attorney. I've seen them both. The minister is harmless

enough, but her lawyer might be able to get some kind of injunction. They'll probably try it tomorrow morning... tonight, if they find out we're going so quickly."

Ray rose and quickly packed Barbara's things, then said, "I'll take your bag to the car and come back for you." Barbara smiled as he paused at the door and looked back. Panoramas of happy days flashed before Ray's eyes. It's going to be much easier for her, he thought. A blink of those lovely lashes and she'll be on her way to the future. But these memories are going to have to last me a long, long time. A moment later Ray tore himself away and left the room.

The short, plump nurse was visibly upset, her voice sharply edged, when Ray pushed Barbara's wheelchair out of the room. "You can't take her out of here on a night like this!" she objected. "In her condition? She's so weak she shouldn't be moved at all! I have instructions she's not to leave her bed!"

"There's somewhere she wants very much to go," smiled Ray sadly. "If people were telling you any moment could be your last, if there were a special place you wanted to be, wouldn't you go?" Ray and Barbara were approaching the main door, and the nurse could see nothing would stop them. Returning quickly to her station, she thought a moment, then called the doctor. Her supervisor had warned her something funny might happen.

Snow was beginning to fall, as Ray rolled Barbara's wheelchair toward the plane. A phone call with a physician in California had satisfied the terminal's authorities that a sick person needed to be moved on an urgent basis. "Is there any chance the flight might be cancelled?" Barbara asked, brushing her hair back and looking out the plane's window at the drifting flakes.

"I don't think so," said Ray. "The snow's not deep, yet! The main front is still a hundred miles away, but it's moving very rapidly. Any delay like a phone call from your mother's attorney or a judge could hold things up till the field's unusable. Let's hope that doesn't happen!" He put his arms around her. Together they watched the snow continue to fall, covering the plane's giant wings with a velvet whiteness. The wait seemed endless!

Finally, one by one, the large turbojet engines were started; the plane rolled down the taxiway toward its takeoff position. Neither Ray nor Barbara knew that after a hurried conversation with her attorney, Barbara's mother had called the police, telling them her daughter had been "kidnapped"! Roadblocks were being set up in the dark roads filling with snow. As the pilot applied full throttle to all engines, neither Ray nor Barbara knew that the police were having a heated argument with the airport's manager about whether or not a husband could "kidnap" his wife when she appeared to be going willingly and doctors were waiting at the other end.

Neither Ray nor Barbara knew that before the plane reached cruising altitude, attorneys in California would have talked to a local judge, convincing him that a meddling old woman had no right interfering in her daughter's life. They did not know that at a research building in the foothills of the San Bernardino Mountains, a surgical team had been alerted, should it be needed upon their arrival. Their plane was expected to land at dawn. A rescue vehicle would be at the unloading ramp to meet them.

Ray and Barbara were totally unaware of these things. They were curled deep in each others arms, asleep beneath soft, warm blankets, while the storm was left a thousand miles behind. Thirty thousand feet below, full moonlight fell on fresh snow as the Rockies slid silently underneath. Tiny clusters of lights from small towns came and went as the huge plane sped toward a California sunrise.

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Development Of A Mobile Advanced Life Support System For Human Biostasis Operations

by Jerry D. Leaf, Hugh Hixon, and Mike Darwin

Introduction

The objective of biostasis is to deliver the patient into a state of arrested biological change with as little damage as existing biopreservation technology will allow. Recent years have seen tremendous strides made to improve the state of care for cryonics patients[1,2,3]. Most of these advances have consisted of transferring and adapting existing medical technology to the special needs of the cryonic patient, such as improving metabolic support, minimizing ischemic injury, preventing particulate obstruction of the vascular bed and improving cryoprotectant distribution[4,5,6]. Application of such improved techniques has allowed for longer postmortem perfusion times with better distribution and equilibration of cryoprotective agents[7,8].

Of the four major areas of of patient care (see Table 1) the one which has undergone the least amount of upgrading since the first cryonic suspension was carried out in 1967 is Transport. Transport consists of the stabilizing support provided the patient during the interval between the pronouncement of legal death and the start of the introduction of cryoprotective agents. The method of support employed during this interval has been external cardiac compression and artificial ventilation (CPR) (usually administered with a heart-lung resuscitator) in conjunction with external cooling and the administration of stabilizing medications as shown in Table 2.

TABLE 1

PHASES OF SUSPENSION PROTOCOL

Transport
Surgical
Cryoprotective Perfusion
Cooling to Storage Temperature

Field experience with this method of support has shown a number of serious inadequacies[9]. The most serious of these inadequacies is that CPR, under the best of conditions, can only produce a blood flow of 20-30% of normal resting cardiac output[10] (Graph 1). The condition of the typical biostasis patient is usually one of multisystem organ failure characterized by extensive underlying disease(s), such as advanced atherosclerosis, pulmonary edema, or disseminated

TABLE 2

CURRENT TRANSPORT PROTOCOL

Restoration of Blood Circulation and Pulmonary Function

HLR - Sternal Compression and Airway Ventilation

or

Extracorporeal Circulation With Heart-Lung Machine

Pharmacological Treatment

Buffer Acidosis

Anticoagulation

Prevent Edema

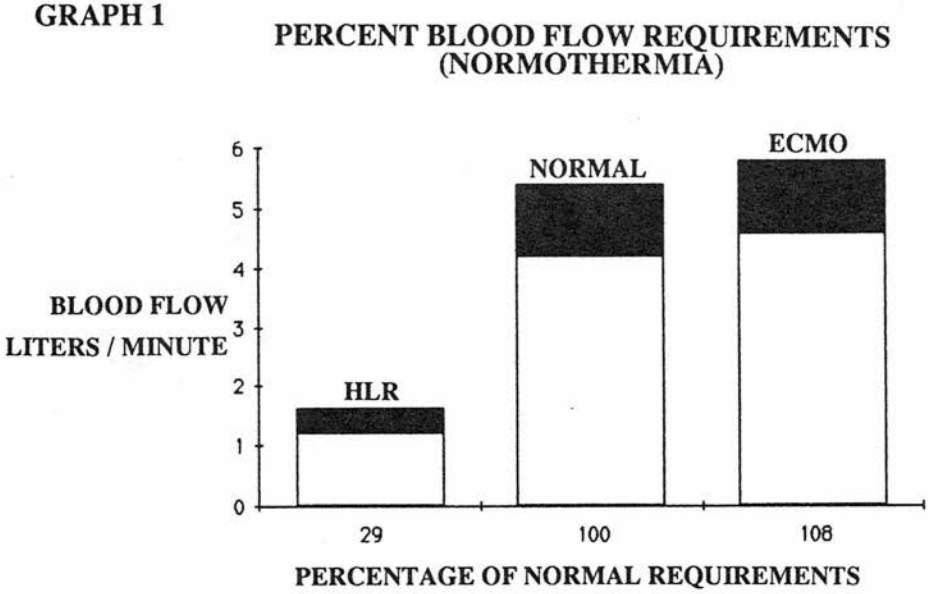
Reduce Metabolic Demands

Hypothermia

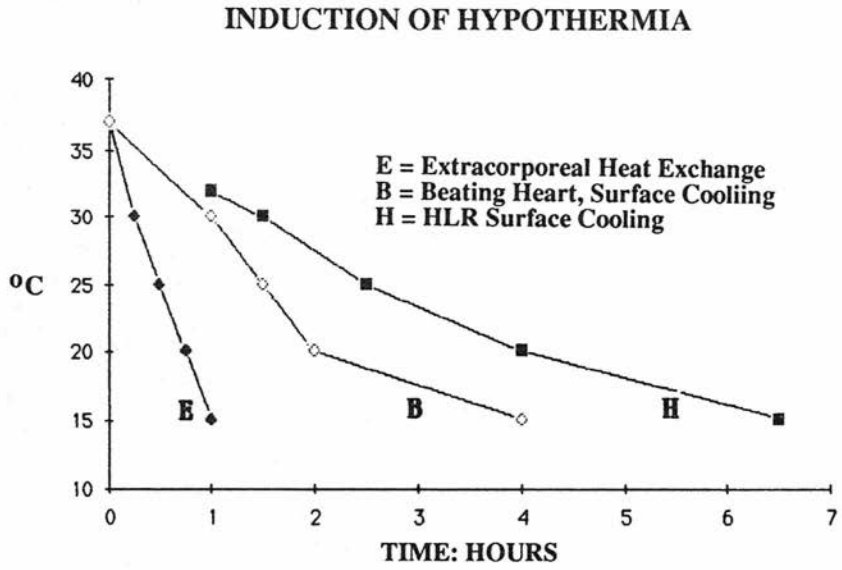
malignancy. Frequently the patient has experienced a long agonal course, the final hours of which are often characterized by hypoxia and/or grossly inadequate perfusion. In such a situation extended CPR is not able to meet the patient's metabolic demands and undesirable postmortem injury such as acidosis, altered capillary permeability, rigor mortis, and other ischemic and hypoxic changes continue. A corollary of the inadequate levels of perfusion obtainable with CPR is very slow cooling during induction of hypothermia with surface ice packs, due to low blood flow and peripheral vasoconstriction, secondary to inadequate perfusion. Graph 2 shows a comparison between surface cooling employing extracorporeal support, surface cooling with a beating/working heart in a living patient (i.e., normal cardiac output), and surface cooling employing an HLR on a biostasis patient in a field setting. As this graph illustrates, HLR supported external cooling is very inefficient in reducing patient core temperatures to safe and acceptable levels.

The objective of transport is to eliminate additional injury to the patient during the interval from the time of legal death until cryoprotective treatment can begin, as well as to reverse, as much as possible, any injury which may have occurred during clinical death and the agonal period preceding it. The only alternative to HLR support which has the ability to completely meet the patient's blood flow requirements and allow for the possibility of "recovery" from agonal hypoperfusion is extracorporeal support employing a blood pump, oxygenator, and heat exchanger[11-15] (Graph 1). The lack of suitable equipment has been the major barrier to the application of extracorporeal procedures to such "field" situations in cryonic procedures.

GRAPH 1



GRAPH 2



Development Of A Mobile Advanced Life Support System (MALSS)

Early in 1985 a decision was made by Cryovita Laboratories with support from the ALCOR Life Extension Foundation to develop an easily transportable, fully self-contained extracorporeal perfusion and cooling unit for use in the transport of biostasis patients. The objectives to be met in the design of this unit were that it be readily transportable, relatively straightforward to operate, fully self-contained in terms of power requirements and supporting supplies (disposables, surgical instruments, medications, etc.), and that it be capable of meeting the normothermic metabolic demands of the average adult.

The primary purpose of the MALSS is to allow for field cardiopulmonary support by extracorporeal perfusion. However, because of the necessity to await the pronouncement of clinical death imposed by current legal constraints, preparation of the patient for extracorporeal support must begin after respiratory and cardiac arrest. In order to minimize ischemic damage during the interval between pronouncement of legal death and the start of extracorporeal support it is necessary to administer CPR. While it is anticipated that under most circumstances femoral cutdown and initiation of bypass can be undertaken with 15 to 30 minutes of legal death, it is still necessary to have mechanical adjuncts for CPR available in order to maximize use of the extremely limited number of personnel available in a field setting.

Configuration of Major Components

The first step in the design of a Mobile Advanced Life Support System (MALSS) was the selection of an appropriate gurney (wheeled stretcher) to house the heart-lung resuscitator, extracorporeal equipment and related supplies. To this end, the Travenol Life Support Litter marketed by Survival Technology was selected. The Travenol unit was designed to meet the needs of paramedic personnel remote from high quality emergency room service. The unit consists of a gurney with a built-in Brunswick HLR-50-90 Quik-Fit heart-lung resuscitator with accompanying oxygen supply (2 each 22 cubic foot "E" cylinders of oxygen), a cardiac monitor/defibrillator and three equipment/medication stowage drawers which are mounted under the patient cot. The gurney, before structural modification carried out to make it suitable for MALSS use is shown in Photo 1.

Photo 1. The original Travenol Life Support Litter with a dummy patient. The HLR thumper and mask are in position. The monitor is on the stand between the patient's feet.

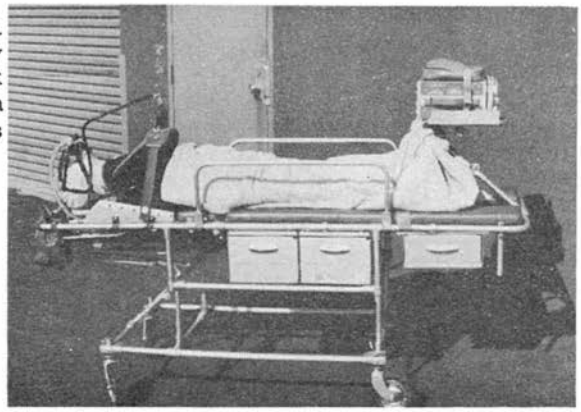
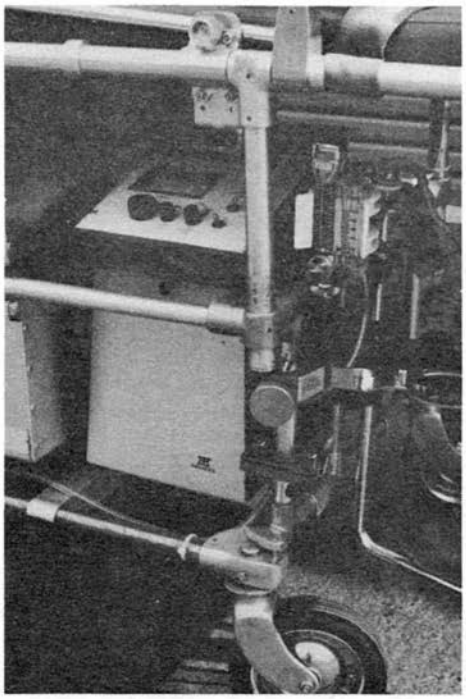


TABLE 3

MALSS COMPONENTS

COMPONENT:	POWER REQUIREMENTS
Travenol Model #5M6202 Roller Pump	110v AC or 24v DC
Tektronix 412 EKG/Pressure Monitor	110v AC or 6v DC
Bentley Blood Oxygen Saturation Monitor	9v DC
Shiley Blood Temperature Monitor	6v DC
ITT Water Pump (for heat exchanger)	12v DC
Suction/Air Compressor	12v DC
Control Panel and On-Board Lighting	12v DC
Brunswick Heart-Lung Resuscitator	Oxygen at 50-90 psi.
2 each Sears GEL/CELL Deep Draw 12v Batteries	
2 each 22 cubic foot capacity "E" oxygen cylinders	
Side Rail Mounting I,V. Pole	
2 Liter Suction Reservoir	
Sci-Med Membrane Oxygenator and Venous Reservoir Holder	
Custom Ferno-Washington Lifting Handles	
Auxiliary "E" Cylinder Caddy with Yoke (allows 2 additional "E" cylinders to be carried)	



The nondisposable core components from which the MALSS was assembled and (where applicable) their power requirements are listed in Table 3. The blood pump was affixed to the bottom frame of the gurney by a specially fabricated bracket made from 1 1/4"x1/8" aluminum angle. The batteries, battery charger/AC power supply, suction reservoir and suction/air pump were attached to the cart by mounting them on two separate platforms fabricated from sheets of 1/8" tempered aluminum sheet (Photos 2 and 3).

During assembly of the MALSS it became apparent that the 1-1/8" aluminum longitudinal supports of the bottom frame of the cart were unable to carry the added load from the pump, batteries, supporting equipment, and supplies. Consequently, they were replaced with 1" chrome-moly steel tubing which has 4 to 5 times greater load capacity than the aluminum tubing it replaced.

Photo 2. The roller pump mounted on the frame of the cart, with part of the oxygenator holder seen on the right.

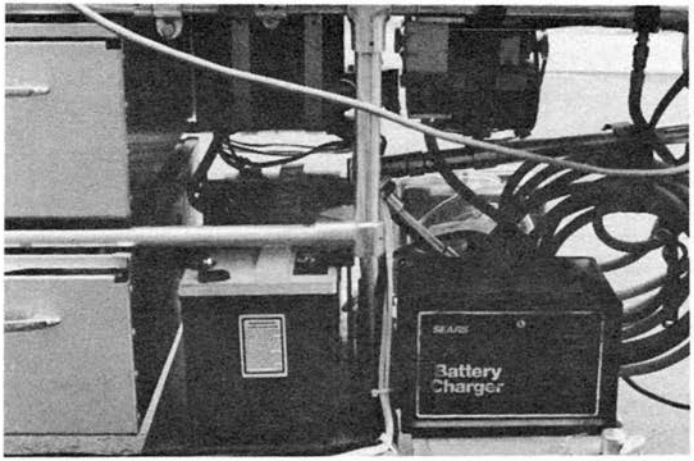


Photo 3. The batteries mounted on the frame of the cart, with the modified battery charger on the right, below the HLR (not seen). The storage drawers are on the left, in the center of the cart.

HLR and Oxygen Supply

The HLR oxygen supply yoke was specially adapted to allow for use of wall or other external oxygen supplies. A variety of adapters for hospital gas systems currently in use in the United States are stocked on the cart, as well as a standard medical oxygen regulator for use with "G" or "H" cylinders.

The HLR oxygen regulator on the Survival Stretcher incorporated a flowmeter downstream from the line to the HLR. This was removed and one arm of a "T" connector attached. The other arm of the "T" connector then delivers 50-90 psi oxygen to a standard Ohio flowmeter connected to a "Y" connector on the gas intake port of the Sci-Med 2 oxygenator (the other leg of the "Y" is connected to a low pressure compressed air source). The leg of the "T" terminates in a check valve attached to 15 ft. of 50-90 psi oxygen line (conductive) for connection to auxiliary oxygen sources, such as hospital wall outlets or O_2 cylinders. Photo 4 shows these gas connections under the head of the cot.

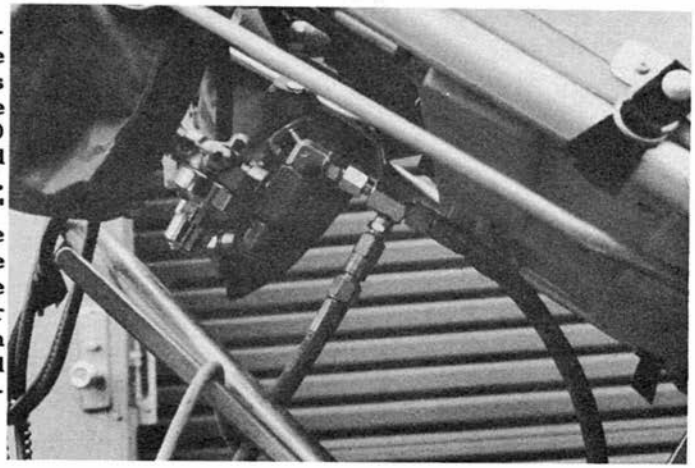
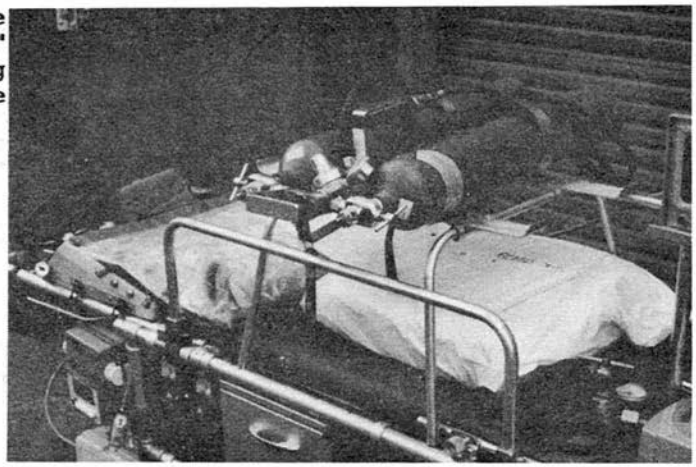


Photo 4. The oxygen fittings under the HLR at the head of the cart, which has been raised up. The regulator delivers 50-90 psi oxygen to the HLR and the left arm of the "T". The right arm of the "T" delivers oxygen to the oxygenator. The leg of the "T" connects to outside oxygen sources. Under working conditions, an oxygen cylinder is mounted on either side of the fittings.

Photo 5. Support frame with two additional "E" cylinders in a carrying yoke in position across the center of the cart.



A support frame and extra "E" cylinder regulator yoke were obtained to allow carriage of two additional "E" cylinders on a frame over the patient's abdomen (Photo 5) (for a total of 4) . The two "E" cylinders which normally power the HLR are located at the head end of the "cot" portion of the gurney directly under the HLR (Photo 4. The cylinders go on either side of the regulator and "T" connection.). Each "E" cylinder is able to operate the HLR for a period of approximately 15 minutes. When the MALSS is carrying a full load of 4 "E" cylinders the HLR can operate for up to an hour without external gas sources. The "E" cylinders would normally be used only during those periods when the MALSS is being moved and cannot be connected to a vehicle or building oxygen supply.

Primary Power Supply

Two Sears 9616 40-ampere-hour Gel/Cel "deep draw" batteries were selected to power the components of the system which did not have self-contained power supplies: the blood pump, suction/air compressor, heat exchanger pump, and the lighting system. A Sears 608.718430 10 amp battery charger (Photo 3, right) was modified to allow charging of the batteries or operation of the MALSS independent of the batteries using 110v AC wall current. Because some components of the system operate from 12v DC and some from 24v DC it was necessary to reconfigure the charger so that it could simultaneously recharge both of the batteries even if they were unevenly discharged. (Since some components such as the heat exchanger pump draw power from only one battery it is possible that one battery will discharge faster than the other.)

As purchased, the charger was of a center-tapped full-wave rectifier configuration. The existing diodes were removed and the two secondaries wired together in series to produce approximately 30v AC. This output was run through a 30 amp, 200 PIV bridge rectifier and into a pair of 5 ohm, 50 watt resistors. While this causes a great deal of the power into the rectifier to be dissipated as heat, it is absolutely necessary to allow both batteries to be completely charged. The two resistors are in series, and power to charge the batteries is taken off in a center-tapped configuration. To prevent discharge of the batteries through the resistors when the power supply is turned off, 16 amp 1000

PIV diodes (ECG 5910) were placed in the output legs of the power supply. The Metal Oxide Varistor in the charger was retained across the bridge rectifier to block transient spikes, and the ammeter and thermal circuit breaker that came with the charger were retained in series with the output. The bimetallic element of the circuit breaker was ground down to give a lower opening current, consonant with the parallel-to-series modification of the transformer. A wire pair was run from the AC output side of the transformer to run a pilot light on the MALSS power distribution panel. A 3" Muffin-type fan (running off 110v AC) was installed in the side of the power supply to keep the case cool, and the portions of the case in line-of-sight of the power dropping resistors were covered with reflective metal-backed tape for the same reason.

All externally powered DC electrical elements of the MALSS terminate in the power distribution box (Photo 6, right). The battery and power supply connections are tied together at a 4-pole double-throw switch which connects the power supply for charging the batteries, and/or running the externally-powered DC elements. Power is distributed in two legs, one from each battery. The voltage (and hence to some degree the state of charge) of the batteries is monitored by two Zener-diode biased voltmeters which indicate in the 9.1 - 14.1 v DC range. The voltmeters are permanently connected to the batteries, and their drain is considered negligible. Power from both legs in series operates the 24v blood pump. The air/vacuum pump and one light are run off one 12v leg, and another light run off the other leg. The 12v coolant pump, being an essential system and a high-current item, can be run off either leg, switched by a DPDT center-off switch.

AC power for the MALSS is distributed through a 6-outlet Midland Ross 15 amp Voltage Surge Suppressor. An additional 25 ft of reel-mounted 10 amp extension cord with 6 outlets is carried as an accessory.

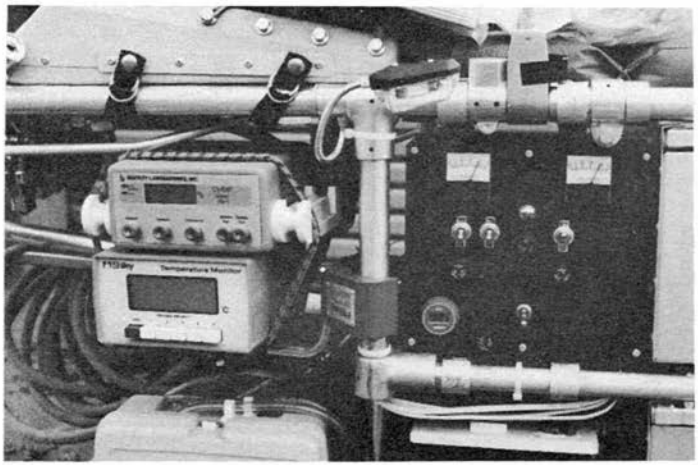


Photo 6. The power distribution panel (right), mounted over the batteries. To the left, mounted under the HLR are the Oxygen Saturation Meter (top) and the thermocouple thermometer (bottom).

Extracorporeal System

The perfusion circuit for the MALSS is shown on the next page.

A Travenol Model 5M6202 roller-type blood pump and a Sci-Med 2 Membrane Oxygenator were chosen to provide extracorporeal circulation and oxygenation. The blood pump was mounted on the bottom frame of the cart (Photo 2) at the end opposite the HLR, oxygen bottles, batteries, charger/power supply, and air compressor. The membrane oxygenator and Sci-Med 2 MB2000 mounting bracket for the cardiotomy reservoir were mounted under the foot end of the cart adjacent to the blood pump (Photo 7). The Sci-Med oxygenator is the only true membrane (i.e., non-porous) oxygenator available as of this writing, and is rated for extended (days to weeks) extracorporeal support[16,17]. The Sci-Med 2 also incorporates a high efficiency corrugated, anodized aluminum coil-type heat exchanger capable of rapidly reducing patient core temperature.

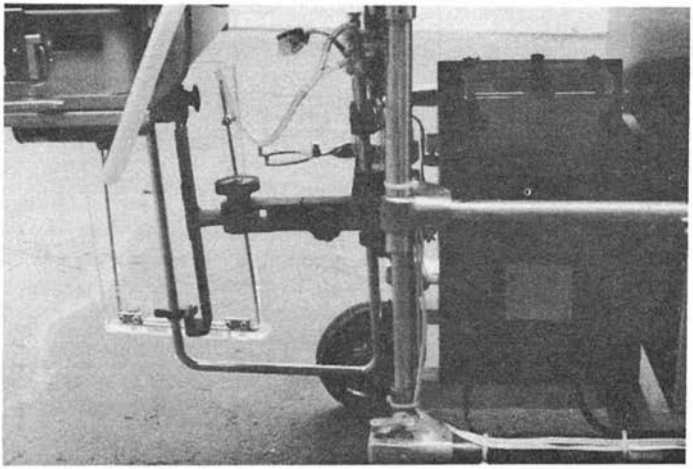
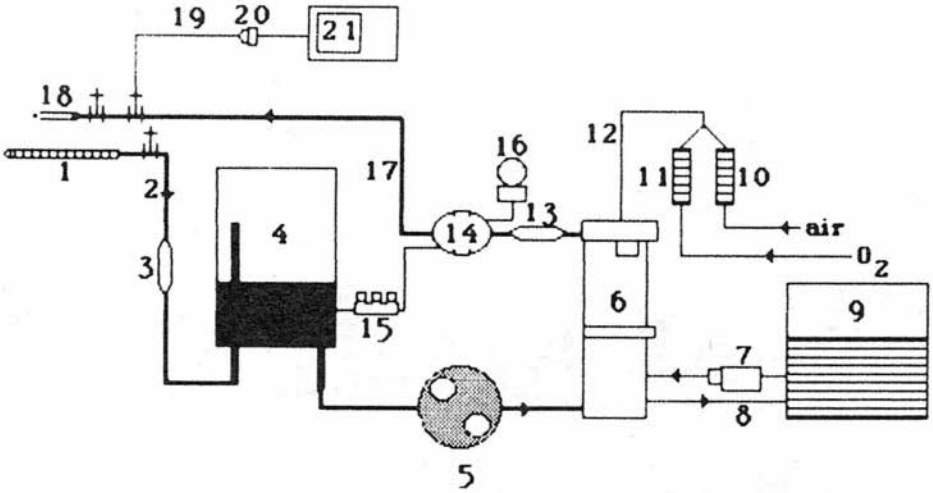


Photo 7. The mounting bracket for the Sci-Med oxygenator, on the end of the cart frame. The blood pump is seen from the back, mounted within the frame of the cart. In the upper left corner of the picture is the AESCULAP sterilizer box containing the surgical instruments.

This ECMO system is designed to provide circulatory support via the femoral/femoral bypass route. The extracorporeal circuit consists of a 1/2" inch venous return line connected to a Sci-Med SC4000F cardiotomy reservoir from which the arterial pump withdraws blood to circulate through the oxygenator/heat exchanger to the femoral artery. A Shiley SPF40 40 micron blood filter is interposed between the oxygenator and the arterial cannula.

pH and Blood Gases

The extracorporeal circuit also incorporates cuvettes in both the arterial and venous lines which allow for continuous measurement of the oxygen saturation of the patient's arterial and venous blood by use of the Bentley Oxygen Saturation Meter (Photo 6, upper left). The Bentley O_2-Sat Meter is powered by an independent, standard 9v battery. Blood pH is measured with a Cole-Parmer pH Wand; a small, hand-held, battery operated pH meter with an accuracy of $\pm$ 0.01 pH units. The pH Wand in conjunction with the O_2-Sat Meter allows for in-field determination of blood gases by use of a Radiometer pO_2-O_2 %-saturation nomogram (Radiometer Chart #984-204).



MALSS PERFUSION CIRCUIT

1) Venous Cannula and Stopcock
2) Venous Return Line
3) Venous Oxygen Saturation Cuvette
4) Venous Reservoir, Sci-Med RV-1500
5) Roller Pump
6) Membrane Oxygenator, Sci-Med SM 35
7) Water Pump and Line to Heat Exchanger
8) Water Return Line
9) Reservoir, Ice Water
10) Air Flowmeter
11) Oxygen Flowmeter
12) Gas Line to Oxygenator
13) Arterial Oxygen Saturation Cuvette
14) Arterial Line Filter, 40 micron
15) Cobe 3-gang Stopcock Manifold (for blood samples, drug administration, and filter vent)
16) Aneroid Manometer for system and patient pressure monitoring.
17) Arterial Line
18) Arterial Perfusion Cannula and Stopcock
19) Trans Cannula Femoral Artery Pressure Line
20) Trantec Pressure Transducer
21) Tektronix Monitor

Temperature Monitoring

Patient and extracorporeal circuit temperatures are monitored with a Shiley TMI Temperature Monitor (Photo 6, lower left). The Shiley system employs copper-constantan thermocouples which can be placed rectally, esophageally, and in the reservoir of the oxygenator or the arterial blood line of the bypass circuit. The Shiley Temperature Monitor operates on an independent 6v battery power supply (4 each 1.5v "C" cells). The monitor can receive five temperature probes simultaneously and has front panel pushbutton probe selection and a liquid crystal display in degrees Celsius.

Suction and Compressed Air

Vacuum for patient suction and compressed air to provide gas flow for the oxygenator are provided by a modified 12v automobile type air compressor. The compressor, model # MC-150 was manufactured by Interdynamics Company of Brooklyn, New York and is capable of generating a 10 LPM airflow in a low load (0-2 psi) condition. The compressor was removed from the plastic housing provided by the manufacturer, and a barbed plastic connector was epoxied in place on the air intake port for attachment to the suction line. The compressor was then remounted in a custom built plastic enclosure which was lined with sound absorbing foam (Photo 8). The output line of the compressor was connected to a Dwyer Instruments VFA-5 0-10 LPM air flowmeter by 1/4" ID Tygon tubing. Air is directed from the flowmeter to the oxygenator by an additional length of 1/4" line which joins a "Y" connector, allowing delivery of either room air or pure oxygen to the oxygenator.

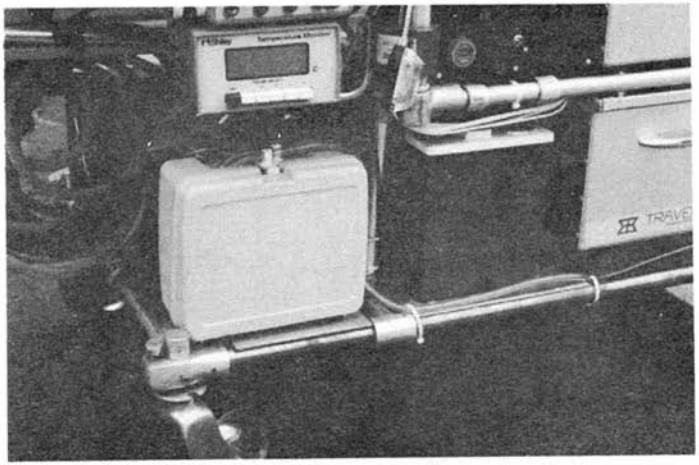


Photo 8. The case containing the air compressor/vacuum pump. The thermocouple meter is above the compressor, and one of the batteries is to the right, in the frame.

Heat Exchange

As previously noted, the Sci-Med 2 oxygenator also contains a high efficiency heat exchanger. Cold water for the heat exchanger can be provided by either a 40 lb capacity on-board ice reservoir or an 80 lb capacity auxiliary ice reservoir (Photo 9, right). Cold water is circulated through the reservoirs with an ITT model # 44010 water pump (Photo 10). The pump is capable of delivering 0°C to 2°C water to the heat exchanger at a flow rate of

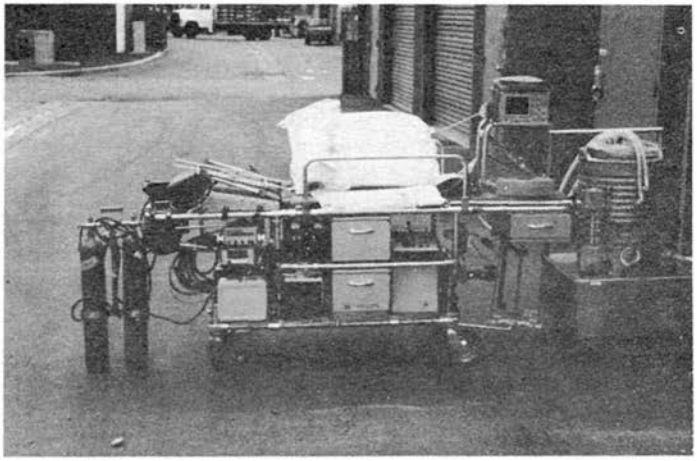


Photo 9. The Cryovita/ ALCOR MALSS. From left, top to bottom, the auxiliary "E" cylinders in their yoke, the head of the cart with HLR, Oxygen Sat. Meter, thermocouple meter, and compressor. The power distribution panel and batteries. The storage drawers. The blood pump. The oxygenator holder. The cardiac monitor and tool drawer. On the top, the oxygenator and sterile tubing pack. At the right end of the cart, the auxiliary ice reservoir.

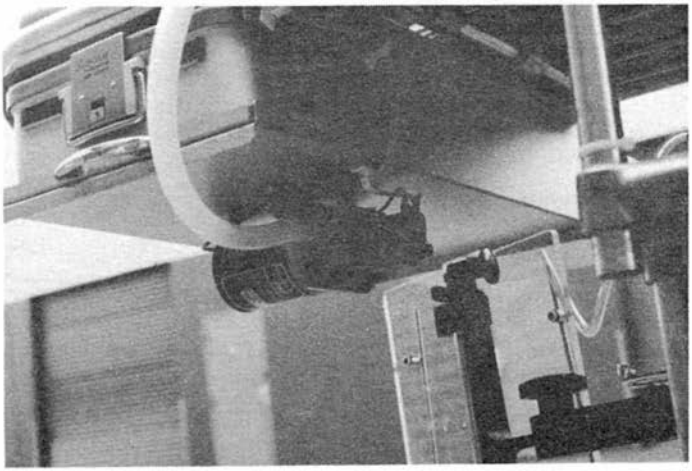


Photo 10. The water pump, attached to the bottom of the tray holding the AESCULAP sterilizer box with the surgical instruments and the tool drawer (far side, not seen). A portion of the oxygenator holder is seen at lower right.

approximately 9.5 liters/minute. In addition to extracorporeal cooling, the MALSS has been designed to accommodate external cooling of the patient. A waterproof blanket is available for the top of the cart, and the patient can be packed in tight-sealing Zip-Loc plastic bags containing crushed ice.

Pressure Monitoring

A Tektronix 412 Monitor is used to monitor arterial blood pressure with a Trantec 800 transducer. The 412 Monitor can operate on 115v AC or on its own internal NiCad battery power supply. Battery charge level is displayed on a front panel meter. The 412 has a dual trace CRT (cathode ray tube) that can display pressure in mmHg and ECG from a 3-lead electrode or pulse from a fingertip sensor. The pressure display has three pushbutton selectable ranges; 0-50, 0-125, and 0-250 mmHg.

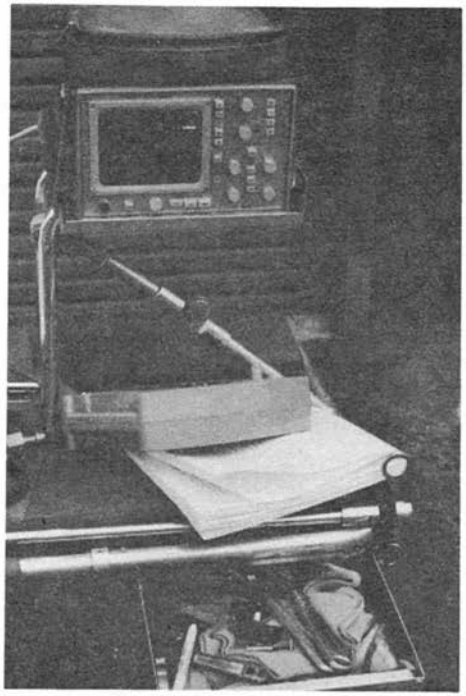


Photo 11. The Tektronix 412 Monitor on its platform at the foot of the cart. The open tool drawer is at the bottom of the picture.

The 412 Monitor is mounted on an instrument platform at the foot of the ECMO gurney (Photo 11). The platform, with monitor, folds down below the patient's feet during the surgical procedure and stores in a position above patient's the lower legs for monitoring during transport.

An aneroid manometer is used to monitor arterial line pressure as an emergency backup for patient arterial pressure given by the 412 Monitor. A calibration chart for the specific arterial cannula can be used as previously described[3] to determine the patient's arterial pressure.

Support Equipment and Supplies

Since the MALSS is designed to function as a completely independent mobile life support unit, a significant amount of storage space was incorporated into the unit. Two centrally located 1 cubic ft. capacity drawers contain intubation and ventilatory support equipment and supplies (endotracheal tubes, laryngoscope, manual ventilator, etc.), emergency medications, sterile drapes, gloves, and other disposable surgical supplies (Photo 12). A drawer located at the end of the cart directly over the oxygenator contains a selection of tools and replacement hardware and batteries (Photo 11, bottom). A complete inventory of the contents of the supply drawers is given in Tables 4 and 5. (Next page).

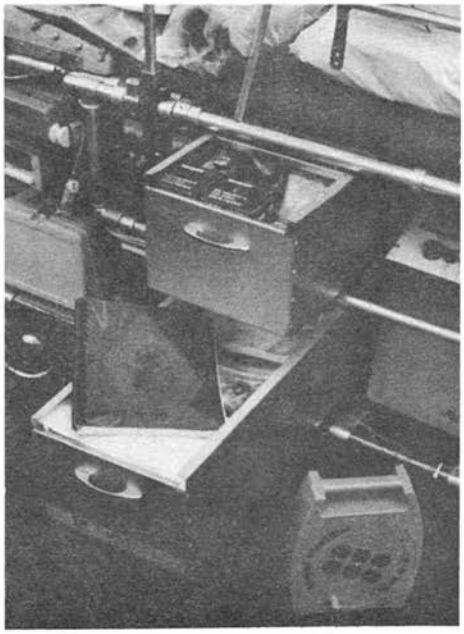


Photo 12. The open storage drawers in the center of the cart. The blood pump is on the right. At lower right is the 25' extension cord reel.

TABLE 4

MALSS PHARMACEUTICALS

THAM	Cimetidine
Heparin	Maalox
Mannitol	Solu-Medrol*
Diltiazem	Erythrocin
Desferol	Dexrtran 40
Nalaxone	Dextran 1
Metubine Iodide	

*Not given after 5 or more minutes of circulatory arrest.

TABLE 5

SUPPLY DRAWERS

1 ea Surgical Prep Kit, Deseret
1 ea Drape Pack (drape sheet, 4 towels, 2 gowns)
1 set Transport Medications
1 ea Extracorporeal Tubing Pack (custom)
1 ea Arterial Line Filter (40 micron, Shiley)
1 ea Gas Line Filter (Pall)
2 pr Surgical Gloves (size 7-1/2)
1 ea Arterial Cannula, 20 Fr
1 ea Arterial Cannula, 24 Fr
1 ea Venous Cannula, USCI Type 1967, 28 Fr
1 ea Venous Cannula, USCI Type 1967, 30 Fr
1 ea Venous Cannula, USCI Type 1967, 32 Fr
1 ea Manifold, 3-gang (Cobe)
2 ea Monitor Lines, 2 ft., w/ male-male Luer Connectors (Cobe)
1 ea Intracath, 19"
2 ea Angiocath, 18 ga
1 ea IV Set, vented
1 ea IV Set, unvented
2 ea HESPAN 500 ml bottle
10 ea Hypodermic Needle, 18 ga
30 ea Hypodermic Needle, 20 ga
2 ea Syringe ,60cc
10 ea Syringe, 12 cc
20 ea Syringe, 3 cc
12 ea Vacutainer, 10 cc, Red Top
1 pkg Syringe Tips (B-D)
1 ea Plastic Tape, 1" Roll
1 ea Plastic Tape, 1/2" Roll
2 ea Plastic Drape, 18"x18"
1 ea Oxygenator, Sci-Med 2
1 ea Reservoir, Sci-Med

A cut-down tray consisting of surgical instruments in an AESCULAP sterilizing box is stored in a compartment at the foot end of the gerney, (Photo 10), upper right) opposite the tool drawer. The instrument tray contents are given in Table 6.

TABLE 6

INSTRUMENT TRAY CONTENTS

1 ea DeBakey Bulldog Clamp, Curved
2 ea DeBakey Forceps, 7"
5 ea Tubing Clamps
1 ea Wietlaner Self-Retaining Retractor
1 ea Mayo Scissor, Curved, 5-1/4"
3 ea Mosquito Hemostats, Straight
4 ea Towel Clamps, 5"
1 ea Kelly Hemostat, Curved, 5"
1 ea Mayo-Hegar Needle Holder, 5"
1 ea Scalpel Handle
1 ea Metzenbaum Scissors, 7"
1 ea Ligature Passer, Right Angle, 7"
1 ea Instrument Clip
1 ea Fenestrated Drape, Cloth
1 ea Surgical Towel, Coth
1 ea Gauze Sponge, 4"x4"

Evaluation of the MALSS

Evaluation of the MALSS in a large animal model has not yet been undertaken. At the time of this writing the MALSS is undergoing a variety of static tests to determine the suitability and durability of the various components comprising the system. Early results of static tests indicate that the MALSS should be able to meet the criteria set for it and that, at a minimum, it should be capable of providing over 6 hours of independent extracorporeal support. This is a more than adequate amount of time to induce deep hypothermia and carry out blood washout in the average adult.

Substantially longer periods of operation should be possible in practice, since a substantial source of power drain is the air compressor and the heat exchanger pump. The availability of wall oxygen and supplemental cylinder oxygen in transport vehicles such as ambulances should confine the need to operate the compressor to emergency conditions or while switching "H" cylinders during vehicular transport.

Presumably once the patient has been cooled to a stable temperature and/or blood washout carried out, extended operation of the heat exchangee pump will no longer be required. This should be particularly true if the patient is packed in ice externally during vehicular transport.

Evaluation of these and other factors will have to await testing in a large animal model, and ultimately in a clinical setting with a human patient.

Discussion

Invariably, whenever an upgrade in the quality of care for cryonic patients is suggested or implemented there is discussion of the merits of the change. Usually this discussion is centered on the issue of cost vs. benefit. A significant and vocal faction within the cryonics community can be counted on to criticize each new advance as costly and unnecessary, arguing that any available cryopreservation protocol is equally likely to result in successful reanimation (with the principle difference between protocols being time to reanimation). Much of the motivation for the development of the MALSS system has come from extensive research which ALCOR has conducted over the past three years to determine the extent and nature of cryopreservation injury -- under both optimum and suboptimum circumstances. While a detailed summary of this work is inappropriate here, it is appropriate to note that major gross and fine alterations in structure can be directly attributed to the quality of perfusion and the extent of the distribution of cryoprotective agents. These factors in turn are dependent upon the patient's condition at the start of cryoprotective perfusion.

It is of course, impossible to disprove a negative. The authors cannot demonstrate that any currently available preservation protocol will **not** result in eventual reanimation. What we can say with assurance is that we (ALCOR and Cryovita) have a strong commitment to improving the quality of suspension techniques and firm belief that the less injury done today, the better the quality or fidelity of recovery the patients we treat will experience tomorrow. The application of modern medical techniques to satisfy established physiological requirements for the prevention of injury should be hardly controversial.

Much of the discussion over what is or isn't appropriate in biostasis procedures is likely to soon be swept away. Steady advances in the quality of cryopreservation techniques are likely to lead to the development of biostasis procedures which are either reversible or very nearly reversible for parenchymatous organs such as the kidney, heart, and liver. The development of perfected or nearly perfected vitrification techniques for whole organs seems likely within the next few years (at least in the laboratory)[18,19]. These developments will almost certainly greatly increase the demand for quality cryonic care as individuals within the cryonics community begin to appreciate the potential benefits of these advances and demand them.

The need for further upgrades in the quality of Transport (and other aspects of patient care as well) is thus likely to become even more urgent in the immediate future. As cryopreservation techniques improve, and particularly with the application of a perfected or near perfected technique for vitrification looming on the horizon, it will be even more important to insure that the patient is in as "viable" a condition as possible at the start of the biostasis procedure; i.e., has suffered little or no ischemic injury which would compromise adequate distribution of cryoprotectant in sufficient concentration to completely inhibit ice formation in the brain.

The MALSS is an attempt to further contain and eliminate damage experienced by biostasis patients. Properly deployed, in many cases it should offer virtually complete elimination of ischemic injury and delivery of the patient to cryoprotective perfusion with the central nervous system in a viable state. For the patient in whom brain injury was not the primary cause of death that is

a goal which is currently achievable. The authors feel strongly that it is a goal we must pursue.

REFERENCES

1. Leaf, J.D., (1979), Cryonic Suspension of Sam Berkowitz: Technical Report, **Long Life Magazine, 3(2),** (Mar-Apr 1979).

2. Leaf, J., M. Federowicz, and H. Hixon, (1985), Case Report: Two Consecutive Suspensions, A Comparative Study In Experimental Human Suspended Animation, **CRYONICS, 6(11),** 13 (Nov, 1985).

3. Darwin, M.G., J.D. Leaf, and H. Hixon, (1986), Case Report: Neuropreservation of ALCOR Patient A-1068, **CRYONICS, 7(2,3),** 17 (Feb-Mar 1986).

4. Leaf (1979), ibid.

5. Leaf et al, (1985), ibid.

6. Darwin et al, (1986), ibid.

7. Leaf et al, (1985), ibid.

8. Darwin et al, (1986), ibid.

9. Leaf et al, (1985), ibid.

10. White, R.D., (1983), Cardiovascular Pharmacology: Part 1, in Textbook of Advanced Cardiac Life Support, McIntire, K.M. and Lewis, A.J., Eds., p. 99, American Heart Association, Dallas, 1983.

11. Ionescu, M.I., and G.H. Wooler, Eds., (1976), Current Techniques in Extracorporeal Circulation, p.517, Butterworth & Co., 1976.

12. Bregman, D., Ed., Mechanical Support of the Failing Heart and Lungs, p.166, Appleton-Century-Crofts, New York, 1977.

13. Turina, M., B. Litchford, I. Babotai, M. Intaglietta, and N.S. Braunwald, Servo-Controlled Extended Cardiopulmonary Bypass, **Trans. Amer. Soc. Artificial Internal Organs, 19,** 504 (1973).

14. Wetmore, N.E., R.H. Bartlett, A.B. Gazzaniga, and N.J. Haiduc, (1979), Extracorporeal Membrane Oxygenation (ECMO): A Team Approach in Critical Care and Life-Support Research, **Heart and Lung, 8(2),** 288 (Mar-Apr 1979).

15. Lande, A.J. et al, (1977), Mobile Profound Life Support, **Trans. Amer. Soc. Artificial Internal Organs, 23,** 736 (1977).

16. Kolobow, T., R.G. Spragg, J.E. Pierce, and W.M. Sapol, (1971), Extended Term (to 16 days) Partial Extracorporeal Gas Exchange with the Spiral Membrane Lung in Unanesthetized Lambs, **Trans. Amer. Soc. Artificial Internal Organs, 17,** 360 (1971).

17. Personal communications by J. Leaf with all U.S. manufacturers of current

membrane oxygenators. Only Sci-Med is rated for long term support (i.e., over 7 hours).

18. Beasley, A., Scientists move in on organ storage breakthrough, **Orlando Sentinel**, Summarizes a news release by the American Red Cross on the work of Dr. G. Fahy. Article reprinted in **The Orange County Register**, p.1 (Dec 27, 1986).

19. Fahy, G.M., (1986), Vitrification: A New Approach to Organ Cryopreservation, in Transplantation: Approaches to Graft Rejection, H.T. Meryman, Ed., Alan R. Liss, 1986.

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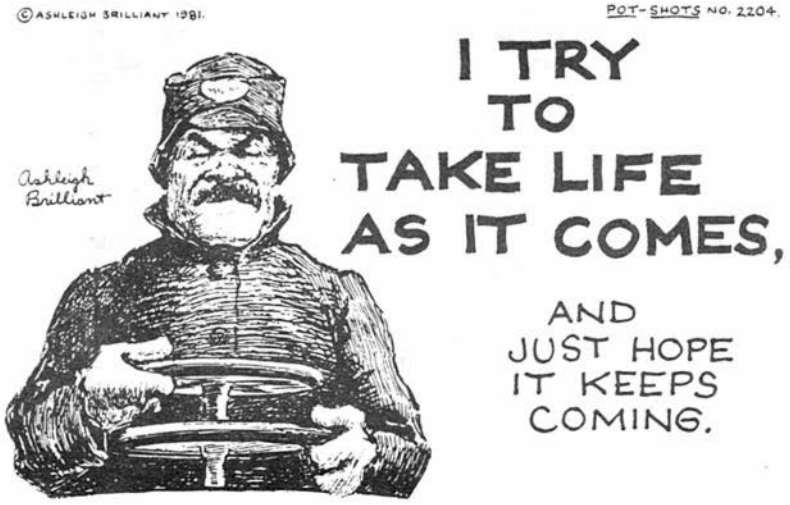

MARCH - APRIL 1987 MEETING CALENDAR

ALCOR meetings are usually held on the first Sunday of the month. Guests are welcome. Unless otherwise noted, meetings start at 1:00 PM. For meeting directions, or if you get lost, call ALCOR at (714) 736-1703 and page the technician on call.

ALCOR

ALCOR LIFE EXTENSION FOUNDATION

The MARCH meeting will be at the home of:

(SUN, 1 MAR 1987) Paul Genteman
535 S. Alexandria, #325
Los Angeles, CA

DIRECTIONS: From the Santa Monica Freeway (Interstate 10), exit at Vermont Avenue, and go north to 6th St.
From the Hollywood Freeway (US 101), exit at Vermont Avenue, and go south to 6th St.
Go west on 6th 4 blocks to Alexandria, and turn right. 535 is the first apartment building on the west side of the street. Ring #325 (Note: See the building directory for the correct phone number to punch) and someone will come down to let you in.

The APRIL meeting will be at the new ALCOR/Cryovita facility:

(SUN, 5 APR 1987)
ALCOR/Cryovita Laboratories
12327 Doherty St.
Riverside, CA 92503

DIRECTIONS: Take the Riverside Freeway (State Hwy 91) east toward Riverside. Go through Corona, and get off at the McKinley St. exit. Go right (south) on McKinley. Turn left (east) on Magnolia. Go across the railroad tracks and turn left (north) on Buchanan St. Doherty is the second street on the left. Turn left on Doherty, and then turn right into the back of the industrial park. 12327 is the third building from the back, on the right.

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"Any day above ground is a good one."

— California Bumper Sticker

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