

Courtesy of Mike Darwin

Longlife MAGAZINE



(Formerly LIFE EXTENSION MAGAZINE)

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Significant Advances Made in Total Body Washout for Cryonic Suspension.

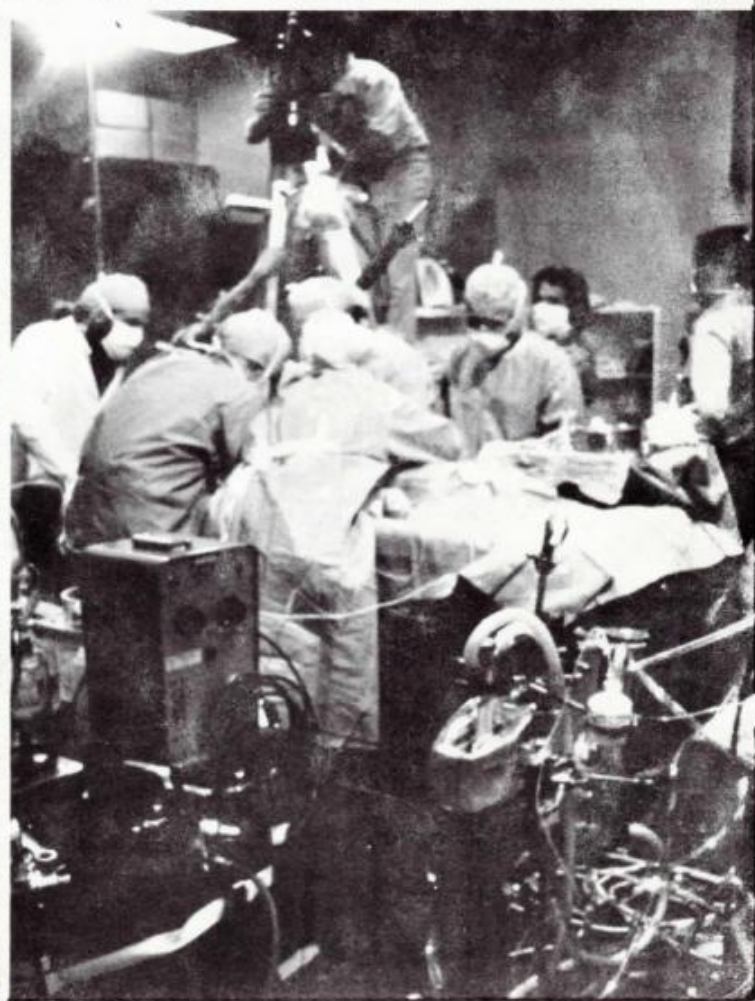


Revive Dog for 17 Hours.

New Column: Laid to Rest

**Parapsychology: An Expectancy
Effect**

**Hot Air and Vacuum: What Kind of
Pyramid Can You Build on the Moon?**



Trans Time Conducts Total Body Washout Experiment

by Art Quaife

"That dog is breathing."

The Trans Time Board of Directors recently journeyed to the Los Angeles area, conducting a meeting for potential Bay Area Cryonics Society Suspension Members. During the meeting we had the opportunity to talk with Jerry Leaf, a Staff Research Associate in the Division of Thoracic Surgery at the UCLA School of Medicine. After learning that he had extensive experience in cardiopulmonary bypass operations using hypothermia, and that he owned substantial surgical equipment for his private laboratory, we asked him if he would come to the Bay Area with his equipment to demonstrate these surgical procedures on experimental dogs. We wished to learn how Phase I of cryonic suspension should be carried out in a medical setting, while attempting to duplicate Dr. Gerald Klebanoff's success in reviving dogs after total body washout of blood with an appropriate perfusate. Jerry agreed to do so on the weekend of a visit by an ABC-TV film crew, who were preparing a feature on Trans Time for their show Special Edition.

Jerry and Kipp Grant arrived from Los Angeles late Friday night (July 22) in Jerry's van, which he had loaded with a virtual operating room of equipment and supplies. After setting up the equipment at the Trans Time facility in Emeryville until 3:00 AM, we took a few hours of sleep, a commodity which became increasingly scarce over the weekend.

Saturday morning at 10:00 AM we resumed setting up the equipment and calibrating the instruments, which took until 12 midnight. We then bled the first donor dog, to obtain a supply of blood for transfusion and for priming the oxygenator. At 4 in the morning, we finally began our first experiment in hypothermic cardiopulmonary bypass.

Although the bypass circuit was successfully instituted, we experienced difficulty in establishing adequate venous return flow to the oxygenator, and were only able to lower the dog's temperature to about 27°C. We finally decided not to attempt blood washout on this dog, but to instead use him as a donor of further blood. The experiment was terminated at about 1:00 PM Sunday afternoon, some 27 hours after we had begun. After a few hours sleep, we returned to the Trans Time facility for another late night session obtaining blood from another donor dog, and making further preparations for the main experiment the next day.

On Monday morning, preparations again began at about 10:00 AM. Surgery began at about 2:00 PM, after the ABC-TV film crew had arrived. Jerry Leaf's article in this issue gives the full technical details of the experiment, so I will just report some of the drama that began about 2:00 AM Tuesday morning, when Jerry had to leave for the airport to meet a 4:00 AM call for surgery at UCLA.

When he departed, the left femoral in-

cision and the jugular incision still needed to be closed. At about the same time, our supply of oxygen for the Bird respirator ran out. To further compound our problems, the dog was still hypothermic at about 32°C. The prognosis for the dog then looked quite grim! Heroic measures were called for, and heroic measures we took. Jerome White, who had his first experience in surgery as Jerry Leaf's assistant that weekend, took over as chief surgeon and proceeded to close the two open incisions. Eric Warnick, Mike Gray, and Eddie Fitzgerald took turns administering artificial respiration to the dog through the endotracheal tube. We placed a heater underneath the operating table and a heating pad on the dog's abdomen, attempting to rewarm him.

But the dog still wouldn't breathe on his own, and at 4:30 AM we were ready to cease artificial respiration and terminate the experiment. Suddenly Jerome White exclaimed "That dog is breathing!". Over the next few hours he showed increasing signs of life, including a strong heartbeat, mucus running from his nose, and eyes closing partially in response to strong light.

By 8:30 the next evening, the dog still hadn't regained consciousness and his breathing was becoming faster and shallower. We took him to a veterinarian, who diagnosed pul-

monary edema. The dog died at 9:45 PM.

Since the dog survived for about 17 hours after revival, we consider this an unqualified success for a pilot experiment. Jerry Leaf has predicted that with a few more trials to perfect our procedure, we should be able to bring a dog back with long term survival.

Undoubtedly the hero of the occasion was Jerry Leaf, who impressed us greatly in many ways. First, with his competence as a surgeon and scientist, having complete mastery of this complex operation. Next, with his calm and unflappable manner under fire, answering hundreds of questions from dozens of people, under the additional pressure of TV filming. Finally, with his iron man constitution in enduring hour after hour of difficult, demanding work. While Paul Segall, Kipp Grant, Jerome White, and I worked just about the same long hours that he did, Jerry had the additional responsibility of continually directing a whole crew who had never before participated in such an experiment.

Jerry has agreed to head up our Trans Time suspension team in the Los Angeles area. He already has his own research laboratory, with virtually all of the equipment needed to carry out Phase I of cryonic suspension as it would be done in a hospital. Now that the merger between Manrise and Trans Time has been approved (see article elsewhere this issue), we plan to integrate the former Manrise equipment and personnel with Jerry's laboratory. We will then be capable of conducting cryonic suspensions using the best medical techniques and equipment available anywhere.

More than 20 people participated in various phases of this project. In addition to those mentioned previously and in Jerry Leaf's article, Chadd and Royce Everone, Saul Kent, David Seaborg, Edgar Swank, Jim Yount, and other friends of Paul Segall were present for parts of the experiment to help with support functions. And while most of us were occupied with the dog experiment, Judy Murrell was busily placing two hamsters into suspended animation and reviving them for the film crew!

Two observations from these experiments:

1. Surgical experiments on large mammals such as dogs require considerable personnel and money, when conducted with a procedure calculated to bring the animal back to life. When all the bills and work reports are in, this experiment will have cost Trans Time about \$3000. To carry out further experiments of this nature, we need more money. Research contributions can be made directly to Trans Time, Inc. Alternatively, tax-deductible contributions can be made to the Bay Area Cryonics Society, which has federal tax-exempt status. (Our thanks to the Foundation for Infinite Survival, and to the Bay Area Cryonics Society, for their small contributions toward this experiment.)

For considerably less money, we can test washout perfusates on smaller mammals such as hamsters and rats. Dr. Paul Segall, our Director of Biological Research, is anxious to begin such experiments; see his research proposal in LONG LIFE MAGAZINE (formerly LIFE EXTENSION MAGAZINE), Volume I, Number I.

2. More than 20 people were also involved, directly and in support functions, in the last whole-body cryonic suspension we conducted. If suspensions were being conducted frequently enough for the procedure to become routine, fewer people would be required. But that isn't the case now -- suspensions are few and far between, and occur under such diverse circumstances that last minute preparations have to be made by a number of people. Extant and potential cryonics groups who think they can conduct suspension responsibly using only a few people are just whistling in the dark. Although many suspensions have been carried out in the past with but a few participants, one can only wonder just what was done!

Many thanks to Jerry Leaf for the valuable training session; we look forward to a long association with him.

A Pilot Study in Hypothermia, using Femoral Jugular- Femoral Bypass and Total Body Washout

by Jerry Leaf



Above: Operation being filmed by ABC-TV.
Right: Recorder shows dog's heartbeat
resuming. Photos courtesy Trans Time, Inc.

Objectives

With this experiment we hoped to achieve four main objectives. First, to test the feasibility of using a limited bypass procedure -- femoral-jugular-femoral bypass -- for obtaining deep hypothermia and total body washout. Second, to determine the value of a physiological solution similar to Klebanoff's (1), as a perfusate for total body washout. Third, to establish a model for future experiments. Fourth, to demonstrate and teach, by direct participation, those Trans Time personnel who will later be involved in the use of this procedure as a research model.

Introduction

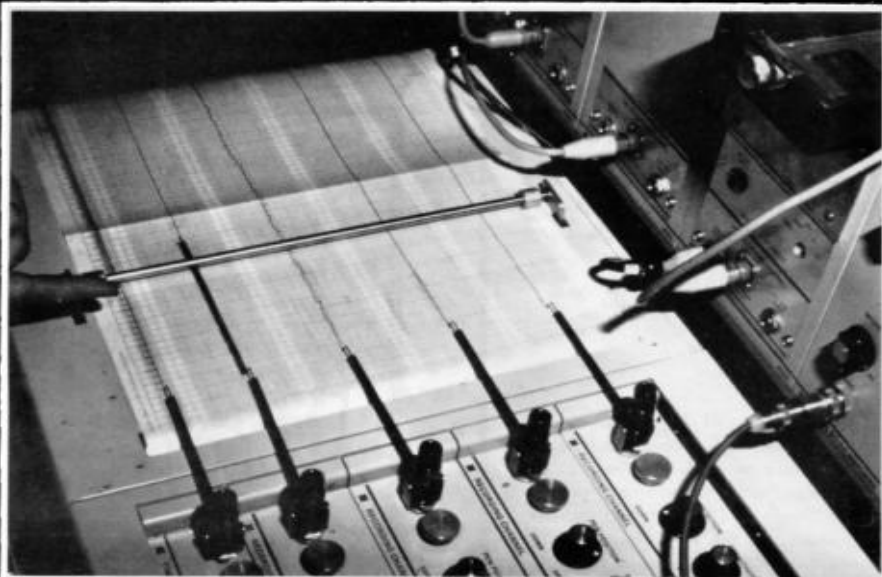
Among the many problems with which the cryobiologist must contend, if he is to do whole organ or whole body deep hypothermia experiments, is the selection of a perfusate for blood replacement. The blood must be replaced at a low temperature above the freezing point if continued circulation for further cooling is to be accomplished. At low temperatures the viscosity of blood becomes dangerously high and eventual congestion of the capillary system is certain. If total circulatory arrest is performed at higher tempera-

tures, the problem of injury to blood cells and components compounds of tissue survival. Blood itself can best be preserved in more controlled circumstances.

The ideal blood replacement solution would be physiologic in the sense that it would be able to replenish some of the high energy substrates of organ systems and carry on gas exchange functions, as well as being ionically and oncologically compatible.

Fluorocarbon compounds have excellent oxygen carrying capacity, but have not been refined enough for biological use. Wrapping the hemoglobin molecule in a suitable molecular sheath, which is currently being researched, also has future promise as a method of carrying oxygen in a perfusate, but is not ready for use at this time. Consequently, there is no available solution for blood replacement that can carry on gas exchange functions.

This problem can be partially obviated by the use of hypothermia before the blood is removed, thus reducing oxygen requirements to prevent ischemic injury to tissue. Once the blood is removed, the organ systems must rely on anaerobic metabolism. Hypothermia will reduce the metabolic rate so that high energy substrates, such as glucose,



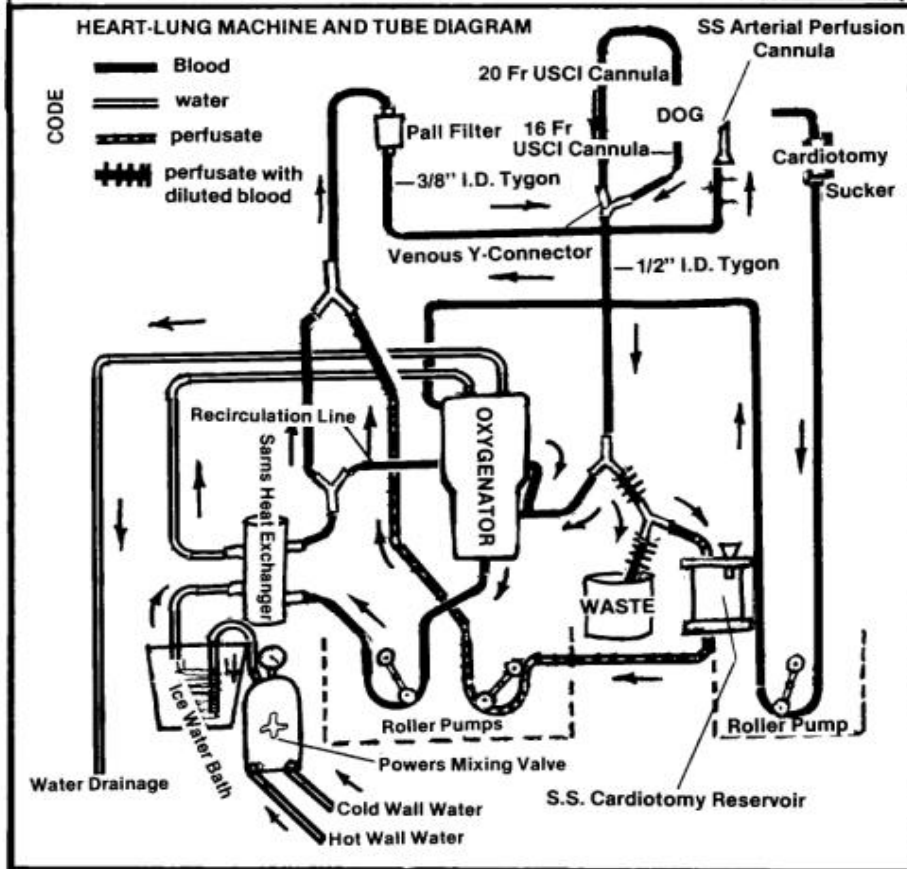
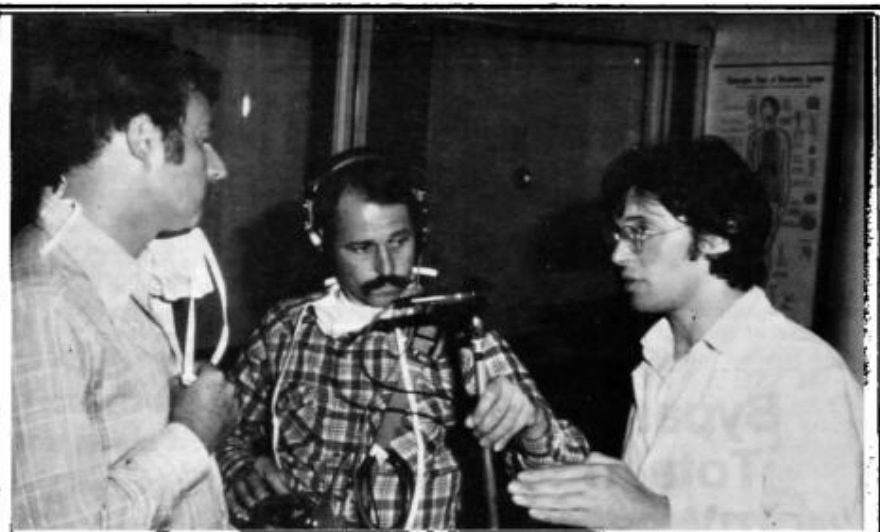
can be replenished. In addition, we can provide appropriate electrolytes and adjust oncotic pressure to prevent edema.

There have been many physiologic solutions formulated for organ preservation, but few have been used clinically for total body washout. Gerald Klebanoff (2) has used the technique of total body washout clinically to treat patients in hepatic coma with some success. For this reason, I'm sure, Trans Time decided to use a solution similar to Klebanoff's. If we could demonstrate that Klebanoff's perfusate is an adequate replacement for blood, then we could use it to deliver cryoprotective agents during cryonic suspension, as well as for other cryobiological research.

Another critical problem is how to deliver the perfusate. Crude techniques of blood replacement have been used in previous suspensions, but under those circumstances the blood did not have to be reinfused or even preserved. In this experimental model, the animal's blood has to be kept in good condition and reinfused before hypothermia is terminated. At present, the only acceptable methods of handling blood in this manner involve the use of extracorporeal circulation with heart-lung machines. To establish effective extracorporeal circulation -- partial or complete heart-lung bypass -- one must establish good venous drainage to an oxygenator and adequate arterial perfusion. Since partial bypass had previously been used successfully, and we wanted to minimize surgical trauma, we selected the femoral vein and jugular vein for venous return and the femoral artery for arterial perfusion.

Methods and Materials

A 22 kg male mongrel dog was given 25 mg Thorazine I.M. pre-operatively, one hour before general anesthesia. A 19 gauge butterfly infusion set was placed in the front leg vein and sodium pentobarbital, 30 mg/kg, was given for general anesthesia. The dog was then intubated with a 9mm Portex endotracheal tube and supported on



A Step Forward . . .

by Saul Kent

Last July, I witnessed, and to a minor degree participated in, a dramatic weekend of experimentation at the Trans Time facility in Emeryville, California. The events of that weekend were important for the following reasons.

1. The Trans Time pilot study represents the first large-scale research project ever carried out by a cryonics organization.
2. Preliminary work was performed on a significant experiment which has only been accomplished previously by Lt. Col. Gerald Klebanoff of Lackland Air Force Base in Texas.
3. The pilot study was performed for a total cost of about \$3,000, which is probably less than any comparable research project in history.
4. Except for Jerry Leaf of UCLA Medical School and two assistants who helped out for a short period, the entire research team was almost without experience in conducting such an experiment. Considering the relative success of the procedures carried out that weekend, it was a remarkable achievement.

The entire weekend was an exhilarating experience for all who attended, despite the long hours and tediousness of much of the work. For once, we were taking a giant step towards extending our lives entirely on our own -- without the help of any institution or the hinderance that such an association often involves. We were proud of what we accomplished and determined to continue to move forward.

Continued page 140

DETERMINED TO MOVE FORWARD



Surgical Staff

Surgeon: Jerry Leaf
 1st Assistant Surgeon: Jerome B. White
 2d Surgical Assistants: Jay T., Nancy B.
 Circulator: Kipp Grant
 Anesthesiologist: Mike Gray
 Physiological Monitoring: P. Segall, Stephen Kehrer
 Blood Ph Measurements: Art Quaife
 Hematocrit: Bobby Riordon

Photos

LEFT: J. Leaf, Nancy B., Jerry White ready to begin cannulation. Foreground David Seaborg acting as anaesthesiologist. BELOW: Jerry White, Jerry Leaf establish extra-corporeal circuit. TOP PAGE 136: Paul Segall being interviewed by ABC-TV.



a Bird Mark 8 respirator. A 17 gauge line, needle over catheter system was placed in the left hind leg, via vena puncture, for future medication and venous pressure monitoring. The 19 gauge butterfly was removed. Keflin, 1/2 gm, was given I.V., prophylactically, and Anectine, 20 mg, as a muscle relaxant. The venous catheter was connected to a Harvard pressure transducer with an 8-ft. Cobe Laboratories P.E. monitoring line and ECG leads attached. Blood pressure and ECG were recorded on a Harvard Biograph recorder. A Yellow Springs esophageal temperature probe was used to record temperature.

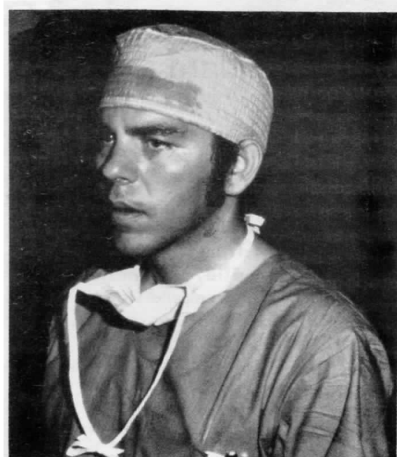
The dog was positioned on his back, legs extended and secured with nylon cord. The surgical sites were shaved, then prepped with Phisohex and Povidone iodine solution. The sterile field was draped using a combination of cloth towels, 3M plastic drapes and Surgiband disposable sheets. All personnel were gowned, masked, and gloved in accordance with accepted operating room procedure.

The right groin was opened with a #10 Bard-Parker scalpel blade and the right femoral vein and artery

were dissected out. Proximal and distal ligatures were placed for cannulation. The right femoral artery was opened with a #11 blade and cannulated with an Aloe cut-down catheter with luer-lock connector and connected to the arterial transducer. The left groin and right side over the jugular were similarly opened and ligatures placed on the left femoral artery and right external jugular vein for cannulation. Hemostasis was achieved with a Birtcher electrocautery unit.

The Cobe Laboratories oxygenator was primed with 6 units of ACD preserved blood, converted with 2,500 units heparin and 6 cc of 10% calcium chloride per unit of blood. Sterile lines from the heart-lung machine were handed off to the sterile field. All tubing in the bypass circuit was of S-50-HL Tygon blood compatible formulation. The arterial perfusion line was guarded by a Pall filter in the usual manner. Blood was then circulated in the heart-lung machine using a standard roller pump to clear air from the system and oxygenate and warm the blood to normothermia. [See diagram for heart-lung circuitry, page 136.]

Heparin, 3 mg/kg was given I.V. A stainless steel arterial perfusion cannula was placed in the left femoral artery and con-



JERRY LEAF, the surgeon who directed the Trans Time total body washout experiment.

nected to the arterial perfusion line, 3/8" I.D., from the heart-lung machine. Two USC1 type 1967 venous return cannulas, 16 FR and 20 FR, were placed in the right femoral and jugular veins, respectively, and connected to the venous return line, 1/2" I.D., from the heart-lung machine by a 1/2-1/2-1/2 Cobe venous Y-connector.

Partial bypass was initiated at 37°C. and maintained until arterial pH, 7.65, hematocrit, 39, and base line venous, 12mm/hg, and arterial, 110 systolic pressures were determined. We then began rapid cooling by means of a Sarns torpedo heat exchanger in the arterial perfusion circuit and the internal heat exchanger built into the oxygenator. The cold wall water was further cooled before reaching the blood heat exchangers, by passing it through a stainless steel coil immersed in an ice bath. At 25°C., the ECG indicated cessation of heart beat. The perfusate (3) which was cooled to 5°C., was poured into a glass and stainless steel cardiotomy reservoir from which it could be perfused by roller pump into the arterial circuit [see diagram]. When esophageal temperature reached 23°C., the arterial pump was stopped and a tube clamp placed on the arterial line at the blood side of the Y and the tube clamp removed from the perfusate side of the Y. The perfusate roller pump was started and maintained at a flow rate of 250 cc/min. Venous return to the oxygenator was continued until noticeable dilution was



JUDY MURRELL with revived hamster. Cryonics procedures and techniques become increasingly more sophisticated.

4. High pH used during hypothermia per Turtle Principle by Doug McConnell and Gerald Buckberg, UCLA Thoracic Surgery. Paper on this principle currently undergoing revision.

Jerry D. Leaf

What the Trans Time Study Means
by Saul Kent.....Con't from
page 137.

Perhaps the most significant consequence of the project is that the life extension movement is finally capable of conducting top-level suspended animation research without institutional support. This capability includes private ownership of most of the equipment needed for experimentation and several scientists with experience in the field. In addition to this, there are several of us who have already conducted significant biomedical aging research at major institutions and who are ready and willing, given appropriate funding, to work privately on future projects.

These accomplishments make it possible for us to solicit financial support in a responsible manner for the full spectrum of life extension research. We can now provide potential patrons with convincing evidence of both our competence and our dedication.

Another significant consequence of the project is that Jerry Leaf has agreed to head the Trans Time cryonic suspension team in the Los Angeles area. As a result, Trans Time should soon be able to offer cryonics services approaching an optimal state-of-the-art capability.

It is important to make it clear to the public and to the scientific community that we offer first-rate cryonic services and that we have the research capability to improve upon our procedures and, eventually, to perfect them.