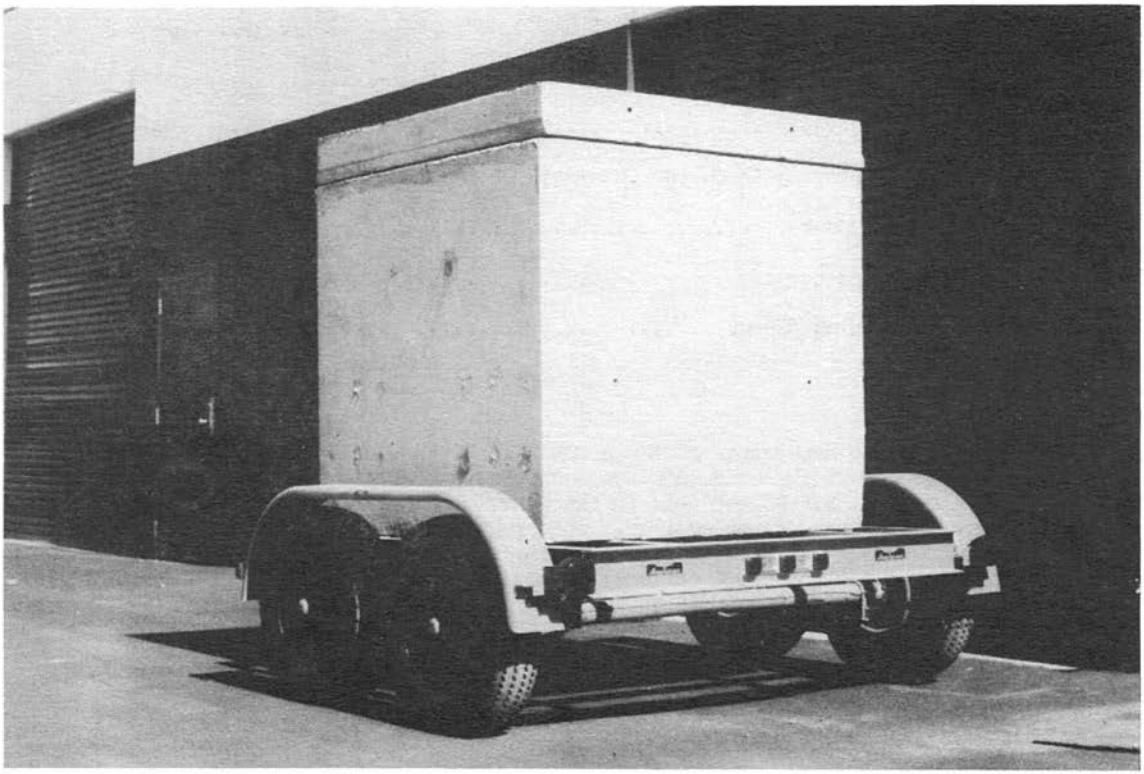
CRYONICS

DECEMBER, 1984 ISSUE # 53

VAULT ARRIVES



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EDITORIAL MATTERS

If you look through this issue of CRYONICS you will notice that it is loaded with "custom" illustrations. These graphics were produced by Mike Darwin and the newest member of the CRYONICS staff, an Apple Macintosh computer. The new computer is courtesy of Saul Kent and Bill Faloon. We have needed a second computer for some time now, due to heavy workload and downtime which occur with our present system. Our present system has also become something of an orphan and servicing it and acquiring software for it have turned into serious problems.

Please excuse us if we're a little "heavy" on illustrations this month, but we haven't quite come down from Cloud 9 yet. The MacPaint program (which assisted in generating our "comic-book" issue of CRYONICS) is exciting beyond words. If ever there was a frustrated artist inside you, MacPaint offers the possibility of setting you free. Since the machine arrived, Mike Darwin has been glued to it busily illustrating everything. At last report he was hard at work on a complete set of illustrations for the Bible...

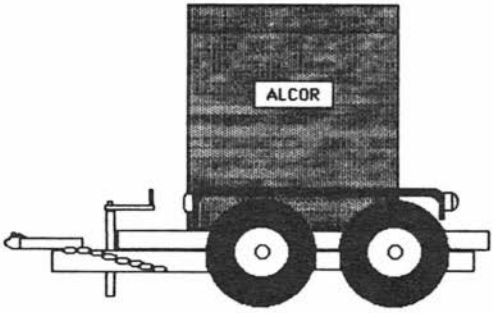
Our new Macintosh is basically a "Fat Mac" with 512K, two disk drives, a 1200 baud modem and an Imagewriter printer. For those unfamilar with computer jargon this translates as follows: the system is "loaded" with goodies. We also got this system at a bargain basement price: $3,400!

Two other reasons we chose the Mac were its incredible graphics program (MacPaint) and its user friendliness (It practically gives you a hug and a kiss when you turn it on). We also hope that two computers (when the Mac is fully deployed) will reduce the number of vicious (ha, ha and you think we're kidding!) fights between would-be system users. Of course, the Mac will also allows us to prepare research results more quickly than has been possible in the past and also simplify and improve the quality of our accounting and billing. For the latter we have plans to purchase a new, inexpensive accounting package from Peachtree (a leading business software house) which includes General Ledger, Accounts Payable and Accounts Receiveable. This should simplify and integrate financial accounting.

Our sincere thanks to Bill and Saul.

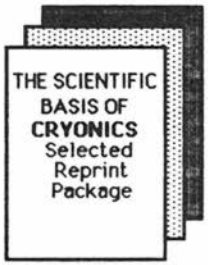
CEPHALARIUM VAULT ARRIVES

As you can see from our cover, the cephalarium vault has arrived. On October 25th a large flat-bed truck with a massive boom crane pulled up to the rear of Cryovita (where ALCOR leases space) and gently set down the 10,000 pound vault and trailer assembly. The previous week we had taken the trailer out to Utility Vault Company in Fontana, CA to have the vault attached to the trailer. A few days later Hugh Hixon and Mike Darwin went out to Fontana to inspect the vault and mounting job and assess the feasibility of towing the assembly 30 miles back to ALCOR with Hugh Hixon's 3/4-ton Toyota Land Cruiser. A two mile jaunt demonstrated that towing the vault (at speeds up to 30 miles an hour) was possible with such a comparatively lightweight vehicle, but that long distance towing would require something heavier. Since Utility Vault offered delivery at a rate lower than renting a truck, it was decided to have the vault/trailer delivered.



Of course, taking delivery on the vault was the easy part. Making space for it in our current badly overcrowded quarters was another matter altogether. However, a little ingenuity paid off and we managed to accommodate the vault without losing a serious amount of space. The next step will be to complete detail work to prepare the vault to receive the cephalarium. We had planned to apply waterproof paint to the concrete, but Mike Darwin in calling around for information discovered that the releasing agent the manufacturers used to separate the reusable form from the concrete also has the effect of releasing any other material (i.e.-paint) too. A quick test verified that it is indeed easy to produce an unsupported piece of paint. The vault will need to be outfitted with an insulated neck plug and "water-logs" to improve its fire resistance, and with other accessories to make its maintenance as simple as possible We anticipate that this "detail work" will take about two more months to complete and we should then be ready to proceed with moving patients into the vault.

We are still in urgent need of contributions to help complete work on the vault and we urge you give us some added support to help us over the hump.



NEW ALCOR LITERATURE PACKAGE AVAILABLE

We are now offering an extensive collection of offprints on the scientific basis of cryonics. This package contains articles on a wide range of topics which bear on the feasability of cryonics and the possibilities for repair of freezing injury. Included in the package are articles such as "Histological Study of a Temporarily Cryopreserved Human" (which appeared in the November issue of CRYONICS), Suda's classic brain freezing paper, and numerous papers on molecular engineering.

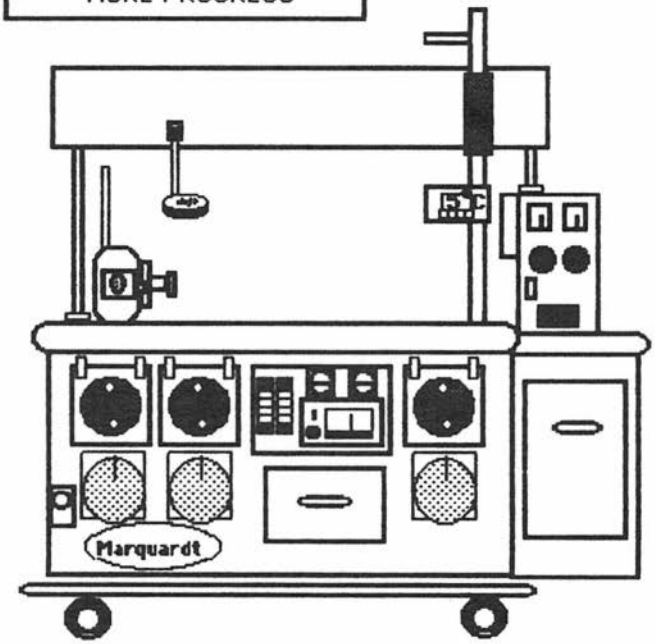
This offprint package is an ideal way to inform technically oriented people about the basis for and feasability of cryonics. There are ten offprints in the package and we have plans to add more in the future. The package is available for $10.00.

New Edition of Cryonics: Threshold to the Future

The ALCOR "Bluebook", Cryonics: Threshold to the Future has been updated, illustrated (pre-Mac) with photographs and drawings. This attractive handbook of basic information about cryonics and ALCOR is now a full 8 1/2" by 11" in size. In order to make spreading the word easier, we are offering the Bluebook at half of our production/mailing cost: $1.00. Quantities of 10 or more are available for 75 cents each.

Whenever you order items from us, including subscription renewals please be sure to make your checks payable to the ALCOR LIFE EXTENSION FOUNDATION. Unfortunately, we cannot cash checks made payable to CRYONICS. We have to return such checks for re-issue and that a means a delay in receiving merchandise for you and an administrative headache for us.

TOTAL BODY WASHOUTS: MORE PROGRESS



The ALCOR Suspension/ Research Team has completed Total Body Washout (TWB) #4. This animal, named Mr. Bear, was subjected to blood washout (hematocrit was unreadable), cooling to 5 degrees C, and four hours of continuous perfusion at that temperature. We were better able to control some of the variables which were partly responsible for failure with our last animal (namely too low a perfusion temperature, acidosis and poor electrolyte balance). Mr. Bear recovered from perfusion much faster than our previous four-hour survivor, Enkidu (see November 1984 CRYONICS). Mr. Bear was eating solid food 48 hours after perfusion and was walking within 72 hours.

Twelve days following the experiment Mr. Bear had recovered most of his previous energy level and was going for extended outdoor jaunts. One of the fascinating and rewarding things about this work is the opportunity it has afforded us to study the physiology of the post-perfusion state. By monitoring the animal's biochemistry we have been able to track injury (and recovery) of various organ systems as a consequence of perfusion. We are very excited by the results we've obtained so far and hope to have more results to offer in the near future.

So far we've subjected four animals to TBW; three for 4 hours and one for 1 hour. We have had all these animals survive with the exception of one 4-hour animal.

The volunteers who've shown up weekend after weekend deserve the generous thanks and support of ALL the ALCOR membership. It is especially worth noting that Sherri Cosgrove, Jerry Leaf, Brenda Peters, Al Lopp, Scott Greene and Hugh Hixon spent the night at Cryovita (bunked out on the floor, sofas and anywhere else that would hold them) with very little sleep and no creature comforts. It's hard to say how good the thought of a shower, clean clothes and a warm bed can seem after 18 hours of tense activity in scrub suits! These team members

avoided the lure of a quick escape and stuck it out till Mr. Bear regained consciousness. Sherri and Jerry deserve a special thanks as they remained awake for over 20 hours continuously (constituting a two person ICU nursing crew) when the rest of the team had sacked out (and Mike Darwin had snuck off to home). To all of the team: congratulations and keep up the good work!

Mike Darwin and Mr. Bear

THE ETHICS OF ANIMAL RESEARCH

One of the first questions which comes to some people's mind is the morality of research with animals. This is particularly the case when large, intelligent animals such as dogs, monkeys or cats are employed in research. The question is often asked, do we have the right to cause the suffering and death of other creatures in the pursuit of knowledge and survival? This is either a very tough or a very easy question, depending upon your point of view. Some people take the position that rights are "natural" and "inalienable," while others argue that rights are what people (or other intelligent creatures) sit down and agree on. Regardless of the position taken, there can be no denying that work with "pet animals" such as dogs and cats is a tough business emotionally. The fact of the matter is that many large mammals have personalities, psychologies and emotional lives which are very like our own. They may not be symbolic or intellectual creatures, but they can suffer, be affectionate and dependant, and try very hard to please. These are the kinds of things that we prize in humans too. It is hard to cause discomfort or inflict death on a good-natured creature who bears you no ill will, and in fact looks to you with trust.

For cryonicists, life, our life is the central value. To hold any other position would end us—as individuals and as a species. We think that would be a pretty stupid and counterproductive thing to have happen, not just for ourselves but for the animals and other life forms which will probably benefit in the long run from more stable and more developed human control of the world. Simply put, we here at ALCOR hold human life and our lives as more valuable than the lives of animals. This is not to say that we do not respect animals and that we do not feel an obligation to treat them humanely and well. All of us involved in animal research feel quite strongly that animals represent a valuable and even sacred tool which should not be callously or carelessly misused.

Recently we have become aware that there is a growing and vociferous group of people in this country who oppose all animal research—even where human lives and health are at stake. We cannot and will not stand idly by while these individuals injure and attempt to destroy our species. The success and growth of cryonics (and thus our own survival) rest to a great extent upon work conducted with animals. Our Total Body Washout work is only one of many examples where this is the case. We freely admit our use of animals in the past

and our commitment to their use in the future. We do not shy away from the fact that our work has caused discomfort and death for other creatures. In a world of gratuitous death and mayhem we feel we have nothing to be ashamed of. We also wish to point out that the place to start with animal rights is to eliminate their slaughter where it is unnecessary. We live in a world where animals are inconvenienced, tortured and slaughtered for clothing, food and recreation. As we point out elsewhere in this issue, there is a growing body of evidence which indicates that consumption of animals as food is not even healthy—leaving completely aside its cruel and wasteful aspects.

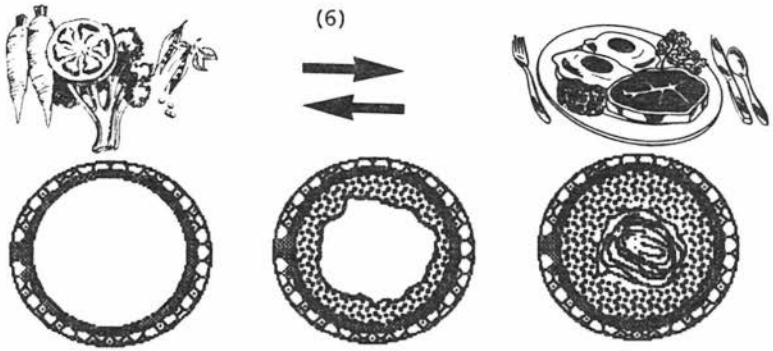
Several ALCOR members (including ALCOR's President Mike Darwin) are vegetarians for these very reasons. It would behoove animal rights advocates to put their own houses in order and lobby to eliminate truly wanton slaughter and misuse of animals where it is not only optional but actually a threat to human health and well being. Terrorist attacks and threats of mayhem and bodily harm on researchers and their families by animal rights radicals leave us angry and indignant. In a world of predators and prey, they are attacking research for the same reason that any predator attacks a given target; it's an easy mark.

ATHEROSCLEROSIS: ANSWERS BRING DILEMMAS
by Mike Darwin

The November, 1984 issue of SCIENTIFIC AMERICAN contains a very interesting article on the cause and treatment of atherosclerosis by two of the world leading researchers in that field; Michael S. Brown and Joseph L. Goldstein. The article entitled "How LDL Receptors Influence Cholesterol and Atherosclerosis" is a beautifully crafted story of scientific detective work. It is essential reading not only for those with an academic interest in atherosclerosis, but also for those of us with a more personal interest in the disease.

The article is impressive because it explains clearly the mechanism(s) by which atherosclerosis occurs in a variety of conditions. A good part of the current understanding of the disease has grown out of an uncommon, accelerated form of the illness known as familial hypercholesterolemia (FH). FH is a genetic disease which results in rapid progression of atherosclerosis leading to heart attacks and other atherosclerotic disease in very young people; in the most serious form of the disease, as early as six to eight years of age. FH results due to defective or absent low density lipoprotein (LDL) receptors.

In so-called "normal" people atherosclerosis occurs at a slower rate. About 50% of the population in Western countries develop atherosclerosis in a severe enough form to result in death. In these individuals LDL receptors begin to decline during the first years of life and the remaining receptors may become defective as well. The reason for this is not well understood, but one major factor which has been identified is the high fat diet of Western man. As the work of Brown and Goldstein as well as the work of other investigators has established, humans are born with similar levels of LDL receptors to other animals such as rabbits and dogs. When these animals are put on high fat diets their levels of LDL receptors decline by as much as 90%! Low levels of LDL receptors result (through a complicated series of events) in high circulating levels of cholesterol containing LDLs which ultimately end up being taken up and deposited in artery walls.



Perhaps the first person to realize that a high fat diet was a primary culprit in atherosclerosis was Nathan Pritikin. Pritikin approached the problem from an epidemological point of view rather than a mechanistic one such as Brown and Goldstein have used. Pritikin looked at human populations who have low or nearly absent levels of atherosclerosis and then drew conclusions about desirable diet on that basis. Nearly 20 years later the basic mechanism of atherosclerosis has been elucidated and Pritikin's dietary recommendations have been largely vindicated.

Brown and Goldstein conclude "If the LDL-receptor hypothesis is correct, the human receptor system is designed to function in the presence of an extremely low LDL level. The kind of diet necessary to maintain such a level would be markedly different from the customary diet in Western industrial countries (and much more stringent than moderate low-cholesterol diets of the kind recommended by the American Heart Association). It would call for total elimination of dairy products as well as eggs, and for a severely limited intake of meat and other sources of saturated fats."

All very well so far. The good news in all of this is that there is a way to protect ourselves against atherosclerotic disease. But then Brown and Goldstein go on to say "We believe such an extreme dietary change is not warranted for the entire population... First such a radical change in diet would have severe economic and social consequences. Second, it might well expose the population to other diseases now prevented by moderate intake of fats. Third, experience shows that most Americans will not voluntarily adhere to an extreme low-fat diet. Fourth, and most compelling, people vary genetically. Among those who consume the current high-fat diet of Western industrial societies, only 50% will die of atherosclerosis; the other 50% are resistant to the disease." The authors then go on to conclude that drugs should be developed to increase LDL receptors or otherwise reduce cholesterol deposition on artery walls.

It seems to me that there is a lot wrong with the conclusions these authors have reached. First of all, they neglect extensive research done outside of their immediate area of interest which links diets high in both saturated and unsaturated fats not only to atherosclerosis but to cancer and other degenerative diseases as well. Overall, the number of people who might benefit from low fat diets is probably much greater than 50% of the population. Second, they neglect the fact that 50% of the population is a pretty high mortality rate. In fact, it's an epidemic! At least educating people vigorously about the known and possible benefits of a low fat diet would seem prudent. Imagine failing to use quarantine or sanitation in the face of infectious illness

because it might inconvenience the 50% of the population who won't catch the plague and die! The author's arguments about Westerners not tolerating a diet low in fats might have been used against the Heart Association when they successfully (and mistakenly) launched their campaign to reduce saturated fat intake and replace it with polyunsaturates over 20 years ago. The fact of the matter is that Westerners have shown remarkable dietary adaptability in the face of persistent education. In part this is because food companies, reacting to pressure, have delivered palatable products which don't contain animal fat. The same kind of thing needs to be undertaken with respect to fats in general. Certainly it goes without saying that reducing fat intake for the next generation should be an achievable goal with good education and proper products in the marketplace.

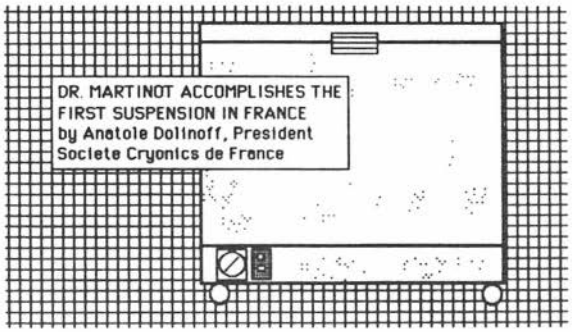
Perhaps the most amazing thing in Brown and Goldstein's conclusions is the notion that dairy products would be "totally eliminated." I am on a modified Pritikin diet (i.e., I restrict fat to his recommended 10% of calories consumed but allow myself salt and some sugar) and skim milk, nonfat cottage cheese, nonfat yogurt and food products derived from nonfat milk constitute the major part of my protein intake (I am also a vegetarian). It is nothing short of amazing that these authors would not have heard of NONFAT MILK!

The authors' notion that a very low fat diet would result in economic dislocation is not only callous, it is absurd. Consider the economic gain if 50% of the population isn't debilitated and killed by atherosclerosis. Think of the lost productivity resulting from heart attacks, strokes and other atherosclerosis related illness in people during the "prime" of productive life.

Finally, the issue of unspecified disease that might result from lowfat diets needs to be addressed. There is, to my knowledge, no evidence that very low fat diets cause disease, any disease, if the individuals are otherwise adequately nourished. On the contrary, high fat diets are currently responsible for a morbidity and mortality which claims half the population.

There is also one other thing which needs pointing out about this article and that is that nowhere does it mention Nathan Pritikin or any evaluations of his success or failure in getting Westerners to switch over to a very low fat diet. Even more to the point, the article fails to assign any credit to Pritikin for his pioneering role in identifying high dietary fat intake as a primary cause of atherosclerotic disease in humans.

I have a healthy respect for the effort it takes to alter one's diet radically. But I also know that it can be done, particularly if the stakes are high. It seems to me that as a minimum those individuals with a known risk for atherosclerosis (i.e., those with cholesterols over 160, or those who have a family history of atherosclerotic disease) should be advised to alter their diet and provided with the materials and methods to do so (these already exist in the form of a number of cookbooks and dietary guides available largely as a result of Pritikin's work). In the long run, perhaps solutions such as genetic manipulation of receptor levels or other changes may provide a solution to the problem. But at the present time, in the absence of clearly workable alternatives, failing to appraise people of a known, workable way to avoid atherosclerosis is a pretty poor excuse for good ethics or good science.



Doctor Martinot is now 62 and retired. He is both a Doctor of Medicine and a Doctor of Science, and has worked as Assistant at the Faculty of Medicine of Paris and as Medical Manager of the House for Old People of Rueil-Malmaison, a town of over 50,000 to the west of Paris.

Dr. Martinot has been a partisan of the concept of human suspension at low temperatures since the beginning of the cryonics movement, and is President of the Association Cryonics Francaise, which has been inactive since 1972. He has often attended our meetings as an associate member, and is a major European advocate of human hibernation.

Because of a dangerous illness, he has since 1975 owned a mechanical freezer capable of a temperature of -95 degrees centigrade, and had instructed his wife to put him into it in case of his death. Since that time, he has lived in a chateau near Saumur, about 300 km. SW of Paris.

In February, 1984, his wife was hospitalized for a non-cancerous tumor in the iliac region, and died on the 25th of that month, due to a hemorrhage of the iliac vessels. In accordance with the instructions of Dr. Martinot, she was immediately perfused with heparin and plasma substitute, and her temperature lowered to 0 degrees centigrade. She was then taken to the chateau and placed in the freezer at -65 degrees centigrade.

Dr. Martinot made no announcement of all this. Unfortunately a power failure occurred, and Dr. Martinot bought dry ice from a funeral organization. The funeral organization immediately called the police, thinking that perhaps the dry ice was for the preservation of a cadaver.

This was the reason why the freezing of Dr. Martinot's wife was revealed on July 26 by all the French media, including TV, radio, the largest daily French newspaper, France-Soir, and the weekly newsmagazines like PParis Match, that you have seen.

The comments have generally been between bad and extremely bad. On this evidence, the general opinion of the public is that death is God's job and that whatever is done to counter this is the Devil's enterprise. I have answered all the reporters and their editors by pointing out their misconceptions, sending them our "Motivations of the Societe Cryonics de France", and a paper developing the following ideas:

-Now that aging can be arrested by cryonic suspension, psychological views about death must be changed. To die at age 85 is an imbecile ambition.

-We are a non-profit organization.

-We do not interfere with Christianity because even those brought back to life will die finally in wars, accidents, or other misadventures.

-We are not suspending a dead person, or cadaver, but an organism in which all the cells are still alive and possess all their

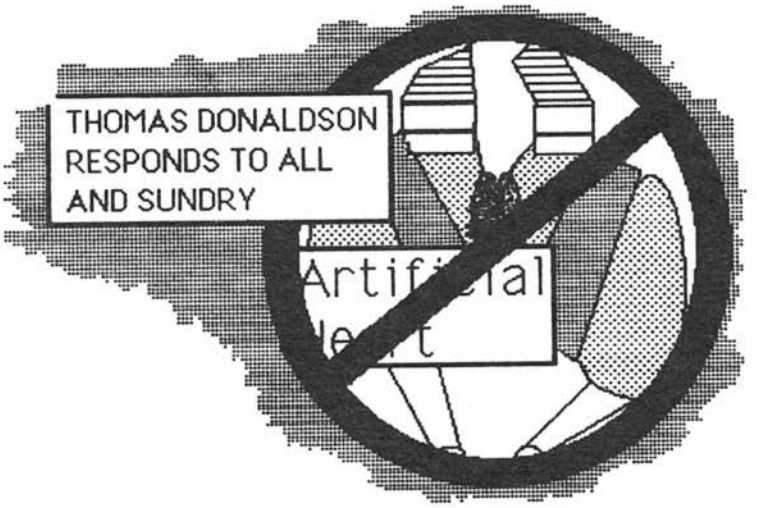
biological potential.

-We use a cryoprotective agent giving a vitreous state at microscopic scale, and an isotonic solution which supresses the exchange of ions between vessels, extracellular spaces, and intracellular spaces. This suppresses the formation of ice crystals.

-Presently, lyophilization (freeze-drying) doesn't work.

-We do not have the ambition to freeze all of France, but only those who: 1)Want to, and 2)Can, be suspended at low temperature. To freeze the entire French population would require 4 millionths of the surface of France, covered with buildings 20 stories high.

The answer to my representations has been an article on me, with my picture next to the front page title of the 15 August France-Soir, with two other pictures and text covering about half of page 2, with the concluding line, "And perhaps, if he is right?"



I enjoyed the latest issue of CRYONICS, despite (and perhaps because) there were a lot of disagreements with me in it. To continue the debate, here are my comments in reply to Mike and Hugh.

First, about Barney Clark. Mike does report my opinions with reasonable accuracy, except in his belief that I'm not aware of the difference between experiments on human beings and experiments on dogs. Experiments on apes might be more to the point, and I should have said so. However, I don't feel he's answered my major criticism.

In the first place, being frozen and being dead just aren't the same things. I can reasonably claim that someone is better off frozen when they would certainly not be better off dead. Furthermore, Mike is mistaken about my motives. He tries to mock my attitudes by saying that I "want to hop in the

freezer" whenever I become terminally ill. That is exactly what I am intending. I don't think it will be an easy decision, but as a cryonicist I KNOW that it is eventually going to come down to that. The best I can do is to try to prepare myself emotionally for it. Perhaps I won't be able to do it; if so that would be a terrible disaster, because failure to do so is likely to severely impact my suspension.

"If I had any say over the billions of dollars going into kidney dialysis I would favor devoting almost all of it to suspension research and suspension practice, unequivocally."

The reason why it will come down to that is one fundamental point which Mike neglects completely, which is equally valid in the case of kidney dialysis, and which blows his argument to pieces. It is the point about cost and value for money. Somehow we have to pay for these treatments. The expense will directly or indirectly reduce the money available for our suspension. We will have to make a CHOICE.

Looked at in individual terms, if we all had to pay for our artificial hearts, we would be faced with a very expensive procedure which will prolong our lives to only a trivial extent and waste our suspension funds. I don't think there would be any choice at all, in logic. Perhaps I wouldn't feel so at the time, but that's no argument at all. If I were hooked on heroin I wouldn't want to give it up, but that's not an argument for heroin. If there is anything I could do now to deal with the problem, it would rationally be activities aimed at preventing me from wasting my estate in that way. I resent very deeply all the attempts of medical researchers to produce still more temporary fixes which may hook me onto their machines and drain my suspension funds. Furthermore, every rational cryonicist is faced with precisely the same choice. We know that we could, if we wanted, spend every penny upon temporary measures, and the day will come when we will have to say: Enough! We will have to say it.

I don't know what is "smug" about that attitude, either.

Now (still speaking in individual terms) some of these procedures have been paid for by the government. Someone, of course, is still paying. If it cost me nothing, of course I would avail myself of such technologies...at the time and if they existed. But there is still the question of whether they should be brought into existence. Mike, wouldn't you rather this money went into research into cryonics? I know as well as you right now that it wouldn't go into suspension research; that is exactly the problem and the screwy sense of priorities with which noncryonicists are afflicted. If I had any say over the billions of dollars going into kidney dialysis I would favor devoting almost all of it to suspension research and suspension practice, unequivocally. There simply is no comparison.

In fact, let's take this all the way in individual terms. Let's suppose that I actually suffered from kidney disease and required dialysis, and furthermore in a case in which transplantation was not possible and survival looked grim (not always the case, of course). Right now I would have no chance at all of devoting the money (well over the amounts needed!) which would be spent on my for dialysis to my suspension. Suspension is the thing I would want much more if I had to choose between them.

You have been a dialysis technician for a long time. Well, Mike, wouldn't you rather be a suspension technician? I know very well that you don't have the choice. That fact, and what it says about public and private priorities, is exactly the point on which I was being nasty. I think that public, common values about life are perverted and deserve great acidity and nastiness in comment. If these people want life, why don't they choose suspension? We know that if they choose artificial hearts they are choosing death. It may look like life, but it is death.

When Mike says "with cryopreservation techniques being so poor, every day I stay alive may work to improve my chances," he is talking about a period of a year only. Just who is he fooling?

The individual case wasn't the whole case you were making for in favor of dialysis (or artificial hearts). You were also saying that useful knowledge would be gained and we can't expect progress without pain and failure along the way. I agree that useful knowledge would be gained. However, the question of cost-benefit still arises. Not all experiments are equal. From any experiment something may be learned; it doesn't follow that the experiment is worth performing. There is a question of cost-benefit here too.

As you know, Mike, I am a well known supporter of the FDA, just as you say.* The FDA is also well known for promoting immortality through medicine. Actually, though, artificial hearts as temporary substitutes would be a useful thing and I agree with that. It can be very useful to delay suspension for a week when it is not useful to delay it for a year. If there is any merit to Barney Clark's ordeal, it may lie in demonstrating the fatuity of the FDA one more time and thus producing a situation in which a real honest benefit could come from an artificial heart. However, I can't convince myself that the experiment on Barney Clark had any redeeming merit in itself nor any actual merit as a political move. It is simply a fact that Barney Clark did not have the option of a transplant. Suppose it were you there, Mike. Suppose particularly you had to choose one or the other but not both? Would you have taken the artificial heart or would you have taken suspension? We know what Barney Clark and the attending surgeons did; but that's a sign of their screwy values. (My contempt is directed much more at the attending physicians, for Clark I feel pity.)

We did not discover a vaccine for polio by researching hi-tech artificial lungs. It just didn't work that way. True, iron lungs still have marginal use in medicine, but they weren't really where the action was at the time and they aren't now. Similarly, research directed at artificial hearts just doesn't look to me like proper research directed at the central problems. It really isn't a sufficient argument to say that something may be learned by such experiments. You have to answer the case that a lot more and of a lot more significance might have been learned by some other experiments.

What these researchers want to do is spend enormous amounts of money to achieve very marginal and temporary benefit. Their motto is: "Millions for defeat and not one cent for victory!"

It is also true that a vast publicity apparatus accumulates around some

* Editor's note: Donaldson is being sarcastic here. He actually hates the FDA with a passion.

kinds of science. I am in favor of science. I am in favor of science if it means the application of our intelligence and skill toward the improvement of our lives. That doesn't obligate me to take seriously every scientific "triumph." Some of these may be wrongheaded or worse; the claims of their proponents can't be taken at face value. Progress is great, but some kinds of progress are greater than others.

It was trumpeted about as a great victory, but Barney Clark was an abject defeat. Where is he now, after all? Or to put it in other words, the attending physicians have assured us that There Is Light At The End Of The Tunnel. The Enemy Has Suffered Tremendous Losses And Our Body Count Is High.

In The Prospect of Immortality Ettinger comments that if we do not adopt cryonic suspension now, we will condemn an entire generation to death, and that this will be monumental stupidity. That is exactly what is happening now, and it is monumental stupidity.

Secondly, now that we are on to the subject of values, I'll comment about Mike's supreme goal of survival. Mike knows, and I know, that he can't possibly mean continued existence in ANY form at all. Mike is a bundle of values, and if deprived of the ability to exercise some of these values, Mike, too, will reject the price of "survival." In the very same issue of CRYONICS Mike gives us cautions about antiaging drugs. We know that everything will have its price, and Mike has just said in so many words that some prices would be too great. Those are cautions about antiaging drugs.

What needs to be done if we are to think about this issue at all is to make explicit just what our values are here. Survival just isn't explicit enough. Where is the Mike who will survive if he is turned into an amoeba? All of my commentary on this question was an attempt to make this issue explicit. I certainly don't pretend to have the last word on this problem, but I disagree strongly that asking it suggests that I am unaware of human diversity, or smug, or any other of the things Mike has called me. Values are not beyond questioning. The question of what I want or what Mike wants is not settled if Mike or I simply announce that we want something.

The "diversity" issue is worth mentioning here too. People do have many different values. My first article stated quite explicitly that I was trying to describe the sorts of changes which would become common. I know, just as Mike knows, that people can be found who will want and do absolutely anything. Of the possible a much more limited class will become common.

Furthermore, I believe that Mike is wrong about the examples where people attempt (he says) to redesign their values. Yes, it is true that some people don't like their sex drives, but that's not the point. Drives aren't the same as desires. Anyone who has striven for self-control knows the difference. Furthermore, cyproterone acetate is often the best of bad choices, and those who take it know that. Of these people (a very interesting thought) even fewer want to go all the way and have themselves castrated. I believe that this situation will continue. Monks and other religious are perhaps the poorest example of all, because the point is to make a sacrifice to God. If they were castrated they could not sacrifice something they didn't have. Finally, Mike in his discussion seems to me to confuse temporary abstention with total abstinence. Just because we want sex it doesn't follow we want it constantly.

Again, it isn't enough to show that our values change in order to show that we will redesign them. Values do change, but not by design. Mike, do you propose to redesign away your desire for survival? That's exactly the kind of redesign I was talking about. I have thought about these issues; I believe you have. I'm not going to tell you what to do with your life, Mike, but I don't feel its presumptuous to analyze someone's expressed desires just as I would analyze my own. We are discussing the question of desires and how they fit together. I don't claim my analysis is the last word, it's just my analysis.

On telepathy. I understand what you say but I start wondering about whether even you would want telepathy when you start talking about controls. What is this limited telepathy which you want? We do have limited telepathy now. It is called "speech." There is a fundamental problem, not a technological one, about human separateness, togetherness, and how we are to balance between them. It is the choice of that balance which is the fundamental problem: if you really want somebody to know something, why don't you tell them right away? Will your telepathy admit lying or deceit? That is part of what you may mean by "limited." The problem isn't really with the means of communication, the problem is that we don't want to give up our controls.

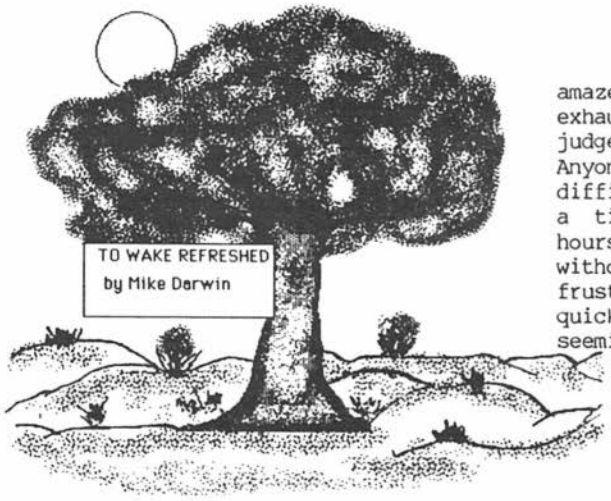
Finally in this vein, on the question of values, I still feel that Mike or Hugh or me duplicating ourselves is likely to be a far less happy procedure than using robots as tools to take our place. Cooperation is very well, but there must be a reason for the cooperation. Just being identical does not create a reason for cooperation.

Mike did however clarify the kind of circumstances he had in mind. This wasn't clear to me before, and many of my objections don't hold in that case. I will say, though, that superprotection of one single copy is a perfectly viable procedure to produce survival. Casting copies of ourselves to the stars, even suspended copies, seems awfully chancy. We'll lack control over the fate of these copies. Hostile individuals can capture them and use them to our detriment; since they are known to exist, they will capture them. If we did have control, the question arises: why don't we simply protect our live original? Mike's ideas do however suggest useful ways of duplicating ourselves and I don't feel the question is settled yet. There is an analogy with suspension itself, in that a group of people cooperating might achieve more than an individual who simply leaves copies of himself lying about in various solar systems. We're really talking about more advanced forms of suspension, aren't we?

Finally, to Hugh Hixon. The point of my comments about cryonics in a prison camp is really about delivery of cryonics services to many scattered isolated individuals. When I raised the question of past suspensions, which used embalming machines, and how they were done, it was precisely because the history of cryonics may contain important lessons for small groups who are trying to get started away from Los Angeles or San Francisco. The history of cryonics will be the only source of such lessons so long as Jerry and Mike don't present any ideas on the subject in CRYONICS. When Hugh brought up the German physician who successfully carried out surgery in a prison camp due to his knowledge of the history of medicine, Hugh is talking about exactly the issues which I am raising and bringing up points which support the points I wished to make.

As for animal experiments for the sake of training, I would in fact be

extremely interested in suggestions for very modest but useful things a small group on a low budget could do to improve their capability. Learning HLR techniques counts as one such, and catheterization another; I would like to hear Jerry or Mike speak to the question of others. I believe that these are important problems because for a long time many cryonicists, for many different reasons, simply won't be living near cryonics centers. If we can nothing but wait for Jerry or found another Cryovita, it's unreasonable to expect many to do very much. We are not all going to found another Cryovita. Furthermore, now that there is a Cryovita, we have a question about whether we should try to create another or do something else entirely.



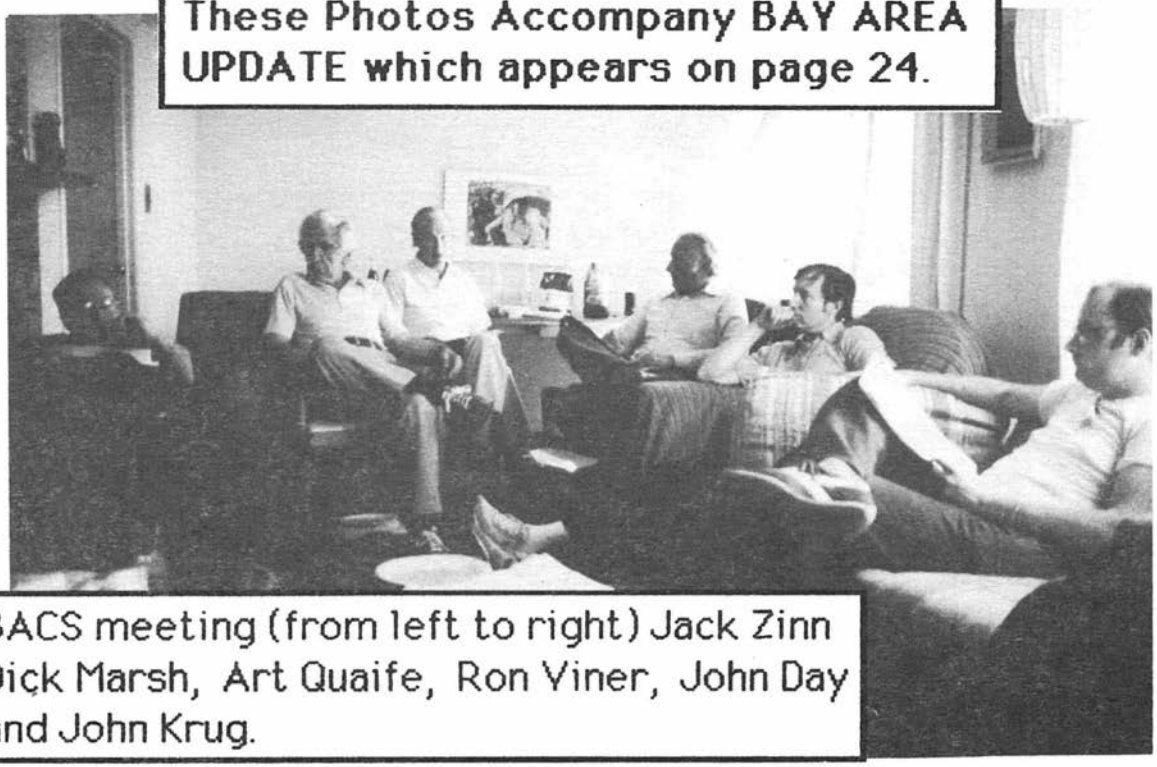
One of the things that still amazes me in life is the power of exhaustion or depression to fog good judgement and distort reality. Anyone who has ever worked on a difficult and demanding project under a time limit, well into the small hours of the morning without sleep or without adequate tools knows well the frustration and despair which can quickly turn small problems into seemingly insurmountable mountains. Most of us live protected from that kind of thing. Such events are the exception rather than the rule in our lives, because in the Western World, anyway, we live lives where proper rest, food and the basic necessities of life are provided for.

Of course, this isn't true for an awful lot of the world and it's instructive to travel a bit and see how people who are sick, infested with parasites, dirty and malnourished manage to struggle through and survive (of course an awful lot of them don't survive). What's instructive about this is to either imagine yourself or worse still find yourself in a similar bad situation and see how quickly fighting spirit departs and demoralization and hopelessness set in. I believe it was Bob Ettinger who once remarked that he had seen healthy young men succumb to shelling during World war II because they were simply too exhausted and demoralized to crawl into the trenches—to safety.

One of the great hazards of civilization is that it softens us up. We aren't accustomed to adversity and bad times and so not only is our appreciation of the goodness of life dulled, our ability to cope with stress is also diminished.

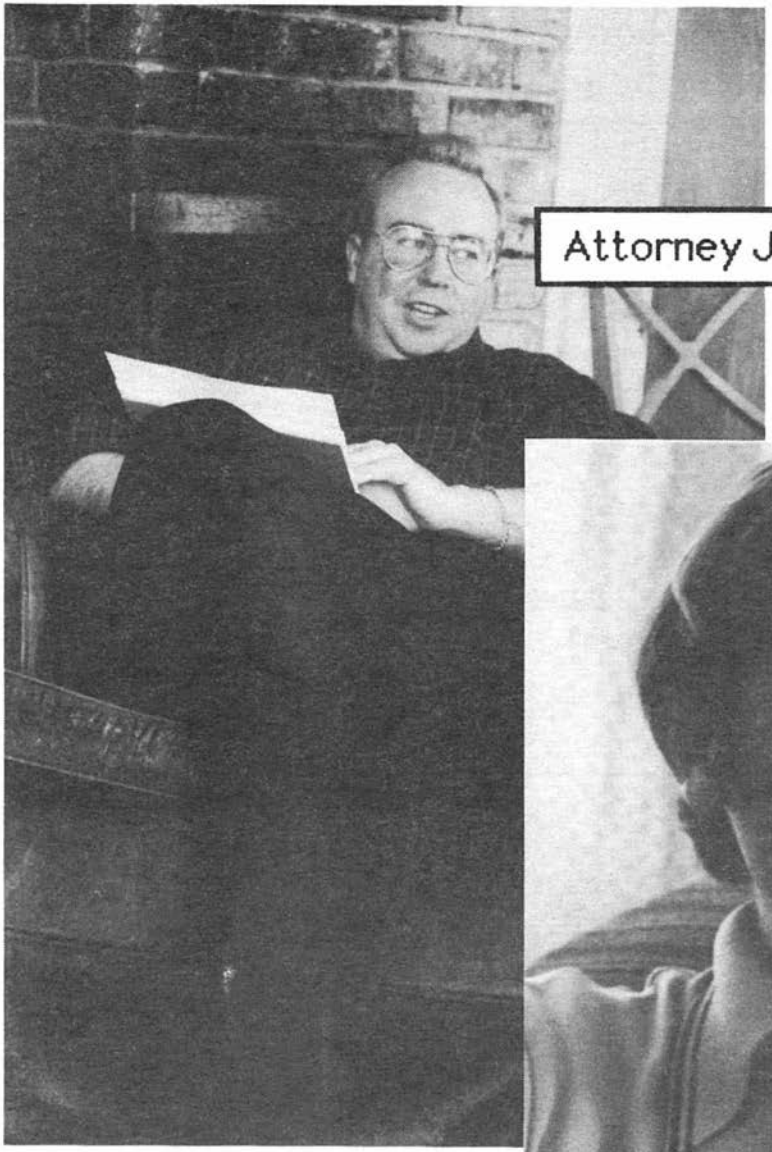
I can't pretend to be an exception to this. To a great extent I cave in and "give up" sooner than I should—especially if I'm feeling poorly, and not well rested or am badly stressed. In my work as a hemodialysis technician (someone who operates artificial kidney machines) I've seen a very large (relative to average Western experience) number of people die from chronic

These Photos Accompany BAY AREA UPDATE which appears on page 24.



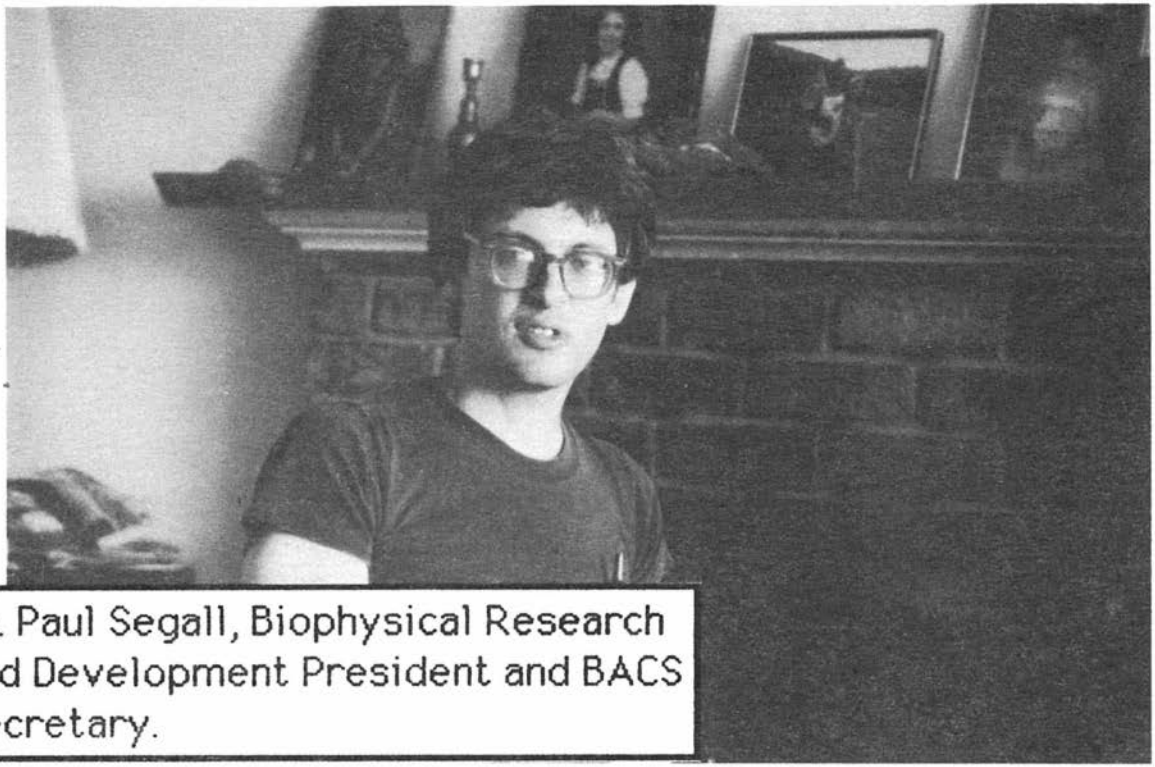
BACS meeting (from left to right) Jack Zinn Dick Marsh, Art Quaife, Ron Viner, John Day and John Krug.

BACS member Norm Lewis.

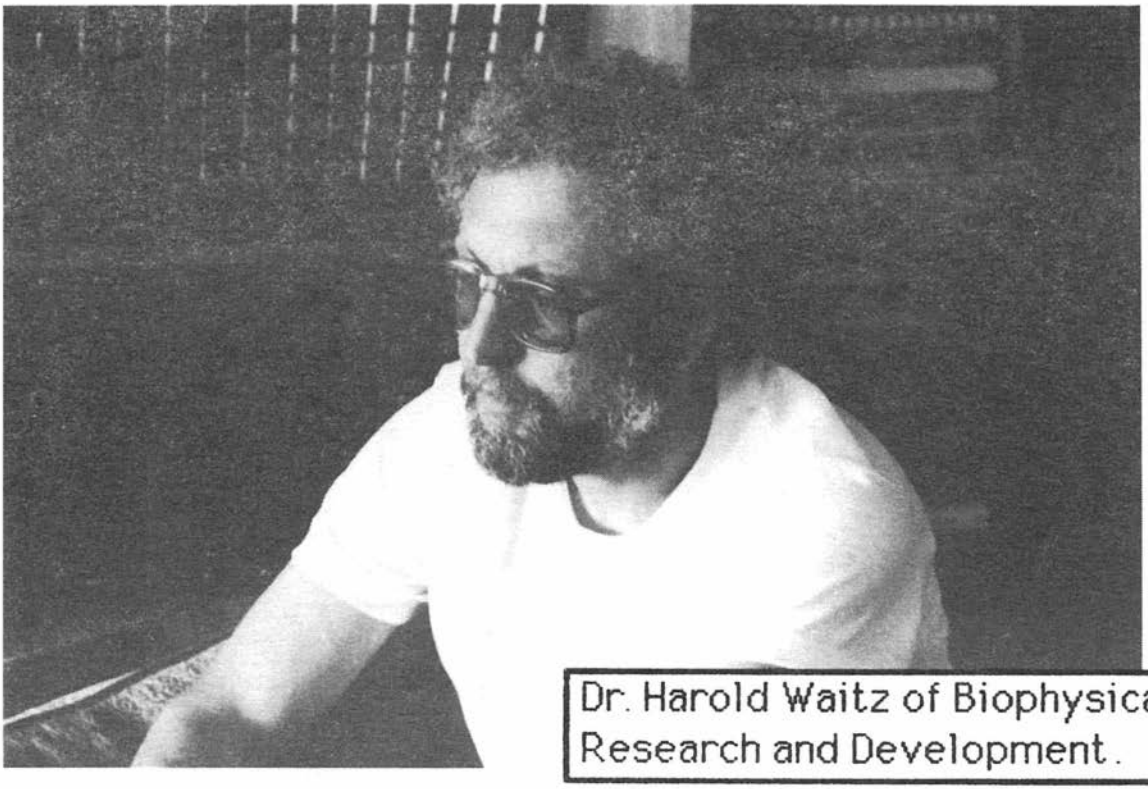


Attorney Jack Zinn, BACS President.

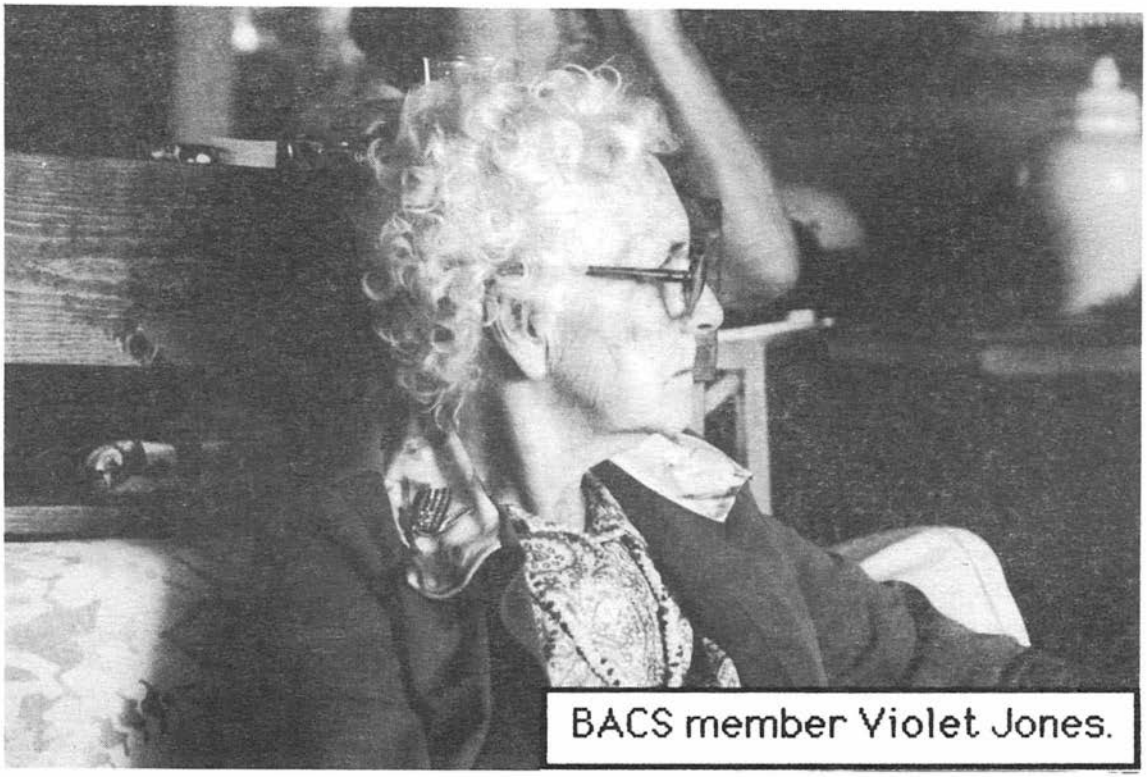
John Day, Trans Time Director.



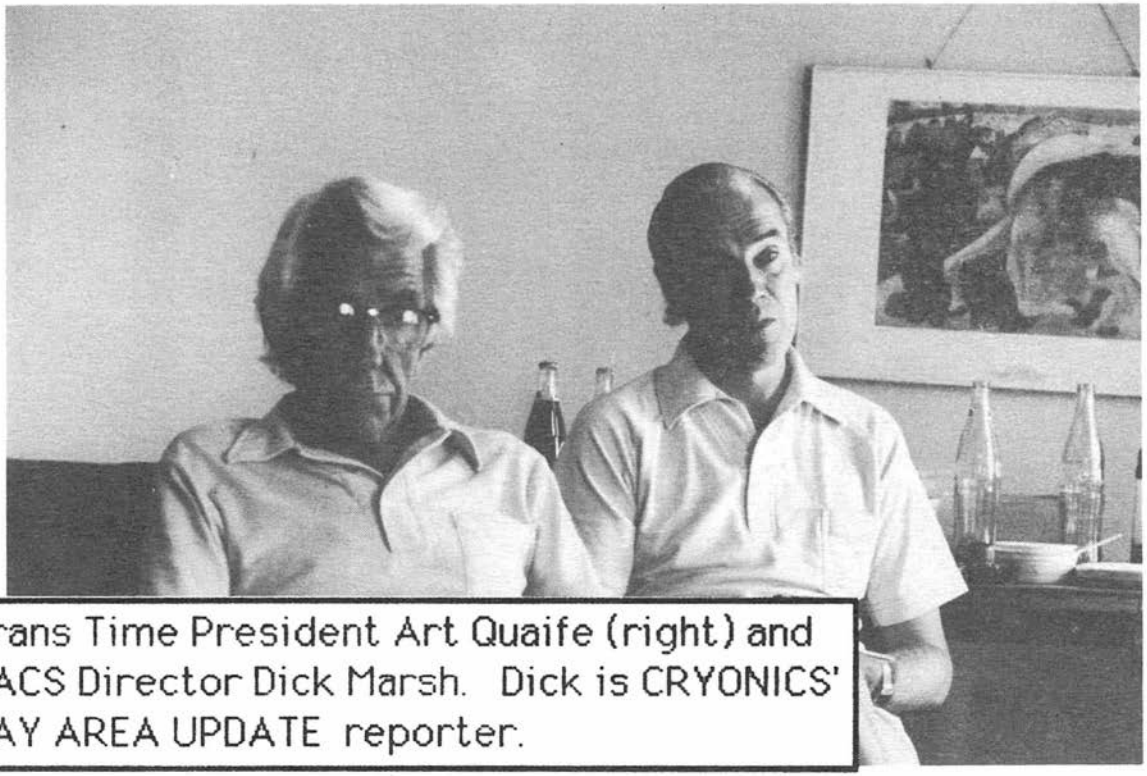
Dr. Paul Segall, Biophysical Research and Development President and BACS Secretary.



Dr. Harold Waitz of Biophysical Research and Development.



BACS member Violet Jones.



Trans Time President Art Quaife (right) and BACS Director Dick Marsh. Dick is CRYONICS' BAY AREA UPDATE reporter.

illness. The overwhelming majority of people, especially the old and already debilitated, just give up. They give up in large measure because they can't remember what it was like to be young, strong, and facing a full life filled with challenge and adventure. I have been sick, very sick, myself sometimes, and I can attest that it is easy to get demoralized and that it doesn't take many days of serious, debilitating illness before you forget about what it was like to be well and wonder, despairingly, if you'll ever feel that way again. For me, a good night's sleep was the best medicine to help me regain my equilibrium and during the worst of my illness I used to "live for the mornings," knowing that for a few hours after I awoke I'd have some taste of what it was like to feel well and whole—before the demands of the day wore me down again.

Unfortunately, a large number of people (probably the overwhelming majority) find themselves in just this kind of situation as they grow older and lose health and vitality. The senses fade, every activity becomes more of a struggle and brain biochemistry shifts towards chronic depression. Growing old and becoming ill are terrible. We are aware of that intellectually as cryonicists. But we probably don't know it emotionally. I feel in a fortunate position in some ways because I have some idea, both intellectually and emotionally of what may lie ahead. This awareness has forced me to be prepared, at least intellectually, for the possibility that I will all but forget how good life can be, and that illness and depression may seem to be unending and not worth the effort to escape from.

It's important to "gear-up" psychologically in this way because, for the time being, surviving demands that we do so. We live in a world where cryonics is not an automatic thing which we have to fight to avoid. In fact, we have to fight to keep it. As we grow older we may lose perspective, we may give up at some point because the fight may not seem worth the effort.

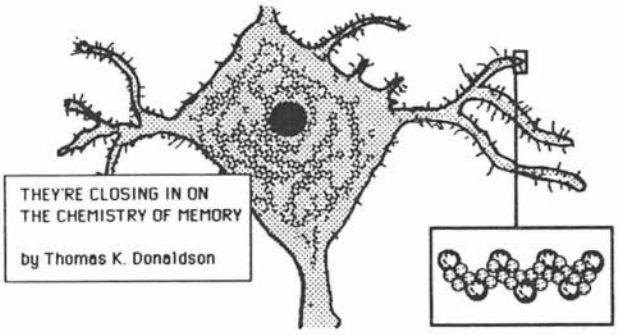
Unfortunately, I've seen this happen several times already to cryonicists. I know of several cases where people have let the "little" day-to-day troubles wear them down to the point where they say "what's the use" about cryonics. I've seen a few people who were "go-getters" about cryonics shift gears when sick and depressed and just opt out. Suddenly, life doesn't seem worth living anymore to these folks and they just give up.

It seems easy to be hard on these people. To criticize them for softness and lack of the "right stuff." Hard—until you've been there. The brutal fact is that it is pretty easy to break most people's spirits and, once broken, not so easy to mend them. Part of preventing that from happening is to mentally prepare in advance for the possibility of such feelings. Deep inside ourselves, hidden away, we have to make a committment to ourselves to always try to live, to always try to fight, no matter what. That's an easy committment to make, a much harder one to keep.

But, it can be kept. In my work in health care as well as in my work as a cryonicist I've seen people make that committment and I've seen them struggle through, against incredible odds and survive. Putting paperwork in order and providing for supportive people to step in and take over if you can't carry on is an important part of the physical preparation which all of us should make. Everybody should know, in fact needs to know, that there are others out there to help when the going not only seems rough, but impossible. ALCOR has done that already, and we'll continue to do it. It's my great hope that even though I can

become ill and worn down, ALCOR will remain young and able to help me. It is my strong conviction and ardent desire that ALCOR be that kind of organization for ALL its members.

It is my certain belief that if we can just get through the night—however long and black and hopeless—we'll wake refreshed. A good part of living to see that dawn is to never forget it's possible, even when everything and everyone tells you it isn't.



As we've noted many times in the past, no one yet has given an adequate account of how our brains store memories. In particular, cryonicists belief (or surmise?) that memories will survive ischemia and freezing depends on very general ideas about how biological processes work, all suggesting survivability without proving it in any sense at all.

Recently in SCIENCE (224, 1Ø57 (1984)) two neurophysiologists, Gary Lynch and Michel Baudry, have published a long paper suggesting a quite specific and detailed chemical mechanism for one particular kind of memory. Their mechanism is so specific that it can probably achieve actual confirmation or rejection; it is very important, even if their hypothesis is false, that thinking on this question of physiology has gotten so far as to present some very specific hypotheses. Furthermore, not only do they present a hypothesis, but they also present a considerable body of experimental evidence to support it.

Their memory process occurs only in the telencephalon, the part of our brains unique to mammals. They suggest that other chemical mediators may control memory in other brain areas and other types of memory.

The main problem anyone proposing a theory of memory confronts is to produce a mechanism which will produce a long-lasting change and which at the same time connects to what we know about brain physiology. Neurons are very complex ongoing chemical machines; it's very easy to find biochemical changes caused by learning, but almost all of these have the severe defect that they are involved in the constant ongoing metabolism of the neuron and wouldn't be expected to cause any LASTING effect.

Essentially, what Lynch and Baudry have done is to find a biochemical change with memory which acts on the STRUCTURE of neurons rather than simply on their metabolism. Since it acts on structure rather than metabolism, we'd expect that the change it causes would be very long-lasting — just what is required for memory. Since (even more specifically) it acts on the structure of the synapses, those parts of the neurons which carry impulses from one neuron to another, the case that it may relate to memory becomes very strong indeed.

Specifically, their proposal involves a chemical mechanism which breaks up fodrin, a special protein molecule which forms part of the structure of the neuron wall near a synapse. Because fodrin affects the structure of the synapse, its removal changes this structure. Learning already appears to change the structure of the synapses; furthermore, electrical stimulation of brain slices in a manner which might reasonably be thought to mimic learning will cause similar changes in the structure of the synapses. Circumstantial evidence that fodrin is involved therefore seems strong.

Since the basis of their proposal sits upon these experiences with brain slices, I'll discuss them a bit further. The characteristic brain change which may resemble learning is a very brief period of intense stimulation. Such treatments cause the synapses through which they pass to have an increased ability to pass other nerve impulses. This increased ability persists for a very long time, at least as long as months, and the effect increases even more with repetition. The effect is so important that it has received a name, long term potentiation, or LTP.

The biochemical processes involved in the breakup of fodrin, and what this breakup may mean for memory, come from the effects of calcium ions in the cell upon certain specific enzymes. Lynch and Baudry report a number of experiments showing that a special enzyme, calpain, becomes active in the presence of a raised level of calcium ions in the cell. Calpain then starts breaking down fodrin.

Although relations with memory involve some extrapolation, Lynch and Baudry can show that this effect of calpain definitely occurs. Calpain will break down fodrin, and only in the presence of calcium ions. Furthermore, they can prevent LTP from happening in brain slices by adding chemicals which bind calcium; without calcium, the calpain can't act.

What's the relation between fodrin and passage of a nerve impulse? Fodrin does in fact line the face of synapses; one characteristic structure at a synapse is a thickening in the receiver cell at the point where the sender touches it. This post-synaptic thickening is called the postsynaptic density, and fodrin lies concentrated in the postsynaptic densities. Fodrin and related proteins also are involved in regulating the receptors for various chemicals. Fodrin should therefore also regulate receptors for the special neurochemicals transmitting nerve impulses.

There's evidence that it does. Lynch and Baudry tested directly for the number of receptors of glutamate in synapses both before and after LTP. They found that LTP significantly increased the number of glutamate receptors. Glutamate is a simple amino acid which serves as one of the neurotransmitters in our brains; there are many different neurotransmitters, including acetylcholine and dopamine. Breakdown of fodrin by calpain, therefore, may cause an increase in glutamate receptors, and this increase in glutamate receptors then causes the increased ability of the synapses to transmit impulses. That is, it causes the LTP effect.

Even better for a hypothesis of memory, Lynch and Baudry could show that concentrations of calcium would increase the number of glutamate receptors on nerve cell membranes in a very lasting way. The change would not reverse even after extensive washing of the membranes with calcium-free media or chelators which might remove calcium.

As further evidence that this breakdown of fodrin by calpain caused memory, they used their ideas to devise drug treatments which would specifically block the formation of a new memory. The drug leupeptin prevents calpain from working; giving it to rats continuously would severely impair their ability to learn a maze task. At the same time, leupeptin would not impair the ability of animals to learn the avoidance of a foot shock. The difference between these two types of learning is reasonable; Lynch and Baudry are proposing a hypothesis for one kind of memory, rather than all of them, and the two kinds differ in ways expected by their hypothesis.

As it stands, the greatest defect of this theory is that the memory mechanism envisioned, that is, the increase in the number of glutamate receptors, would die away in time. Chemical receptors on cell walls themselves have a lifespan. However, Lynch and Baudry have suggested a mechanism which would produce a much longer-lasting effect than any others. Furthermore, they suggest answers to this problem, which is that breakdown of the fodrin of the synapses may precipitate a much more permanent reorganization of the synapse.

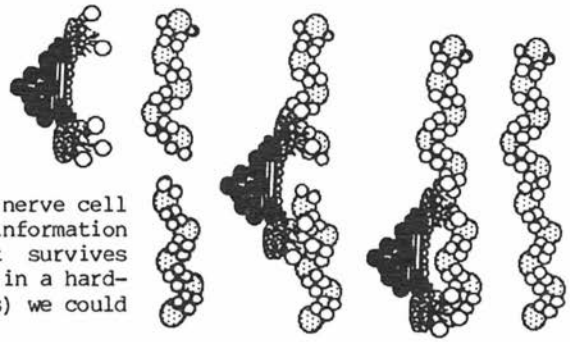
It's also possible that Lynch and Baudry are in the right neighborhood, but haven't actually found the centrally important mechanism involved in memory. For instance, breakdown of fodrin by calpain may be only one of the reactions happening with a new memory which change the synapse and cause encoding. Perhaps there are others even more important.

Although published separately and independently, two other papers present some further indirect evidence which corroborates this theory of Lynch and Baudry. T.W. Berger, at the University of Pittsburgh (SCIENCE 224, 627 (1984)), presents some additional evidence that LTP does in fact relate to memory as Lynch and Baudry suppose. He was able to increase the ability of rabbits to learn by stimulating their brains so as to mimic the effects of electrical stimulation to brain slices which cause LTP in those slices. They were then trained in a task involving the learning of a discrimination; animals whose brains were stimulated by implanted electrodes learned the task much faster. The suggestion is that LTP does resemble learning in the way it creates a long-lasting change in properties of the synapses.

A third paper by Acosta-Urquidi, Alkon, and Neary (SCIENCE 224, 1254 (1984)) comments indirectly on the other two by studying learning in Aplasia. Lynch and Baudry themselves comment in their paper that animals such as mollusks, which are not mammals, very probably learn by quite different biochemical mechanisms. Furthermore, even different regions of our own mammalian brains probably learn by different processes. This paper by Acosta-Urquidi et al represents further evidence that another different kind of chemical modification may code for memory in mollusks. The main common factor with the process of Lynch and Baudry is the importance of calcium to it. Rather than breakdown of a protein which forms part of a synapse, this other mechanism involves the attachment of a phosphate group to an existing protein: that is, chemical modification of a protein. Acosta-Urquidi et al could identify the enzyme which causes this reaction. It becomes active in the presence of calcium; what these researchers have done is to show that merely by injecting it into the nerve cell (a photoreceptor) they could produce effects similar to LTP. This strongly suggests that their enzyme plays the same role in the coding of memory.

I am impressed by this work as progress in understanding memory. It is

therefore very interesting to see what it may imply as to survival of memory in suspended patients. The main point is that the structure and number of receptors in the brain are likely to reprsent an extremely durable form of memory storage. Any generalized process which breaks down glutamate receptors would very likely break them down in proportion to their number, so that a repair machine would distinguish those areas with high concentrations from those without. To preserve the memories contained in a particular cell, we should have to preserve, not so much the general architecture of the cell as the information about where the synapses were and the level of glutamate receptors on them.



Furthermore, this memory process would survive considerable mechanical disruption of the brain. If the actual existance of synapses does not encode for memories, but rather the level of glutamate receptors on these synapses, then even if particular nerve cell connections are cut, so long as information about how they should reconnect survives (either in the cells themselves or in a hard-wired map stored outside our brains) we could reconstruct our memories.

Of course, biochemical changes at nerve cell synapses, no matter what they may be, still give only the lower substrate of memory, the individual flecks of paint which make up a painting. Many of these might suffer outright destruction while the picture still remains, ready for restoration.

In terms of cryonics research (given we have sufficient funds) it would be most interesting to directly verify the survival of glutamate receptors in the synapses of frozen brains, and then go on from there to study just what kinds of damage and how extensive the damage must be in order to significantly destroy the information contained in them. For instance, just how long would these synapses and their receptors survive? They would almost certainly survive brain refrigeration at Ø degrees C, probably for many days. They would also almost certainly survive many poisons. If kept at room temperature, they would probably tend to fade away gradually, perhaps faster but rather in the same way that a photograph fades when exposed for a long time to light. Like a photograph, it is likely that advanced means of extracting the information could recover our memories long after they ceased to be obvious or visible.

"It's better to be live dog than a dead lion.
And even better to be a live lion."

Lazarus Long, from
The Notebooks of Lazarus Long,
by Robert A. Heinlein

"When all else is lost, the future still remains."

Bovee

BAY AREA UPDATE

by Dick Marsh

Lucky Dog.

To this editor/paraphraser/reporter the liveliest event at the July 29th meeting of BACS was the appearance of the healthy-looking one-year-old German shepherd dog led in by welcome-visitor Mike Darwin from ALCOR. This friendly pooch, his tail wagging steadily, bounced from person to person, making friends quite unselfconsciously and sniffing curiously at everything in sight. Not unusual--except that this energetic animal had a few days previously been lowered by ALCOR technicians to 4°, given a calcium blocker, connected to an ECMO (an extra-corporeal membrane oxygenator) by both femoral arteries, perfused with a new type of blood substitute, dialyzed, and rewarmed, apparently none the worse for his chilling experience except for a couple of scars on his underside.

Somehow, seeing this happy animal, petting him, and scratching his head, made the process of cryonic suspension seem more real to this layman, and its eventual success more probable.

Congratulations, ALCOR.

Frozen Embryo

Do Frozen Embryos Have Rights?

Another high-interest spot of the BACS meeting was the discussion between Paul Segall and visitor Mike Darwin which occurred when BACS President Jack Zinn described "the debate currently raging in Australia over the rights of frozen human embryos." Mike was pro rights, Paul con. Mike's view: Assuming rights for frozen human embryos strengthens the rights of cryonically suspended people. Paul's view: defending the rights of frozen embryos "might interfere with the use of embryos in cloning, a method which. . . will be important in repairing and reconstructing suspended patients."

Who Publishes What?

Mike and Paul discussed also the contrasting editorial policies of Cryonics magazine and the BACS Notebook. Mike requested that information to be published in Cryonics not be sent to any other publication, including the BACS Notebook. Paul, on the other hand, said that the BACS Notebook not only welcomes information from all sources but offers its contents for use by by other life-extension magazines such as Cryonics, Anti-Aging News, and The Immortalist.

Keeping and Sharing Records.

The Board discussed several problems in connection with record keeping:

** Paul Segall noted that a BACS office in a permanent cryonics facility (such as that being worked for by the Cryonics Building Fund) together with hoped-for funds for hiring full-time BACS workers will eliminate many of the problems. Meanwhile, Paul emphasizes, there should be "strong legal disclaimers to protect BACS."

** Art Quaife explained that Trans Time keeps individual files with "substantial information" on all patients. One file, however, has gone astray: the cooling record for Katherine M., believed to have been misplaced during Trans Time's recent departure from its Berkeley office.

** Mike Darwin presented BACS secretary Paul Segall with copies of the negatives made at the Janice F. autopsy. He also promised to provide a copy of the fill record for the capsule containing Luna W.

Contract desirable? **Cryonics Contract**

Should BACS have a written contract with BioPhysical Research and Development "covering. . . the assignments of patents and/or profits from scientific research grants or copyrights on an equitable basis between the two parties"? Yes, say BACS member Frank Rothacker, board member John Krug, and BACS President Jack Zinn. No, say researcher Paul Segall and Update editor Dick Marsh. Why not? Because "it would involve considerable amounts of time to negotiate, as well as substantial legal fees. . . . (and) it could conceivably interfere with the free flow of scientific information and thus retard progress in the life extension sciences." The Board will consider the matter later.

How Do I Know I'll Be Suspended if I Suddenly De-Animate?

When your Update editor played the devil's advocate with that question, Trans Time President Art Quaife, a guest at the BACS meeting, supplied the following reassuring answers:

** The phone number on a patient's medic alert bracelet will bring a rescue team who will oxygenate him/her, introduce the proper combination of buffers and anti-coagulants into her body, oxygenate him, and cool her/him with ice packs.

** Trans Time has an operative extra-corporeal membrane oxygenator (ECMO) as well as adequate supplies of perfusate constituents and cryoprotectants.

** Trans Time's directors and rescue team have a good history of emergency response.

** Perfusions and cryonic suspensions have been previously carried out at the Trans Time facility.

** Trans Time has a legal responsibility to suspend all BACS suspension members in good standing should the need arise.

After that explanation, your Update editor felt less uptight.

The Uniform Anatomical Gift Act as a watershed. **U.A.G.A.**

BACS' legal authority--and responsibility--are intact for patients suspended before the Attorney General's published Opinion about the inapplicability to cryonics of UAGA, the Uniform Anatomical Gift Act. This according to Attorney Jim Bianchi. Reason: they were suspended prior to the publication of the Opinion.

Attorney and BACS President Jack Zinn, however, is concerned about burdens which BACS might incur owing to lack of funding for these patients. How broad might BACS powers be, he wonders, under "extenuating circumstances"?

Quaife, the Mathematician.

Art Quaife presented to BACS a copy of his recently completed paper describing the mathematics of heat flow in the cryonic suspension of humans. Art based his paper on computer-simulated models of heat flow in solids approximating the human body in size, shape, and composition. Art is uniquely qualified to

pioneer in this critical branch of bio-mathematics: he was the world's first full-time professional cryonicist, he is a former grad student in math at U.C. Berkeley, and he is experienced in the use of computers.

* * *

So much for our BACS sampler. Now, a few items about Trans Time:

Finances.

The money scene is reasonably bright. In August, Violet Jones contributed six months accumulated interest on an $80,000 sum held in escrow by Trans Time for future services. This wise and gracious act offset a $1200 deficit and produced a positive income for the month of $1376.59.

This led to a discussion about the best possible investment plan for escrow funds. The upshot: the Loan Committee was redesignated the Investment Policy Committee and "empowered to define and implement investment policies and decisions regarding all funds owned by or under Trans Time control, or deriving from stock issue or facility acquisition."

But in September, the Treasurer reported a $1997.90 loss. This, however, may be offset by the purchase for $1000.00 by an Australian television Company of the rights to exclusive use of a TT videotape together with the use of considerable amount of time for $500 a minute.

Facility Acquisition.

Trans Time still needs a new home--either permanent or temporary. A method of achieving a permanent (or semipermanent) home would be long term leasing or purchasing of space in the projected Cryonics Building Fund Facility. At its August meeting, the Board discussed various methods of doing this.

In September, President Art Quaife reported on a thorough search for rental property in the Emeryville-Berkeley industrial area. Available spaces tended to be either too expensive or too large.

The owners of the present facility have proposed a rent increase from $605 to $790 a month, with a lease which allows escape after four months if the new facility is to be purchased but not rented. Also stipulated: TT is to give warning $2\frac{1}{2}$ months in advance of any impending move to a facility purchased by the Cryonics Building Fund.

For the time being the Board agreed to stay put.

Inflation Strikes.

Because costs are rising faster than income and now exceed it, Art moved that the Board raise charges for Long Term Storage from $3200 to $3600 a year and Emergency Responsibility rates from $96 to $108, the latter not to take effect until the BACS Board is notified. The TT Board passed the motion.

Computerized Life Extension. 

Trans Time helped BACS member Violet Jones acquire a pendant size emergency signal generator which works via a computerized telephone interface. An emergency will bring the Emeryville Fire Department paramedics and ring the TT emergency number. Cost: $95 installation, $12 monthly rental.

Freezing Large Mammals Pending?

Trans Time Directors Dr. Paul Segall and Dr. Harold Waitz "have been asked to develop plans for a Northern California research program entailing suspension of large animals such as dogs and monkeys. This program will be designed to upscale progress from small animal research and incorporate recent gains in large animal and human research by other groups, in conjunction with Bay Area academic institutions and physicians.

"Achievements from this research will be applied to improving Northern California's human suspension capabilities."

Trans Time Welcomes BACS Inspection.

Responding to Attorney Jim Bianchi's suggestions for updating Trans Time procedures, the Board has approved a policy of inviting a BACS representative to be present whenever a capsule containing BACS patients is to be opened. This will permit verification of the presence of the patients and of the adequacy of the nitrogen level. The representative will be invited to inspect the capsule-filling logs and make a signed entry.

Further Suspension Guarantee?

Here's another angle on the how-do-I-know-I'll-be-suspended anxiety discussed above: a protoype wallet card, distributed by Art Quaife, informing emergency rescuers that the bearer is to be cryonically suspended by Trans Time and providing emergency instructions. A nice gimmick suggested by a Board member: a $100 reward to the rescuer who cooperates with the instructions.

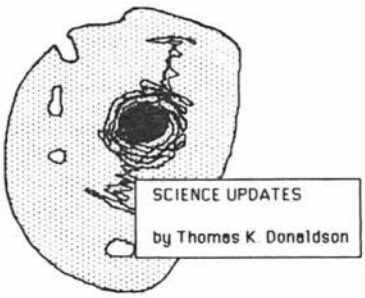
* * *

Wrap Up.

That'll wrap it up for this issue of BAY AREA UPDATE. These items--largely selected from various BACS and Trans Time minutes--have been paraphrased and simplified, except when directly quoted. If at any point the wording seems felicitous, credit should be given to BACS-and-Trans-Time Secretary, Paul Segall. When it limps and groans, blame your UPDATE editor.

Nothing from BACS NOTEBOOK this time. Blame space and time limitations. The little magazine, however, continues to report the research achievements of BACS scientists. Maybe something from the NOTEBOOK in the next issue of UPDATE.

WHERE ARE OUR MEMORIES?



Recently a neurologist from Stanford, Richard Thompson, announced in SCIENCE and elsewhere that he had found the location of memory for a particular conditioned response: eyeblink of a rabbit in response to a tone. He had discovered that removing a particular small region of the cerebellum, no more than 1 cubic millimeter in size, would also remove the ability to engage in this conditioned eyeblink response. At the same

time it would not remove the ability to blink in response to a puff of air (an inborn reflex response). Therefore he concluded, removal of this tiny region must remove the conditioned memory.

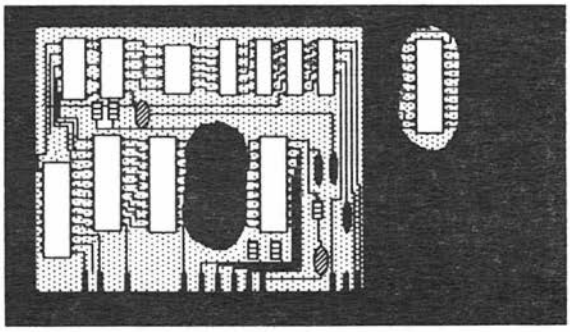
When I heard of this announcement I felt that his conclusion lay somewhere between overblown and false and dismissed it. It seemed to me and it still seems to me that he was in much the same position as a savage who might remove one vacuum tube from a radio and (since the radio fails to work) announce to all and sundry that he had discovered the place from which music comes! Right here, from THIS TUBE! (In justice, perhaps he's been badly misquoted in the SCIENCE article and elsewhere.)

Unfortunately, even in 1984 studies of brain function depend far too much on removal of particular brain parts. If we were to attempt to figure out, say, the memory function of a computer by simply removing parts, we'd have a very hard job. A computer with parts removed just isn't the same as one with (say) new parts which function just as well as the old, but contain blank memory. Although we've now developed several means to "shut off" brain parts temporarily using drugs, this is really only an ability to reversibly remove THE SAME PARTS and then put them back again. It doesn't help us much more than before.

No one would try to reach significant conclusions about the running of a computer by simply removing parts and observing how the resulting damaged machine failed to work. We wouldn't really know about memory storage and memory expression until we can do with brains what we can do with computers, which is not just to remove certain parts but to run the system again with these parts replaced by other parts with known properties. Paul Pietsch at Indiana University actually carried out experiments of this sort, studying memory in salamanders not just by removing brain parts, but by removing them and replacing them with others. Despite their gross and inexcusable neglect by most neurologists, these experiments of Pietsch are very important precisely because they are our closest approximation to studying brain function as we should study it.

In this light, any memory or habit involves a complex interaction of many different brain regions over a nontrivial time. It seems inconceivable that this interaction might stem from only one small brain region, even though removal of that brain region can certainly destroy it (just as removal of a single capacitor can destroy the ability of a computer to function). Asking for the location of a memory, in these terms, is like asking for the particular single point in a circuit which will break the circuit.

"No one would try to reach significant conclusions about the running of a computer by simply removing parts and observing how the resulting damaged machine failed to work."



It should be pointed out that the empirical observation that Richard Thompson has made might well lead us further into understanding memory. Not because he has already gotten to places where it might lead, but because it stands out as the most specific deficit in memory anyone has ever produced by surgical or chemical

removal of one brain area.

A very good review by Robert Thompson of memory and how it might code into our brains recently appeared in BEHAVIORAL AND NEURAL BIOLOGY (37 (1983) 1-45). It puts the observation of Richard Thompson into a context which makes a lot more sense than Richard Thompson's own account of the matter.

Robert Thompson presents a general view of lesion studies and their significance. By "lesion studies" I refer to studies which attempt to work out how recall processes are affected by temporarily or permanently removing particular brain regions or parts of brain regions.

Robert Thompson begins the meat of his essay by pointing out the mechanisms for storage of a memory and the mechanism for its readout (that is, its expression in some form of behavior) very likely occur in the same brain regions or circuits, and simply shutting down a whole circuit could not distinguish between storage and readout because they occurred in and from precisely the same location. However, after reviewing a large number of different lesion studies, Richard Thompson comes to the conclusion not that particular brain areas deal with particular memories, but rather that groups of brain areas seem to specialize in both the storage and the expression (through action) of a memory. A fair proportion of this work comes from Thompson's own work, which depends on this hypothesis.

Part of this hypothesis involves the idea that not only the cortex (the "higher" brain centers) is essentially involved in memory, but also regions such as the thalmus, the amygdala, or the olfactory bulbs which have formerly been thought to deal only with "lower" functions such as emotion. In particular, besides Thompson's own work, other scientists have reported that damage to regions of the limbic system (which covers regions such as the cingulate cortex, the septum and others) will cause a loss of ability to perform some kinds of learned response. Again, damage to the basal ganglia (which are involved in the performance of complex motor tasks) will also impair ability at pattern discrimination tasks which require no great amount of coordination, but simply approach to or avoidance of one particular stimulus card.

Thompson's own work consists of the attempt to map particular brain areas involved in the retention and expression of some item of knowledge. His fundamental idea is to damage particular regions of the brain and take note of where this damage causes the most amnesia. The result of such an attempt to map circuitry would consist of a picture of those brain regions involved in, say, memory for a maze. Thompson reports to date his results on 8 different habits; they include visual discrimination, card displacement, maze learning, kinesthetic discrimination, active avoidance or passive avoidance learning, learning of an escape response, and how to open a latch box. Rather than a single brain region of course, Thompson obtains what he calls a pathway, a list of brain regions involved in learning or expressing a particular habit. Different habits give other lists. His present list includes six different groups. One group, for instance, contains the basal ganglia, the reticular formation, and the limbic midbrain, and seems to deal with "sets," or our expectation of what kind of events shall occur next. Another group consists of the cerebellum, the thalamus, the cingulate cortex, and the parietal cortex. It deals with memory and expression of memory for tasks involving kinesthetic memory. A third complex, consisting of the mediodorsal thalamus, the amygdala, and others, deals with recall and expression of both active and passive

avoidance. Most learned responses seem to require that the animal have intact basal ganglia, reticular formation, and limbic midbrain, but also require other structures as well depending on their type.

It's also important that all of these brain regions I've discussed do not belong to the neocortex; any loss of memory achieved by damaging the neocortex can also be achieved by damaging other brain regions.

However, what is important in Robert Thompson's thinking is the suggestion, and some cogent supporting experimental evidence, that NOT ALL BRAIN CIRCUITS CONTRIBUTE EQUALLY TO A GIVEN MEMORY. That is, these different circuits involve different pathways, and by understanding these pathways we might come to understand how different memories are stored and expressed.

In these terms what Richard Thompson from Stanford has done is to discover one very precise location involved in the conditioned blinking response. Since this response is so simple, we might come to understand one memory very well if we can trace out the other parts of its circuit.

What does this mean for our own memories? A critical test is still lacking because we don't know how to do it: that is, to produce an intact, functioning animal with one brain region replaced by a control region. If however, a memory of one kind is encoded in a particular circuit, then even though it may not lie in one location, destruction of all parts of the circuit should destroy the memory. Thankfully such a wholesale destruction usually would not happen either through freezing or injury due to stroke. However, we must accept that if we are unlucky, whole parts of our memory might disappear after injury, suspension and revival. We may in fact only see provable destruction of memories after successful cryonic suspension, since brain damage of such severity could now only result in death.

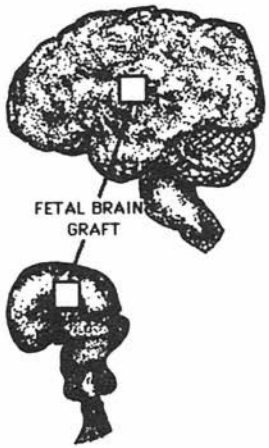
MORE HOPES FOR BRAIN CELL REPAIR

We've been reporting on work relating to repair of nervous tissue for some years now. Initial papers describing partial success on this question appeared in lesser-known journals. The dogma that repair could not occur dominated almost completely. However, as work continued it gradually moved up from more obscure and unprestigous journals in the social scale of science until now a significant number of papers appear in the more prestigous central journals of the scientific community. The idea has even become respectable! Naturally, those who opposed it are now either dead or would not admit to their former sins.

Recently, this work was reviewed in NATURE (309, 406 (1984)) on the occasion of a conference, The Fourth Annual Conference of the Institute for Child Development, "Hope for a New Neurology," 16-18 April, 1984. Attendees reviewed quite a number of interesting results, many of which we have already reported in CRYONICS. Neurons will form in the brains of adult rats, for instance (Bayer, S.A. EXPL BRAIN RES, 50, 329 (1983)), and formation of new neurons even seems to play a specific role in the yearly development of singing in canaries. Even in primates, olfactory neurons are renewed throughout the lifetime of the animal, although other kinds of neurons don't appear to be.

Perhaps the most important work on nerve tissue repair so far has been the

demonstration by Anders Bjorklund et al of brain repair by injecting fetal neurons into rats whose brains have been damaged (specifically the hippocampus, which mediates many kinds of memory). The fetal neurons will grow and form connections within the recipient brains. Even more important, these grafts restore a lost ability to learn a maze (Bjorklund, A. ACTA PHYSIOLOGICA SCAND, Suppl 522 (1983)).



Every discussion alludes to the "ethical" problems of using fetal tissue for repair. I would prefer that they called these problems by their right name, which is "political"; the word "ethical" lends a spurious respectability to those objections.

Several other workers reported their own work on brain grafts as a means of repairing Parkinsonism and the possible factors which make adult nervous systems less able to repair injury than young nervous systems.

Besides this conference, which essentially reports on the main lines of research so far, several recent new papers provide some additional information. A paper by H.S. Lin, S.A. Mackler, and M.E. Selzer from the Department of Neurology, University of Pennsylvania School of Medicine, reports on some interesting work with lampreys (SCIENCE, 224, 894 (1984)). Readers may recall that many vertebrates, including both fish and salamanders, have a very great capacity to repair damage to their nervous systems, including such things as severed spinal cords. Lampreys lack this ability, but at the same time they are a simple system. Studying nerve repair in lampreys may help to illuminate the reasons why it doesn't happen in mammals. In lampreys (as in mammals) the nervous tissue attempts to repair injury, but repair aborts before it gets very far.

In other vertebrates, cut axons will actually know in what directions they ought to grow for repair. Neurons don't simply grow at random, but behave as if a plan is laid down which they are trying to restore. Yin et al studied lampreys to see whether their axons also showed signs of coding which might tell them in what direction they should grow for repair. They found this evidence: even if the nerve fibers started out by pointing in the wrong direction, they would actually turn around and attempt growth in the right pattern for repair.

Yin et al asked whether or not this direction of growth could simply result from growth in the direction of an injury. By making two adjacent injuries, they could show that this wasn't so: the nerve cells always tried growth in the right direction.

These experimenters therefore conclude that the inability of lampreys to regenerate a cut spinal cord does not come from a loss of information about where they are to grow TO, but from some other loss. The suggestion here is that mammals, too, retain this information.

In CRYONICS, we've often discussed some very advanced means of repair, involving if necessary the total disassembly of the brain, repair of all individual cells, and their reassembly after repair. The point of this work on brain repair is that much more pedestrian, near-term techniques may very well

work too. No one should get the idea that extreme methods are the only ones which can work; it's very likely that actual revival and repair will happen with techniques not unrecognizably evolved from our present techniques, and not in the remote future.

SIMPLE GENETIC ENGINEERING?

We all know the kinds of manipulations of life which will eventually be possible. However, it's still interesting to know what kinds of manipulations are imminent, not only for their own sake, but because they suggest that often we simply won't have to solve our cryonicist problems by using the ultimate technology. Much more modest discoveries will suffice.

A recent paper in SCIENCE (225, 1052 (1984)) by A.M. Yeager et al suggests one simple means by which we can improve some inborn genetic defects even without futuristic technology. There are a large number of genetic defects which produce mental deficiency (and other faults too) by destroying or altering the ability of our brain and cells to deal with lipids and other chemicals. These are called the sphingolipidoses. Krabbe's disease is a medical name for one such, but there are others such as Neiman-Pick disease.

Mouse strains which suffer from such diseases exist and scientists use them to study these diseases. The simple procedure which these scientists studied was early transplantation of the bone marrow from normal mice into "twitcher" mice, which suffer from a sphingolipidosis. They achieved a partial remission of the condition of their mice and a considerable improvement of survival. Specifically, after transplant, the peripherial nerves of treated mice started to repair themselves. Breakdowns of their myelin sheath healed over. Both treated and untreated mice still showed tremors, but treated mice had improved gait, foraging, and grooming, and their survival improved also. Unfortunately, the treated mice showed no improvement in the condition of their central nervous system.

The reason for this partial success is very simple. These genetic diseases involve the loss or inactivity of a single enzyme. The transplanted marrow was producing this enzyme, which did not have to originate in cells of the peripherial nervous system in order to act there. The failure of the enzyme to improve the central nervous system of course came from its blockage by the blood-brain barrier.

Often in cryonics we discuss the problem of repair as a problem of the worst case. That is, if the problem is as difficult as we can reasonably expect it to be, how would we repair it? This is very reasonable, since it puts a floor under which we don't expect to go. However, the point also needs making that many quite minor changes and improvements may cause marked increases in our longevity, our abilities, and even our recovery from freezing.

(Editor's note: sphingolipidoses are one of several large classes of recessive genetic diseases which result from the absence, for one reason or another, of ability to do specific degradative steps of body chemicals. Enzyme replacement therapy can be used for some of the mucopolysaccharidoses, for example, the source of the enzyme being in one case the patient's own urine. While these enzymatic "patch jobs" will be of great use for allowing the breeding of afflicted strains of animals for research, when the normal course of

the disease does not allow the animal to reach breeding age, their use in humans is of somewhat greater consequence. Human breeding habits being somewhat less controlled than lab animals, proliferation of these diseases into the general population would seem assured by these techniques.)

DECEMBER 1984 - FEBRUARY 1985
ALCOR MEETING CALENDER

ALCOR meetings are usually held on the first Sunday of the month. Guests are welcome. Unless otherwise noted, meetings start at 1:00 PM.

ALCOR
ALCOR LIFE EXTENSION FOUNDATION
4030 NORTH PALM #304
FULLERTON, CALIFORNIA 92635
(714) 738-5569

The Annual Turkey Roast is being co-ordinated by Maureen Genteman. Her home telephone number is: (213) 392-2137

The DECEMBER meeting (Annual Turkey Roast) will be at the home of:

(SUN, 2 DEC 1984) Marce Johnson
8081 Yorktown Ave.
Huntington Beach, CA
Tel: (714) 962-7898

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

The JANUARY meeting will be at the home of:

(SUN, 6 JAN 1985) Brenda Peters
8150 Rhea
Reseda, CA
Tel: (818) 349-7424

DIRECTIONS: Take Interstate 405 (San Diego Freeway) north into the San Fernando Valley, to Roscoe Blvd. Go left (west) on Roscoe 3-4 miles. Rhea is 2 blocks past Reseda Blvd. Turn left on Rhea. 8150 is the second house in the second block, on the left.

The FEBRUARY meeting will be at the home of:

(SUN, 3 FEB 1984) Mike Darwin and Scott Greene
350 W. Imperial Hwy., #21
Brea, CA
Tel: (714) 990-6551

DIRECTIONS: Take the Orange Fwy. (Hwy 57) to Imperial Highway (Hwy 90) and go west through Brea on Imperial Highway. 350 is about one mile from the freeway and in the second block beyond Brea Blvd., on the south side. If the gates are closed, park on Madrona Street to the east.

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