CRYONICS

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Contents:

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Editorial Matters

Boosting Subscriptions

Do you enjoy getting CRYONICS magazine? Do you want to continue to see CRYONICS published and see its quality remain high and go higher? If the answer to these question is "yes" then you should consider helping us. The nice thing about the help we're asking for is that it will hardly cost you anything: just the price of a stamp.

One of the big battles we've had with producing CRYONICS is keeping our mailing list of paid subscribers at or over 200. Here's how you can help: send us the names of anyone you know who is interested in cryonics and is not receiving CRYONICS magazine and we'll send them a free issue. If you know of fellow members in your cryonics group who aren't getting CRYONICS or worse yet, don't know about it, let us hear from you. Just send along their name and address, and if they're not on our mailing list already, we'll send them along a sample issue with a subscription offer. It's chance to help them, us, and yourself all at once. Don't miss it!

ALCOR East Activities

On April 24 the members of ALCOR East met to discuss progress and set goals for the coming months. It was an excellent meeting with over twenty people in attendance--and this despite the fact that several of the "regulars" had to work.

A review of the independent training activities was undertaken by Glen Tupler, and members of CSSF who have not completed their ALCOR paperwork were given advice and copies of the new SUMS booklet to assist them in doing so. Both Glen Tupler and Bill Faloon stressed the importance of completing paperwork promptly, and emphasized that suspension coverage would not be forthcoming for these people until it was.

Because none of the Florida Rescue Team works in a medical environment, it was decided by both team leaders Glen Tupler and Ross Hartman that teams should meet on a monthly basis to refresh their skills and gain increasing familiarity with the equipment. In order to better inform members about happenings since the pace of activity is accelerating, it was decided that membership meetings will be held quarterly instead of twice a year. This will also allow a better opportunity for new people to get acquainted with the group and find out what's happening.

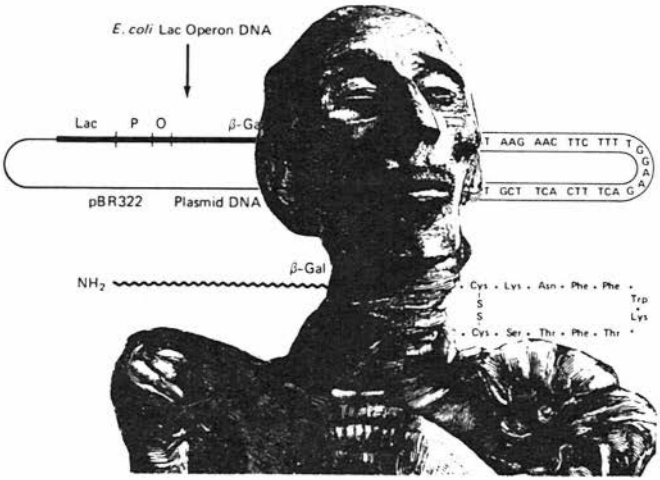
Mike Darwin will be traveling to Florida in July to go over the facility again and conduct some additional training sessions. Mike probably will also be engaged in some local publicity and speaking activities to try and generate more members in the South Florida area.

Cloning The Past: DNA From Eggptian Mummg Is Cloned

A few months ago we reported on the cloning of DNA taken from the dried, 1ØØ-year-old hide of the extinct quagga (SCIENCE NEWS, 125, 356 (9 Jun, 1984). Now this work has been extended to human remains: in this case to the remains of an Egyptian mummy of an infant. The DNA, about 3,4ØØ base pairs long, was reportedly preserved intact and showed little damage despite the fact that it was over two thousand years old!

This remarkable work was conducted by Svante Paabo of the University of Uppsala and was reported in the April 18 issue of NATURE. (This report is based on a summary in SCIENCE NEWS, 127(17), 262 (27 April, 1985).) According to the NATURE article the "DNA fragments seem to contain little or no modification introduced postmortem." DNA was in evidence in three of 23 mummies examined, but only in the case of the infant mummy were Paabo and coworkers able to successfully reproduce the DNA by inserting it into a bacterial plasmid. (Plasmids are special carrier rings used by microorganisms to reproduce genetic material.)

The immediate significance of this work is that it opens the door to studying the genetics of ancient Egyptians. Refinement of this technique may allow for precise tracing of family lineage in royal mummies and may also serve to answer questions about the infectious disease histories of ancient peoples. Identification of genetic material from viruses or other disease organisms may help to answer questions of intense interest to historians and epidemiologists about the origins, history and distribution of various viral and bacterial diseases. To this end, it should be pointed out that Egyptian mummies represent only one class of preserved tissues available for such scrutiny. Precolumbian mummies and preserved remains found in Europe may also be rich areas for study and investigation.



The significance of this to cryonics is somewhat more indirect, but

nevertheless worth pointing out. A scant few years ago many of the experts not only would have, but **did** decry the notion that any portion of the human genome could survive such crude preservation techniques. A few years before that none of the "experts" would have believed that it would be possible to tell a mummy's blood type, infectious disease history, and so on. With the advent of radio-immunoassay techniques, this kind of information is now available--even from remains nearly three thousand years old. Cryonic suspension is preserving many, many orders of magnitude more information about the individual than mummification did. It is our hope that not only will future technology be able to tell our blood type and lineage, but our memories, personalities, and physical makeup as well. It's our job to leave enough "clues" for such a reconstruction to take place. This and other recent work with mummies suggests that at least some biological information is quite hardy, and that with a little care, it can last the centuries.

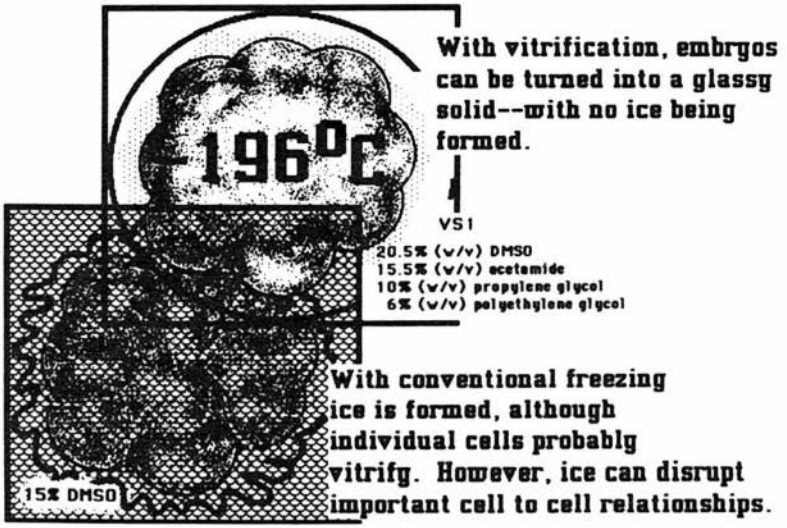
Does it make any sense to gamble otherwise?

Successful Vitrification Of Mouse Embryos

Many of our readers will be aware of the work of Dr. Gregory Fahy of the Red Cross Blood Research Laboratory in Bethesda, Maryland. Dr. Fahy has been attempting to achieve low temperature preservation of organs (principally the kidney) by the rather unusual method of avoiding freezing altogether. If a high enough concentration of certain cryoprotective agents is present before cooling, it acts as an antifreeze and depresses the freezing point to a temperature where the solution has become too thick for ice crystals to form. Such a condition of **nonfrozen** solidfication is called "vitrification." If this sounds very "alien" and "counterintuitive" it shouldn't: all you have to do to see an example of vitrification is to look out the window or pick up a drinking glass--both are made of vitreous (i.e., noncrystalline) materials—in this case, glass.

Water is a bit more difficult to vitrify than glass. Cryoprotectant concentrations have to be in the range of 50% to 60% and the solution must be cooled with reasonable speed and rewarmed very rapidly (otherwise freezing will occur). Vitrification offers a number of advantages in terms of biopreservation. Since no ice is formed, the vast chemical and mechanical effects of ice crystal growth are completely sidestepped. Cell membranes are not exposed to damaging concentrations of salts, and cell-to-cell relationships are not disrupted by masses of ice. So far, so good. Unfortunately, vitrification has a few problems of its own. Aside from the aforementioned constraints of fast rewarming and moderately fast cooling, the very high concentrations of cryoprotective drugs needed to circumvent ice formation can also be toxic. Thus, it was with special interest that we read of successful vitrification of mouse embryos in a paper by W. F. Rall and G. M. Fahy which appeared in NATURE(313, 573 (14 Feb, 1985)).

Using a cryoprotective mixture consisting of 20.5% DMSO, 15.5% acetamide, 10% propylene glycol and 6% polyethylene glycol, Fahy and Rall vitrified the



With vitrification, embryos can be turned into a glassy solid--with no ice being formed.

With conventional freezing ice is formed, although individual cells probably vitrify. However, ice can disrupt important cell to cell relationships.

embryos by cooling them to liquid nitrogen temperature at a rate of approximately 20°C per minute. Embryos were rewarmed rapidly at a rate of 300°C per minute. This technique yielded survival rates in the 80%+ range: comparable to that achievable with conventional cryopreservation techniques. Attempts at rewarming the embryos at rates of 10°C per minute or below were unsuccessful. Embryos were evaluated for viability by observing the progression of cell division in culture and, ultimately, by the production of normal offspring after reimplantation into a host mother.

Cryonicists should be very excited by this work, since it offers a real alternative to the seemingly insurmountable obstacles presented by ice formation. While individual cells can be protected reasonably well from freezing damage, their relationships to each other are almost invariably altered. The problem of achieving successful organ **freezing** is a little like the problem of trying to successfully carry a house of cards on a roller coaster ride. Ice is always going to have to form somewhere, and wherever it forms, it takes up space and changes the relationship between cells.

The survival of embryos preserved by vitrification demonstrates an important "proof of principle". It is now clear that at least one mammalian "tissue" can withstand the rigors of this procedure. With fine tuning, this procedure may well be extended to other, more complicated tissue types. The acceptance for publication of the Rall and Fahy paper by a journal as prestigious as NATURE is a hopeful indication that others in the scientific community understand the significance of this fundamentally new approach to cryopreservation. Perhaps the next few years will see a rapidly widening arena of investigation in this area.

Crgogenics Companies Due For Major Shakeup ?

The two largest and most reliable manufacturers of cryogenic equipment in the United States, Minnesota Valley Engineering and Union Carbide, are reportedly in for some big changes in the near future. We understand that both companies are likely to change management and ownership soon, and this raises interesting questions about the future of cryogenic equipment fabrication in the United States.

For over a year rumors have been circulating that Beatrice Foods (the giant food conglomerate that owns Dannon Yogurt and Rosarita Mexican Foods), owners of MVE, badly want **out** of the cryogenics business. Reportedly, Beatrice is undertaking a corporate streamlining which includes dumping all nonfood related businesses acquired during a frenzy of "diversification" during the 1970's. MVE has been up for sale for over a year with an asking price that was reportedly put in the vicinity of 50 million dollars. Unfortunately for Beatrice, no one's buying at that price, and MVE appears to be having some troubles. In our own experience, containers purchased from them recently have been performing at about 20% **over** the rated boil-off rate, and their repair work has deteriorated sharply. We recently had to send a brand-new custom container **back** to MVE for re-evacuation and reworking because it did not meet specifications. (Happily, in our case the repairs they made were good) Recent conversations with others in the cryogenic industry have told us of similar experiences, and word is out that MVE sales are slipping seriously.

In part, this is probably due to the fact that Union Carbide's Cryogenic Equipment Division has been aggressively marketing a wide range of highly reliable, thoughtfully designed containers that beat the stuffing out of "comparable" MVE dewars on boil off and handling performance. Union Carbide has further strengthened its market position over the last few years by acquiring more local cryogenics companies and employing a strong and aggressive local sales force to market their updated line of equipment. Carbide has also switched to all stainless steel construction on their larger dewars, and have abandoned the fiberglass inner liner which has made their equipment so undesirable from a repair standpoint. (When a Union Carbide dewar develops an inner container leak under the fiberglass, all you can do is throw it in the trash.)

Sources inside the industry recently reported that MVE is likely to change hands in the near future, with a leverage buyout by MVE stockholders likely. We understand that Joe Schuster, the hard-driving businessman and engineer who founded MVE is **not** among the people involved in the leveraged buyout deal. Several calls to MVE failed to elicit any response as to who the principals in the deal are or as to when the deal is likely to go down. Apparently a great deal hinges on the would-be buyers raising the necessary capital, and Beatrice settling for the notion that a 50 million price tag isn't realistic for a company that may be in serious trouble.

What is much more surprizing than the potential sale of MVE, is news that Union Carbide is dumping its Cryogenic Equipment Division. The Equipment

Division is not really a separate entity from the Cryogenics Division as a whole, but reportedly Carbide wants out of the equipment market and plans to divest itself of the equipment section but not the rest of the Cryogenics Division (speciality gases and liquefied gases). Several calls to Union Carbide's Cryogenics Division in Speedway, Indiana confirmed that Carbide has filed a letter of intent to sell its equipment section to Harsco Welding of Camp Hill, Pennsylvania.

This is a rather amazing development in view of Carbide's strong posture in the cryogenic equipment market over the past few years. All of these changes leave us wondering about what the future will hold for the cryogenic equipment market in the U.S. Frankly, we think this shakeup is likely to prove for the best and may make for some interesting times ahead. We'll keep our ear to the ground and our eyes on the trail and we'll also try to keep you posted. After all, these people make the things we're likely to end up in. It pays to keep informed.

Kodak In Pursuit of "Elixir Of Youth"?

In a story which appeared in the April 26, 1985 issue of the Long Beach (CA) PRESS-TELEGRAM, Eastman Kodak has reportedly joined with ICN Pharmaceuticals, Inc. in search of "an elixir of youth." According to the PRESS-TELEGRAM story Kodak has committed 45 million dollars to the venture.

ICN (short for International Chemical and Nuclear) is a Newport, California based company which manufacturers specialty biochemicals, isotope-labeled chemicals, and a few pharmaceuticals--including the antiviral drug Isoprinosine. Isoprinosine is of interest because it is currently being evaluated in AIDS clinical trials for its ability to restore competence to damaged immune systems, and it has been reported to significantly extend the mean lifespan of mice in several studies (most immune stimulators, such as BHT and CoQ1Ø seem to have this ability). ICN's special areas of research and expertise have been isotopic labeling of chemicals and nucleic acid chemistry. The joint venture between Kodak and ICN is aimed at discovering new compounds which may slow or halt the aging process by turning on genes which have been turned off by aging. Both

firms also hope to bring to the marketplace nearly 50 compounds which have shown promise in this area, or in the area of antiviral/immune stimulating activity during clinical trials. (Reportedly ICN has nearly another 300 potential new drugs which they hope to bring to the clinical evaluation stage.)

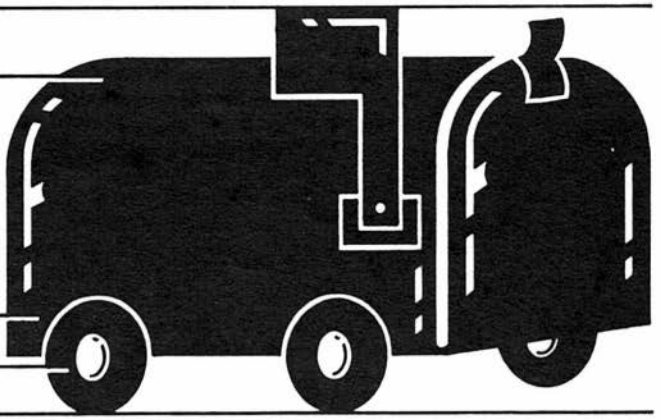
Rumor has it that ICN has several immune modulating drugs produced by recombinant DNA technology which have shown substantial promise by extending both the mean and the maximum lifespan of experimental animals. We understand that ICN hopes to use Kodak expertise and dollars to move these drugs to the production stage both internationally and in the U.S. ICN has historically had a great deal of difficulty in introducing its products into the U.S. market--seemingly lacking the expertise (and perhaps the money as well) required to get them past the FDA. As a consequence, two of its most outstanding products, Isoprinosine and a potent antiviral, Ribavirin, are available only outside of the U.S. (Ed's Note: Isoprinosine is available in Mexico at the border towns and is by all accounts a "miracle worker" in treating viral infections such as hepatitis, herpes, cytomegalovirus (CMV), and influenza.)

As far as we know, this commitment by Kodak is the first time a pharmaceutical firm has made a public commitment to investigate lifespan extension with an eye to marketable products. Some years ago, Upjohn Pharmaceuticals of Kalamazoo, Michigan funded gerontologist Johan Bjorksten's work, and even ran a few magazine ads on the importance and potential of gerontological research. Nevertheless, no one in the past has ever made the massive commitment of funding that Kodak has with the expressed purpose of finding drugs effective at extending lifespan. While 45 million dollars is a **small** amount of money compared to what needs to be spent, it is nevertheless a generous beginning and we applaud Kodak's and ICN's courage.

ICN Pharmaceuticals

Kodak

Letters to The Editors



Gentlemen:

I am a bit put off by all the unqualified and unbalanced praise given to the hamster research work of Biophysical Research and Development (BPRD) in the May installment of Bay Area Update. While I myself am not a research scientist in any sense and therefore am hesitant to go into earnest evaluation of the value of such work, I find it difficult to believe that such glistening laurels are entirely appropriate—and this feeling is substantiated by the disclosure that such evaluations are being made not so much by the writer, Dick Marsh, but at the dictation of one of the principals in the research, Dr. Paul Segall.

Let me be totally candid that this reaction is not completely founded in scientific reasoning. I'm certain no small part of it comes from my viewing of the videotape by Segall et al called "Hamsters on Ice", which was shown at last year's Lake Tahoe Life Extension Festival. I do not consider myself at all a squeamish person, but I found this videotape to be excruciating to sit through. While I am fully aware that animal research is sometimes not a very aesthetic activity, the sight of one hamster after another being sliced open from crotch to sternum with a laboratory scissors was absolutely nauseating. When Dick points out that this approach to research "eliminates the need for a surgeon", I'm afraid I simply can't agree. What I saw on that screen was definitely a NEED for a surgeon——although upon occasion I've seen better surgical technique being practiced in the meat room at Alpha Beta.

I understand that a similar slide presentation was shown at the last International Society for Cryobiology convention. That upsets me even more because, quite frankly, I think such research could be treated more tastefully and I'm not pleased that this presentation is possibly being used by the non-cryonics scientific community to evaluate the laboratory expertise of cryonicists as a whole. The fact that Dr. Segall is obviously so proud of these presentations probably says very little about his scientific competence, but I think it says a lot about his level of political savvy, particularly if he is interested not only in presenting scientific information but also in cryonicists being "listened to with increasing interest and respect."

And although I do not have the credentials of a research scientist, I do have a reasonably effective head on my shoulders and there are some aspects of Dr. Segall's et al hamster project which do bother me on both scientific and practical grounds. One is what I understand to be their criterion for "resuscitation and survival." Apparently if the hamster is cooled to near 0° C, rewarmed and dies without waking up, it's a failure. If the hamster wakes up momentarily and then dies, it's a success. I am told the longest any of these hamsters have survived after the procedure is slightly less than 24 hours. Furthermore, all the hamsters that do survive this procedure exhibit massive neurological damage before they die. With that record of limited viability, it is apparent that essentially lethal damage is still being done to **all** these hamsters. Contrast this with ALCOR's dog washouts, which have the same primary research objective (i.e., perfusate nontoxicity validation through hypothermic recovery of the model) and have better than an 80% **long term** survival rate (but admittedly with a **much** smaller population sample). Basically I find that results such as BPRD's are interesting but not impressive, and certainly not earthshaking.

The choice of hamsters as a model for study is easy to question, Audrey Smith notwithstanding. Smith was not necessarily trying to perfect a technique that she wanted to eventually apply to humans (at least I don't believe there is any evidence of this goal on her part). Cryonicists are actually directly interested **only** in techniques useful on humans, and subservient to this goal select animal models which hopefully are reasonable human surrogates. The fact that hamsters are hibernators is a **minus** not a plus because **humans are not hibernators.** Although I do not consider this likely, it is conceivable that hamster work could produce a complete suspended animation technique that is **totally unusable on humans.** This would render the hamster work quite an accomplishment but almost totally irrelevant to cryonicists and cryonics. The "edge" that Segall points out with hamsters could possibly **undermine** the value of his work.

When so much weight is given to hamsters being economic research models, I have to wonder if such research isn't penny-wise and dollar-dumb. Segall and his colleagues have been working with these hamsters for about three years and gone through well over one hundred of them. I'm sure many of those initial hamsters were lost simply due to the difficulty of learning the tiny hamster model. I understand that these researchers had to perfect a special machine for making Teflon cannulae, explore using various circulatory access sites, and in short, expend valuable research time establishing lab practices for the hamster which have already been established by other research for slightly more expensive models such as cats, rats, guinea pigs or rabbits. How many hundred hours of research time was spent to save $20 or $40 dollars per animal, and how many fewer animals would have been needed if the animal model was larger and more clinically well "domesticated"?

However sound or unsound use of hamsters because of money was in the past, I understand that Segall can now afford to move to a more advantageous animal model since he has been receiving a whopping $5000 per month from a yet-to-be-publicly-identified wealthy individual for close to a year now. The fact that he did not immediately move to a different model once he found adequate funding to do so makes me question whether the money he's getting is being put to optimal use. Since I know that each of ALCOR's dog washouts ran about $1800 to $2000 each, I expect he could even use dogs now if he were so inclined. (However, all the research team at ALCOR were volunteers, and I am told this is not the case with BPRD.)

I expect these comments will be met with sighs about how once again a member of one cryonics group is trashing the members of another cryonics group. The intent of these remarks is destructive only to the extent that if someone wants to so blatantly toot his own horn, then he should be prepared for some honest criticism also. I would be interested in seeing an unbiased evaluation of the scientific merits of Segall's and BPRD's work by a qualified objective researcher. Such review by peers of course is a part of publishing one's work in a scientific journal. Unfortunately, cryonics is small enough that the few truly qualified scientists (Segall and Waitz included) are almost invariably also in sensitive political positions which make constructively criticizing each other's work very touchy business indeed. Very few of us—if any—are consistently above letting our egos get in the way of simply doing what it takes to get the job done as quickly, as efficiently, and as excellently as possible. On the other hand, research money is very scarce and much of it can go wasted if we do **not** perform constructive review of the quality and relevance of each others' research. The need for such review exists not only for BPRD's work, but also for that of ALCOR and any other research work within cryonics.

Very truly yours,

Allen J. Lopp
Cerritos, CA

Bay Area Update

by Dick Marsh

FutureWorld Expo '85

It was hard work for a few of us — especially BACS Veep Ron Viner — and including Trans Time President Art Quaife, TT Resident Engineer John Day, new TT Board Member Dr. Hal Sternberg, and assorted colleagues who sweated that others might live forever — but we had a successful BACS-Trans Time exhibit at the FUTUREWORLD '85 EXPO. The Exposition was staged on April 18-21 in San Francisco's cavernous Moscone Center, where Walter Mondale was nominated for the presidency last summer.

Would you believe a free booth? How about three of them in a row? That's what Fair Director Tod Mills offered us, and it's what we accepted with thanks. We had on display a cryocapsule, a continuous screening of videotapes and slides, a large diagram graphically comparing life expectancy with and without freezing, colored prints, and a variety of books and pamphlets for sale.

The capsule was an eye-catcher, but after the eye was caught it tended to focus first and most on a videocassette recording of Paul Segall doing a freezing experiment with hamsters.

We also discreetly displayed a sign-up sheet for those interested in being

on our mailing list. We did not push this, yet 84 people signed. BACS President Jack Zinn sent each a gracefully worded letter which, among other things, invites them to participate in our near-weekly cryonics dinners (more on these below) and lists the location of the restaurants where the dinners will be held. It also briefly summarizes the purpose of both BACS and Trans Time, and promises to answer questions about cryonics, suspended animation, and organ transplantation research, and to keep the recipients informed about upcoming cryonics activities in the Bay Area.

It also gives basic information about the upcoming Life Extension Festival at Lake Tahoe and even tells how to reserve an inexpensive room.

Finally, it concludes with this upbeat flourish: "I believe that we are on the threshold of life-extending developments which will be truly exciting and revolutionary. Given the direction of scientific progress, I also believe that they are inevitable."

That oughta bring 'em in.

Quips and Questions on The Quake

Radio station KQAK in San Francisco is known as "The Quake." It deserves the title. It emits the energy of a major earthquake: high-powered rock, wild (but good-natured) announcers, ebullient studio audiences of college-age people to whom its programming is slanted, lots of improv comedy, and general mayhem. Into that environment I went with Tod Mills, director of the FUTUREWORLD '85 EXPO, to talk about cryonics during a KQAK broadcast the day before the EXPO opened.

The program host asked good questions, and so did the many listeners who phoned in. But answering them was a problem. Coherence and clarity are not easy at best. In an amiable electronic insane asylum like the *KQAK studios where competitive quipping and vigorous audience involvement are the order of the day, they are next to impossible.

Yet, by going with the torrent, I was able to swim. I enjoyed myself, had fun, did a little quipping of my own, but kept persistently coming back to the question of the moment, and answering it to the best of my ability.

Behind the horseplay, there was a real attempt to listen for the message. These young people are alive, and they want to stay that way. So they listened — and heard.

For me, it was a good experience. For them, it was a message of hope.

I am encouraged.

Catholics: "Cryonics Works!

This is not a National Enquirer headline, but a summary of Jack Zinn's analysis of the demographics at the San Francisco exhibit. Jack points out that a disproportionate number of Hispanic and Italian names appear on the sign-up sheet. He reasonably assumes that these tend to belong to Catholics, and he

suggests that their willingness to sign the sheet is not surprising in view of the support already given to cryonics by the Catholic Church.

What support?

In the recent controversy in Australia over the frozen embryos whose natural parents had been killed, the Church opposed the State, which wanted to destroy the embryos, on the grounds that an embryo is already a person with a soul and that to destroy one is a form of murder similar to abortion. Thus, since frozen embryos can be thawed and brought to term, Jack speculates, Catholics believe that cryonic suspension has already successfully occurred, that it has the blessing of the Church, and that there is no reason to oppose it.

Jack finds further evidence for the openness of the Catholic Church to cryonics in the response to his recent mailing offering for sale Jim Bianchi's legal forms manual. A disproportionate number of Catholic law school libraries bought the manual, including Boston College, Villanova University, Notre Dame University, St. Mary's University (in San Antonio), and the St. Louis University Law School.

Jack points out that, for that matter, Catholic openness to cryonics greatly predates the affair of the Australian embryo. A brochure published years ago by Trans Time, Answers to Questions Most Frequently Asked About Cryonics, mentions the consecration of a cryonics capsule by a Catholic priest.

Your Own Capsule?

Like to own your own capsule? Or start a suspension company? Or add to your present collection of capsules? Speak to John Day. He was approached at the EXPO by a man interested in building capsules. Name: D. Aman. Lives somewhere on the San Francisco Peninsula.

More Freebie Conferences Pending

Mr. Zinn has told UPDATE about two more no-cost-to-BACS exhibitions in the near future, one a certainty, one a high probability.

The "certainty" is FUTURE SHOWCASE scheduled for May 17-19 in the Main Pavilion on the Santa Rosa Fairgrounds. We'll be given a single ten-by-ten booth -- not as much space as we had in the San Francisco exhibition, but enough room for most of the items with which we boggled minds in the Bay City.

The "high probability" is a futures show scheduled for the Oakland Civic Auditorium some time in September or October — on Labor Day if possible. Another freebie and another chance to titillate the imagination of our local life-lovers.

Cryonics Dinners

Another bright idea of Jack Zinn's, who has been quietly scheduling them for many weeks, the cryonics dinners are low-key, no-host, informal affairs at

various Bay Area restaurants. To quote Jack's letter to EXPO sign-ups (see above), "(i)t's separate checks, no speeches, and people enter and leave when convenient."

What's the structure for these dinners? There is no structure. What happens at the dinners? We eat and talk, mostly about cryonics. We more fully develop our half-formed ideas. We grow closer. We feel ourselves drawn together as we experience the most fundamental human process: communication.

Communication Continues

Here are three more communication projects with the Jack Zinn stamp:

** Jack has mailed 500 print-outs in Japanese to Japanese television stations, newspapers, magazines, museums, colleges, and universities describing Trans Times's services. We now have computerized mailing labels for future use in Japan.

The master list of Japanese contacts was culled from The Europa Yearbook and other sources.

** BACS now has its own phone number — and at no cost to BACS: (415) 397-3386. At present the number is available only from "Information," but it will be in the phone directory in September. The phone sits on Jack's desk in his law office.

Why "at no cost"? In BACS NOTEBOOK, Jack runs a column called "Save Yourself" devoted to suggestions — gimmicks? — for saving money, of which you will need lots if you plan to be suspended when you deanimate. He has a talent for thinking these up (unlike me, who am hopelessly impractical). The gimmick which produced the free phone for BACS is this:

In his law office, Jack already had two phone lines, which he was paying for, with only one telephone book listing. He now has a second listing at no extra charge, which is the BACS number.

Did you follow that?

** BACS has an improved logo. We have added: "Since 1969." This gives some sense of stability, and it reminds those in the know that BACS is the oldest extant cryonics organization outside of Michigan.

New BACS Members

Two associates, one full.

Legal Forms Manual Sales

A slow torrent — to put it oxymoronically. Twenty purchases of Bianchi's legal forms manual by law libraries (see item above on open-minded Catholics), state supreme courts, and large law firms.

Benefits to BACS: profits, improved image of cryonics, and possible future sales of supplementary legal forms such as Zinn's please-don't-embalm-me form.

Vitamin Sales?

May be prohibited to BACS because of our nonprofit status. But Trans Time might well expand from suspension capsules to vitamin capsules.

Hal Sternberg Praises Alcor

Dr. Sternberg reported to BACS on his visit to Alcor. He discussed their experiments with dogs and gave them high marks for results, personnel, quality of experiments, and degree of cooperation. He said that he was "extraordinarily impressed by their techniques, care, and efficiency."

Cryovita Contract Offer Considered

BACS has received a contract offer from Cryovita matching Trans Time's. What to do? Will TT underbid Cryovita? BACS Board member Edgar Swank proposed that Jack Zinn or a committee appointed by Jack have power to negotiate with TT subject to telephone ratification by BACS governors.

Prospect List Swap

Alcor's Mike Darwin wants to exchange prospect lists. The BACS Board is agreeable — subject to approval of the Trans Time Board.

BACS Dues Increase

The cost of immortality just went up a bit. Stern economic necessity forced the BACS Board to raise annual dues from $150 to $160.

I Never Promised You a Rose Garden

The Rose Garden in Berkeley, while not promised, is being seriously considered as a site for the upcoming BACS picnic and is probably available. Big lawn, pleasant view, and tables make it ideal for food, drink, games, and frolicking.

If Ron Viner recovers from the heroic job he did serving four daily 12-hour shifts at the FUTUREWORLD EXPO '85, and if he serves equally heroically in producing the BACS picnic, it will be a blast.

Trans Time Finances

Trans Time is still in the red overall (this is not a reference to their colorful work clothing), but its earnings and assets are both up. However, its

chief creditor has had to call in her loan, and that poses a big problem. The TT Board decided to raise money by selling the van.

The Spirit of Trans Time

Selling the van to keep the show on the road epitomizes the indomitable spirit of Trans Time. In the same spirit, Trans Time raised money for mailing flyers in Japanese to television stations in Japan: they did it by passing the hat.

There is no stopping these determined pioneers. They will prevail, and thanks to their determination death will die.

I hope my friends at Trans Time will consider these comments a one-man standing ovation.

CRYONICS IN A COONSKIN CAP:

Trailblazing The Suspension Paperwork

by Steve Bridge

When pioneers were blazing new trails in the West, they frequently met up with hostile natives, hungry bears, starvation, and numbing cold, impassable mountains or chasms, and a lot of frustration. Cryonicists have their own hardships, of course, from confused or hostile family and friends to financial hardship to seemingly impassable state laws. And all of that paperwork. At various times during the past year it has been easy to think that if Lewis and Clark had been required to fill out as many forms to start their expedition as a cryonicist does to prepare for his own "adventure," they would have given up the entire enterprise.

When you get frustrated by the paperwork (as we all do), remember that we are blazing trails into a future even more unknown than the wilderness which the pioneers explored. The legal forms for cryonic suspension for the various cryonics societies have been under near constant revision for several years. In response to various legal decisions and to problems encountered in actual or near suspensions, ALCOR has completely rewritten its suspension forms over the past year. We are aware that this constant change can be pretty frustrating for our members, most of whom would rather buy cryonics like an insurance policy and then go about their business until the "big moment." ALCOR would like to think that the latest revision will be valid for several years; but realistically, we know that one major legal battle could overturn the entire basis of the forms

and require a complete rethinking.

ALCOR's new suspension forms, complete with detailed instruction book, are now ready for new members to fill out. After the forms have been "debugged," copies of at least some of the forms will be made available to old members. My own attempts to revise and test these forms during the past few months have resulted in some frustrating but enlightening experiences, from which I have gathered some practical suggestions for my fellow trailblazers.

The Physician Forms

For several years the ALCOR paperwork package has contained two interesting forms: The Patient's Directive to Physician or Health Care Provider and The Physician's or Health Care Provider's Affidavit. The purpose of the Patient's Affidavit is to tell his physician what ought to be done to cooperate with ALCOR. If the physician is willing, he signs the other form. It sounds simple, but it's not. Apparently many physicians (and their attorneys) are a bit nervous about agreeing to anything in print, especially to actually cooperating in freezing a patient.

I obtain my medical care through a Health-Maintenance Organization (HMO), which takes the place of health insurance. HMO's are basically clinics which provide all of the patient's care, including family practitioners, internists, X-ray, pharmacy, etc. If a specialist is needed, the patient is sent to that doctor at no further cost. As long as you take a strong interest in your own care, the system works pretty well (at least it has for me) and is definitely cheaper than most regular medical insurance.

After we had an updated copy of these forms last fall, I sent one of each (plus copies of our literature) to the Chief Medical Officer of the HMO, Dr. K— called me in to discuss them. He informed me that he understood what I was doing and felt that it was reasonable; but the corporation attorneys had informed him that these procedures would be considered "experimental medicine," which was specifically disallowed by the corporation charter. Undissuaded, I asked if the corporation would at least be willing to agree not to interfere with ALCOR taking possession of the body. Dr. K— thought that would be acceptable, so I went home to revise the forms. With the revised forms, I also included a list of specific procedures that ALCOR had told me were the most important, to find out if any of them were possibilities. Several weeks later, I received an answer to the effect that they had decided not to have anything to do with the procedure, and they hoped I could find another physician who was more cooperative.

Not exactly the answer I was looking for--or expecting. Now what? Do I put an ad in the paper? Write to each doctor in town and ask how they feel about cryonics? It could take years. So instead I have filled out the Patient's Directive... and sent it back to the HMO to place in my file. If I do happen to deanimate while covered by this HMO, they will at least be covered if at that time they decide to cooperate in any way. (In my case, I am still better off than some, because my family has agreed to cooperate. If the HMO Directors know they won't be sued for being nice to me and to ALCOR, they may at least get me out of the door quickly.)

A cooperative physician is preferable, and you should continue to make

inquiries to find one, as I will do. But even if you have not found such a physician, ALCOR requires you to complete the Patient's Directive. When ALCOR personnel go to the facility where you are hospitalized, the fact that you have completed this form may make it easier for ALCOR personnel to persuade hospital staff to cooperate.

Medical Surrogate and Power of Attorney

The Patient's Directive also allows you to designate some person as your "Medical Surrogate," whom you empower to make medical decisions in your stead if you are unconscious or otherwise legally incompetent. It is critical that you have such a person appointed. You do not want to be left on a respirator for days while your brain falls apart and people argue about when to sign the Certificate of Death. Beyond that, both of my attorneys are convinced that the most critical problem for a suspension patient may well be the actual transfer of remains to ALCOR. It is at this point that hospital administrators and uncooperative relatives can create the greatest legal delays, enough to potentially prevent your suspension if you have not prepared well for this circumstance. If you have given the Medical Surrogate proper authority, he or she could possibly arrange to have you transferred to a more cooperative hospital, perhaps even one in California.

Your Medical Surrogate is most likely to be accepted as your spokesperson if he or she is one of your next of kin. If you are married, this should be your Spouse, if possible. (My attorney went so far as to suggest that I find someone interested in cryonics and get married, as soon as possible.) For this person to legally have the authority to make decisions for you, it will be necessary for you to give this person a "Durable Power of Attorney," to take effect with your incompetency. (A regular Power of Attorney is effective only when the principal is able to act for himself.) The Medical Surrogate and the Attorney in Fact (the person with Power of Attorney) MUST be the same person, and it should be a next of kin. If you do not have a next of kin willing to be cooperative, then some other person should be given these powers. Be aware that Power of Attorney gives this person the power and responsibility to pay your bills, run your affairs, and even sell your property while you are incompetent. (At the time of your legal death, this power passes to the Executor of your estate.) Be very careful whom you appoint to this crucial position, and then give this person specific written instructions concerning how you want these decisions to be made. My attorneys stated quite strongly that the

"Power of Attorney" could turn out to be the most important form in your entire suspension preparation. We agree.

Since the laws dealing with Power of Attorney vary so much from state to state, and since individual circumstances may change how much power your Attorney in Fact should have, ALCOR cannot provide you with a basic form to use. IT IS ESSENTIAL THAT YOU DO THIS WITH AN ATTORNEY. We are aware that some of our members would prefer to avoid attorneys, but folks, we are dealing with your lives here. We are at the mercy of the laws of the land and the judges who interpret them. Legal documents are actually a very complex "word game," where the object is to put the words in the right order, which will cause a judge to rule for your side. We cannot do that; you cannot do that. You are a plain fool--and possibly a dead fool— if you fail to use a lawyer to help you with your Will and Power of Attorney.

Your Will

If you have not yet made out your Will, a good starting place is an article in the February, 1985 issue of Consumer Reports magazine. Your public library or bookstore will have several books which can provide more details on completing the Will. However, it is important to understand that for you as a cryonicist, the Will does more than save your family some hassle and money. It legally affirms your decision to be suspended and may be crucial to maintaining ALCOR's right to retain possession of your remains. This is a complicated problem. You are already providing many thousands of dollars for ALCOR to suspend you; PLEASE, spend a few hundred more on an attorney. Don't be penny-wise and pound-foolish.

My Will has been set up with the bulk of the cryonics information placed in a Codicil (or Amendment) to the main document. This Codicil can be shown to physicians, relatives, and ALCOR without it being necessary to reveal the bequests and other personal details of the Will. Also, changes in details can be made more easily if the entire Will does not have to be rewritten. NOTE: If any portion of your minimum funding is being provided through your Will, ALCOR will have to see the entire document.

Morticians

While cryonics has tended to move away from its earlier dependence on mortuaries, a friendly mortician can still come in handy. If a hospital administrator is unhappy about turning your remains over to ALCOR, your Next of Kin and attorney can arrange to deliver the remains to a mortuary. This is a perfectly normal method of handling human remains and relieves the hospital of any supposed legal burden. The mortuary then releases the remains to ALCOR, possibly even leasing space to ALCOR to do initial preparation of the body before shipment to California. For an excellent example of this kind of cooperation, see the Suspension Report in the April, 1985 issue of CRYONICS. If you can make friends with a mortician now, do so.

Going Public

It is not easy to discuss your cryonics involvement with family, friends,

or lovers. No one is comfortable discussing death in a personal way, even if the remains are to be handled in a traditional manner. The concepts of cryonics may be a mixture of depressing and startling to your family and friends. "We used to think he was a reasonable fellow. Now we found out he is a fruitcake who only talks about death and freezing." At the very least, being a cryonicist calls attention to yourself. Some of us get a certain pleasure in being thought "unique;" but many people prefer to blend into the scenery.

While you might rather keep your involvement a secret, the people around you ABSOLUTELY HAVE TO KNOW THAT YOU HAVE ARRANGED TO BE FROZEN. If ALCOR is the only one who knows your wishes, you will probably not get suspended! Sometimes you end up with ex-friends, ex-lovers, and fewer invitations home for holidays; but it must be done. While your family may react with shock or surprise when they first learn of your suspension plans, give them some time to get used to the idea. The shock of learning these plans after your death would be far worse and may cause your next of kin to be paralyzed by indecision or even to assume you were insane or defrauded. An even greater disaster would be if they only learned of your wishes when the will is read—several days or weeks after you have been buried or cremated! Beyond your family, you should briefly discuss your suspension plans with as many people as possible: those at your employment, those you socialize with, your neighbors, etc. If you should suddenly deanimate while with friends who do not know what your ALCOR bracelet means, it might be hours before your family finds out and notifies ALCOR.

I have lost no close friends over cryonics, and my family--while not overjoyed--has been very supportive. Generally my friends have been curious instead of antagonistic. I discovered that it was far harder on me when I kept it a secret. One key is to present your desire to be suspended in reasonable terms. Show that you have given this serious thought, that you have good reasons for making this decision. Mention that you have filled out legal paperwork, including a will, and that you have made other careful arrangements for this purpose. Do not try for "converts," at least not at first. Explain that you have made a personal decision, based on your desire to see the future. Wait until after your family and friends have had a chance to think about the idea before you start encouraging them to consider a similar choice.

Doing it Yourself

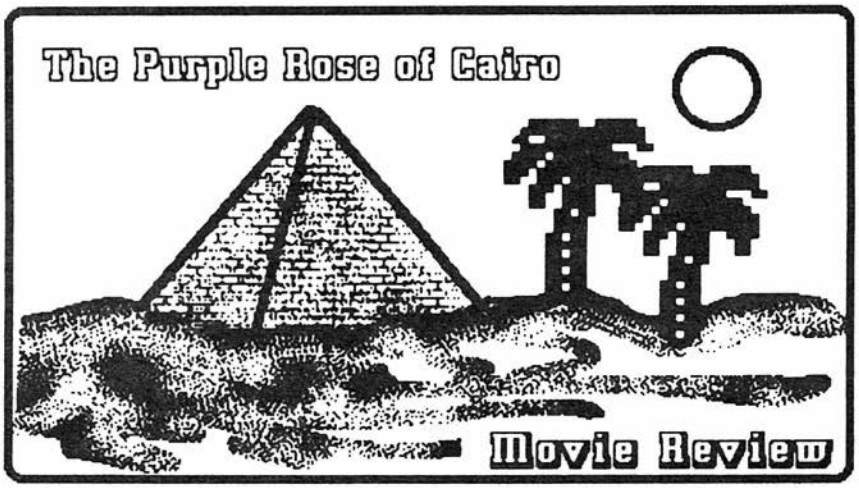
So it's not easy being a pioneer cryonicist. Just keep thinking of yourself as the Wright Brothers, as Louis Pasteur, as Galileo. Sure, lots of people called them crazy; but many more people eventually realized they were correct and admired them for their perseverance. Tom Robbins, in his recent novel, Jitterbug Perfume, (Reviewed elsewhere in this issue. Ed.) says this better. Kudra is a young Hindu girl who wanted to make perfumes but instead was married off to a family of rope-makers.

> "Rope. The gods have a great sense of humor, don't they? If you lack the iron and fizz to take control of your own life, if you insist on leaving your fate to the gods, then the gods will repay your weakness by having a grin or two at your expense. Should you fail to pilot your own ship, don't be surprised at what inappropriate port you find yourself docked. The dull and prosaic will be granted adventures that will dice their central nervous systems like an onion, romantic dreamers will end up in the rope yard. You may protest that it is too much to

ask of an uneducated fifteen-year-old girl that she defy her family, her society, her weighty cultural and religious heritage in order to pursue a dream that she doesn't really understand. Of course it is asking too much. The price of self-destiny is never cheap, and in certain situations it is unthinkable. But to achieve the marvelous, it is precisely the unthinkable that must be thought."

When you think about the problems of the pioneers, remember that besides the hardships, they also saw magnificent geysers, crystal-clear volcanic lakes, immense forests, painted deserts, and vistas of unspeakable grandeur. When you get lost in the wilderness of ALCOR's paperwork or get worn down by the desert of public opinion, remember that if you can just get past the snakes and grizzly bears, there may be a glorious view right around the corner—in a future for all of us.

Two Reviews Of "The Purple Rose Of Cairo"



Art For Immortality's Sake by Saul Kent

For the past couple of years, Dick Jones (a prominent TV writer/producer) and I have been working on a screenplay for a science fiction movie on immortality. The idea has been to attempt to persuade people that their lives are worth preserving through the emotional appeal of an engrossing story rather than by appealing to scientific evidence.

I wouldn't ordinarily mention a project that has yet to be completed, but I'm doing so because it has taken far too long already and I want to spur Dick and myself to move faster. I'm more convinced than ever that we need art to

achieve immortality and that the sooner we create popular immortalist novels, movies, and TV shows, the sooner we'll have a major impact on public consciousness.

Woody Allen's New Movie

I was stirred to action after seeing THE PURPLE ROSE OF CAIRO--Woody Allen's new movie. Woody Allen is one of the few popular artists whose works have dealt with life, death, and immortality.

In THE PURPLE ROSE OF CAIRO—which takes place during the Great Depression of the 1930's--Allen creates a character who "escapes" from a movie to pursue the love of a woman (Mia Farrow) who's been going to the movies to escape the drudgery of her life. The character actually walks off the screen and into a theatre in New Jersey, which creates havoc in the "real" world and brings the other characters in the movie to "life" on the screen of the theatre.

THE PURPLE ROSE OF CAIRO deals with several themes related to the pursuit of immortality including the differences between illusion and reality, the question of personal identity, the desire for romance and fulfillment, and the relationship between innocence and cynicism.

A Brilliant, Thought-Provoking Movie

THE PURPLE ROSE OF CAIRO is a truly brilliant, thought-provoking movie that is essential viewing for anyone interested in their own survival. The movie raises profound questions about the effects of illusion on our lives while—at the same time—it enraptures us with its own illusions and the illusions of its characters.

I think it's Woody Allen's best movie (of the one's I've seen) and one of the best I've ever seen. It will undoubtedly be considered a classic for many years to come.

Failure To Deal With The Central Issue

Yet—for all its virtues--THE PURPLE ROSE OF CAIRO did not truly engage me emotionally because it fails to deal with the central issue around which all the issues in the movie revolve around—the issue of personal survival.

Woody Allen is a "cerebral" director who deals with important philosophic issues in the context of comedy and motion pictures as effectively as anyone around today. He is also someone who seems to be well aware of the utter tragedy and absurdity of death.

His failure to probe into the emotional depths of the human response to the prospect of annihilation in his movies is probably due to his failure to appreciate the value of cryonics and the potential of life extension research in his personal life.

I think it's too much to expect artists like Woody Allen--who aren't themselves committed to personally extending their own lifespan--to produce works of art that deal directly, honestly, and profoundly with the quest for immortality. They just aren't enlightened enough, nor do they have the courage

to do so.

The Need For Immortalist Art

I'm afraid that the kind of art that will truly move us and the rest of humanity to action will have to come from within the immortalist community itself. We're the only ones who feel intensely enough about the value of our lives to communicate the need to conquer aging and death to others.

The time has come for us to attempt to reach the masses by transforming our deepest emotions about life, death, and immortality into stories, novels, TV shows, paintings, sculptures, music, and any other forms of art that speak to the emotions.

Art is not only an expression of ideas and experience, it is also a highly effective method of persuasion. It's been used throughout history to promote revolutionary movements. Right now, we need it more than ever because—in the immortalist revolution—it is our own lives that are at stake!

The Face Of Reality? by Mike Darwin

OPENING SCENE:

A man. Thirty. Unshaven. He looks tired. He is floating down a freeway at sunset, windows down, cool breeze blowing in, tangling his already disheveled hair. The sun is a gold ball in a blue sky. The freeways are layered sheets of concrete, ribbons of steel and stone supporting thousands of smoothly flowing cars--Mercedes, Jaguars, Jeeps with tops down full of laughing young people. The setting sun sparkles off glittering towers of chrome and glass. The radio in his car is playing loudly. Music. Loud, hard. "A Night in Bangkok". "It's an Obsession."

CAPTION IT: A billboard, boats sailing with multicolored sails. Runners in pairs; young, healthy, glistening in the sunlight. Caption it: "The California Promise."

Is it real? Is it a dream? How do we know what's real? How do we know what's a dream?

THE STORYBOARD: The man in the car on the freeway in the setting sun among the beautiful people. The man with the two day growth of beard who's thinning hair is tinged with the silver calling card of death who has slept six hours and was up till 5:ØØAM is dying. And he knows it. His car will crash and he will be thrown about. Broken glass. Broken skin. Ruptured organs. Bleeding. Death.

The car doesn't crash. The man lives on. Moves through life. Falls in love. Grows old. Dies. Is murdered. Breathes his last in a nursing home. Dies. What is real? What is a dream? Where does the storyboard end and life begin?

Who is this man? What would he choose if there was a way out? Does the story always end with a fade-out? Will the audience stay for the credits...or will they just walk out? And forget? Does it matter that the man lived at all? Does it matter that he knew he was going to die? Does anything matter? Who **is** this man?

I can answer only the last question. The man is me.

He has just returned from a movie that has asked a lot of those questions and laid out the storyboard. It is a movie that deals with a pivotal issue: the tension between what we want and what we choose. The reason why some of us run after dreams while most of us don't, and the reason why some of us will be ready for the dreams when they arrive, and some won't.

Woody Allen has written and directed a masterpiece of a film in "THE PURPLE ROSE OF CAIRO." So much does the flow of this movie mimic the flow of life that it is hard to separate my storyboard from its.

Imagine a small town in New Jersey during the depths of the Depression. A waitress, who as a human being is a near total flop, finds escape in the movies. A story like that is a dime a dozen. Except this waitress gets the chance she's been waiting for. The man she idolizes on the screen steps out of the movies and into her life. But he isn't real. Or is he? He's perfect. He's everything she thinks and wants and **desires** a human being to be. Only he isn't "human": in his world people don't grow old or suffer poverty or die.

The actor who played him is human. He's real enough. Real enough to be threatened by the loss of his career if a scandal results should the character he's created (who's suddenly become real) rape someone or knock over a liquor store. How can anyone tell the character from the actor? Where do the actions and responsibilities of one leave off and the other begin? How can the woman, in the small town, who is beaten down by life, tell the difference?

THE PURPLE ROSE OF CAIRO hinges on questions like these. Our "heroine" meets the **actor.** He, like the character he has created, is also charming, handsome and in love with her. Who **is** she in love with? Who is real? Should she choose to walk back across the screen and go on living in a world that isn't "real"? Does she love the character? Or does she love the man, the real man who has entered her life and who has challenged the illusion, the character in the movie, for her love.

As our heroine has said: "...this is real life. People grow old and get sick and are sometimes never loved. And die." What do we want from life? Can we deal with the world we imagine when it arrives? Do we have the courage to **live** our dreams? Or will we, in the end, be bound by what we know, by what all the security of the past, of a civilization's worth of values tells us we must be bound by?

Woody Allen's movie raises all these questions artfully in an emotionally engaging way. But he fails to answer them or even to deal with them honestly. Our heroine's problem is **really** that she is trapped in an ugly, dirty world with an abusive husband and no prospect for escape to anything but old age, disease, and death. She **knows** this. She spends all her available time trying to escape from the "reality" into a world where "people live happily ever after." Unlike everyone else we know about who has ever lived, she gets the chance to make just

such an escape. But she doesn't. Why? What is her reason for staying in a life that is cheap, ugly, brutal, and dull? Allen doesn't answer these questions--and that flaws the film. But it only slightly detracts from its worth, because at least he's asking the right questions.

It's likely that few of those who sat and watched THE PURPLE ROSE OF CAIRO saw it as anything more than a sad and somewhat comedic commentary on the nature of life for "losers." Most will get up and walk out of the theatre without ever asking themselves the questions the film raises—let alone trying to find the answers. They will probably never know that the real losers, just like those in the film, were the ones who were left sitting in the theatre after the "movie" was over.

THE FADEOUT: The man, looking out from a small office. Sitting at a computer. Writing this review. Watching the sun fade. Wondering about the California promise. Wondering if he'll live. Wondering if he'll have the courage to step through to the other side. To the world he dreams about. If he gets the chance.

JITTERBUG PERFUME by Tom Robbins (Bantam Books, 1984. $15.95)

"The Great Immortalist Novel"

"The price of self-destiny is never cheap, and in certain situations it is unthinkable. But to achieve the marvelous, it is precisely the unthinkable that must be thought."

"Each and every morning when I awake, my eyes brim with tears at the realization that I am still here breathing when all who shared my natal day have for half a millennium been dust; each and every morning when first I see the dawn ray take your sleeping face tenderly in its tongs, I tremble in a kind of ecstasy that you and I continue to lie in love together, century after juicy century, while every other pair of lovers who have lived has had to helplessly watch their passion suffocate in the sags of their sickly flesh."

For several years I have thought that one thing which was needed to advance the idea of immortalism was an entertaining novel on the subject. My idea was to take a character somewhat like the Wandering Jew, show his travels as

exciting and pleasant ones, and let the world see how being immortal might be an extraordinarily positive happening rather than the curse many authors seem to label it. Well, I can stop worrying about it now. That book has already been written, and in a more intelligent, entertaining, and literary way than I could have hoped to accomplish.

Tom Robbins has been considered sort of a spokesman of the counter-culture in his previous novels, such as Even Cowgirls Get the Blues and Still Life With Woodpecker. His fans will have their minds opened to something quite new as they read this novel, which has already hit the best-seller lists.

Robbins' hero is Alobar, a 10th century Bohemian King who rises to power because of his prowess as a warrior, but who develops a reputation for fairness and governing (as opposed to "ruling"). He also conceives two amazing (for 10th Century Europe) ideas: he views himself as an individual with rights and desires beyond that of the society, and he thinks that death is a singularly unpleasant thing to happen to someone as enlightened as he is. Unfortunately, it was the custom of Alobar's city-state to execute their kings as soon as they showed any sign of old age. Finding a white hair, Alobar is forced to escape and wander east toward India, looking for answers.

Eventually, he meets a woman, Kudra, who is fleeing the funeral pyre of her late husband (the Hindu had these funny ideas about widows, you may recall). Together with some ideas picked up from a strange local sect, they develop techniques which enable them to survive for hundreds of years. These techniques include rituals for controlled breathing, regular bathing, proper diet, lots of sex, and resisting death by embracing life. (Whether we agree or not about the effectiveness of these activities, the attitude is wonderful—and the activities don't sound so bad, either.)

Alobar and Kudra's story is alternated with a modern plot dealing with Priscilla, a genius waitress from Seattle, her attempt to reproduce the most amazing perfume she has ever smelled, her sudden involvement with an immortalist lover, and her search for the perfect taco. Along the way you will also pick up amazing insights on perfumery, New Orleans, Paris, bees, beets, evolution, and —oh, yes—immortality.

Priscilla: "Everything that's alive was born, and everything that was born has got to die. There's no getting around it. It's the law of the universe."

Wiggs: "The universe does not have laws. It has habits. And habits can be broken."

There is something for everyone to disagree with in this book; but immortalists will generally be fascinated, because it is primarily a book which explores the joys of being alive and of staying that way for a long, long time. The biggest message of the book is that death is a rotten thing which needs to be overcome; with the secondary message that death cannot be avoided by technology alone—immortality has to be in the spirit also. In other words, an unhappy or warlike person cannot be an immortalist. If you don't find ways to be happy, you won't stay alive and technology won't help you. This point may turn out not to be technically true, but as a philosophy it's not bad. Certainly you won't bother to try to stay alive unless you have a good reason. So let's all find lots of reasons. Tom Robbins has plenty of ideas; give them a try.

I should point out that cryonics is not mentioned in the book; but it certainly does a better job of explaining why we are involved in cryonics than almost anything else I've ever read. I recommend that you buy lots of copies and give them to friends. Tell them it's just a witty, entertaining book (which it is, but not "just") that you think they would enjoy. Mention it in talks you give. Remember, although it is not a cryonics book, you can use it as a partial solution to Problems #1 and #2: how to convince people that life is worth living and how to convince people that death ought to be overcome. I am also pleased that Jitterbug Perfume remains an immortalist book right up to the last page. While life may not work out perfectly for everyone in the book, Robbins doesn't end up with tragedy, moroseness, or losers. Each character in the book can get the knowledge required to win, if he or she has the right attitude. From our point of view, that is completely realistic.

This is one book which every immortalist should read. Please purchase a copy --I'm a librarian, but I think people who write this kind of book should profit from it. Maybe we'll get more.

(I want to thank The Immortalist for pointing out this book in their February, 1985 issue.)

Prospects and Applications for Genesis and Ultra Mass Production of Sub-Millimeter Machines, Devices, and Replicating Systems

Conrad Schneiker

PART 2 OF 3

MOLECULAR ENVIRONMENTS FOR ASSEMBLY AND OPERATION

There is a wide variety of environments for both the assembly and operation of molecular structures. These environments may be very uniform, or may vary sharply over very short time and space scales. The parameters that may be varied include temperature (cryogenic, etc), pressure, phase (gas, aerosol, liquid, liquid crystal, gel, solid, etc.), chemical (pH, polarity, etc.), electromagnetic fields, particle currents (electrons, protons, neutrons, etc.) and so on. Transport of molecular structures between these environments may be used.

For example, at the extreme lower end of the temperature scale, one could make microscopic cryogenic castings of parts using many liquids, some (room temperature) gases, and other materials. Tiny superconducting loops attached to nonconducting components would allow such building blocks to be "glued" and "unglued" to each other by switching indefinitely persisting currents on and off. All sorts of electrical machinery, including magnetic bearings, electromagnetic mass transit systems, etc., might be constructed. This involves building up a range of microindustrial manufacturing, handling, test, and assembly capabilities (including teleoperators) which would always remain in, and function in, a superfluid liquid helium environment. This avoids problems such as thermal cycling induced stress that plague superconducting technologies such as Josephson junctions.

VLSI MICRO-CHEMISTRY SYSTEMS

For chemical processing systems using DNA, RNA, ribosomes, polymers, enzymes, etc., the intermediate products consist of small numbers of molecules that can be exponentially replicated for the final product if needed. Here, one could use Very Large Scale Integration (VLSI) pattern definition equipment from electrical circuit deposition to deposition of highly miniaturized chemical transport channels, reaction chambers, piezoelectric pumps, electromolecular propulsion (Maugh, 1982), solid state laser (Zewail, 1980) and ultrasonic wave (IRD, 1982) "catalysis" sites, immobilized enzymes, electrophoresis sorters, pH sensors, impedance sensors, etc., on a chip. These would be extensions of the technology used to put miniaturized gas chromatographs on silicon chips (Angell, Terry, & Barth, 1983). If DNA synthesis systems and ribosome-based protein synthesis systems and various other chemical building systems were thus miniaturized, mass-produced, and operated in parallel, thousands or millions of experimental molecular products could be generated, and then tested for various desired properties, using systematic parallel trial-and-error experimental data collection.

PROCESSING SUPERLATTICES AND THIN FILMS

A variety of techniques permit relatively easy fabrication of extremely thin films and superlattices (Pomerantz, 1982; Hanker & Giammara, 1982; Schuller, 1980). The uniform structure of stacked molecular monolayer thin films and layered superlattices along two dimensions (with just one anisotropic axis) makes for easier modelling, analysis, and control over such structures relative to VLSI semiconductor parts (where the three-dimensional distribution of atoms is such that overlapping chemical gradients occur along 3 dimensions). Thus, it may prove feasible to design ultra-thin (5-50 nm), uniformly layered structures, which, in correspondingly small cross sectional cores, would form tiny discrete transistors, sensors, transducers, actuators, and the like. Literally thousands of such parts could fit in the volume occupied by a single conventional VLSI transistor. Such layered structures might be diced up, tested, connected to conducting or support leads, and assembled into ultradense 3-dimensional products using the tools described in the section on bootstrapping (see below). Alternatively, deposition and bonding of self-assembling biomolecules onto the surface of the layered substrate might be used. These could also function as a shadow mask pattern for radiation or chemical cutting of the unmasked underlying substrate into separate pieces, exposing the layered sides for layer-specific bonding with other sets of self-assembling biomolecules. The resulting objects would then be placed in a liquid solution to use the self-assembly mechanisms of the attached molecules (Thompson, 1982; Ostroff, 1983) to produce the desired product.

Similar approaches could be used to build up optical computing and signal processing devices and their electronic and acoustic hybrids. This would allow precisely controlled variation of indices of refraction (and other properties) in all three dimensions. It would also permit fabrication of rectangular cross-section vacuum wave guides for optical radiation.

BIOLOGICAL CELLULAR AUTOMATA FOR LARGE MEMORIES AND PARALLEL COMPUTING.

Biological cells (and perhaps the larger viral capsids) are obvious

candidates for the implementation of cellular automata. If biological cells can be augmented with very simple, communicating, state machines, their ability to replicate provides a method to generate a cellular computational space for implementing an exponentially expandable network of computing systems, a la Von Neumann. Cells have the advantage of being mass-producible in great quantity at low cost. They pack quite densely, allowing 100 trillion to 10 quadrillion (depending on size) to be packed in a volume the size of an adult human. If substantially larger numbers of cells are desired, large oil storage tank sized computers may be used for bio-automata analogs of supercomputers. Unlike most cellular automata, such a biological system would not be organized in a cubic lattice. For many applications, (e.g., signal processing, associative memories, video data storage, etc.), this would not matter. Artificial cells (Chang, 1972), optionally using biologically derived materials, might also be used in cases where they would simplify engineering.

To function as cellular automata, these cells must be able to represent a digital or analog state, and be able to signal neighboring (or more distant) cells. The characteristics of cell membranes permit signalling via chemical and ion currents, electric fields, photons, or acoustics. Some naturally occurring mechanisms of direct cell-to-cell communication are discussed by Loewenstein (1975) and may be feasible to modulate. The use of genetic engineering to produce naturally-occurring phototransducer (Honig, 1982) and bioluminescent (DeLuca & McElroy, 1981) molecular communication systems seems feasible. Conformation-changing proteins and vibration sensitive molecules might be used for acoustic signalling. In each of these cases, the potential for multiple signal channels exists.

State information and state transitions might be based on plasmids, together with operators, repressors, and enzymes which are functionally orthogonal to the host cell's original molecular machinery. This set of gene-specific machinery for switching transcription on and off could then be used as logic gates and flip-flop registers of 1-10 bits. These would be slow (perhaps in the millisecond range, at best), but, as with neural synapses in the brain, parallelism and network processing that result in tremendous bandwidth will be possible. These would be suitable for proof of concept, and to do logical debugging of architectures to be used in much faster future assemblies, perhaps with a phototransducer communications network. (Extraction and micro-encapsulation of the bare-bones genetic machinery might reduce the overall cell size tremendously while speeding things up.) Instead of plasmid-based state functions, states of groups of conformation changing enzymes might serve as distributed sets of redundant toggle switches. Another approach would involve adding genes to generate allosteric enzyme/substrate networks with feedback loops (in place of, or in addition to, the above-mentioned plasmid machinery), which, in effect, compute differential equations. Such systems can function as variable gain amplifiers (Koshland, Goldbeter, & Stock, 1982). Their reaction topology would determine state transition functions, which could optionally be "digitized" via chemical coupling to the signalling system. (It is interesting to note that this approach is similar to Von Neumann's class of automata represented by partial differential equations, a topic which his untimely death prevented him from ever developing. This seems another good research area for automata theorists.) In vitro systems exhibiting tunnel diode and flip-flop switching behavior have been constructed using a 5 nm thick lipid bilayer and channel proteins extracted from nerve cells, suggesting yet another approach to fabricating cellular automata. Inter-cell communication might use randomly distributed assorted lengths of optical fibers, insulated metal or one-

dimensional organic conductors, or soliton-propagating macromolecules. The ends of these links may require special binding sites for coupling to complementary cell membrane proteins. There is evidence that conformation and binding states of the protein subunit lattice of microtubules may function as cellular automata (Hamerhoff & Watt, 1982a, 1982b). Other faster computing mechanisms might be produced along the lines suggested in the section on computer-assisted heuristic design.

Biological cellular membranes may provide an early, primitive support and communications matrix for the various types of molecular electron structures of Carter (1982b). Larger scale analogs of such devices might be constructed sooner from arrays of protein and lipid subunits or protein crystallites, using the types of interactions and transitions summarized by Monod, Wyman, and Changeux (1965), Kilkson (1969), and Changeux (1970). Artificial cells could consist of a solid sphere of concentric layers of such differentiated membranes, and might be electrically or optically powered.

An interesting problem is to devise algorithms that will break the local symmetry with respect to communication between neighboring cells, so that cross-connection can be directionally selective, rather than just broadcast to all neighbors. This problem is analogous to embryogenesis. This might be most simply accomplished via chemical gradients or electric and magnetic fields. Another interesting problem is to develop algorithms which use this symmetry. These might include threshold and fatigue effects as in grassfire propagation, or might use wave interference patterns. The ideas of Pettit (1982) may prove useful for the programming and use of biological cellular automata.

MECHANICALLY ACTIVE BULK STRUCTURES

Collections of thousands or millions of MT versions of miniaturized robot walkers (Railbert & Sutherland, 1983), climbers, and graspers may be coordinated to form mechanically active forms of connected, dynamically variable, kinematic cellular automata topologies, where each cell can independently position and orient itself relative to its neighbors in virtually arbitrary 1-, 2-, or 3-dimensional configurations in real time. (The apt term "army ant principle" was coined to describe applications of such systems by Drexler [1982a]). Such collections can exhibit "phase changes," simulating a variety of pseudo-solid, elastic, or viscous liquid states, and generating a large variety of motions and kinematic transformations. Each cell may be optionally augmented with some combination of miniature reflectors, color filters, antennas, sensors, light sources, and/or effectors for cutting, joining, or transporting parts. These parts could be combined into a very general model-building and display system, with seemingly magical properties, for use in a very wide range of applications. Arrays of very high frequency vibrating or rotating magnetic dipoles, of nanometer to micron scales, should be possible.

ADVANCED ELECTROMAGNETIC RADIATION PROCESSING

Phased-array antennas, consisting of 2-D or 3-D patterns of nanometer- to millimeter-scale quarter-wave dipoles or other types of receiving and radiating elements, steerable independently or in parallel (mechanically, or by electronic control), could give tremendous latitude for the generation, reflection, or reception of a very wide, but narrowly selectable spectrum of electromagnetic

radiation. All manner of passive and radiating electronic "eyes" (similar in principle to advanced phased-array radars for ballistic missile defense) with instantly variable focal lengths, frequency combinations, scanning patterns, and magnifications, should be possible. Such radiating "eyes" could be made very small and operate in the infrared. Non-laser coherent electromagnetic radiation generators may be achievable at much higher frequencies than are now possible, by using miniaturized phased-array antennas and analogous structures. Very high frequency acoustic wave signal processing devices using end-supported linear polymers with appropriately placed and sized side groups and cross-linkages may be useful in vacuum or superfluid helium environments. **This technology could form the basis of very tiny, large-bandwidth communications systems.**

COMMUNICATION NETWORKS

MT will permit fabrication of very low mass and ultra high bandwidth communications transmitters and receivers operating in the sub-millimeter through optical frequencies. With replicating technology, these could be fabricated by the thousands (or even millions, eventually), and then suspended from miniature versions of ultra-light-weight, solar-powered, aerostatic balloons, floating high in the stratosphere, in geostationary positions 25-30 km above the Earth (above 99% of the atmosphere, and thus above any substantial weather [Okress & Soberman, 1981; Shipley & Smith, 1977]). They are ideally situated for optical communication with each other (over a 200-500 km range) and can use very narrow beam, very high bandwidth submillimeter communication links to ground stations. They would permit worldwide, high resolution, high fidelity color TV links for person-to-person (or person-to-electronic library, computer, teleoperator, etc.) communication on a global basis. Being closer to Earth, such a communications system would be faster, require much less power, and have a much greater total bandwidth than geosynchronous satellites. Adding extra antennas to the top of each aerostat, and TV cameras to the bottom, would make weather and resources satellites obsolete on one hand, while permitting the formation of an Earth-sized multifrequency, phased-array antenna of enormous range and resolving power for astronomy and very deep space communications.

MEDICAL TECHNOLOGY

Small (red blood cell sized and smaller) MT robots and teleoperators, singly or in groups of thousands or millions, should allow internal microsurgery, general internal examination, and health monitoring without the need to ever cut open patients (at least from the outside). Such procedures should be much less damaging to the body and greatly extend the range, effectiveness, and ease of medical monitoring, maintenance, and repair. It would make inexpensive, completely side-effect free contraception available on a worldwide basis. It might allow precisely located, internal, metered delivery of drugs, thus reducing undesired side effects relative to current delivery methods by lowering the quantity required and greatly limiting exposure elsewhere. It would allow much earlier detection and more successful treatment of many diseases, especially cancer.

Since blood is somewhat transparent to red light, thousands of very tiny robotic MT optical store-and-forward communications relay nodes might be dispersed throughout the circulatory system, and programmed to pass data when

sufficiently near other nodes. These could be the basis of a communications network that would relay data from internal sensors, or to effectors, located virtually anywhere in the body. Power for operation and semi-passive communication might be supplied using light transmitted through the skin to near-surface blood vessels of the face and hands. Miniature versions of biological fuel cells may also be used (Henry, Furman, & Fishman, 1973).

In the more immediate future, it should be possible to create a "VLSI" microchemical factory, which could reside in the stomach and synthesize vitamins from surrounding food on an as-needed basis, at virtually zero long-term cost. This would also allow humans to maintain internal levels of vitamin C at levels comparable to that of other mammals, compensating for synthesis capabilities apparently lost during evolution, until such time as "repair" by genetic engineering becomes feasible, reliable, and safe. Analogous micro nutritional devices might help combat the destructive long-term effects of smog and poor diet.

Given the rather advanced levels of MT suggested by Feynman (1960), and Drexler (1981), what are the ultimate limits to miniaturization of existing biochemical and biomedical instrumentation? The answers to this question will limit the ultimate capabilities of medical "micro-robot-cops" (Miller, 1981); These are proposed tiny (cell-sized) devices that would patrol the blood stream and function as a second immune system, a disease early warning system, and a general biological maintenance and repair system. They should be capable of detecting and removing cancerous cells. Whether detection, repair, or replacement on the subcellular level is ultimately going to be technically feasible is unknown at present. However, if DNA repair, micromechanically assisted genetic engineering, or removal of cross-linked or otherwise damaged macromolecules becomes possible, an exponentially replicating MT capability would be desirable for manufacturing a trillion or more such devices (one per every 10-100 cells). This could be repeated for each of the billions of human beings living on the planet. The possibility of piecemeal replacement of nonregenerating tissue needs to be examined as does in situ cellular cloning and replacement. The latter may require the extraction and transplantation of key peptides, proteins, and other key molecules, especially for neural cells.

That every person now alive is living under a biological death sentence calls for corrective action, within our lifetimes if possible! This is one of several incentives to greatly extend our knowledge of human molecular biology. One general way ARMT or MSPMT could help here involves compiling a catalog of the hundred thousand or so types of molecules that make up a human being. It would be useful to know which cells produce what kinds of molecules when young or old, when healthy or ill, when resting or active, when medicated, when irradiated, etc. This would provide researchers with a general atlas of human physiology at the molecular level, filling an area of tremendous ignorance and removing a tremendous stumbling block to further understanding of the incredibly complex dynamic chemical networks of life-sustaining activity. Great progress may be possible using rather brute force techniques. This may be overkill, but that seems appropriate for a matter of life or death. The first step is to develop ARMT or MSPMT as fast as possible. These could then be used to make millions, billions, or trillions of copies (as required) of fully automated miniaturized biochemical and biophysical laboratory equipment. This would be used to find, identify, catalog, and characterize all major biomolecules in

humans and other life forms. This includes sequencing the DNA and corresponding proteins for most of Earth's gene pool. Three-dimensional molecular structure determinations may soon be made by the development of X-ray holography (Robinson, 1982), as may the elucidation of cellular molecular micro-architecture and dynamics. To collect and analyze this tremendous body of data will require tremendous computing power, as will the quantum-mechanical calculations needed to design, simulate, and construct arbitrary new molecular structures (Ludena, Sabelli, & Wahl, 1977; Lykos & Shavitt, 1981). Similar levels of computing power are also needed to help plan, do, and analyze experiments, by the billions or trillions. The resulting data base should be useful for understanding and developing cures for most human diseases while helping to improve the health of aging populations. It should prove useful for combatting new diseases as they involve, which is likely to become an increasingly serious problem. This would be especially critical in the aftermath of a nuclear or biochemical war, which even if limited, would transmit new disease vectors around the world community. **Hence, this project should be central to any serious civil defense plan.** Whatever happens, this project could indirectly provide one of the very best forms of life insurance.

MICROMECHANICAL SYNTHETIC CHEMISTRY AND ADVANCED MATERIALS FABRICATION

Controlling chemical reactions of large molecules by mechanical handling with miniature machines has been suggested by Feynman (1960) and Drexler (1981). The materials that could thus be fabricated would not be limited by chemical kinetics, unwanted side products, nor the other factors that restrict the current state of the art in synthetic chemistry. For instance, it may be possible to overcome the obstacles of previous attempts to synthesize room temperature (Cope, 1982; Little, 1981). Ultra-strong materials such as diamond fiber and carbyne fiber, with strengths or 50 giganewtons per square meter may be possible to fabricate with MMT (Drexler, 1983a); other possibilities include fibrous fracture-tough refractories.

ENERGY PRODUCTION

Given the level of MT proposed by Feynman (1960), new types of energy conversion devices (Yater, 1974, 1979) might become competitive with advanced low cost solar photovoltaic devices, with great potential for large scale, worldwide power generation. Billions of small MT units which incorporate natural or modified chlorophyll systems to generate electricity or to "farm" films of biomass for in situ conversion into energy would be attractive with replicating MT systems; the needed transducer systems might be developed along the lines suggested in the section on computer aided heuristic design. However, the great computing power made available by ARMT may sufficiently accelerate fusion development to make the above energy conversion devices unnecessary.

PEST CONTROL

ARMT should be able to produce vast numbers of artificial insect-like robots for non-chemical, non-toxic, pest and rodent control, greatly reducing food losses around the world.

WATER PURIFICATION

Biological ARMT should be useful for the production of membranes for the purification of water.

TO BE CONTINUED

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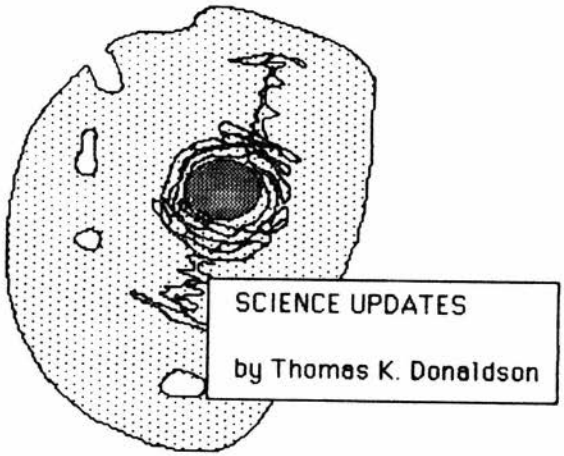
BREEDING IN PUBLIC



In CRYONICS we have reported on the growing opportunities for genetic modification of people born with inherited disorders. Means exist or will soon exist by which physicians should be able to change genes in body cells of people with such afflictions, carrying out genetic surgery. Because current techniques are far more crude than those we can imagine, we'll only be able to help, soon, a narrow range of genetic diseases. Among the kinds of diseases for which gene therapy ought to work are Lesch-Nyhan disease (which causes self mutilation and mental deficiency) and adenosine deaminase deficiency (ADA deficiency), which also results in mental deficits.

Among the researchers who are preparing such trials are Theodore Friedman, et al, at the University of California at San Diego, and David Nathan and others at Harvard Medical School for treating ADA deficiency.

A recent article in SCIENCE (227, 493 (1 Feb'85)) reports not so much the science and medicine involved as the regulatory structures developing around this experiment. Someday genetic surgery will become routine; however, to judge from the amount of public and official attention, this day is nowhere near arriving.

The Office of Technology Assessment has issued a report on gene therapy. Thankfully there is a high consensus that gene surgery on **body cells**, that is, surgery that does not change inheritance, should go ahead. (The OTA assessment observes that such surgery is quite similar to others kinds of surgery). Senator Albert Gore has promoted public debate on the issue.

Resulting from these deliberations, the Recombinant DNA Advisory Committee set out a long series of guidelines which any experiment to modify body genes must satisfy. Among others, they require first tests in primates. Not everyone agrees that such studies are necessary.

The Advisory Committee passes on government grant applications and therefore cannot directly affect the experimentation of highly motivated fanatics such as cryonicists. However, most proposals without funding will simply die. There's evidence that infighting has specifically led to the demise (perhaps only temporarily) of one such proposal. Theodore Friedman had asked for money to do a study on gene therapy of Lesch-Nyhan disease in primates. His proposal was turned down. It's a curious fact that a major scientist on the committee which made the negative decision was Thomas Caskey, a geneticist from Baylor College of Medicine who is also working on gene therapy for Lesch-Nyhan disease.

Of course, genetic therapy of primates will also run afoul of the animal rights activists. The entire episode, in fact, seems to display the true nature of "regulation." In practice the regulating authorities often have no interest in promoting development or technology. They have many private axes to grind. It's a way of doing in a rival. It's a way of slowing down development for any of a number of imagined theological reasons. Of course, all of this infighting

goes on to a background talk of "ethics".

Every time a man and a woman produce a child they carry out a genetic experiment. Advisory Committees, Senator Gore, and prolonged informed consent from the child don't seem to be required. We may feel very thankful that Committees from the NIH do not insist on watching us in our bedrooms.

BRAIN ISCHEMIA AND PROSTAGLANDINS

Many studies of the effects of cutting off blood flow to the brain describe the swelling which happens when we try to restore circulation. This swelling cuts off flow through the capillaries. Of course, without further oxygen and nutrients, brain cells die.

Ordinarily, brain cells maintain a strict separation between themselves and the rest of the vascular system. A complex set of physiological processes prevent many chemicals from entering brain cells from the blood stream. These processes collectively receive the name "the blood--brain barrier". After ischemia, swelling occurs because the brain cells take up much more than the normal amount of water. This swelling appears to happen because the blood--brain barrier breaks down.

Many different scientists have raised different suggestions about the causes of this breakdown. None of these suggestions clearly meets the tests of a mechanism. Recently, however, a very important paper by T. Koide, et al from the Department of Neurosurgery, University of Tokyo, (J. Neurochemistry, 44, 85-93 (1985)) makes some real progress towards a full explanation of brain swelling after ischemia. Moreover, Koide et al have produced a drug which completely stops this swelling in their experimental animal, the rat.

Before Koide et al, several scientists had described a considerable increase in free fatty acids just after a period of ischemia. Some had suggested that oxidation of these free fatty acids into toxic products might cause some of the damage due to ischemia. The walls of our capillaries also contain mechanisms which will create prostaglandins from free fatty acids. Prostaglandins and related substances (the general term is eicosanoids) can cause serious toxicity to our body cells.

Koide and his coworkers therefore decided to watch, in detail, the synthesis of eicosanoids from free fatty acids in rat brains. They did this by making preparations of capillaries from brains of rats subjected to ischemia at varying times after the injuries. They also, of course, studied similar preparations of capillaries from control rats.

They found that after ischemia, levels of two different enzymes increased considerably. These were the enzymes lipoxygenase and cyclooxygenase. Both enzymes make eicosanoids from the free fatty acid arachidonic acid. Brain ischemia releases arachidonic acid.

Why should the levels of the two enzymes increase? It turns out that the products which one of these enzymes makes from arachidonic acid will stimulate the cell walls to make still more enzyme. A vicious circle sets up. Not only are these products injurious in themselves, but they also promote their own production. The offending enzyme is lipoxygenase.

Koide and his coworkers also studied the mechanism by which this vicious circle gets started. They found that one drug, a product of free radical oxidation upon arachidonic acid, would promote the production of the enzyme lipoxygenase. They could mimic that swelling from ischemia in rat brains never deprived of oxygen.

Swelling would start this way. With ischemia, injured brain cells release free fatty acids (like arachidonic acid). Free radical reactions cause these to make peroxides. These peroxides cause the level of lipoxygenase to go up. The lipoxygenase creates eicosanoids, which damage the brain cells, thus creating more free fatty acids, more lipoxygenase, and so on.

With this process in hand, the Japanese researchers could then go on to try and intervene. Several free radical scavengers might suppress this vicious circle, among them Vitamin E. The one which Koide and his coworkers found most effective is a free radical scavenger called nicotinamide propane (NAP). They could completely suppress brain swelling after ischemia by giving doses of NAP three times daily to their rats.

I believe that this work has a lot of significance for the treatment of brain ischemia. Brain swelling presents a major obstacle to recovery in patients whose heart has stopped or who have otherwise suffered a lack of blood flow to the brain.. It may also have significance for suspension techniques, although in many suspensions we can already control brain ischemia quite well.

SOME OBSERVATIONS OF BRAIN STRUCTURE AND MEMORY

For some time we've wanted indications that memory would survive in suspension patients. Some of this problem is the old one of proving a negative. Like most such questions, it's of course **relatively** easy to show that memory survives and far harder to show that it does not!

However, an interesting paper from the Russian FIZIOL ZHURNAL SSSR (68(2), 206-211 (1982)) has recently arrived, after translation, in the West. A.S. Iontov and V.F. Shefer ask the interesting question: "What does the **anatomy** in cases of impaired memory show us about memory storage?" The major case of impaired memory they study is deficits associated as **aging.** They report a detailed electron microscopical study of the brains of three persons who died at ages 78, 79, and 83 and who suffered from amnesias or faulty memory.

I do not believe that these authors executed their study very well. Among other problems they present no controls, nor do they specify as much as we would like about the nature of the memory loss of their experimental subjects. I am reporting it because the question is a good one even if the answers in this particular case are not.

The paper comments about two different changes observed in its subjects. First, the number of Nissl bodies decreased. The Nissl bodies are characteristic to neurons. They are involved in RNA metabolism. Since RNA production may be involved in short-term memory. a decrease in the number of Nissl bodies may support an involvement of RNA in memory. Second, the number of **dendritic spines** also decreases. These are characteristic structures at the synapses (the location where neurons connect to other neurons and transfer impulses). The dendritic spines may also be involved in memory.

We could get some indirect evidence about memory **by checking for survival of these structures after freezing.** Even in young animals, stresses can cause temporary disappearance of the Nissl bodies (and perhaps a temporary derangement of memory). The dendritic spines also exist because of underlying changes in the structure of the cell membrane near the neuron. It is therefore reasonable in both cases to expect that brain tissue in the frozen state will show an apparent disruption of both structures. What is very interesting, therefore, is to see whether or not they recover after freezing and thawing of brain tissue. Since we lack firm knowledge of how memory is stored, such evidence wouldn't be conclusive either way. However, it would provide some indications.

June-August 1985 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. For meeting directions, or if you get lost, call ALCOR at (714) 738-5569 and page the technician on duty.

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

The JUNE meeting will be at the home of:

(SUN, 2 JUN 1985) Hugh Hixon
289 Cerritos Avenue
Long Beach, CA

DIRECTIONS: Take the Long Beach Freeway (State 7) to Long Beach, and get off downtown at the Broadway exit (goes east). Continue on Broadway to Alamitos, where Broadway turns into a 2-way street. Bearing to the right, continue two blocks on Broadway to Cerritos and turn north (left). 289 is in the old apartments on the SE corner of 3rd and Cerritos.

The JULY meeting will be held at the home of:

(SUN, 14 JULY, 1985) Brenda Peters
(SECOND SUNDAY) 8150 Rhea
Reseda, CA

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

The AUGUST meeting will be at the home of:

(SUN, 4 AUG 1985) Jerry and Kathy Leaf
13152 S. Blodgett
Downey, CA

DIRECTIONS: From the Long Beach Freeway (State 7), get off on Imperial Highway and go east to Lakewood Blvd.
From the San Gabriel Freeway (Interstate 605), get off on Imperial Highway and go west to Lakewood Blvd.
Go south on Lakewood to Gardendale (1st light) and turn west (right) on Gardendale. Blodgett is the 2nd street on the left. Turn left on Blodgett. 13152 is on the left (east) side of the street, about midway down the block.

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ADDRESS CORRECTION AND FORWARDING REQUESTED