CRYONICS

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Contents:

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Editorial Matters

We would like to thank those of our readers who have responded to the questionnaire in our last issue. In the first ten days after the July issue was mailed we received over thirty responses. We would also like to remind those who have not yet sent in their questionnaires to please do so. These questionnaires will help us to determine what kind of marketing strategy to use in the coming year as well as how to improve the magazine to better serve your needs or interests. Please, take the time to sit down, fill out the questionnaire, and return it to us. This is one very simple and direct way you can help us to find out how to reach more people.

Response to the gift subscription offer contained in the July issue has been less than overwhelming. Surely you can think of someone you'd like to send a subscription to CRYONICS to? If not to a friend then perhaps to an enemy? These gift subscriptions will hopefully go a long way toward helping us reach the minimum necessary to bulk mail effectively and thus reduce our postage costs over two-thirds.

In order to send someone a gift subscription you must 1) be a member of IABS, Alcor, or BACS, 2) send your friend's name and address, 3) a check for $5.00 and 4) sure your friend is not a member of IABS, Alcor, or BACS.

In this issue we present the first half of a very important and much needed article by Thomas Donaldson entitled "What You Can Do." This is an article which everyone who is not within easy reach of a cryonics group should read and pay special attention to. Donaldson offers some very thoughtful advice and it is advice of the best kind; that which is based on hard-learned experience. In the next issue of CRYONICS IABS will be announcing the reactivation of the Cryonics Coordinator Program. The Coordinator program will help individuals who are isolated from active cryonics groups to establish a network of support in their own areas. We urge people who might be interested in becoming Coordinators to read Dr. Donaldson's article carefully as many of the suggestions he makes will serve as the backbone of the Coordinator program.

Letters to the Editors

Dear Mr. Michael Darwin:

Recently one of my clients who is a member of the Cryonics Society was talking with me and indicated that some insurance companies are reluctant to issue policies for suspension coverage. In arranging my client's affairs I have had no problems at all and do not anticipate any problems either. As General Agent for Guardian Life Insurance Company of America, we do a lot of estate planning for clients and coordinate their insurance programs with all of the other desires they may have. If the insured is certified dead and a legal death certificate submitted, then our company will pay a death claim. Whether or not the claim should be paid directly to the society, to a trust, or to another person is the client's personal decision.

Sincerely
Matt Kokkonen, CLU
General Agent
The Guardian Life Insurance Company

Dear Mr. Kokkonen,

In our experience the following companies have refused to write life insurance policies for cryonics purposes on the basis of no insurable interest:

Life of Virginia
Metropolitan
New York Life

Prudential Insurance was willing to write a policy with a cryonics organization as beneficiary, but as recently as 1978 they refused to write for an amount greater than $5,000; hardly of much use. All of the above companies requested and received copies of suspension documents before they declined to write insurance for cryonics purposes.

Some individuals who have insurance with the above firms have obtained it by first taking out the policy with their estate as beneficiary and then two years later changing the beneficiary to the cryonics organization. All of this leaves the question of insurance interest unresolved. If your company is willing to issue a letter stating that arranging to have oneself suspended constitutes insurable interest, then I see no problems. I would point out here that such a statement should come from the corporate offices of the carrier itself and not from a field agent. If the Guardian is willing to do this, it would, to my knowledge be the first company that has ever done so. In such case, I would be happy to recommend your company as

a firm that says it will pay to cryonics organizations. M.D.

Dear Editors,

I have noticed that CRYONICS contains for Alcor. Would you consider doing the same for BACS? Publication of our meeting schedule may help get more interested persons in Northern California to attend and possibly get involved in our activities.

BACS's upcoming meeting will be held as follows:

1pm to 5:30pm	1pm to 5:30pm
Saturday, September 18, 1982	Saturday, November 13, 1982
Home of Frank and Geri Rothacker	Home of John R. Day
3017 Greer Street	7710 Huntridge Lane
Palo Alto, California	Cupertino, California
Phone: (415) 858-0869	Phone: (408) 255-8460

The "Unlocking the Directorates" article in the July issue was accurate in describing BACS's overall problems in it relations with Trans Time. It is not easy to have ten to fifteen people doing the job of thirty. I think it is amazing that we manage to pull together in spite of our difference to suspend deanimated patients when the need arises. If I am correct, BACS president Jerry White said that he will write a response to the "Unlocking the Directorates" article.

At the last BACS meeting some of those attending requested further information on your cremation arrangements with the Omega Society. Please forward same to me as soon as possible. Of course, I'd like to note that I still find the neuro option to be personally distasteful and grisly. Savings on storage costs will be offset by the costs of cloning R&D, etc. I also think this practice is dangerous from a public image point of view.

Evermore,
John B. Krug
BACS Secretary/Governor

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Dear John,

We would be happy to run meeting schedules for BACS in future issues of CRYONICS.

Any of your members wishing to take advantage of cost reduction for cremation through the Omega Society should write to BACS, not IABS. I will send the BACS administration information on how their members can participate.

We look forward to editorial or other commentary from BACS and hope to see more from your organization in the pages of CRYONICS in the future. M.D.

Southern California Open House

The weekend of September 10 through 12 Cryovita Labs, the Alcor Life Extension Foundation, and the Institute for Advanced Biological Studies will sponsor an open house. The purpose of the open house is for cryonicists in both Southern and Northern California to get together, talk things over, and see what progress has been made at Cryovita over the past year or two. This is expected to be a very informal, low-key event. No major technical or business sessions are planned. There will be plenty of time for individuals to quietly meet and/or to take in the sights that Los Angeles and Orange County have to offer. Currently we anticipate attendance to be in the range of 15 to 30 people.

Schedule

The weekend will open with a reception at Marcelon Johnson's home in Huntington Beach on Friday, September 10 starting at 5:30 pm. Marcelon, IABS, and Alcor will be supplying the food. We request that anyone who attends the reception leave a dollar or two in the barrel to help defray food costs.

On Saturday, September 11 there will be an open house and tour of Cryovita Labs with Jerry Leaf and Mike Darwin. The open house will begin at 11:00 am and last until 4:00 pm. People may come and go from the open house as they choose. Mike Darwin and Al Lopp's apartment, which is located about a mile from Cryovita, will be available for people who wish to talk and relax. Light refreshments will be provided at both Cryovita and at Mike and Al's place. Following the tour of Cryovita there will be an evening pitch-in at Marce Johnson's starting about 6:00 pm. Guests are asked to bring a food item to contribute to the feast.

Scheduled events will pick up again on Sunday, September 12 with an IABS/Alcor meeting to be held at Beverly Hills Savings, located approximately 2-1/2 miles from Cryovita east on Imperial Highway. The meeting will begin at 11:00 am and run through 1:00 pm. Then there will be a break for lunch. There are many restaurants and eateries in the area for all tastes and budgets. Many restaurants are within walking distance of the meeting room. At 2:00 pm there will be a Trans Time meeting which will last until 4:30 pm. Should the TT meeting overrun it can be moved to Mike Darwin's about a mile down the road. Scheduled events for the weekend will end with the adjournment of the TT meeting on Sunday evening.

Lodging

Marcelon Johnson has limited sleeping bag accommodations available. Several other individuals in the LA area have also offered to help put up people. Anyone interested in this kind of lodging should contact Mike Darwin c/o IABS, 4030 N. Palm #304, Fullerton, CA 92635 (714) 990-6551 or (714) 879-0414.

Very reasonably priced motel accommodations are available in Brea less than two miles from Cryovita. In our experience, the best place for the money is the Twin Palms Motel located at 805 S. Brea Blvd., Brea, CA 92621 (714) 529-3078. Twin Palms' rate for one bed, one or two persons, is $26.

The charge for two beds, two people is $34.00 per night with only $2.00 more for each additional person. Twin Palms' modest facilities are clean and attractive and we have found the management to be friendly and responsive. We recommend reservations two weeks in advance, although it is likely rooms will available at almost any time up to and including the open house weekend.

Adjacent to Twin Palms is the Regency Motel. The Regency features slightly more stylish rooms. The Regency's rates for single occupancy are $29.00 per night and for double occupancy with two beds $36.00. Parties with more than two adults other than family units are discouraged and no rates were quoted to accommodate them. Once again reservations are suggested. Both the Regency and Twin Palms have swimming pools.

Directions

People coming in from Northern California on Interstate 5 can most easily reach Marcelon Johnson's home by taking I-5 to the 605 Freeway South. Take the 605 to the 405 (the San Diego Freeway) and proceed south on the 405 to Beach Blvd. (Hwy 39) in Huntington Beach. Go south on Beach Blvd. approximately 4 to 5 miles to Yorktown Avenue. Marce Johnson's home

is locate at 8081 Yorktown, left off of Beach Blvd. less than 1-block on the north side of the street.

To reach Cryovita from Marce Johnson's home turn right (north) onto Beach Blvd. from Yorktown Avenue. Go north on Beach Blvd. approximately 17 miles to Imperial Highway. Turn right (east) onto Imperial Highway and go about six miles to Palm. Palm is about 1/2 mile past the major intersection of Imperial and Harbor. Turn left (north) onto Palm and enter the main drive to the industrial park immediately on the right. You will travel up Palm only about 100 feet. Follow the main drive back to the last driveway on the right. Turn into this driveway and Cryovita will be

immediately to your right in unit #303. There is an easily seen sign on the front of the unit and the entrance door has three blue hexagons on the glass.

Locations for Beverly Hills Savings and Mike Darwin's apartment are all within 2 miles of Cryovita on Imperial Highway. Reproduced below is a map showing all three locations as well as the location of both motels mentioned under "Lodging."

RSVP

We would appreciate a statement of intent to attend the open house so that we can plan effectively for food and lodging. Enclosed in this issue is a registration form. Please, fill it out and return it to us before September 1st, 1982 if you plan to attend.

We look forward to seeing you in September!

**********LISTED ON THIS PAGE IS A GUIDE TO THE LOCATIONS MENTIONED ABOVE. THE FIRST HALF OF THE NEXT PAGE CONTAINS A MAP IDENTIFYING THESE LOCATIONS IN THE FULLERTON-BREA AREA.

INTERVIEW WITH THOMAS DONALDSON

by Mike Darwin

Dr. Thomas Donaldson holds a unique and unprecedented position within the cryonics community; he is universally admired and respected. In any community of strong willed, opinionated people that is an incredible accomplishment.

In January of 1982 I had the privilege of meeting with Thomas for the first time during his visit to the United States from Australia. I found him no less original in person than he is in print. The most startling and delightful things about Thomas are his insightful and original views on almost any subject you care to discuss, and his persistent, realistic optimism. I think it is this last quality that I am most in awe of, and to some extent it shows up well in a piece he authored for this issue entitled "What Can You Do." Thomas is the type of man who could sit there and calmly tell you: "Well, I was trapped in the jungles of Malaysia surrounded by unscalable mountains on all sides, pretty much cut off from any hope of rescue. So, the first thing I had to do was teach the natives mining techniques. Then, you see it was just a matter of setting up forges and within twenty years we had light industry going. At any rate, to make a long story short I eventually was able to put together a single engine airplane and fly out of there." I might add that all of this would be related in the most modest and matter of fact way. And what's more, there

wouldn't be a shred of doubt in your mind that Thomas was telling anything less than the truth.

Thomas is an incredible man. He holds a doctorate in mathematics and a professorship at the Australian National University in Canberra. He has traveled extensively; Mexico, Europe, Japan, and Indonesia. Originally from Kentucky, Thomas relocated to Australia about eight years ago and has carved out an impressive reputation for himself in pure mathematics. I stand in awe of his flexibility and openness to change. In fact, I paid him the highest compliment I've ever paid anyone. I told him that when he is revived after 100 or 200 years the one thing I could be sure of is that he wouldn't miss a step. Here then is Dr. Thomas Donaldson in an interview conducted at Cryovita Laboratories on January 27, 1982.

MD: What are the most important issues confronting cryonics today?

TD: Improving the scientific and cost sides of the operation.

MD: In what ways?

TD: Take insurance, for example -- a lot of it is profit that should be going to cryonics societies. That's the problem -- it impacts on our ability to recruit people. With remote standby, for instance, rates should be assessed on the basis of age and possibility of deanimation. But they aren't, which means basically that younger people are being asked to pay more than they really should on a strictly financial basis. These are problems that are not easy to solve. I don't have any magic answers. A lot of the present cost of cryonics comes from the fact that so few people are being suspended. Those who are suspended thus have to pay quite a large sum.

If we want to keep going for a long time we have to pay attention to issues like this. How can we reduce our costs? How can we best use our own suspension funds and other economic strengths?

MD: What do you think are the critical scientific areas that we should be investigating as cryonicists?

TD: Brain freezing. All kinds of brain freezing under all kinds of conditions. Everything you can do: freeze brains that have been mistreated in a lot of ways; freeze brains that have been perfectly prepared; examine these preparations with light and electron microscopy and histochemistry.

MD: What do you feel we should be doing to improve our scientific credibility and standing?

TD: I've stopped worrying about that. If the cryobiologists want to become cryonicists they are more than welcome, but I don't see the need for their approval. As long as cryonics conducts its science honestly, accurately, and with a high standard, I really don't see how it means anything what cryobiologists have to say.

MD: What about public credibility?

TD: One of the problems is that public credibility is so poor that if the entire Society for Cryobiology decided to take on cryonics, the net result would be that they would waste a lot of money and dissipate a lot of effort and maybe go out of existence much faster than otherwise. I can't see any

other effect it would have. It might be a good thing because it would probably accelerate the demise of the Society for Cryobiology. That would be lovely. I don't think it could hurt cryonicists.

MD: I take it you do not see any great social benefit to society as a whole or any personal benefit to cryonicists in the continued existence of the Society for Cryobiology?

TD: I think blood freezing is a good thing. I'm not against people

who work on it. My attitude toward blood freezing is similar to that of an astronomical engineer toward someone who's busily trying to improve airplanes: it's probably a good thing, but it has nothing whatever to do with my interests.

MD: Aren't you equating the Society with blood freezers when in fact they are a very diverse group of people -- insect physiologists, organ preservationists, and so on?

TD: That's probably true. You asked me, "Have they done good things?" Blood freezing is one of the good things they have done. But just because an organization has done good things, that's not sufficient for them to get my support. There are so many organizations that have done good things that you have to choose. True, there are people involved with organ freezing which is a good thing; but they are NOT working with brains and that is what is of supreme importance.

I can remember in the past much debate in cryonics about how to freeze brains. Of course this debate was not going to be resolved empirically, it was going to be resolved by debating about the best way to freeze kidneys based on reports in the literature about attempts to cryopreserve these organs. That is not the way to learn how to freeze brains. The way to find out how to freeze brains is to actually freeze them.

MD: Where does your organization in Australia stand now?

TD: There is a viable cryonics enterprise in Australia now. It may not be impressive or large, but it is viable. There are cryonicists and they have some degree of organization. I think it may take as long as five years before we are ready in terms of equipment to freeze someone. It may take as long as ten years before we actually freeze someone. It is important to remember that the population is much lower in Australia. So, even if people were as interested in cryonics as they are in the States, the raw numbers would have to be much lower. Even with help, it is going to take a long time before we have enough money and expertise to do a freezing in Australia.

MD: How many of you are there?

TD: There are six people signed up with all arrangements complete. There are two people who are very interested. But your guess is as good as mine as to when they will join. When I go back I plan to do some additional promotion and hopefully get other interested individuals. The media still goes crazy over there about cryonics, and all that is necessary to get interviews is to send out a few postcards.

MD: What about California cryonics? Any comments or suggestions?

TD: They could use more legal help. Lawyers are not cheap. I am sorry to say this, but I think that some of the lawyers in California could probably be of a great deal more help to cryonics if they would be prepared to work at reduced rates. After all, their interests are at stake, too. The Detroit people seem to have a lot of good legal advice. I thought that CI

was in a very good position legally.

MD: Where do you see the big legal deficiencies in the California program?

TD: It isn't so much a deficiency of the program as much as it is an inability to handle the legal problems that come up. The problem with the Uniform Anatomical Gift Act is a good example. Further difficulties will arise and they will have to be worked out. I can guarantee it without specifying what they are. And what have you got? You've lawyers wanting to be paid for their time -- even though they are signed up and have suspension arrangements. I understand that everybody has to put brad on the table, but that attitude is very unfortunate. Michigan has a couple of lawyers who are prepared to work for free. This is important, not so much with existing programs, but with respect to threats which arise which something has to be done about. You get a hemorrhage in finances when you have to pay a lawyer to do these things. After all, we're not asking them to do anything more than the rest of us are doing. Look at Jerry Leaf and yourself for instance.

MD: What about your visit to the Florida group?

TD: They have plenty of money. They seem to be very low on manpower. Particularly on committed manpower that will spend a significant amount of time on anything. Of course, the manpower can be bought, but the price of manpower is likely to be astronomical even compared to the price of a heart-lung machine. They have a completely different set of problems. I suppose if they were prepared to spend a great deal of money they could go a long way toward buying their way out of these problems. I mean a heart-lung machine is a piece of capital equipment and you buy it, and if you don't use it maybe you can throw a tarpauline over it and it just sits there. But if you are going to have somebody do something for you on a regular basis and you want them to be good, you are asking them to devote a large slice of their life to your concerns and that does not come cheap.

MD: Why do you think the Florida people have been unwilling to make the commitments of time and energy that have been made elsewhere?

TD: Well, there are a lot of issues in organizing a cryonics capability which can only be solved by the application of a great deal of personal attention. If someone is not willing to devote that attention it is going to be hard for them to buy it. There are some things that they can't really delegate. Some very sensitive decisions have to be made. On the other hand I don't feel any of these groups are near collapsing. It is not a matter of survival.

MD: How do you feel about aging research? Any breakthroughs lately?

TD: I don't foresee any in the near future. The problem is that by the time any drug is clearly and definitely established as a good workable life-extending drug to take, you will probably be over 75 and it will not matter in the least to you personally. The difficulty with these gerontological

treatments is that it really would take a long time to find out if they work. I mean, even if you have something that would make someone look a lot young, you still have the problem

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of what it is going to do to them over a period of 20 years. It could be dealt with on a long-term basis by finding good ways of assessing physiological age; but then it is going to take just as long to find an accurate, calibrated way of assessing physiological age as it is to discover an anti-aging drug and prove that it works.

MD: So I gather you don't feel gerontology offers much hope for those of us who are now middle-aged or older.

TD: No, I don't think it even offers much hope for somebody who is in their 20's. I am very in favor of work on gerontology, but I just don't think it can be responsibly sold as some way to prevent us all from growing old and dying -- even those of us who are very young.

MD: Are there any gerontological therapies which you feel particularly ripe for immediate human application?

TD: I am taking Deaner (trade name of dimethylaminoethanol, also know as deanol) and I'm also taking calcium pantothenate. I really don't think that my word means much of anything. Anyone contemplating doing this kind of thing is going to have to look at the literature and decide for themselves. I take GH3 very seriously. I am not taking it myself, but I think it deserves a great deal of further investigation. I think L-Dopa is another serious possibility, but there are a lot of troubles and serious side effects which need to be better quantified. I am looking at this drug very hard right now.

MD: What about Donner Denckla's work with removing the pituitary glands from rats in order to find the "death hormone"?

TD: I have problems with Denckla mainly because there is this fellow named Everett in Australia who has been working with hypophysectomized rats for many years. He can get apparent rejuvenation of the animals without lifespan extension. So, I think that what Denckla has ought to be perused, but I don't think it is at all clear that it is going to rejuvenate anybody.

MD: Are there any other areas of gerontological research which especially interest you?

TD: I've seen lots of lip service to the idea of circadian rhythms (biological clocks) being related to aging, but precious little research. Everybody talks about the "clock of aging," but the amount of work that has actually been done to establish any relationship between known circadian

clocks and aging rates is negligible. This ought to be taken more seriously.

MD: What do you feel are the prospects for raising enough money to allow for some significant "in house" cryonic research?

TD: Significant to whom? Significant to us? If you mean significant to

the world at large, well, I don't think the world in general is going to consider cryonics significant for quite a long time.

MD: Many people within the cryonics community are very anxious to see

cryonicists do research which results in publishable papers of interest to the general scientific community. How do you feel about this?

TD: As someone who has actually published papers as a working mathematician, I must draw a distinction. There is publishable research that is good research and, while it may be sad, it is quite possible for research to be good and not publishable. You've seen the sort of problems we've had with the Society for Cryobiology. I don't think the Society for Cryobiology is going to publish a paper that is openly cryonicist. I'm sure they would publish papers that were not openly cryonicist. But that's a problem, because Cryovita and IABS, for instance, are likely to be considered tainted and therefore unsuitable for publication.

We do want to do good research. But we can't count on seeing even good research in print in a major journal such as "Cryobiology." We like to think of scientists as being people with open minds, but very often that is not the case. Over a period of 100 years or so this will probably work itself out, because I think that good research does win out in the end. In the meantime I really don't think we should let our judgement about the things that really need to be done be influenced by the possibility of publication "Science" or "Cryobiology."

MD: What kind of chance do you feel people making cryonic suspension arrangements today have?

TD: Providing they are quality arrangements, I would guess that it's really good. Particularly assuming that funding is well provided for -- well over the minimums. I'm talking about the possibility of being frozen for four hundred years. In four hundred years you've got a lot of time.

MD: You don't feel that biological problems such as cracking, failure to preserve ultrastructural information, or other problems which might result from the introduction of cryoprotective agents will present any insurmountable problems?

TD: I feel those things will be very significant in that they may well determine how long it is before someone is brought out. I can't prove this, in fact there is no way to prove this, but my own gut feeling is that -- in terms of preservation of information -- in a high quality suspension it is there. Now there are fantastic problems in recovering that information and incorporating it into a workable human being. But I feel that the information is there. Once you have that, then the chief problem you have is time. The chief problem with time is money -- failure of continued suspension.

MD: There is a question which is related to this which has been raised by several people, namely the issues of low cost, lower technology freezings, such as minimal or no perfusion, and extended storage on dry ice. What is you opinion of these alternatives.

TD: All of these things are very different. If I wanted to cut costs, the first thing I would do would be to have my head frozen. The last thing I would do would be to have my head frozen. The last thing I would do would

be to give way on the matter of storage temperature. Dry ice storage is definitely something I would be very

uncomfortable with. I would feel very insecure about depending on the notion that a small number of reactions are likely to proceed to completion at this temperature and then there would be no change. I would expect that there is going to be continued change and reactions at that temperature. Based on the Arhennius equation alone, there are tremendous grounds for concern.

On a percentage basis of the actual funds that need to be available for freezing and storage, the $20,000 currently being charged for perfusion is negligible. I think it's silly to argue about this. I think people take these "minimum" amounts for suspension all too seriously. All these minimums represent is the absolute, rock bottom price that the procedure can be done for -- regardless if it is CI's minimums or Trans TIme's minimums. The question you have to ask is, "how will I be cared for if there is a ware or a depression?" You want to have a lot more money available to the organization which is caring for you. If they have enough money then they can move you overseas, or they can buy a nitrogen liquefier to deal with shortages of nitrogen. They are more flexible and that is definitely the key to long-term survival. Whereas, if you just have the minimum you'll probably be frozen; but if there is any significant amount of trouble it is likely that you'll go under.

For those who want to go with CI's $28,000 minimum, I think they should think very seriously about neuropreservation. Even those who have much larger amounts of money should open the possibility legally that they can be converted to neuropreservation if economic necessity calls for it.

MD: Any thoughts on strategy and tactics for us here in the states?

TD: No. The problems you face are obviously difficult ones. I could suggest lots of things if large amounts of money were available, but we all know that large amounts of money are not available.

MD: So you don't see some radical new approach as being necessary? I gather you feel we should just continue to proceed as we have.

TD: I don't believe in dealing with problems as they arise. What I meant is that all the problems are difficult ones and I don't have any magic answers. The trouble with dealing with problems before they arise is that it takes a lot of time and trouble and money -- when it may not seem absolutely necessary. The trouble with dealing with problems when they arise is that you are not as likely to be as thoughtful or as thorough in solving them.

MD: Do you feel that provisions should be made for cryonicists to relocate, both the animate and deanimate ones?

TD: Well, you're talking about forward planning. I can think of lots of things that would be good to do if somebody would like to do them. The thing is everybody is swamped already. It would be nice to have some contingency plans worked out if the legal situation gets much worse.

MD: What would be the prospects for an emergency relocation to Australia? Could it be done? Would we have problems in moving patients to Australia?

TD: No, I don't think you would have problems. I think you would want to have lead time. I actually checked into the legality of bringing bodies into Australia, and if it is done properly and according to procedure it can be done. The one problem I could foresee is inadequate lead time. I really don't think you could undertake such a move with 24 hours notice. But if the lead time is there I foresee no insurmountable problems.

MD: Are we talking about whole body or just neuro patients?

TD: Legally, even moving whole body patients would be entirely tenable; but obviously if it ever came to that, the practical difficulties in whole body transport are staggering. I would actually recommend that you only take neuros. In other words, convert everyone to neuro.

MD: Would there be individuals in Australia who would be willing and able to act in securing facilities for us and handling legal negotiations on the Australian side?

TD: Certainly, certainly. There would be people here. One of the advantages we've got is that our proportion of people who actually are prepared to do something is much higher than it is in groups in the States. Indeed, with enough forward planning you could even take a significant amount of equipment of equipment with you as well.

MD: What about costs? Any ideas?

TD: A fair bit. For a whole body patient on ice it would cost in the vicinity of $10,000. Obviously, if you're talking about neuropatients you might be able to transport as many as 10 or 20 in the same volume and weight limits and not spend any more money. You would probably have to arrange a special container, especially if you wanted to keep them on LN2 during transport as opposed to dry ice. If you had enough patients it would probably make sense to charter an airplane, which could probably be done for $50,000 or so. Of course, if you are only going to move neuropatients then this would not likely be necessary. Of course, this is all off the top of my head. Careful planning might quite possibly reveal other, safer and more efficient ways of going about this.

MD: You have spoken out in the past, at least privately, against rescuing suspension patients who have exhausted trust funds or have no funding for other reasons. Could you elaborate on your reasons for this position?

TD: That's complicated. I'm not against rescuing people in general so much as I am against this particular situation to which I think you are referring. This situation with BACS patients leaves me with a bad taste. The people who are being rescued had not joined a cryonics organization. Their son had, but he had never completed his suspension arrangements. Really, these people were rather marginal. At some point you just have to put your foot down as to how far you will go for people who have done nothing for themselves.

MD: What about the benefit to BACS and TT which came as a result of freezing these patients? What about the benefits that might come in using their plight as a test case for the Uniform Anatomical Gift Act?

TD: This is a major conflict in my own mind. One of the great advantages that the California groups have that none of the other groups do -- which is very important in a way that you only find out when you do it -- is that they have actually frozen people. So they have had all the problems and all the learning that goes with that. They have some real bodies there. There's a lot of things that you can sit there in the corner of your desk and calculate how much it ought to cost until the sun burns out; but the only way to really find out is to try it and see what happens. That's important. I wouldn't want to give that up. It is also true that most of the people who are frozen in California have made no preparations. It is quite possible that many of these people will be thawed out eventually due to failure of their finances.

I think that an organization can go into it quite openly and state, "This is what it will cost to perform a suspension operation. You know that a suspension operation is useless unless storage takes place indefinitely. We are not altruists and we do not intend to carry out the storage without payment." But ultimately, of course, in order to have these test cases, these people have to show up and they have to be given some kind of service. We have that problem in Australia in that I would really like for there to be a test case on remote standby. But someone who has never signed up and never made arrangements -- in other words, not someone I know!

I guess what I'm saying is that I think our altruism should be limited in that respect. But then it could also be said that we could limit it too much and all of the "experimental" subjects we get are going to disappear. If this case had happened differently I would feel much differently about it. If both of these people had been suspension members I would feel much more reluctant about letting them go. Certainly if someone wants to contribute money to this I am not going to speak against it. On the other hand, I wouldn't want my BACS dues to go for this. About the best I can say is that I feel uncomfortable about it.

MD: Any last profound piece of wisdom to offer to other cryonicists out there?

TD: I'm sure that any profound piece of wisdom I might have would seem really rather stupid in 300 years. So I think it would be better for me to say nothing, so I don't feel ashamed of myself in 300 years.

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"It doesn't hurt to be optimistic. You can always cry later."

-- Lucimar Santos de Lima

What You Can Do -- Part I by Thomas Donaldson, Ph.D.

Membership in a cryonics society is much more like buying a sailboat or a computer than it is like buying a shirt. The shirt we only need to wear, and with no further effort all the benefits of shirts hang from our shoulders. But sailboats or computers mean little unless we put out some effort and knowledge of our own to use them. When you joined a cryonics society you have have only made a first step toward protecting your life. To get the full advantage of your membership you will have to do a lot more on your own. I shall here describe some of the things I have done myself, and some thing I haven't done, but have put on my plate to do in future. They are all things which will increase my chances of freezing under good

condition. They cost varying amounts of money and time (some cost more of one than the other). It is true that I am in Australia, but considerable acquaintance with the United States and prolonged acquaintance with the particular problems anyone wanting to be suspended must solve convinces me that they are not at all special to Australia. In fact, I believe many of these suggestions might be followed with benefit by people resident in California!

I should begin by clarifying some points which will be clear to any Suspension Member of a cryonics society, but less clear to someone who may only be considering the possibility of joining. First, while it may be true that someday you will only need to sign a paper and all of the other (MANY other) things which need doing will be done for you by a superbly equipped cryonics society, that is not at all true now. Furthermore, it is unreal to expect that it will be true anytime in you natural lifespan. When you join, you will have taken only the most rudimentary initial steps, and if you take your own survival seriously you will have to do a good deal more, all on your own. If you want to live, you must do more than sign a paper, you must push hard. Second, I'm not going to pay attention to matters of publicity and how you might gain more adherents to cryonics. Everything I shall discuss is something which you can do, if necessary, entirely by yourself, with the cooperation of NO OTHER HUMAN BEING required to achieve it. As the only cryonicist in your state, you may feel alone, but that should not worry you at all. You don't need anyone else's help to do these things.

I can say, however, both to existing suspension members and to those who may be considering joining our ranks, that some of these things can be done BETTER by a group. You should think very seriously about meeting with any other cryonicists in your area so as to plot strategy and lay plans.

All these points understood, here are some things which need doing:

LEGAL ARRANGEMENTS

1. The most elementary thing to do is to make you Will. It's so elementary that I hesitate to mention it, because most suspension members will have probably done this long ago. But there are still some important things to say about it, and it belongs in any checklist. First, you will have probably arranged for most of your property to pass by means of Trusts or other means, rather than by Will, and I won't bore you by describing why you don't want to make arrangements for suspension by Will. BUT you should check up on some points. For instance, you are likely to have extra security if you name your Executor as a cryonicist or a cryonics society. The point is likely to differ with every state, and you should definitely check with your lawyer, but the Executor has some power to override ALL OTHER PARTIES in deciding what is to be done with your body. A second point to remember about Wills is that at the time of death, or afterward, you may have additional property which you hadn't planned on having. For instance, if the doctor treating you

accidentally kills you, the proceeds from any malpractice or wrongful death suit will go to your estate, and you want them probably to go to your Suspension Fund. So a Will is very much needed, first for naming an Executor and second for disposition of unforeseen assets.

2. We would all like to believe that we will be completely sane and

capable of conducting our own affairs right up to the moment in which we are pronounced legally dead. Anyone at all who thinks seriously on this question must realize almost instantly that such a state of affairs is one of the least likely ways in which we will die. Countless television and movie scripts, with their "death scenes" have fortified this idea, but it simply ain't so. If we seriously want to be suspended, we will have to ASSUME as a matter of course that WE WON'T BE MENTALLY SOUND OR PHYSICALLY CAPABLE AT THE TIME OF OUR DEATH. We won't even be so for WEEKS BEFORE our death.

To someone who wants to be suspended, this raises all kinds of problems. In the first place, you might burn up your entire estate in your final illness. State and Federal Authorities do not look kindly upon people who would rather be suspended than pay their medical bills. Secondly, there will be decisions on how and where you must be treated which need to be made, and which will affect your chance of being suspended. When they happen, you will be in no condition at all to make them yourself.

The clear solution to this problem is to make out a Power of Attorney authorizing someone you trust to do all the necessary things: for instance, the power of Attorney should allow this person to move you to another hospital and select and hire doctors, surgeons, and other medical personnel to move you to California if necessary. It should allow him or her to bankrupt you (i.e. take all your property) if necessary, transferring ownership to your cryonics society. It should place on this person the right to decide how you are to be treated, medically and otherwise.

All of these are much more complicated than they might sound at first, and you will have to work out legal details according to the law of your own state. But to begin with the complexities, we can discuss the very first point, WHO is this person to be?

If you are utterly alone, the only cryonicist in your state (there are such people) then the natural choice is probably your cryonics society. That is what your society is there fore. Perhaps this seems paranoid, but my own strong feeling is that you would be very unwise indeed to place this power in the hands of anyone who was not already a Suspension Member of a cryonics society. Even if this person wishes to carry out your desires, he or she is going to meet with a lot of opposition. Only a cryonicist is likely to push hard enough to overcome this opposition. If your wife, for instance, is supposed to do these things, are you really sure that she will not give it all up? After all, she probably stands to inherit from you, especially if you're not frozen.

If there are other cryonicists available in your state, you have a much wider choice of possibilities. It is obviously an advantage to have someone nearby rather than someone far away in California. If nothing else, they can arrive on the scene much quicker and at less cost. If there is only one cryonicist nearby, then the thing to do is to set up a "buddy system," in which you and the other cryonicist agree each to make the other your Attorney. You can both add a clause to your Power of Attorney stating that if the other for any reason is not available then your cryonics society is to be the attorney unless and until your friend can be found and is able to help you out.

Finally, about giving a Power of Attorney with authority to bankrupt you, of course this thought is going to seem unpalatable! Perhaps it will help to

list some protections to you. First, of course, the PoA can be limited only to a case in which you are unable to deal with your own affairs; your Attorney will therefore have no power to bankrupt you, so long as you are sane and healthy. There are many other protections you might build into your plans too: for instance, you might require a committee of cryonicists to [*** TEXT SEGMENT OMITTED BY AUTHOR ***] and property, you might consider allowing your cryonics society to only take certain selected parts of your wealth (I feel that even relatively wealthy cryonicists would do well to consider this option, since medical bills might easily rise to hundreds of thousands of dollars). Unfortunately I don't see any easy way to legally require you to receive your property back in case you recover (Please note that this needn't mean that you won't get it back. It only means that your cryonics society can't be forced to give it back. For instance, your cryonics society might vote to give the money back anyway).

Finally, here is one of the things a group can do. If there are at least two other cryonicist in your state you might INCORPORATE YOUR OWN CRYONICS SOCIETY. (Some people might live in U.S. States where a cryonics society was once founded, and it may be worthwhile to look into reviving it). The purpose of this society is not to carry out publicity or anything of that nature: its purpose is to allow you and your friends to arrange your Powers of Attorney in a more efficient manner. What you do, is to all give your Powers of Attorney to this new Society, and then work out a member of the Society who is to exercise it and a second person who will exercise the PoA in his or her absence or inability. Here in Australia we call these people the Suspension Officer and the Alternate Suspension Officer respectively. Even if your incorporation does nothing else, it will allow you to switch around who is to be responsible (i.e. the Suspension Officer) much more easily than otherwise. Otherwise you would have to each write out a new PoA every time you wanted to change Suspension Officers.

There are a lot of other things you can do with a corporate structure, too. For instance, if Trans Time or some other society is going to come into your state, they may need to have someone available who is authorized to act for them before they actually get there. Remember that it may take as long as 8 hours for a Trans Time team to actually arrive on the scene, and that even once they arrived, they are going to meet with problems. They won't know the town, nor will people be prepared to do things merely because because they say to do them. Your State Cryonics Society can be authorized by your cryonics society to act on its behalf too. Eight hours is a long time and a lot can be done in that time by somebody who is already on the scene. Finally (need I say it) a corporate structure provides a base for further growth: I'll talk more about this later.

Furthermore, if you have your own cryonics society you can make arrangements to protect your estate by bankrupting yourself through this cryonics society. As in all other cases, YOU DON'T HAVE TO WAIT FOR BACS OR ALCOR OR CI to institute arrangements to do this: you and your three friends in your home state need only work out such arrangements for your own home cryonics society. This is of course one more advantage of incorporating.

For those with interest in tax shenanigans (very important, since estate taxes will take away a large slice of our property which we might otherwise hope to use for our suspension!) a further advantage of a local home corporation can be suggested: you might use it to evade taxes. For

instance, you might transfer property to the cryonics society prior to death, with an agreement that gives you the continued use of it. Your taxable estate at death might then be reduced to ZERO. However this is a large and complex subject needing an entire article to explore properly.

MOVIES TOMORROW. The first in a series of articles about the texture of tomorrow. By Michael Darwin.

One of the most incredible developments in recent history was the discovery that visual information could be stored in a durable form through something as simple and inexpensive as photography. When one looks at the wealth of information present in a single visual image, it is hard to imagine any way to capture it and recreate it at will short of massive computers. And yet a simple silver photographic emulsion will suffice. Add to that simplicity the mechanical genius of Edison and you have images that move. Laughing, dancing, crying -- all of it can be captured and held in a sort of suspended animation. The people who made the images may be long gone; but like an empty bottle of perfume, a strong message of the character of the fragrance can be had just by opening the vial and holding it in the warmth of eager hands.

The movies are miraculous; but I believe they are but a glimpse of marvels yet to come. Because the images film stores are stored by a trick of chemistry rather than by an orderly, numerical description of the information they contain, we cannot change what the film has recorded. The information is preserved, but it is like a painting which has dried; we cannot manipulate it. It is forever as it was. I believe this will soon change. Within a few years at most the Sony Corporation will release digital sound, which will relegate analog music such as conventional records and tapes to the same archives that hold wax cylinder recordings. Pioneer already is marketing their laser video image system which employs a digital system for encoding visual information. What is the significance of these developments beyond the superior quality of the image and the sound they deliver? The significance is that the images are represented by numbers in strings of ones and zeros. Unlike the hardened oils of the silver emulsion we can get to numbers and we can manipulate them -- with the aid of sophisticated computing equipment. It means magic! It means artistry is about to be born which we can only glimpse at this moment. But even what we can vaguely see gives great reason for excitement.

Imagine movies made without sets, without actors. Imagine computers so sophisticated that they can, at will, produce living images on screen of such quality that animation ceases to be animation. Imagine a playwright or screenwriter freed from the tiresome business of trying to find a particular human being to fit the image he has so clearly in his head. Imagine a machine able to generate visual images of such quality that they are indistinguishable from footage of real actors and actresses. If you can imagine this then you have a hint of the wonders that digital imagery and high speed computation will bring. Expensive movie sets, special effects, even actors and actresses will vanish. With direct control over the synthesis of visual information, the filmmaker will be transformed in ways we can only begin to realize.

And this wonderful technology will not be only for new film efforts. It will extend even into the past. Consider this: Humphrey Bogart is dead; yet through the artistry of makeup, chance (in the form of look-alike doubles), and a studied extrapolation of his manner and style, movies have been made which present a reasonably good Bogart imitation. When a contemporary filmmaker wishes to use Bogart he must

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make a number of compromises. He must find the closest available physical look-alike with acting ability and voice to match. Nature, economics, and this double's own inclinations and talent all come into play in limiting the extent to which the filmmaker's dream is realized. This would-be double will have to examine a large sample of what Bogart has done, storing the information about responses, facial expressions, and nuances of behavior as best he is able. All the while this absorbed information will be colored and changed by the flavor and the responses of the imitator's own personality. THe effect is a less than perfect pentimento -- a veneer image over an older and more solid one, the artist's own self. The advent of computer generated digital imagery will eliminate all of these problems. The machine has no prejudices of its own, no personality to submerge or interpret through. When computing capacity of the appropriate sophistication becomes available, it will be possible to reproduce the image of a Bogart, a Judy Garland, a Joan Crawford with absolute fidelity and move it through dialogue and scenery which that individual could never have imagined, let alone seen during his or her lifetime. But capacity to manipulate will not stop with images or voice; it will go much, much deeper.

When we imitate someone either in jest or in the more serious attempt to recreate what they were, we are reproducing bits and pieces of information gleaned through watching them either in person or on film. If we watch carefully, the imitation can be surprisingly faithful at times. Regardless of how closely we watch, our ability to absorb and organize information about another's behavior is sharply limited. We cannot catch every nuance, every muscle contraction, or grimace. We cannot reproduce the exact voice to every phoneme and treble. We are limited to generating a caricature. The computers of tomorrow will not be so limited. They will be able to examine a film or an entire film library of a long vanished performer and capture every nuance of acting, every response. More importantly, they will be able to predict responses based on the information they have in storage. Thus, it may be possible for a machine to generate a credible young Joan Crawford replacing Jane Fonda in the contemporary production of "On Golden Pond." It is important to point out here that the machine will probably be unable to give you anything new in terms of acting responses. You won't get Joan Crawford the woman playing in the new role. You will only get the Joan Crawford who exists on tape and film. This should be quite enough for many marvelous things to happen.

As this computational tour-de-force becomes more available, all sorts of things become possible. How about interaction between the viewer and the film? Each film becomes different for each person. Perhaps in your version of "The Wizard of Oz" Dorothy doesn't get back to Kansas. The possible permutations and combinations this technology will open up are almost endless. Contemplating them, with all the excitement and anticipation attendant on such thoughts, is a good part of what makes us immortalists. In the face of such wonders, who could ever want to die?

Waving To Jill by Bob Brakeman

Prologue: The author wishes to acknowledge the role of Shelley Pickard in the preparation of this article.

A blizzard in a place like Lexington, Kentucky is a blizzard-of-the-worst-type: Because it's in a southern state, and because snow "obviously"

has no place in a southern state, people blizzarded-in always feel doubly-imposed-upon when it happens to them south of the Ohio River. When it happened to me in Lexington, I managed to make it to a hotel, and as I staggered through the sleet with my luggage I was feeling pretty sorry for myself -- over the snowstorm and other things.

A man I met at the door of the hotel was bright-and-cheerful as he (A) helped me get my car unstuck and (B) dragged half of my bags inside through the howling winds-and-slush. Still in a depressed/surly mood, I asked him if he was staying there because he was a poor, trapped, snowbound fool like me. He -- still cheerful -- said that, no, he was in town because his 9-year-old daughter had to have a major operation the next morning at the University of Kentucky Hospital. Like a fool, I plunged right ahead and asked him what kind of operation. He said, "Well, I suppose you could say that it's the kind-that-only-one-person-in-ten lives through." Now I tried to look cheerful as I said I sure hope it would go all right. He said he sure hoped so too -- because it sure hadn't gone all right when her two older sisters had had the same operation. . . .

My surprise at how well he seemed to be taking all of that was quadrupled (or quintupled, or something -- one of those big ones) when I entered round two: Meeting his daughter. He asked me to do so by saying: "I sure hate to ask you to take the time, but she hardly ever gets to meet anyone 'cept doctors, what with having this heart condition ever since she was born . . . and I don't think she's ever met anyone from the North before, so if you could just take a minute . . . ."

I could take a minute.

Her name was Jill, and the "minute" turned into an hour and a half. She gathered that I traveled around a lot, so she asked me to tell her "all the very best place, so when I'm all better after my operation I can go see 'em." At the sound of that I thought I saw something in her father's eyes that wasn't cheerfulness.

Still, it might have been my imagination, because on the surface at least both he and she refused to be anything but happy, calm, and pleasant, even in the face of what was ahead for them the next day. They were so "up" and undepressed that for most of the 90 minutes they actually made me forget why she was in Lexington.

If they could refuse to let problems of even that magnitude get to them, how can the rest of us justify getting depressed over the trivia that happens on a day-to-day basis and that we dare to call "problems"? They aren't in fact real problems -- they're just the minor nonsense which ought not to be taken seriously, in the full knowledge that there are other people out there with real problems.

So, post this article on the wall, and refer to it whenever the sorry-for-yourself syndrome gets a good grip on you.

Epilogue: The last thing Jill asked me to do for her as I left was to go downstairs and then wave up at her through the window -- because her heart condition has kept her from having any friends to wave at her, and when she waved at passing strangers they usually wouldn't wave back.

This passing stranger waved back.

Epilogue to the epilogue: Like all true cowards, I was afraid to check

back later to see if Jill recovered (afraid of what I'd find out), even though her father gave me their address. Maybe the writing of this will prompt me to finally find out.

SCIENCE UPDATES by Thomas Donaldson, Ph.D.

TEST FOR TOXICITY OF DILANTIN

One of the interesting possible antiaging drugs is the antiepileptic drug dilantin, but together with considerable possible activity against aging dilantin also shows a quite considerable risk, both of relatively minor side effects such as gum disease and memory loss and of other quite seriously life-threatening side effects. One of these is a rare reaction involving fever, skin rash, liver damage, and a constellation of symptoms which closely resembles that of the form of cancer, lymphoma. Patients who suffer this reaction also show blood dysfunctions, too. Although the reaction is itself rare, it is quite dangerous, with 7 out of 17 patients dying from it; so far doctors lack any knowledge of why dilantin might cause this reaction or how it might be prevented.

A recent paper in NEW ENGLAND JOURNAL OF MEDICINE (305 (1981) 722) by Spielberg et al gives us what may turn out to be an excellent and clinically useful test for predisposition to this reaction. The toxic reactions to dilantin both in humans and in animals seem to stem from production of a class of chemicals called the arene oxides, which stem from the chemical reactions by which our bodies metabolize dilantin. The place where these reactions take place both in humans and in animals is the livers. Spielberg et al used these facts to test human patients for possible susceptibility to side effects of dilantins; they exposed cells taken from human patients to the arene oxides generated by cells from mouse liver.

Cells from patients who had shown this dangerous side reaction to dilantin responded quite differently from normal controls, displaying signs of toxicity at levels low enough to leave the normal cells unaffected. The cells from abnormal patients in fact behaved exactly like normal cells for which

the activity of a critical enzyme in metabolism of the arene oxides, epoxide hydroxylase, had been inhibited. Not only does this experiment provide a test in vitro for whether or not a patient would develop liver damage from dilantin, then, but it also gives us an excellent account of why they do so: they have inherited an inability to produce enough epoxide hydroxylase.

A lot of problems with dilantin still remain before it might stand comparison with other antiaging drugs. Like L-dopa, it may be both more effective (as judged by the response of animals to it) and more dangerous, as judged by the frequency of dangerous side effects. However serious immortalists will probably be quite interested to learn that at least one dangerous side effect of dilantin may be avoided.

DOPAMINE AND LIFESPAN IN FOOD-RESTRICTED RATS

As we all know, the major treatment which prolongs lifespan and affects aging in animals is food restriction. Animals eating only half the normal

calorie intake will live longer than animals allowed to eat as much as they wish. If this regimen of low calories begins prior to puberty in rats, it will increase lifespan by as much as 100%. Many gerontologists have already studied this phenomenon, but an explanation of why it should happen remains elusive.

A recent article in SCIENCE by G.S. Roth et al (214 (1981) 561) has presented us with some very interesting information on this point. One of the known ways in which animals degenerate as they age involves a deterioration in the levels of one of the neurotransmitters, dopamine, in some parts of the brain. Dopamine plays an important role in Parkinson's disease, for which the main therapy is the administration of the dopamine precursor, L-dopa. Dopamine is also involved in other physiological and hormonal degenerations occurring with aging: for instance, decrease in the levels of dopamine in aging brains may underlie menopause, in regulation of blood pressure dopamine also plays a critical role. (H.H. Huang, J. Meities NEUROENDOCRINOLOGY 17 (1975) 289; M.L. Cohen, B.A. Berkowitz PHARM EXP THERAP 196 (1976) 396). One of the changes involved in this derangement of dopamine metabolism is a loss of the receptors for dopamine on the nerve cells of the brain region known as the corpus striatum in rats.

What Roth et al have discovered is that calorie restriction has a quite marked positive effect on this loss. They measured the amounts of dopamine receptor chemical on nerve cell membranes taken from the corpus striatum, both of control rats allowed to age normally, of young rats, and of food-restricted rats. Unlike aged control rats, the number of dopamine receptors retained by the brains of the food restricted rats at age 24 months (old for a rat) was the same as that of 6 month old normal rats.

This information relates to the exact reasons for which food restriction prolongs life. Unfortunately Roth's rats began their food restriction just after weaning, rather than puberty, so that the effect of such a regimen on our own lifespans remains likely to be small. On the other hand, it is a great interest that calorie restriction may act by affecting dopamine metabolism. Besides drawing a connection between calorie restriction and life prolongation by L-dopa, this experiment may give us some valuable clues as the brain processes involved in both effects.

CELL AGING AND THE HORMONAL ENVIRONMENT *

Almost all cryonicists will recall the very interesting experiments of David Harrison, in which he showed that blood-forming cells could be transplanted from mouse to mouse for up to 6 times the normal lifespan of mice; and that by implication aging at the level of the cell had at best an indirect influence on the total lifespan of mammals (Harrison, D.E. J. GERONTOLOGY 30 (1975) 279). Cell lines transplanted according to Harrison's technique will eventually die off; although they apparently last for several years beyond the time that an equivalent cell culture would last. As yet we don't know why such cells die off, whether there may be any relation between this eventual failure and the aging of the animal, and what there may be in, which preserves or destroys them. What we DO know, however, is that answers to these questions might tell us a lot about aging: they would clarify exactly what changes may be involved in hormonal aging and also in cellular aging if indeed cellular aging takes place.

To study this problem more closely, we have needed work relating the

environment of these blood-forming cells to their capacity to grow and multiply. A recent paper in MECHANISMS OF AGING AND DEVELOPMENT (17 (1981) 289) by Kim Mathews and D. Crouse has begun the study of interrelations between the bloodforming cells and the other cells of the bone marrow both in aging young mice. It is these marrow cells which form the immediate environment of transplanted hematopoeitic cells (blood-forming cells); Mathews and Crouse made a cell culture of such cells and then introduced into these cell cultures the actual bloodforming cells themselves. They made cultures of the marrow cells from both young and old mice, introducing into them hematopoeitic cells from both young and old mice. They then studied the growth of the blood-forming cells from these different environments.

Mathews and Crouse found some very clear differences between hematopoeitic cells cultured in a young environment versus those cultured in an old environment, although surprisingly these differences were not of a kind we might have expected. As it turns out, blood-forming cells cultured in an OLD environment seemed to grow FASTER than those cultured in the young environment. However the types of cells produced in the old environment did clearly differ from those produced in the young environment; aged environments contained fewer lymphoid cells and a moderate increase in the number of cells of one type, the megakaryocytes. Furthermore, the old environments produced a greater variability in numbers as between different cultures.

The cells of the megakaryocyte type will definitely fail to grow in a normal young environment (Williams, N. et al BLOOD 51 (1978) 245). Furthermore, if young bloodforming cells are transplanted into old mice, they will produce a significantly greater number of megakaryocytes (M.L. Davis PROC SOC EXP BIOL MED 137 (1971) 1452). The eventual exhaustion of a transplanted cell culture may have something to do with this production of megakaryocytes, as may hormonal changes in the aging mice also. Mathews and Crouse speculate about possible other changes but so far their ideas are speculations only.

It would be of considerable interest, though also of great experimental difficulty, to attempt a duplication in vitro of the experiments of Harrison. The normal cellular environment clearly differs from the environment of a cell culture in which most of the work on cell lifespans has been done. We may hope that Mathews and Crouse pursue this work with a view to clarifying possible hormonal effects on cell lifespans.

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* TYPIST'S NOTE: THIS ARTICLE IS DUPLICATED FROM LAST ISSUE AND THE ONE BEFORE.