

CRYONICS SCIENTISTS FORGE AHEAD

The following is a reprint of the recent progress report sent by the BACS Secretary to the Foundation For the Enhancement and Extension of Life, in Houston, Texas:

Progress Report: September 7, 1984

Bay Area Cryonics Society, Inc.
Life Extension Sciences Research Program

In the past two months, BioPhysical Research and Development, our research subcontractor, has largely concentrated on the Hamster Suspension Project. Little attention has been given to the Mouse Cloning Project due to budgetary considerations and the fact that the waiting list on which we were placed to attend the Gordon Conference on embryology never resulted in an invitation. The Rodent Anti-Aging Project has produced several opportunities to present our ideas on aging and its control to members of the scientific community. Efforts to acquire additional lab space are also continuing, and have become especially important due to recent breakthroughs in large animal suspended animation research by the Los Angeles-based personnel of Cryovita Laboratories.

The major achievement of the last two months has been the increasing reproducibility and reliability of our techniques for reviving hamsters from states of bloodless cold, and the elaboration of this methodology before an audience of researchers expert in the science of cryobiology. We have now restored a total of eleven hamsters to consciousness from states of deep hypothermia near the ice point, and have presented most of our findings to the Society for Cryobiology at their Cryo 84 Conference held at the University of California at San Diego School of Medicine, August 20-24.

Our presentation at this conference, which was received without scientific criticism (although delivered before a group traditionally hostile to cryonics), appeared to accelerate acceptance of our research efforts as "scientific", and has resulted in an appointment to discuss possible collaboration with an in-house cryobiology-oriented engineering group on the Berkeley campus. The conference allowed us to make the acquaintance of workers on several campuses, including that of a very well informed scientist. Dr. Kenneth B. Storey of Ontario, Canada, who has gathered a wealth of information on the partial freezing of tree frogs (Rang aylvatica). These

frogs, as do a few other known species of anurans, actually freeze to the extent of allowing nearly 50% of their body water to be converted to ice. They can tolerate this widespread formation of ice in their extra-cellular spaces because they produce large amounts of glucose, which quickly permeates all their body fluids prior to freezing. Other frogs have been discovered which produce quantities of the cryoprotectant glycerol. These groups of frogs apparently can spend the entire winter in a state of semi-solid suspended animation, during which they do not breathe, circulate their blood (which is frozen solid), or show any other signs of integrative organismic activity.

In another talk at the conference, Cryobiology Society Membership Chairman Dr. J. G. Baust, a researcher from Houston, Texas (to whom Drs. Harold Waitz and Paul Segall both submitted membership applications) described insects which produce a variety of cryoprotective agents. By synthesizing and circulating the sugars trehalose and sorbitol, as well as glycerol, these animals survive temperatures as low as -65°C.

Perhaps the most important information gained at the conference was from the other cryonicists there, and who comprised approximately 7% of the total attendance. The Cryovita Laboratory group described to us how they are perfusing dogs with oxygenated and dialyzed blood substitutes which allow the animals to fully recover after as long as 4 hours of body temperature below 7°C. (Most of these experiments have been or will be reported in Cryonics, the highly informative magazine published by Alcor, 4030 North Palm #304 Fullerton, CA 92635 for \$15/year). Their dogs, unlike our hamsters which have all died from excess anti-coagulation, have survived for weeks, and in some cases now, months, after hypothermic total body washout. They show every sign of full and complete recovery. Discussions with the Cryovita group have led to plans for related experiments in our Hamster Suspension Project. Dr. Greg Fahy, who chaired one of the sessions at the meeting, also presented some of his exciting experiments on the freezing of rat brains, revealing the substantial amount of histological preservation possible after freezing brains in liquid nitrogen. These experiments have important implications in justifying cryonics suspension using even our current imperfect techniques.

Other BioPhysical Research and Development progress to be reported is the continued ability to record central arterial pressure and body temperature on-line while our hamsters are being cooled to and revived from the ice-point. We have proved that the EKG signal recorded on our polygraph not only represents heart electrical activity, but it actually produces a heart beat, and therefore a pressure wave which can be measured by our pressure transducer connected via cannula to the hamster carotid artery. Arterial blood pressures as low as

a fraction of a mm of Hg have been visualized and shown to correspond to EKG signals at temperatures as low as 3°C. Dr. Waitz has constructed a simple device consisting of a tube connecting two hypodermic needles which can be fastened to a sphygmomanometer, and then connected to the arterial pressure transducer, allowing the transducer to be calibrated by the application of known pressure. The tube corresponds in length and inside diameter, and thus in resistance, to the carotid cannula; therefore allowing measurements of pressure approaching that experienced during carotid cannulation.

A series of slides photographed during actual hamster suspensions were prepared, some of which were shown at the Cryobiology Society presentation. A hamster suspension experiment was filmed by a television crew from Los Angeles, who also interviewed us for a PBS documentary on life extension. Unfortunately, this particular experiment did not produce a totally revived hamster, but only an animal whose breathing was partially restored. However, we were somewhat more successful with a student group from the University of California at Berkeley's Educational Television Office, which has videotaped one of our latest experiments in which a hamster is revived to consciousness after an hour without perfusion or respiration at a temperatures below 3°C and as low as 1°C.

As luck would have it, this animal did not display the full range of activities often seen after asanguinous hypothermic perfusion. Due to weakness caused by blood loss, signs of the hamster's recovery were limited to some facial responses to stimuli, weak limb movements when being rolled over on its back, and some squeaking. This documentary also contains interviews with members of our laboratory group on the subject of life extension.

The above experiment in which perfusion and respiration are halted is important because it was preliminary to our new protocol, taken to some extent from the Los Angeles-based Cryovita dog work, in which a blood substitute mimicking the solutions Inside the cell, rather than outside, is used. In this new protocol, the hamster is brought close to the ice-point, perfused with a few ml. of extracellular-type blood substitute, and then perfused with approximately 1.25 blood volumes of intra-cellular type blood substitute. The animal remains at or near the ice-point for various specified times, and is then re-perfused with the original extracellular-type blood substitute, followed by several volumes of whole blood while being re-warmed. It remains to be seen whether the intra-cellular-type blood substitute will convey the same advantages to our hamster model as it seems to in Cryovita's dog experiments and in many isolated organ perfusion techniques.

In our latest experiments, we have also substantially reduced

concentrations of the anti-coagulant heparin, and plan to lower this even more. This reduction in blood substitute heparin concentration has already significantly diminished post-operative bleeding without creating thrombo-embolism.

Past goals from previous months met include the induction of and revival from deep hypothermic states while monitoring changes in blood pressure, EKG, deep body temperature, pH, and hematocrit, but not yet blood gases. Dr. Waitz has continued his efforts to regenerate a blood gas apparatus obtained on loan from Trans Time, in order to collect CO₂, O₂ and pH data using minute samples of blood. As this apparatus is a somewhat cumbersome and ancient machine, known throughout the trade for its accuracy but also difficulty in use and maintenance, we plan to seek outside assistance in both its repair and learning its use.

An abstract based on our new view of aging (see BAGS Notebook vol. 1, no. 1, August, 1984) has been accepted for presentation at the American Aging Association at its upcoming October, 18-20, 1984 meeting. Paul Segall will describe this theory, along with his most recent gerontological findings during an afternoon session which he is scheduled to chair on Saturday, October 20, at the Roosevelt Hotel conference site in mid-town New York City. During the conference, Paul is planning to meet with Saul Kent, well-known author of the Life Extension Revolution, and Director of the Life Extension Foundation, an organization currently supporting state-of-the-art life extension research. They will discuss possible laboratory-based attacks on aging. Both Kent and Segall also plan to attend the Gerontology Society of America's upcoming 37th Annual Meeting scheduled for November 16-20, at the Convention Center in San Antonio, Texas.

On September 19, 1984, Segall will present his experiments and ideas involving nutritional restriction and delayed aging in the rat to the Department of Nutritional Sciences of the University of California at Berkeley. It is hoped that discussion of these ideas within the scientific community will produce useful feedback.

The Cryonics Building Fund, strengthened by actual and potential donations now amounting to approximately \$65,000, has made an offer of \$400,000 for the acquisition of the previously described Oakland mortuary with 4-5000 square feet of usable space, as well as an adjacent parking lot which can then be sold to developers. If the building can be purchased, expanded research space, including room for large animal experimentation will more available. In view of the recent successes of the Southern California researchers, this goal becomes increasingly important.

The above is a summary of the recent direction of our work. We

wish to again reiterate our thanks to the Foundation For the Enhancement and Extension of Life for its continued support, and look forward to communicating further advances in the Life Extension Sciences.

BAGS MEMBER FEARS NOTEBOOK'S FRAGMENTATION POTENTIAL

In response to the BACS decision to make available to its membership (on a strictly experimental basis) the BACS NOTEBOOK, which it plans to send out along with the BACS minutes following each bi-monthly BACS meeting, The BACS Secretary has received a letter from a knowledgeable and long time member warning that the NOTEBOOK could increase divisiveness within the cryonics community. In response to this letter, the editor wishes to state that the BACS NOTEBOOK is merely a tool for the Northern California group to inform BACS members of their latest affairs in a format that is convenient and quick. In no way is the BACS NOTEBOOK to be construed as a competitor to any existing cryonics publication, as it does not and will not have the same scope of information, or copyrighting and editorial standards as some of these other publications.

The NOTEBOOK will be focused only on items which can be simply and conveniently disseminated to BACS members. In fact, due to recent research funding, the editor renewed his own expired subscription to CRYONICS, the excellent magazine of the ALCOR group based in Los Angeles. Any and all life extension oriented publications are urged and encouraged to excerpt material published herein. Only through the free flow of information can our difficult tasks be resolved. We apologize for any inconvenience which the NOTEBOOK causes any groups or individuals in the life extension community.

Salvador Pali Ailing. Once Wanted Cryonics

Salvador Dali, reported by UPI to be ailing, once told BACS member Saul Kent that he wanted to be frozen at death. News reports state that the 80-year-old artist is in serious but stable condition at Barcelona's El Pilar Clinic, after suffering from accidental burns and malnourishment while bedridden and in the care of friends. Official investigations into the bedside accident and his living situation are ongoing. Could cryonicists and Dali-lovers somehow team up to provide suspension services if they became necessary?

HEAT FLOW IN THE CRYONIC SUSPENSION OF HUMANS

SURVEY OF THE GENERAL THEORY

Arthur Quaife, President

Trans Time, Inc.
1507 63rd Street
Emeryville, California 94608

ABSTRACT

Procedures used in the successful freezing and thawing of diverse human cells and tissues are known to be quite sensitive to the cooling and thawing rates employed. Thus it is important to control the temperature descent during cryonic suspension of the whole human body. The paper surveys the general theory of macroscopic heat flow as it occurs during the cryonic suspension of human patients. The basic equations that govern such heat flow are presented, then converted to dimensionless terms, and their solutions given in geometries that approximate the human torso, head, and other regions of the body. The solutions are more widely applicable to the freezing of tissues and organs.

1. INTRODUCTION

Cryonic suspension is the freezing procedure by which human patients are preserved, after pronouncement of legal "death", in hopes of eventual restoration to life and health. The procedure attempts to preserve the basic information structures that determine the individual's identity. These include the memories and personality as encoded in the macromolecules and neuronal weave of the brain, and the genetic information stored in DNA.

The author has previously formulated a mathematical model of the heat flow and the diffusion of cryoprotectant that occurs during the first phase of this procedure, in which chilled blood substitutes and cryoprotective solutions are perfused through the vascular system [9]. The present paper treats the general theory of heat flow, particularly at sub-zero temperatures after perfusion has ceased and the body has solidified.

The author has written a computer program that calculates most of the solutions given below, and in subsequent articles intends to present tables and graphs comparing theoretical projections with experimental data. Other problems for subsequent analysis include change of phase, and thermal stresses from temperature gradients within the frozen tissue.

Editor's Note: The above is the first page of a 15 page article written by Art Quaife. Before becoming a full time cryonicist, Art was a Ph.D Candidate in Mathematics at the University of California, Berkeley. The article is now being submitted to conventional journals for publication. Art will be happy to send copies of the paper to interested parties; write him at the address below.

CRYONICS BUILDING FUND UPDATE
July 23, 1984

Dear BACS Member:

Perhaps the world is designed to frustrate impatient people. Fortunately all the depositors in the Cryonics Building Fund appear to be more patient than I am. We were not able to get enough money together fast enough to make an offer on the first suitable property that was found, but a second property with somewhat different characteristics is now under consideration. It is a wonderful old mortuary in a very good commercial area in Oakland. It turns out that a lot of mortuaries are going out of business these days, and a mortuary building is not much good for general usage, so prices are about the same as for bare land. The one we are looking at is larger than we need now, and has a large parking lot which we do not need, but would be quite suitable for storage, research, or even a storefront type operations of some sort. Because of the large parking lot the price of the whole property is out of reach, but we hope to make a deal with a builder to split the property in such a way that we could afford the portion with the building.

It is not clear yet how much cash will be required to make the deal work, but we are still definitely on the low side for what I consider reasonable leverage. It looks like we can borrow money, some of it at very reasonable rates, but we need more risk takers. I believe the benefits are more than adequate to attract enough capital if we can get the story out to the right people. There are legal risks involved in talking about possible benefits without having a formal prospectus, and generating a prospectus for a deal that does not go through is an unnecessary expense. I hope that enough people who may be thinking of making additional deposits in the Cryonics Building Fund will do so now, so that we can have confidence that when we issue a prospectus the deal will go through.

Because of our slow progress, earnings in the account (about \$600.) now exceed expenses (about \$500.), but I want to assure everyone that both earnings and expenses are intended to become part of any deal growing out of the CBF.

Sincerely,

yodtm R. Day, Custodian,

Cryonics Building Fund
7710 Huntridge Lane
Cupertino, CA 95014

CRYONICS BUILDING FUND AGREEMENT

An account has been established to accumulate funds that may later be committed to buying or building a facility for use by cryonics organizations in the San Francisco Bay area. It is expected that within a few weeks or months a suitable facility location will be found. At that time everyone who has deposited funds in the account will receive a prospectus describing the property and details of its proposed syndication. Before agreeing to the terms of the syndication, depositors may withdraw their funds at any time for any reason. Dividends or interest earned in the account is expected to partly offset legal fees, taxes, and other expenses involved in location of the property and preparation for syndication. If for any reason the syndication does not proceed, each depositor will receive back the full amount deposited before John Day may withdraw what remains as his deposit. (\$10,000. less net expenses)

ACCOUNT NAME; Cryonics Building Fund number 11102406817
MANAGEMENT FIRM: Franklin Resources, Inc. phone 415-574-8927
155 Bovet Rd.
San Mateo, CA
CUSTODIAN: John Day phone 408-255-8460
7710 Huntridge Ln.
Cupertino, CA, 95014

It is expected that the proposed syndication will provide the following advantages to participants:

1. An ownership interest in a viable asset. The property will have income producing potential independent of any other advantages.
2. Substantial tax advantages.
3. Stability and vitality of cryonics organizations in the San Francisco Bay area will be greatly increased.
4. A solid core of skilled people interested in cryonics will be motivated to protect and enhance the value of the property.

John Day and depositor both agree that deposits and withdrawals from the Cryonics Building Fund will be made in accordance with the procedures defined above.

_____/_____/_____
John R. Day (date) (depositor signature) (date)

(depositor printed name)

(street address)

(city, state, zip code)

(phone number)