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LONG LIFE

Longevity Through Technology

Volume 49 - Number 04

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CRYONICS INSTITUTE
Technology for Life

Why should You join the Cryonics Institute?

The Cryonics Institute is the world's leading non-profit cryonics organization bringing state of the art cryonic suspensions to the public at the most affordable price. CI was founded by the "father of cryonics," Robert C.W. Ettinger in 1976 as a means to preserve life at liquid nitrogen temperatures. It is hoped that as the future unveils newer and more sophisticated medical nanotechnology, people preserved by CI may be restored to youth and health.

1) Cryonic Preservation

Membership qualifies you to arrange and fund a vitrification (anti-crystallization) perfusion and cooling upon legal death, followed by long-term storage in liquid nitrogen. Instead of certain death, you and your loved ones could have a chance at rejuvenated, healthy physical revival.

2) Affordable Cryopreservation

The Cryonics Institute (CI) offers full-body cryopreservation for as little as $28,000.

3) Affordable Membership

Become a Lifetime Member for a one-time payment of only $1,250, with no dues to pay. Or join as a Yearly Member with a $75 inititation fee and dues of just $120 per year, payable by check, credit card or PayPal.

4) Lower Prices for Spouses and Children

The cost of a Lifetime Membership for a spouse of a Lifetime Member is half-price and minor children of a Lifetime Member receive membership free of charge until the child turns 18 years of age.

5) Quality of Treatment

CI employed a Ph.D level cryobiologist to develop CI-VM-1, CI's vitrification mixture which can help prevent crystalline formation at cryogenic temperatures.

6) Locally-Trained Funeral Directors

CI's use of Locally-Trained Funeral Directors means that our members can get knowledgeable, licensed care. Or members can arrange for professional cryonics standby and transport by subcontracting with Suspended Animation, Inc.

7) Funding Programs

Cryopreservation with CI can be funded through approved life insurance policies issued in the USA or other countries. Prepayment and other options for funding are also available to CI members.

8) Cutting-Edge Cryonics Information

Members currently receive free access to Long Life Magazine online or an optional paid print subscription, as well as access to our exclusive members-only email discussion forum.

9) Additional Preservation Services

CI offers a sampling kit, shipping and long-term liquid nitrogen storage of tissues and DNA from members, their families or pets for just $98.

10) Support Education and Research

Membership fees help CI, among other things, to fund important cryonics research and public outreach, education and information programs to advance the science of cryonics.

11) Member Ownership and Control

CI Members are the ultimate authority in the organization and own all CI assets. They elect the Board of Directors, from whom are chosen our officers. CI members also can change the Bylaws of the organization (except for corporate purposes).

The choice is clear: Irreversible physical death, dissolution and decay, or the possibility of a vibrant and joyful renewed life. Don't you want that chance for yourself, your spouse, parents and children?

To get started, contact us at:

(586) 791-5961 • email: cihq@aol.com

Visit us online at www.cryonics.org


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LONG LIFE MAGAZINE

A publication of the Immortalist Society

ORGANIZATION NEWS

FEATURE STORIES

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You've signed up for Cryonics Now what should you do?

Welcome Aboard! You have taken the first critical step in preparing for the future and possibly ensuring your own survival. Now what should you do? People often ask "What can I do to make sure I have an optimal suspension?" Here's a checklist of important steps to consider.

- ☐ Become a fully funded member through life insurance or easy pre-payments

  Some members use term life and invest or pay off the difference at regular intervals. Some use whole life or just prepay the costs outright. You have to decide what is best for you, but it is best to act sooner rather then later as insurance prices tend to rise as you get older and some people become uninsurable because of unforeseen health issues. You may even consider making CI the owner of your life insurance policy.
- ☐ Keep CI informed on a regular basis about your health status or address changes. Make sure your CI paperwork and funding are always up to date. CI cannot help you if we do not know you need help.
- ☐ Keep your family and friends up to date on your wishes to be cryopreserved. Being reclusive about cryonics can be costly and cause catastrophic results.
- ☐ Keep your doctor, lawyer, and funeral director up to date on your wishes to be cryopreserved. The right approach to the right professionals can be an asset.
- ☐ Prepare and execute a Living Will and Power of Attorney for Health Care that reflects your cryonics-related wishes. Make sure that CI is updated at regular intervals as well.
- ☐ Consider joining or forming a local standby group to support your cryonics wishes. This may be one of the most important decisions you can make after you are fully funded. As they say- "Failing to plan is planning to fail".
- ☐ Always wear your cryonics bracelet or necklace identifying your wishes should you become incapacitated. Keep a wallet card as well. If aren't around people who support your wishes and you can't speak for yourself a medical bracelet can help save you.
- ☐ Get involved! If you can, donate time and money. Cryonics is not a turnkey operation. Pay attention and look for further tips and advice to make both your personal arrangements and cryonics as a whole a success.

CRYONICS INSTITUTE
Technology for Life

LONG LIFE

A quarterly publication of the

Immortalist Society

24355 Sorrentino Ct. Clinton Township MI 48035-3239

President: York W. Porter Vice-President: Debbie Fleming
Secretary: Royse Brown • Treasurer: Rich Medalie
Director-at-Large: Stephan Beauregard

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CI EXECUTIVE REPORT

Dennis Kowalski - President, Cryonics Institute

Dennis Kowalski - CI President

Hello everyone,

The 2017 AGM and elections are behind us and now we look forward to plans for the new year.

First of all, congratulations to all of our Directors who were re-elected for another three-year term. I also want to thank our two contenders this year who weren't elected. It takes dedication and courage to run for elected office, and it is encouraging to see our membership includes people willing to step up to the plate to make a significant commitment and contribution to the success of cryonics and the Cryonics Institute by serving as a Director.

I also want to thank everyone for voting for me, and to the Board for allowing me to continue my tenure as CI President. I am honored and humbled by the opportunity to serve an organization and a cause I feel so passionately about. I hope everyone is pleased with the positive direction we have been heading in and that you will be just as happy with what we are going to accomplish in 2018.

2017 is going to be hard to top, as we have seen great things at CI. Record membership numbers, significant improvements to the facility, operational efficiencies, and perhaps the most exciting news - the purchase of a new facility to accommodate our steady growth.

One of my primary initiatives for 2018 is going to be creating video standby training materials for CI and the worldwide cryonics community. This will be an important part of our "Phase 3" Standby Initiative, which will also see improvements to our current standby kits, materials and networks.

Regarding standby, I am also encouraged by the efforts of our members and by cryonics groups around the world to create networks and resources both here in the United States and overseas. Equally exciting is the news (announced at the AGM) of "I.C.E." - a new standby service from Aaron Drake and Eric Vogt. Both have a long history with emergency medicine and cryonics, so I am looking forward to watching their progress. That said, I would be remiss if I didn't mention our current professional standby provider, Suspended Animation Inc. SA and CI have enjoyed an excellent relationship for many years, and I am confident that relationship will only get stronger over time. As always, our first concern is our members, and we are dedicated to providing as many quality standby options, both professional and local "DIY" as possible.

Looking toward the future, I would also like to call your attention to the 2018 Teens and Twenties Conference coming up next May. This is the ninth such event, which is a testament to organizers Cairn Erfreuliche Idun and Bill Falloon. One of the most important aspects of this event is the chance to help identify and groom the future leaders of the cryonics movement, and it is always gratifying to see the large number of attendees to these events. If you are a cryonicist between the ages of 18-30, please consider attending. Also, take note that scholarships are available which cover the complete costs of the event, including travel and lodging. Full contact details are included later in this issue of *Long Life* magazine.

Thanks again to everyone who attended the AGM, and to all of our members for their enthusiasm and efforts on behalf of cryonics and the Cryonics Institute. The future looks bright, and I'm looking forward to doing my part as CI President to make sure we all reach that future together!

Respectfully yours,
Dennis Kowalski
President - Cryonics Institute

2017 Annual Meetings Election Results

York W. Porter - Immortalist Society President

The annual meetings of the Cryonics Institute and the Immortalist Society were held as scheduled on Sunday, Sept. 10, 2017, at the ConCorde Inn Hotel and Conference Center, which is located in Clinton Township, Michigan. This has been the first time in many, many years that the meetings were not held at the CI facility but it was obvious at last year's annual meeting that space at CI, due to the continuing influx of cryonics patients was getting more and more sparse and that a change in location was well warranted.

For a little bit of "CI History", way in the past, the meetings of the Immortalist Society and the Cryonics Institute were held at the very lovely home of David and Connie Ettinger. Then, in part, as membership and attendance gradually grew, they began to be held at the CI facility at Clinton Township, Michigan. The ConCorde Inn offered a spacious and attractive venue in which the two organizations could conduct their business. As is the case in virtually any of the facilities of the hospitality industry, the Inn had microphones and other equipment available for the smooth running of the meeting and the staff was friendly and helpful.

A dinner the night before which was held at a separate location resulted in good attendance by many folks and it was, as usual, nice to see fellow cryonicists that, by and large, one only gets to communicate with via e-mail and/or telephone during the year. It is always great to renew old acquaintances and friendships as well as having the opportunity to meet some new people.

In terms of actual business before the two organizations, the most important news involved the election of members of the Board of Directors in both organizations. In the case of the Cryonics Institute, one third of the Board of Directors is elected each year. This year six candidates again were trying to get elected to the CI Board and were vying for the four positions that were "up for grabs". Although the four incumbents were reelected, the fact that there has been gradually a tendency towards "contested" elections is a healthy thing. The "challengers" are to be congratulated for their willingness to serve in an entirely voluntary capacity in a job that requires lots of hours of effort and even more hours of deep thought on helping to decide the best options available for the safety of CI and its patients. It has been my experience in organizations that persistence in running is sometimes a key to eventually getting elected and any qualified member is more than welcome to try their luck at getting placed on the Board of Directors of a very, very important organization. The ballot results were as follows:

Andy Zawacki elected 182 votes

Dennis Kowalski elected 117 votes

Steve L elected 100 votes

Stephan Beauregard elected 80 votes

Dirk Nemitz not elected 44 votes

Blake Delaney not elected 57 votes

Again, each of the members elected serves a three-year term after which all four seats will be open and available for anyone eligible under CI bylaws to run for a position on the Board of Directors. Members not elected may run in any subsequent CI election, including the one next year.

In the case of the Immortalist Society, the IS bylaws provide that the entire Board of Directors of the Immortalist Society is to be elected on an annual basis. These offices are President, Vice-President, Secretary, and Treasurer. In addition, the IS bylaws allow the election of so-called "Board Members at Large". This last position is entirely optional and it is entirely up to the voting membership of IS that are present at the annual meeting to determine whether one or none or a dozen, etc. serve. The sole member serving

President:
York W. Porter

Vice-President:
Debbie Fleming

Secretary:
Royse Brown

Treasurer:
Rich Medalie

Board Member at Large:
Stephan Beauregard

in the position of a Board Member at Large at present is Stephan Beauregard, who serves as the person in charge of the Immortalist Society Facebook page.

After a brief discussion and query to the membership as to any candidates wishing to stand for election, by a vote of acclamation the incumbents were reelected to serve on the Board of IS for another year. Their terms are from January 1st, 2018 until Dec. 31st, 2018. So, the 2017 officers of the Immortalist Society shall continue in their positions with their new term taking effect January 01, 2018. The incumbents are as follows:

President: York W. Porter

Vice-President: Debbie Fleming

Secretary: Royse Brown

Treasurer: Rich Medalie

Board Member at Large:
Stephan Beauregard

As a final note, we would like to urge you to try to attend these annual meetings if at all possible. First, as in any endeavor, there is strength in numbers and the fact remains in human history that "two heads (or a bunch of heads) are better than one". You may have an idea to share that is very helpful to the organizations or to cryonics in general. While we'd always urge you to do some reading, contact some folks, etc. in order to make sure you aren't trying to "reinvent the wheel", even if you are, please start making plans now to become involved in this very important effort in human history. You'll be very, very glad you did. Please note that any organization is only as strong as its members allow it to be through their active participation and attendance so your attendance and participation is both wanted and needed. Trust me, you'll enjoy the fellowship and the chance to meet some folks who, like yourself, believe that the vision of Robert Ettinger is well worth pursuing in a real and meaningful way.

For your enjoyment, here are some photos of the 2017 annual meetings.

IMMORTALIST SOCIETY ANNUAL MEETING MINUTES

Secretary's Report - September 10, 2017

By R A Brown, IS Secretary

Please Note that the Immortalist Society is a non-profit , 501{c}3, 1967-founded corporation, pursuing educational and research objectives in the field of cryonics, publishing the journal *Long Life: Longevity through Technology*, and maintaining a website of www.immortalistsociety.com as part of its mission. The IRS recognizes IS as tax-exempt, so your donations are deductible for federal income tax purposes.

The Annual General Meeting began at 5:35PM, immediately following the Cryonics Institute meeting. Presiding: IS President York W. Porter.

(1) Social Dinner/ Facility Tours. A. As has been the custom for many years, light snacks during the meeting were provided for all participants. B. It has also been the custom for many years for interested guests and members to meet at a restaurant (this year, SAJO's) near the facility the night before the meeting. C. Informal tours were also provided at the 24355 Sorrentino Court CI facility between 12 and 2PM before the meeting. These tours strive to be supportive especially for those patients remaining in deanimation at the Cryonics Institute (the facility where the IS annual meeting has been held in past years). D. These preliminaries help provide pleasant forums for meeting, co-operation, research, and resolution.

(2) President's Report. IS president York W. Porter outlined a short history of IS, from its beginnings in the Cryonics Society of Michigan. York then indicated some serious recent health concerns of his family, the absence today of our IS research staffer; and our best wishes for IS vice-president Debbie Fleming and others currently experiencing the wrath of Hurricane Irma. York discussed the IS Facebook page, with kudos to IS member-at-large Stephan Beauregard for its format and progress. The prospect of greater Amazon Smiles Foundation funding was then mentioned, wherein 0.5% of the price of eligible purchases goes to charitable organizations like IS, selected by customers (This year apparently ASF funds to IS was $59.52 of $43,501.39 IS total assets).

(3) Secretary's Report. Copies of the "Immortalist Society Annual General Meeting…September 11, 2016" were produced for adoption by IS secretary Royse Brown. Royse contrasted the history of past pre-AGM restaurant socials, research lab tours, and CI facility tours. He then briefly compared the origins of the receipts, expenditures, and balances of last year's IS cash flow with those for IS and CI for the current year.

(4) Treasurer's Report. Copies of the "Immortalist Society Annual Financial Report (Sept. 1, 2016 through Aug. 31,2017)" by IS Treasurer Rick Medalie were passed out. Income derived from $6,327.83 donations and $5,180.00 from CI for previous magazines published. Disbursements included $9, 351.19 for Long Life publication and $17000 (sic.) for the ANB research program. Revenues projected for dues and donations were $3,751.08, $4,000 for advertising, and $4,618.54 for ACS reimbursement for magazine production.

(5-6) Old and New Business. Longstanding Cryoprize Director Joe Kowalsky, Esq. reported further on the Cryoprize project (for the first person or organization who successfully freezes one or more mammalian organs). Joe: "We just want to spread the word more than anything else." Joe is to be deeply commended for his hard and unfailing support for this worthy project.

At this point the hour was apparently deemed too late to entertain additional topics, and so the group presented none.

(7) Board and Officer Elections. The following were reelected as officers / directors, by unanimous acclamation, upon motions by Connie Ettinger, Esq. and by Pat Heller, and others: President, York Porter; Vice-President, Debbie Fleming; Treasurer, Rick Medalie; Secretary, Royse Brown; and such members at large as shall be desired; now: Stephen Beauregard. (The elected serve, unlike board members of the Cryonics Institute, one year terms, starting January 1 of the upcoming 2018 year.)

(8) Adjournment. At 6:00 PM, upon motion by Joe Kowalsky, Esq. and second by Connie Ettinger, Esq.

Respectfully Submitted, Royse A. Brown, Secretary

Please Note: Copies of these minutes or partial recordings may be obtained from the Immortalist Society, 24355 Sorrentino Court, Clinton Township, Michigan, 48035. Phone/ Fax (586) 791-5961.

ACS Inspection for 2017

By: York W. Porter

Voting Member, Cryonics Institute

President, Immortalist Society

Member, Board of Governors, American Cryonics Society

The American Cryonics Society has, as part of its purposes, the desire to help insure that quality services are offered by organizations that engage or may engage in cryostorage of past, present, and future ACS members. This is in addition to and an adjunct to any internal quality control program that a particular cryonics service provider may have. This is very, very similar (in reality, more or less identical) to the fact that hospitals, such as the four facilities this writer has worked at, have numerous internal processes and controls to help insure that quality healthcare is being delivered to the patients who use the facility throughout the year. In addition, however, every one of those hospitals, as well as all the hospitals in the state (as is similar in other states) were and are also subject, as an additional attempt to keep quality healthcare services going, to an annual outside look by the Commonwealth of Kentucky. The efforts by ACS to take an "independent look" at a facility and provider should be viewed in a similar fashion, as an attempt to be of help in making sure quality is at the top of the list in cryonics services provision. ACS has as its intention annual visits of organizations and facilities as needed on behalf of ACS members and to engage in an attempt to continually improve its inspection regimen.

In the particular case of the Cryonics Institute, and as a representative of the American Cryonics Society, I conducted an inspection for 2017 of the Cryonics Institute located in Sorrentino Court in Clinton Township, Michigan on behalf of ACS. Some information was received subsequent to the meeting. Direct observations were made by myself on and around the date of the annual meetings of the Cryonics Institute and the Immortalist Society held on the weekend of September 10th. I have been a long standing member of the Cryonics Institute and also have an excellent familiarity with the main personnel and Board Members of the Cryonics Institute, in particular Mr. Andrew Zawacki, who serves as one of the full time employees of CI, and who also serves on the CI board as it's Chief Operations Officer and as Board Secretary. Further I have been in the CI facility on numerous occasions both as a CI member and in my capacity as an officer of over 20 years in the Immortalist Society.

Physical Plant

Located in an industrial park in Clinton Township, Michigan sits the main CI facility. (Note: CI has now acquired an additional facility but such was not the case at the time of the 2017 inspection). As a very functional structure, the CI facility, surrounded by other similarly built structures, the building's exterior is neat and orderly and the parking area is very well maintained. In the front of the building is a well cared for interior. This includes a small office area, rest area/room, and filing cabinet room. There is an associated coat closet/utility closet and a rest room facility for use by staff and visitors.

In recent years, the laying of a very nice appearing tiled floor that exists throughout parts of the building, has given the facility a much more professional appearance to the place than in years past. This floor covering is very substantial and should stand up better to foot traffic than did a utilitarian but not as strongly built floor covering which preceded it and the tile floor covering should make dealing with spills of any kind relatively easy to clean up.

Just off to the right of the area that holds the cryostats is a fairly good-sized room which had previously been used several years ago for member meetings. This room has been upgraded to serve as a functional and attractive Memorial Room and also doubles as a conference and meeting room when the need arises.

There is a large flat screen television in the Memorial Room capable of being used for various purposes. At one previous inspector's visit, this television was running a "loop" of photographs of some of the individuals who are already under the care of CI. This helped to emphasize that the general topic of cryonics is centered on the value of each individual's human life and the reasonable possibility that future medical science may be successful in assisting individuals under the care of CI and/or other cryonics organizations.

Including access to an available and adjoining handicapped accessible restroom, the cryostat area was fairly large. There was an area in a side room where individuals received by CI, and who are going to be undergoing the procedures associated with cryonics, can receive any preparation needed prior to being "cooled down" and ultimately placed in cryostats at the ultra low temperature of liquid nitrogen. The entire work area was quite presentable, neat and orderly, and should make a quite professional impression on any potential visitors/possible members.

The cryostat area has continued to gradually fill up as more individuals are received to be placed under CI's care. This was the subject of great discussion among the CI Board and, after this inspection occurred, CI announced that another location had been obtained but that was not the case at the time of the 2017 ACS inspection and will have to wait until the next inspection attempt to be fully written about. It should be noted that the obtaining of this facility, at the time of this writing, and to the understanding of this writer, was not of an "emergency" nature and storage spots still remain at the existing facility. The CI Board of Directors was, in this inspector's opinion, just engaging in prudent foresight with an attempt to plan and provide for facilities that should be adequate for the foreseeable future in the operations of CI. At over 150 individuals under the care of CI at this time, with anticipation for that much growth, if not much more since interest in cryonics seems to be gradually accelerating, in the future, CI as acting in a very prudent manner in trying to prepare itself for future patients to come under its care.

In the very back of the facility stands a work area, which is quite utilitarian in its nature. It is also separated from the general patient/visitor area as well as the cryostat area by a wall and some doors. An attic area exists for storage of various supplies and materials. The work area is also well stocked with tools and supplies that are needed from time to time by CI personnel.

After exiting outside through a side door from the work area of the facility, one turns to the right and comes upon a large bulk storage tank that is enclosed by dual chain link fencing. With both gates of the chain link fencing secured with locks, there rests inside a large bulk tank that represents CI's present method of receiving new supplies of liquid nitrogen. This has resulted in financial savings to CI over the smaller delivery methods that CI used in its earlier days. It also serves as a "reserve" of liquid nitrogen in case supplies were to be delayed in being received, or if there should be a short term increased need for additional liquid nitrogen between deliveries.

This large bulk tank appeared to be in excellent condition. At present, most cryostats are filled via a nozzle and hose system through the top of the cryostat. There is a metal "catwalk" that workers utilize in accomplishing this task. Through this arrangement, liquid nitrogen flows from the bulk tank through the hose utilized by the CI worker and directly into the cryostat.

Liquid nitrogen invoices looked at by the ACS inspector appeared in good order and seemed to reflect proper purchase amounts for the number of cryostats in use. Lack of ready availability/purchase of liquid nitrogen was a factor in the one major disaster in cryonics that occurred a number of years ago.

Cryostats/Cool Down Box

For a number of years the Cryonics Institute staff did "in-house" construction of its cryostats. An outside company, to specifications provided by CI, now manufactures these. To date these units have been extremely reliable with no major failures of any kind. At the time of this 2017 inspection, all cryostats in use at the facility were intact with no visible signs of leaks/malfunction. It should be noted that repair of said cryostats, if ever needed to be done, is made easier by their fiberglass construction. A further positive point for the Cryonics Institute, is that the efficiency of cryostats at this point, in terms of liquid nitrogen use per patient, has been much less than CI initially anticipated resulting in obvious financial savings. This is obviously a plus in CI operations as monies saved can be used for other organization purposes and/or for investment.

For persons not quite familiar with the operation of a cryostat, it should be kept in mind that the cryostats are basically large thermos bottles that do not require electricity in their day to day operation. Unlike what some persons may erroneously think, the liquid nitrogen, although an "ultracold" liquid, does not actively "boil" inside the cryostats but instead simply slowly evaporates to be replaced by CI workers in the manner described above on a regular basis.

There is also located in the general area a so-called "cool down box". This device is utilized in the effort to slowly lower a patient's body temperature to that of liquid nitrogen. It appeared to be in good working order at the time of the inspection. For those items such as the cool down box and other electrically powered devices such as lights, com-

puters, etc., a 10 kW generator is on site to provide that in case of a power outage.

Personnel

With a wealth of knowledge about cryonics, Mr. Andrew Zawacki serves as one of the key employees of CI. He has worked with CI as its main employee since around 1985. Mr. Zawacki, as mentioned earlier, also serves on the CI Board of Directors. In his dual role as employee and CI Director, Mr. Zawacki ("Andy") is in a position to keep the CI Board of Directors well informed as to problems and concerns in the day to day operations of CI. Mr. Zawacki is well known to be very polite, very honest, and to be a very pleasant and helpful person to deal with. This inspector has dealt with him for around thirty years now and has found him to be unfailingly loyal to CI and deeply concerned about the welfare of the organization as well as its many members. Mr. Zawacki enhances his worth to CI through a wealth of knowledge of the history of CI, as well as its operations and the procedures utilized in cryonics as well. He is a quite valuable employee to CI's operations.

Ms. Hillary McCauley, a quite intelligent young woman, with formal training in Mortuary Sciences, has become a big asset, in this inspector's opinion, to the Cryonics Institute and its many members. Ms. McCauley is quite intelligent, and like Mr. Zawacki, very pleasant to deal with. As Mr. Zawacki, to some degree, is a mentor to Ms. McCauley, CI is building a roster of people to help provide quality services. Ms. McCauley has been a licensed funeral director since April 28, 2015 (Michigan Mortuary Science License Number 4501007964). Ms. McCauley's formal background in mortuary science is a big asset in dealing with other funeral directors worldwide as well as in her dealing with members. It is expected that, in time, Ms. McCauley will become, like Mr. Zawacki, a key and deeply valuable member of CI's operations.

Mr. Dave Fulcher is a part time employee of CI and has been so for quite a number of years, offering a further "safeguard" in the case of illness and/or loss of other employees. The combination of experienced staff in terms of Mr. Zawacki and Mr. Fulcher, combined with what would seem to be an outstanding personnel selection in terms of Ms. McCauley leaves CI in an excellent position, in this inspector's opinion, for the foreseeable future. It also is allowing CI, in the person of Ms. McCauley, to gradually be in a position to fully prepare the next generation of workers and supervisors for its facility.

Governance of CI

A 12 person Board of Directors engages in the day in, day out operational control of CI. Members of the Institute who are eligible to vote are those that have paid a membership fee and that have fully funded suspension contracts up to date. These members vote, at present, on four of the twelve Board of Director's seats at each annual meeting.

So-called "cumulative voting" is utilized by CI in the election of its Board Members. This is a fairly common mechanism in many corporations. Each voting member is allowed to cast a total of four votes at each election. Voting members may cast all four votes for one candidate or "mix and match" votes if they so desire, i.e., one vote for one candidate, three votes for another, or two votes for one candidate, two votes for another, or one vote for each of four candidates, etc., etc. The four candidates receiving the top four number of votes in the election become the new Board Members, serving a three year term each.

A big advantage of this method of voting is that a relatively small group of voters may band together and insure that at least one person sympathetic to and/or agreeing with their viewpoint is elected to the Board of Directors at each annual election. In the case of CI in the particular, if a group consisting of only twenty percent of the members casts four of their votes for one particular candidate, plus gets one additional member willing to cast at least one vote for that same particular candidate, that candidate is insured a position on the CI Board of Directors.

Over a period of three annual elections this group can insure the election of three members of the Board of Directors by using this same "bloc voting plus one" method. This obviously does not constitute a majority but it does insure that the three individuals the group can elect over that three year period can act as a tremendous "watchdog" on the board as they will be privy to any documents, actions, Board minutes, etc. that the organization has. Those three individuals as well may engage in direct and active participation in Board meetings. They can argue for a particular position, make Board meeting motions, look at expenditures for proper disbursement, can consult with CI's legal counsel, etc. and, in short, can make sure that a "dictatorship of the majority" would be an extremely difficult thing to carry out.

It should also be noted that within the Board of Directors, there also resides a "check and balance" since the twelve members of the Board of Directors vote on their officers and determine who shall be the President, Vice-President, Secretary, Treasurer, and Contract Officer of the organization. Other offices may be established by the Board but at the next annual meeting, these offices must be approved by the voting members.

Even the President of the organization, with more or less CEO status, is in a position where they must be quite cognizant of the wishes of the majority of the Board of Directors and, thereby, of a relatively wide number of members in the organization. The President is also subject to assignment of duties as specified by the Board of Directors. This acts as a further mechanism any one individual interested in abusing their

authority.

While as in any organization, a strong willed and forceful personality might be able to greatly influence the operation of things, without a fairly total abdication of responsibility among the Board of Directors ***and*** of the membership as a whole, such an attempt will be short lived.

Further "checks and balances" are represented by the fact that members of the Board of Directors may be removed without cause by the membership (subject to provisions within the Michigan Nonprofit Corporation Act). It only takes five percent of the membership (or five members, whichever is greater) to stop new or non-customary action by the Board of Directors or of the corporation's officers. In that case, a special meeting of the membership must be called.

Two persons who are members of the Board of Directors may also do the same. This aspect of CI bylaws/operations gives great "check and balance" power to any minority group utilizing strategic voting under cumulative voting procedures as outlined above. The action of the Board is then "suspended" in either event until either a majority of a quorum at a membership meeting votes to confirm a Board/corporation officers actions or until a petition representing the majority of the members is presented to do the same.

The membership also retains the "final vote" of any corporate action by the ability of them to pass corporate resolutions ("standing rules") that can control how the organization is run. These standing rules may be passed by a majority of a quorum at a scheduled meeting or may be brought into effect by a petition signed by two-thirds of the voting membership. These would be binding on the operations of the corporation, as long as they are consistent with local, state, and federal statutes/regulations.

An additional mechanism that keeps democracy at the forefront, is the ability of only ten percent of the members (or ten members, whichever is more), to send a petition that would result in a special meeting of the membership. A majority of the Board of Directors may do the same. Thirty days notice must be given to the membership as to the date of the meeting, whether called by the Board or by some of the members. Members may vote by proxy (either general or specific) on any issues that come before a meeting of the membership. Board members may also use proxies in Board meetings.

With all these mechanisms and safeguards, member control capability within CI is ample and abundant. As in any organization, nothing can fully insure the proper operation of that organization except an involved and informed and well-intentioned membership and Board of Directors. Further, it is always necessary for well-meaning people to be willing to be assertive in the face of what might be considerable opposition. This is true in any organization and/or governmental unit in the world. Nothing can save one from himself but the procedures outlined give CI members the ability to be the final arbiters of CI actions.

Financial/Legal Matters

It should be noted that at least three individuals serving on the Board of Directors have work experience and/or training in the field of organizational and/or professional finances. A major avenue for the failure of organizations through inadequate attention to their financial status is, thereby, greatly decreased. One additional method of "self-checking" is that one of these individuals, from time to time, goes to the CI facility for an informal "audit" of CI financial operations. This has been going on for several years and to date no irregularities or problems have been found.

The financial statement that should be found attached to this report is provided regularly to all members present at the annual meeting. Said statements are placed, as well, on both the websites of the Cryonics Institute and the Immortalist Society. Further, the Immortalist Society, as has been its custom for several years, places both its own financial statement, as well as the financial statement of CI, within the pages of its magazine. The provision of a printed written record published independently of CI helps, in a minor way, to maintain a clear record of CI's financial activities, i.e., the record may not be changed without it being noticeable to someone double-checking such figures.

The provision of that record on both CI and IS websites allows that financial information to be readily available to numerous members who may have financial expertise themselves. It basically makes it possible for anyone on the Internet to look at CI finances with a critical eye to errors and/or potential problems.

The Cryonics Institute has utilized, for years, the services of David Ettinger, who is Robert Ettinger's son, as its legal counsel. Mr. Ettinger has been in practice for a number of years now and is well familiar both with Michigan law and with the particular challenges that have been faced down through the years by CI in dealing with legal/regulatory situations.

Further and fortunately, the Institute has on its Board of Directors, two individuals who are also formally trained in the law and both of whom have graduated from law school (though, at present, both work in other areas than direct legal practice). The combination of three individuals with formal legal training has, in this inspector's opinion, greatly aided to help allow CI to avoid legal problems to begin with and to avoid the tremendous and sometimes organization threatening expense and time involved in litigation. The avoidance of this down

through the years has certainly been an aid in helping insure CI has continued to survive and prosper.

Internal Quality Controls/ General Security

CI has as its policy the goal of having internal inspections and quality control. This is a very positive thing as it enhances quality assurance at CI. As in the area of hospital work, which this inspector has been engaged in (with the exception of a one year period) since 1974, efforts within an organization to maintain high standards, coupled with an "outside" look by independent agencies/ individuals, serve to strengthen an organization's efforts towards safe and effective operations.

An electronic surveillance company is hired by CI and there is an alarm system as well as numerous cameras placed throughout the CI campus to help decrease the possibility of break ins/disruptions to daily operations. The cameras are accessible to CI employees with a cell phone app. Stickers announcing the use of electronic security measures are posted prominently to dissuade any persons of ill intent.

Patient records continue to be kept in multiple locations, both inside and outside of the building, in secure, confidential, and fire resistant areas.

Located about two and a half miles away at 21250 Fifteen Mile Road is a local fire station. The Clinton Township Police Department is at 37985 Groesbeck Highway. This is about four miles away from CI. In addition, officers are on active patrol in the Township at any one time. For non-destructive first responders, CI uses the KNOX-BOX® Rapid Entry System.

Both regular land lines and cell phone lines are maintained by CI at all times both for routine and emergency use.

Conclusions:

The Cryonics Institute has been a very long-standing provider of cryonics services. The governance structure of the organization lends itself to relatively easy oversight by its members and by its Board of Directors given, as in any organization, due diligence on their part. Several "checks and balances" that exist in its bylaws should be of considerable help in maintaining stable operations given that same diligence by the membership/Board of Directors. Several individuals of special expertise are on the Board of Directors and that enables the increased likelihood that CI is operated in a safe, efficient, legally correct and financially stable and efficient manner.

The physical plant remains well maintained, reasonably secure, and is relatively near both fire and police assistance. Electronic security measures are in place. Monitoring of safe air levels in the building exists with mechanical ventilation available as needed to keep air inside the facility at a safe level of oxygen and inhabitability. A sprinkler system, paid for in part by the financial assistance of a trust administered by the American Cryonics Society, helps to keep danger from fire very low in a building that is fairly fire resistant to begin with. Fire extinguishers exist as well. Fire department resources are relatively close by. Patient records are duplicated and kept in secure locations. All cryostats have proven to be very reliable and have resulted, in the aggregate, to a cost savings to CI patients due to their lower than expected use of liquid nitrogen. CI seems to be managing its finances in a way that should both be considered reasonably prudent and in a way that should alert the Board and/or diligent members to potential problems. With the addition of an additional facility which happened after the inspection but before this report goes to press/distribution, space for any reasonable number of patient inflow seems to be secure.

It should be noted clearly, in summation, that no inspection regimen can absolutely guarantee proper operations of any organization. The Cryonics Institute seems, however, to continue to function in a well thought out and rational manner which can only lead to a reasonable expectation of its continued operation and the safety of individuals it cares for. While one cannot be fully prepared for very extreme and catastrophic events (i.e., the "Supervolcano" of Yellowstone Park erupting, the possibility of a giant asteroid hitting the planet, etc.), CI continues to apparently work diligently within its manpower and financial resources to deal with reasonable threats to its continued existence and to its patient's safety. As more manpower and finances gradually become available over the decades, it is only reasonable to expect those efforts will be redoubled and that CI will continue to improve its operations. As reported in a previous ACS inspection report, CI's operations give a reasonable level of assurance that individuals under the care of CI are in no immediate danger and that the prospects of their continued long term storage and care, at least for the foreseeable future, are excellent.

(It should be noted by readers that the American Cryonics Society is a totally independent organization from either the Cryonics Institute or the Immortalist Society and the responsibility for the contents of this report lies entirely with the American Cryonics Society).

Cryonics Institute Membership Statistics:

As of December 2017, the Cryonics Institute has 1,471 members, up 47 from our last report. Of the 1,471 Members, 231 have arrangements for Suspended Animation Standby and Transport.

There are 160 human patients and 146 pet patients in cryopreservation at CI's Michigan facility.

CI continues to be an industry leader in terms of both membership and practical affordability for all.

CI MEMBERSHIP

DECEMBER 2017

* New Members = Increase in Membership since last issue

Members	1,471	Pets	146
Assoc. Members	190	DNA/Tissue	257
Patients	160	SA	231

TOTAL **1,821**

Worldwide Cryonics Groups

AUSTRALIA: The Cryonics Association of Australasia offers support for Australians, or residents of other nearby countries seeking information about cryonics. caalist@prix.pricom.com.au. Their Public Relations Officer is Philip Rhoades. phil@pricom.com.au GPO Box 3411, Sydney, NSW 2001 Australia. Phone: +6128001 6204 (office) or +61 2 99226979 (home.)

BELGIUM: Cryonics Belgium is an organisation that exists to inform interested parties and, if desired, can assist with handling the paperwork for a cryonic suspension. The website can be found at www.cryonicsbelgium.com. To get in touch, please send an email to info@cryonicsbelgium.com.

BHUTAN: Can help Cryonics Institute Members who need help for the transport & hospital explanation about the cryonics procedure to the Dr and authorities in Thimphou & Paro. Contacts : Jamyang Palden & Tenzin Rabgay / Emails : palde002@umn.edu or jamgarnett@hotmail.co Phones : Jamyang / 975-2-32-66-50 & Tenzin / 975-2-77-21-01-87

CANADA: This is a very active group that participated in Toronto's first cryopreservation. President, Christine Gaspar; Vice President, Gary Tripp. Visit them at: http://www.cryocdn.org/. There is a subgroup called the Toronto Local Group. Meeting dates and other conversations are held via the Yahoo group. This is a closed group. To join write: csc4@cryocdn.org

QUEBEC: Contact: Stephan Beauregard, C.I. Volunteer & Official Administrator of the Cryonics Institute Facebook Page.

For more information about Cryonics in French & English: stephanbeauregard@yahoo.ca

DENMARK: A Danish support group is online. Contact them at: david.stodolsky@socialinformatics.org

FINLAND: The Finnish Cryonics Society, (KRYOFIN) is a new organization that will be working closely with KrioRus. They would like to hear from fellow cryonicists. Contact them at: kryoniikka.fi Their President is Antti Peltonen.

FRANCE:
SOCIETE CRYONICS DE FRANCE is a non profit French organization working closely withEuropean cryonics groups. For more information : J.R. Missonnier: phone: 33 (0) 6 64 90 98 41or e-mail: cryonics news.inpi@yahoo.fr.

Can help Cryonics Institute Members who need help for the transport & hospital explication about the cryonics procedure to the Dr and authority in Toulouse Area. Contact : Gregory Gossellin de Bénicourt / Email : cryonics@benicourt.com Phone : 09.52.05.40.15

GERMANY: There are a number of cryonicists in Germany. Their organization is called "Deutsche Gesellschaft für Angewandte Biostase e.V.", or short "DGAB". More information on their homepage at www.biostase.de. If there are further questions, contact their Board at vorstand@biostase.de.

GREECE: Greek Cryonics Support Group. Sotiris Dedeloudis is the Administrator. Find them at: http://www.cryonics.gr/

INDIA: Can help Cryonics Institute Members who need help for the transport & hospital explication about the cryonics procedure to the Dr and authority in Bangalore & Vellore Area. Contacts : Br Sankeerth & Bioster Vignesh / Email : vicky23101994@gmail.com Phones : Bioster / 918148049058 & Br Sankeerth / 917795115939

ITALY: The Italian Cryonics Group (inside the Life Extension Research Group (LIFEXT Research Group)) www.lifext.org and relative forum: forum.lifext.org. The founder is Bruno Lenzi, contact him at brunolenzi88@gmail.com or Giovanni Ranzo at: giovanni1410@gmail.com

JAPAN: Hikaru Midorikawa is President, Japan Cryonics Association. Formed in 1998, our goals are to disseminate cryonics information in Japan, to provide cryonics services in Japan, and, eventually, to allow cryonics to take root in the Japanese society. Contact mid_hikaru@yahoo.co.jp or http://www.cryonics.jp/ index.html

NEPAL: Can help Cryonics Institute Members who need help for the transport & hospital explanation about the cryonics procedure to the Dr and authorities in Kathmandu. Contact : Suresh K. Shrestha / Email : toursuresh@gmail.com Phone : 977-985-1071364 / PO Box 14480 Kathmandu.

NETHERLANDS: The Dutch Cryonics Organization (http:// www.cryonisme.nl) is the local standby group and welcomes new enthusiasts. Contact Secretary Japie Hoekstra at +31(0)653213893 or email: jb@hoekstramedia.nl

* Can help Cryonics Institute Members who need help, funeral home, transport & hospital explication about the cryonics procedure to the Dr and authority at Amsterdam with branches in other cities. Contact : Koos Van Daalen / Phone (24 Hours) +31-20-646-0606 or +31-70-345-4810

NORWAY : Can help Cryonics Institute Members who need help for the transport & hospital explication about the cryonics procedure to the Dr, funeral home and authority at Sandvika. Contacts : Gunnar Hammersmark Sandvika Begegravelsesbyraa / Phones : 011-47-2279-7736

PORTUGAL: Nuno & Diogo Martins with Rui Freitas have formed a group to aid Alcor members in Portugal. Contact: nmartins@nmartins.com or visit www.cryonics.com.pt/

RUSSIA: KrioRus is a Russian cryonics organization operating in Russia, CIS and Eastern Europe that exists to help arrange cryopreservation and longterm suspension locally, or with CI or Alcor. Please contact kriorus@mail.ru or daoila.medvedev@mail.ru for additional information or visit http://www.kriorus,ru. Phone: 79057680457

SPAIN: Giulio Prisco is Secretary of the Spanish Cryonics Society. Website is http://www.crionica.org.sec. He lives in Madrid and he's a life member of CI and is willing to serve as a contact point for Europeans. He can be contacted at: cell phone (34)610 536144 or giulio@gmail.com

SWITZERLAND
www.CryonicsSwitzerland.com or www.ria.edu/cs

UNITED KINGDOM: Cryonics UK is a nonprofit UK based standby group. http://www.cryonicsuk.org/ Cryonics UK can be contacted via the following people: **Tim Gibson:** phone: 07905 371495, email: tim.gibson@cryonics-uk.org. **Victoria Stevens**: phone: 01287 669201, email: vicstevens@hotmail.co.uk. **Graham Hipkiss**: phone: 0115 8492179 / 07752 251 564, email: ghipkiss@hotmail.com. **Alan Sinclair:** phone: 01273 587 660 / 07719 820715, email: cryoservices@yahoo.co.uk

Can help Cryonics Institute Members who need help, funeral home, transport at London. Contact: F.A. Albin & Sons / Arthur Stanley House Phone: 020-7237-3637

INTERNATIONAL: The Cryonics Society is a global cryonics advocacy organization. Website is www.CryonicsSociety.org. They publish an e-newsletter *FutureNews*. Phone: 1-585-643-1167.

Please note, this list is provided as an information resource only. Inclusion on the list does not constitute an endorsement by Long Life magazine or our affiliated organizations. We urge our readers to use this list as a starting point to research groups that may meet their own individual needs. We further note that readers should always use their own informed judgment and a reasonable amount of caution in dealing with any organization and/or individual listed.

Cryonics Protocols at the Cryonics Institute: Research and Practice

Chana Phaedra and Aschwin de Wolf: Research Team - Advanced Neural Biosciences

Part 2: Stabilization

"…whoever is present at time of death, or soon after, should probably try to reduce the rate of deterioration by applying artificial respiration and external heart massage."

Robert Ettinger in "The Prospect of Immortality"

(EDITOR'S NOTE: Individuals should keep in mind that in doing CPS as mentioned in this article, chest compressions that don't use a machine are very physically intensive and persons with health problems should proceed with caution in doing them. Also, some procedures in this article may require the assistance of licensed personnel to carry out, depending on the particular procedure and a particular locale's laws/regulations).

Introduction

In this 4-part series we will review cryonics protocols at the Cryonics Institute, discuss recent research to validate and improve cryonics protocols, make recommendations to improve those procedures, and discuss future research directions in the field. Each installment will cover a single topic: (1) Patient Monitoring and Standby, (2) Stabilization, (3) Cryoprotection, and (4) New Research and Future Developments.

Stabilization

If cryonics were an elective medical procedure there would be a smooth transition between the final stages of terminal illness and the start of cryonics procedures. However, cryonics procedures, at present, can only start after pronouncement of legal death. Consequently, a cryonics team finds itself presented with a formidable challenge to preserve the patient without any further deterioration. Stabilization procedures in cryonics comprise the set of procedures aimed at maintaining the patient in the best possible condition before the start of cryoprotection (protection against ice formation).

The objective of stabilization procedures can be stated in two distinct ways. Described in a "negative" way, their aim is to halt any kind of deterioration after the pronouncement of legal death. Described in a "positive" way, their aim is to maintain viability of the person's body and brain cells by contemporary medical criteria as well as possible. One advantage of describing the objective of stabilization as preserving viability is that that it can provide us with a relatively clear set of metrics that can be used to evaluate an individual cryonics case (see our discussion of "monitoring" below).

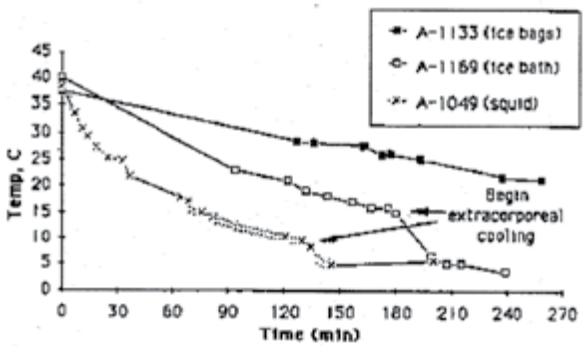
Cryonics stabilization procedures consist of three distinct strategies: restoring blood flow, cooling, and medications administration; and a potential fourth procedure for cases where the member is at a possibly long distance from the cryonics facility, hence after referred to as "non-local cases": blood substitution. One of the most important things to understand about these procedures is that, under realistic conditions, none of them is sufficient to prevent damage on its own and even with their use damage may simply be greatly decreased as opposed to totally prevented. These procedures work together and sometimes reinforce one another (for example, restoring circulation augments the rate of patient cooling during induction of hypothermia). In the remainder of this article we review the different components of stabilization, the relevant science, and how to evaluate the outcome of stabilization procedures.

Hypothermia

In a sense, induction of hypothermia is the most fundamental stabilization procedure because it constitutes the first step towards complete cessation of metabolism in a way that minimizes damage to the cryonics patient. ***Other procedures such as restoring circulation, administration of medications, and cryoprotection, are adjuncts to ensure that this reduction of metabolism through cooling is done with minimal adverse effects***. This raises an obvious question: Is cooling sufficient to prevent damage to the brain? In theory the answer to this question is "yes," but the cooling rates that would be required to eliminate damage to the brain without the help of other standby procedures cannot realistically be achieved at this time. Mike Perry from the *Alcor Life Extension Foundation* has calculated that a cooling rate of 2.89° Celsius per minute is necessary

to stay ahead of the equivalent of 5 minutes of normal body temperature ischemia (Ischemia is a state where there is inadequate or no blood flow to the tissues with the resulting deprivation of those tissues to oxygen and nutrients).

Such a cooling rate as calculated by Mike Perry cannot be achieved through the most sophisticated forms of external cooling now available or what appears reasonably feasible in the near future or even by accessing the vessels of a patient to run cold fluid through them. A typical cooling rate for cooling through the vessels (so-called "extra-corporal cooling") is only about 1° Celsius per minute. This leads to an important conclusion based on current knowledge of the ischemic brain. *Any kind of protocol in which the patient is just picked up from the hospice or hospital and packed in ice will produce some degree of brain injury, regardless of subsequent procedures*. This injury will not just produce changes to the fine structure of the brain, but also affect the quality of cryoprotection further down the road because of vessel damage/collapse and tissue swelling. Even if the beneficial effects of rapid cooling are more pronounced than a reduction of 50% in metabolism for every 10 degrees Celsius of temperature reduction, the prospects of totally preventing brain damage through cooling alone are daunting as can be seen in the following graph, taken from work with actual cryonics patients, that compares several different cooling methods utilized in cryonics:



Source: Alcor Case Report Arlene Fried (A-1049)

This graph distinguishes among three different modes of external cooling: first, by packing the patient in ice bags, second, by placing the patient in an ice bath, and a third procedure in which the patient is placed in an ice bath while the cold water is continuously circulated (currently the fastest method of cooling in cryonics) by a relatively simple device known as a "squid". The "squid" apparently works in speeding up cooling as the constant circulation of the cold water by it prevents the formation of a layer of somewhat warmer water from "hovering" near the patient as it may tend to do in just a regular ice bath. The use of the "squid" thereby allows and insures that a constant state of cold water is present directly against the patient's skin and that the heat gained by that water is taken away more rapidly than would otherwise be the case.

What can also be seen in this graph is the rapid increase in cooling rate when the patient's vessels are accessed to wash out the blood with a chilled organ preservation solution. (This can be noted in two of the graphs where it says "Begin extracorporeal cooling" with the two arrows pointing at the place this effort was begun).

Portable Ice Bath With "Thumper"

Of all the three stabilization procedures, there is little disagreement about the beneficial consequences of aggressive cooling on the brain compared to just leaving the patient at room temperature where cooling of a cryonics patient, generally speaking, proceeds at about one degree Celsius *per hour* thus allowing the brain to be more damaged by the much slower cooling rate that results. A situation where no intervention by active cooling is attempted can easily be compared, then, to the cooling rates that can be achieved for the three different cooling methods. It should be readily apparent that any of them are preferable to no active cooling at all. These active methods reflect, fundamentally, just some basic physics about mass and the way heat is transferred between various types of substances.

This does not mean that there are no longer any unknowns about this part of our procedures. For example, *Oregon Cryonics* has designed a series of experiments to try to better understand how closely the core temperature of the brain tracks the measurements of surface temperatures (see: http://www.oregoncryo.com/researchCoolingRates.html). Cryonics-associated laboratories also conduct research to develop methods to increase initial cooling

rates without the need to do invasive "surgical-type" procedures to access the blood vessels. One such method is called liquid ventilation (also known as "lung lavage") in which an endotracheal tube is placed in the trachea and cooled/chilled saline or (preferably) cooled/chilled oxygenated perfluorocarbons are pumped in and out of the lungs. (Perflurocarbons are a type of chemical compound that contain only carbon and fluorine. Research has been going on with them for a number of years and they have a higher ability to carry oxygen and carbon dioxide than human blood does.)

After the establishment of "lung lavage", circulating blood passes through the lungs that have been cooled either by the cooled/chilled saline or by the cooled/chilled oxygenated perfluorocarbons, and the internal cooling effect of those liquids being in the lungs helps to act as an "internal heat exchanger", helping to further cool the brain and body. This method can approach the cooling rates typically seen in vascular cooling. In principle, the method could be deployed immediately at the start of stabilization procedures.

In our lab at Advanced Neural Biosciences we have investigated the relationship between temperature and brain damage extensively. In one research project we looked at the fine structure of the brain after various periods of normothermic (i.e. normal body temperature) and cold ischemia. This research in our lab firmly established the link between temperature and rate of brain damage, but also generated *specific* knowledge about the degree of ultrastructural damage (damage at the cellular/subcellular level) we can expect after various delays in response time. The results of this research are currently written up for publication in a professional journal.

Cardiopulmonary Support

The "abrupt" nature of today's transition between pronouncement of legal death and the start of cryonics procedures necessitates a series of well-prepared and competently done stabilization procedures which are as well thought out as possible beforehand. Cryonics, like any important procedure in medical work, as well as in other important industries (i.e., aviation) is not an environment in which decisions made "on the fly" tend to work out very well, at least generally speaking. While induction of rapid cooling is the most fundamental stabilization procedure, restoring some measure of circulation is the procedure that can assist in achieving that aim most promptly, if enough prepared people and needed equipment are readily available. In an ideal case, the team initiates artificial circulation immediately after the patient's natural circulation has terminated. In conventional medicine we call this procedure cardiopulmonary resuscitation (CPR), but since our aim is not to revive the patient but to protect the brain from injury, at least as much as reasonably possible, we call this cardiopulmonary support (CPS) in cryonics. Restoring the patient's circulation serves three distinct objectives: (1) restoring cerebral blood flow, (2) circulating medications, and (3) augmenting hypothermia.

Restoring cerebral blood flow. Restoring cerebral blood flow helps to keep the brain biologically viable and also helps to preserve the fine structure of neurons. This not just reduces the requirements of future cryonics revival technologies but also to keep the brain vessels open and free from blood clots (details to follow in the next installment of this series). One important thing to remember about doing external chest compressions is that even the most effective protocols, even as practiced by experienced and qualified personnel in medical settings, fall short of providing normal cerebral blood flow.

This aspect of artificial circulation may be even more pronounced in cryonics patients whose circulatory system is often compromised by old age and disease. Another important difference between conventional CPR and CPS in cryonics is that artificial circulation in cryonics is often sustained for hours instead of minutes. (The use of mechanical pumps to replace chest compressions is a complicated and sensitive issue in cryonics and will be discussed somewhat in the next installment). As the duration of CPS increases its effectiveness tends to decrease, and several unintended phenomena occur such as pulmonary bleeding or fluid accumulation, which in turn reduces oxygen delivery to the brain. It is therefore key to supplement CPS with rapid induction of hypothermia.

In other words, the decrease in blood flow to the brain must be offset, if reasonably possible, by decreasing the energy demand of the brain by cooling and increasing blood pressure through the administration of drugs through the administration of "vasopressors" (see below).

Following the American Heart Association's latest recommendation to emphasize chest compressions over rescue breaths, current protocols in cryonics stress continuous, vigorous chest compressions. This is particularly important when a shortage of team members might necessitate interrupting chest compressions in order to ventilate the patient. When a mechanical chest compression device is used the tension between choosing between maintaining artificial circulation and maintaining artificial ventilation is less of an issue because a preferred ratio between compressions and ventilations can be dialed in mechanically and the equipment can take care of the problem without the attendant stress and fatigue that happens when using only human efforts to try to carry out those goals.

As a rule, CPS needs to be continued until the patient has reached a temperature where it is safe to do more invasive procedures for internal cooling or cryoprotection. In this context "safe" means a

temperature at which the brain will not likely suffer significant injury when circulation is stopped. A good rule of thumb is core body temperature of about 20° Celsius. If there will be no internal cooling or cryoprotection prior to transport of the patient to a facility, CPS should be continued all the way down to 0° Celsius, provided there are no serious contraindications (e.g., pulmonary bleeding, severe chest trauma, etc.)

Circulating medications. While it should be obvious to even non-medical laypeople that administration of drugs is only effective in the presence of circulation, i.e., it does no good to squirt a chemical into an intravenous line if there is no blood flow to carry it throughout the body, there have been several instances in cryonics where this principle was not sufficiently recognized or "tunnel vision" made people omit this seemingly basic principle. Medications to protect the brain, prevent blood clotting, or increase blood pressure require vigorous circulation through chest compressions to be effective.

Augmenting hypothermia. As discussed in the section about hypothermia earlier, the fastest external cooling rates can be obtained by placing the patient in a portable ice bath with continuous ice water circulation over the patient. Cooling is further enhanced as not only the ice water circulates but the patient's blood is circulated through vigorous chest compressions as well. The role of chest compressions in increasing the cooling rate of the patient is another argument in favor of automated mechanical chest compressions. When stabilization incorporates both mechanical CPS and cooling it is important to be careful to avoid putting ice under the patient because the melting of the ice can cause the distance between the piston and the chest to change, resulting in less effective mechanical circulation of the blood.

Since its inception, advocates of cryonics have advocated the use of piston-driven mechanical chest compression devices for restoring circulation in cryonics patients. The "father of cryonics", Robert Ettinger, for example, is shown below with an early version of a mechanical device to do chest compressions. There are several sound reasons to use mechanical chest compressions in cryonics. The most fundamental reason is to prevent fatigue in cryonics team members. Performing adequate chest compressions in CPR is challenging enough but doing vigorous and consistent chest compressions for hours in cryonics is beyond the realm of the possible, even if more team members are available. Mechanical chest compression devices are powered by compressed gas or batteries and do not get tired.

Another advantage of mechanical CPS is that it allows for continuous chest compressions under circumstances where manual chest compressions would be challenging or impossible, i.e. during transport of the patient out of the hospital, in tight transport vehicles, or when certain case logistics might require all team members to possibly briefly be away from the patient (for example, a team member needs to draw up a medication or respond to a hospital staff request). Mechanical CPS also allows for more advanced chest compression modalities that humans would not be able to consistently perform. An example of this would be active compression-decompression CPS in which a suction cup is attached to the piston to raise the patient's chest during the compression to improve blood flow. Mechanical devices can also maintain a very consistent depth of compressions on a patient, something which humans performing chest compressions may have difficulty doing both from rescuer to rescuer due to variations in skill level, personal strength, the rescuer's body habitus, etc. Even in an individual rescuer, compression depths can vary due to that individual's increasing fatigue while the procedure is going on, if for no other reason. Mechanical CPS, at least in some devices, also allows consistent alteration between chest compressions and ventilations with more accuracy and precision than can be accomplished by manual efforts and without the, as mentioned, extreme fatigue that occurs in human/manual procedures.

Robert Ettinger with the Westinghouse Iron Heart in 1964

Mechanical chest compression devices are usually powered by either compressed gas or batteries. One advantage of the compressed gas-powered devices is that when oxygen or room air is used the patient can be ventilated from the same source, too. A major disadvantage of the gas-powered devices is that several small tanks of gas or one large tank needs to be transported with the patient with all the logistical challenges that come with that, especially if the cry-

onics response team has a limited number of personnel and a limited means of transport. Consequently, many of today's mechanical chest compression devices use batteries. For a typical cryonics case it is important to have fully-charged back-up batteries at all times in order to ensure continued operation.

The state-of-the-art in hands-off automated chest compression technology today is Physio-Control's LUCAS 3 Chest Compression System, a compact, battery-powered, active compression-decompression device that can deliver 102 compressions per minute with a depth of 2.1" and which automatically collects performance data. Devices such as the LUCAS can be positioned under the patient in a portable ice bath within seconds of the start of cryonics procedures. Considering the cost of these devices (some newer models can cost about $15,000), the use of the latest models is often confined to professional standby organizations or well-funded local support groups.

LUCAS 3 Chest Compression System

There is paucity of CPS research in cryonics (including in our own lab). The major reason is that small animal models and even many large animal models (except for the porcine model) are not representative of human CPR. Another reason is that there is a strong incentive in mainstream medicine to investigate and optimize resuscitation technologies. This does not mean that there are no meaningful research topics in cryonics. For example, is CPS contraindicated when cryonics procedures are started with delays? What is the most effective form of chest compression in the typical cryonics patient? Do cryonics patients benefit from ventilation in continuous compression CPS? What drug regimen optimizes cerebral blood flow?

Medications

There is little dispute that a well-designed and promptly administered basic medications protocol can make a noticeable difference in a cryonics case. Where perspectives seem to diverge is whether the administration of extensive lists of medications is beneficial and/or can withstand a cost-benefit analysis. Research at our lab on this issue is ongoing but we believe that most of the benefits that can be reaped from drug administration only requires administration of a small set of medications.

There are a number of scientific and logistical reasons to limit the number of medications to a manageable level. The rationale for a lengthy medications protocol with several neuroprotectants is that they can extend the time of circulatory arrest from which cerebral resuscitation is still possible. In our opinion, one issue with such protocols is that they are most useful in a small subset of cases, i.e. cases in which procedures are not started immediately but not after long delays either. In a case where CPS and hypothermia is started right away, the need for neuroprotectants is reduced. In cases where delays in starting cryonics procedures are more than 30 minutes there is little research to back up administration of large numbers of anti-ischemic medications. In non-local cases where extended cold transport times are expected, preserving viability of the brain is not possible at any rate.

That doesn't mean those cases are hopeless, of course, as the whole concept of cryonics to begin with is based on the capabilities of future science and technology, which most experts in the field of nanotechnology believe are going to be quite robust. Still, it makes perfect sense to burden any future efforts at revival and resuscitation as little as possible and to do as good a job as can reasonably done in the present.

A more practical argument against extensive medications protocols is that administrations times can be extensive and medications that are aimed at reducing injury early on can easily get administered too late. Such protocols also often require the administration of multiple large volume solutions that necessitate infusing the medications at several locations in the body to reduce administration time. Large medications protocols also increase the possibility for errors in administration or conflicts between the medications. An analogy comes from the field of commercial aviation where highly trained and experienced flight crews can become overwhelmed by stress and the myriad choices available to them and make a significant error. Occasionally this results in what is called "controlled flight into terrain", meaning that the aircraft was functioning perfectly but due to judgment errors, the flight crew flew it into the ground.

In collaboration with the *Alcor Life Extension Foundation* we designed an ambitious research project (2013-2016) to see which medications (or combination of medications) improved cryoprotection after various periods of circulatory arrest. Improvement was

defined as no, or reduced, ice formation after cryopreservation. In this research we found only two medications that made a meaningful difference: sodium citrate and heparin. What is interesting about this result is that both medications help prevent blood clotting. We saw the best results for sodium citrate.

One potential explanation for this is that citrate binds to calcium. Calcium availability is necessary for blood clotting but also implicated in injury during cerebral ischemia. When we administered these two compounds prior to circulatory arrest in the dose indicated by our research work, we could cryopreserve the brain after *up to two hours of cerebral ischemia without ice formation.*

One important caveat to these results is that the drugs were administered prior to the onset of ischemia. Even when a hospital allows pre-administration of medications for a cryonics patient (a classic example is heparin), not all medications are suitable for this approach. Sodium citrate, the most effective cryonics medication, will instantaneously stop the heart if administered through an intravenous fluid line and thus requires "post-mortem" administration in an IV line established or left in place for cryonics procedures.

When we looked at delayed administration of medications we found no difference in quality of cryopreservation (i.e. presence of ice formation) between administration of heparin and citrate (or any other medications we tested) and no administration of medications if both the administration/no administration occurred after 30 minutes of circulatory arrest. This further reinforces our recommendation to administer cryonics stabilization medications *immediately* after pronouncement of legal death if at all possible in the given circumstances.

Are there other medications that could be helpful to the typical cryonics patient? A sound case can be made to administer a vasopressor like epinephrine or vasopressin in order to increase blood pressure during CPS. Clearly, such medications are of no benefit in cases without CPS or cases with lengthy delays (multiple hours or days). When a cryonics patient suffers from severe dehydration a volume expander like Hetastarch or dextran can be administered. To reduce swelling of the brain, mannitol is a fine option. In non-local cases where long transport times (> 24 hours) are expected it would be prudent to administer a broad-spectrum antibiotic such as gentamicin to reduce bacterial overgrowth.

Our recommendation for a CI medications protocol is somewhere between the sole administration of heparin and some of the more "exotic" medications protocols that have been advocated for cryonics. The core of such a recommended protocol would consist of heparin and sodium citrate, augmented by a basic series of drugs and large volume solutions to support blood pressure during CPS, prevent swelling of the brain (edema), and reduce microbial growth during cold transport, with all those administered before 30 minutes has passed (and preferably immediately) after the person is pronounced clinically dead. There is not enough evidence, in view of our research efforts, for many other medications to pass a cost-benefit analysis.

Blood Substitution

In non-local cases, which are, as mentioned much earlier, cases done at some distance from the cryonics facility, and where the patient would need to be transported on ice to the cryonics facility for the initiation of cryoprotection procedures, replacing the blood with an organ preservation solution before shipping has several advantages. Replacing the blood with a liquid that is totally artificial and that contains no biological cells prevents red blood cells from clotting or aggregating, as their natural tendency is to do in blood. Organ preservation solutions can also be formulated to provide additional metabolic support and prevent cell swelling during cold storage. In addition, the procedure of using precooled liquids for blood replacement allows for internal cooling of the patient through the vessels, delivering the fastest cooling rates possible.

In prior articles for *Long Life* we reported that replacing the blood with an organ preservation solution permits ice-free cryopreservation up until at least 48 hours cold ischemia, which is not possible when the blood is left in the patient. Not all organ preservation solutions, however, are equal. Replacing the blood with ordinary saline (sodium chloride) or m-RPS-2, the VM-1 carrier solution of the *Cryonics Institute*, does not improve upon the default option of leaving the blood in the patient. We found the best results for an organ preservation solution named MHP-2. MHP-2 stands for Mannitol-Hepes-Perfusate. The patent on this solution is now expired and it can be used, therefore, by any individual and/or group wishing to do so for any legal purpose they see fit. (See the formula below). At present it is used by at least one cryonics organization in dealing with non-local cases of their members. It should be noted that we are proposing this as a "transport solution" to buy as much time as can reasonably be had and then each organization can use whatever vitrification solution they prefer. In the case of CI this would, at the time of this writing, be the VM-1 solution developed by noted cryobiologist Dr. Yuri Pichugin.

Notwithstanding the advantages of replacing the blood with an organ preservation solution, it cannot be emphasized enough that this replacement procedure requires making incisions in the chest or legs and placing tubes ("cannulae") in the vessels of the patient. Unlike chest compressions, or placing the patient in an ice-bath, this is not a procedure that should be entrusted to (well-intentioned)

laypeople. Making prior arrangements with a standby organization like *Suspended Animation* or contracting with professional perfusionists and surgeons, or well-instructed funeral directors is essential to benefit from this procedure. If errors, (e.g., a botched procedure, pumping air in the vessels etc.) are made during blood washout, cryoprotection, or other measures, at the cryonics facility may no longer be possible.

MHP-2 Solution Ingredients	***Concentration &/or Amount Per Liter of Distilled and Filtered Water***
Mannitol	170 mM /30.97 g
Adenine-HCL	0.94 mM /0.17 g
D-ribose	0.94 mM /0.14 g
Sodium bicarbonate	10 mM/0.84 g
Potassium chloride	28.3 mM /2.11 g
Calcium chloride (10% w/v solution)	1 mM /0.28 ml
Magnesium chloride (20% w/v solution)	1 mM/1.0 ml
HEPES	15 mM /3.90 g
Glutathione	3 mM /0.92 g
D-Glucose (Dextrose)	5 mM /1.80 g
Hydroxyethyl starch	50 g per L
Heparin	1000 I.U. per L
Insulin	40 I.U. per L
Osmolality	388-403 mOsm
pH	8.0-8.2

Monitoring

One of the biggest misunderstandings about cryonics is that only the future will tell how successful our procedures were. Clearly, in the strictest sense of the word, the success of cryonics procedures stands and falls by whether it allows for future revival of the individual and that will ultimately depend, of course, on the power of future technology. But what allows us to say quite a bit more already is that cryonics can be broken down into a variety of distinct individual procedures and/or steps that can be evaluated based on their outcome. How quickly after pronouncement of clinical death did cryonics procedures begin? What steps were taken and in what order and for how long? How fast did the patient cool after pronouncement of legal death? Is there evidence of ice formation in the brain after cryopreservation? It is beyond the scope of this article to discuss all the metrics and equipment that can be used to monitor and review an individual cryonics case, but we will give some examples pertaining to stabilization.

At the most abstract level it can be said that time and temperature determine the outcome of each cryonics cases. The faster a patient can be stabilized at cryogenic temperatures (without freezing) after pronouncement of legal death, the better in terms of placing a minimal burden on future science and technology. Since the time between circulatory arrest and start of cryonics is highly critical, each case report or summary should report on the (estimated) start of cryonics procedures and the temperature of the patient. Because packing in ice or the use of circulating water ice does make surface temperature measurements unreliable, a thermocouple should be placed in the patient's nose, ear, and/or rectum for continued temperature logging. Automated temperature collection of this kind is also important when the patient awaits transport at the funeral home and during transport to ensure that there are no lapses in protocol and that once a patient has sustained lowering of their temperature to a certain level, then that hypothermic temperature is maintained as a "ceiling" above which no further rise in temperature is allowed, if at all possible.

Monitoring of stabilization procedures can range from basic layman procedures to advanced (internal) procedures. If a patient has been intubated with an endotracheal tube (or related device) for ventilations during CPS the exhaled carbon dioxide can be measured with a relatively cheap disposable CO2-detector (which sells for around $15 right now) to look at the efficacy of CPS efforts. If possible, a funeral director can be asked to draw a (venous) blood sample after receiving the patient that can be submitted to a lab to look at things like pH and electrolytes. These values may not look useful at first but when this is done more often than with just one patient meaningful comparisons can gradually be made from patient to patient and compare them to the values of healthy, living, patients.

For a typical *Cryonics Institute* patient, as well as other cryonics patients, advanced stabilization protocols and data collection may not be too realistic but cultivating a culture in which rapid response and cooling is expected is important. This expectation should be extended to all patients, including those who have not made separate arrangements with standby organizations. A case for which no reliable temperature data are available should raise concerns about whether the patient has been continuously at a stable hypothermic temperature. Absence of such data is not, of course, an absolute indicator that this has not been the case but one wants to do as professional of a job as possible and feedback from temperature data is one way to help do this.

In our next installment of this series we will look at cryoprotection of the patient, the research that informs that part of cryonics procedures, and how prior stabilization procedures may affect any attempt to utilize cryoprotective measures in an individual who is being subjected to cryonics procedures.

Options for Safe, Secure and Legal Asset Preservation for Post-Resuscitation Access

The Ninth Annual *Young Cryonicists* Gathering

Teens & Twenties 9 2018: Getting to Know You - You Getting to Know Each Other

Fri-Sun; May 4-6, '18 Hollywood, FL Host: *Life Extension Foundation* SCHOLARSHIPS AVAILABLE

★★★

Greetings to *ALL Young Cryonicists*,

You are receiving this invitation because you are the future of cryonics.

All attention will be focused on:
our getting to know you and
you getting to know each other.
PLUS: an update on the latest emergency response technologies and revival strategies.

Who is Eligible?

Fully signed up young cryonicists from all cryonics organizations in their late teens through age thirty *(18-30) as of May 8, 2018* - may apply to attend.

Younger Cryonicists With Parent(s):

Thirteen through seventeen year olds may attend when accompanied by their parent(s) or guardian(s).

Parents/guardians of attendees aged 18-19 are also encouraged to accompany their child. All attending parents will be put in touch with each other should they choose to have their own "get together" during the "young cryonicists" gathering.

Program

Some individuals are social butterflies. This is not so for everyone. And we want *everyone to meet everyone.* Therefore, I have designed a diverse range of "getting to know you" activities. *IF* you would enjoy participating in these various getting acquainted activities, *THEN* this is for you.

Enjoy this exciting & fulfilling weekend.

SCHOLARSHIPS:

Life Extension Foundation, through a generous education grant, is offering *40 scholarships* that pay for ALL of the following:

- U.S. airfare to/from Fort Lauderdale, FL (up to $1000 for origin outside the U.S.)
- Hotel accommodations for Friday & Saturday nights - plus Thursday & Sunday nights (specifically) for scholarship attendees who room together.
- Meals and beverages on Friday night, all day Saturday, & Sunday breakfast & lunch
- Registration fee - $350 - also covered

Please click on this website for a full packet with all details and application forms.

https://tinyurl.com/teens2018

Forever,

Cairn Erfreuliche Idun
Founder/Director: T2

PS Come Early. Stay Late.

Some attendees to T2 enjoy spending *extra time in Florida* - especially since their flight is already paid for via their scholarship.

This is at their own expense for additional lodging and food.

I look forward to getting to know you.

The Technology of Repair, Revivial and Rejuvenation

Part III

by York W. Porter

Preliminary remarks by York W. Porter, Immortalist Society President

This is the third installment in this series. As stated before, one of the basic questions in cryonics is just "how" it will work. Since its inception, critics have utilized the quite understandable inability of Robert Ettinger, in his original writings, to fully outline the exact specifics of future science capabilities to try to poke holes in the concept Ettinger developed. (The critics were frequently in error then, and are even more so now). While it isn't possible, even at this date, to fully determine the particular details as to the exact mechanisms that will be needed and/or utilized to make cryonics a working reality, it is possible to go into the subject to such a depth that any reasonable person would have to conclude that, whatever their particular preferences or viewpoints, cryonics is a quite sensible and rational thing to do for those persons with an interest in extended physical life. This "third installment" basically takes up with additional efforts by very talented and intelligent individuals

Dr. Charles Tandy served as the editor of the book, The Prospect of Immortality: Fifty Years Later, to which I contributed a chapter (Interested readers may purchase a copy of Dr. Tandy's excellent book on amazon.com). The information presented here, as well as in future installments of this series, basically first appeared there, and then was slightly edited/updated and then was utilized in a series in Cryonics magazine, the house publication of the Alcor Life Extension Foundation. Readers should note that this article might differ, however slightly, from the material published in Cryonics and in Dr. Tandy's book.

MERKLE AND FREITAS'S JOINT WORK

Ralph Merkle and Robert Freitas's 2008 paper, "A Cryopreservation Revival Scenario Using Molecular Nanotechnology"[80] reminds one of NASA's initial methods of thinking about a moon landing. ("What do we need? A rocket. A straight shot to the moon or earth orbit first?Earth orbit first.How many stages does the rocket need, one or more? Three stages: … and so on). The paper begins by considering what temperature repair should be attempted at, liquid nitrogen or a higher temperature where things are fluid, then goes from there.

The lower temperature is, of course, the better choice. Deterioration of tissue is halted, and things stay put while you do your excavating or patching or whatever. Critical biological structures are "locked down" at the molecular level and will stay in place when not intentionally altered. You can also correct such problems as fractures in tissue, before they become the gaping, leaking wounds they would be if you warmed up to fluidity. (Actually, Merkle and Freitas envision at least a two-stage process for correcting fractures, starting at a very low temperature—see below.) The brain especially should benefit from the most delicate, painstaking restorative procedures that could proceed unhindered for indefinitely long periods of time, and also in massively parallel projects that restored different parts concurrently. Will the tools be available, molecular machines that can operate at the desired temperatures? Merkle and Freitas, who consider the tiny components such machines would be made of, are optimistic: "Gears, bearings, ratchets, sliding interfaces work quite well regardless of temperature."[81] Such components can operate in a vacuum and do not need lubricants. A second needed feature would be intelligent control of the molecular machines. Tiny computers able to work at low temperatures, in the range needed, have been designed using "rod logic" (a type of computation using mechanical movement of parts rather than electrical switching). Communications could be by molecular cables designed to transmit data at gigabit rates or higher. The onsite devices, machines with onboard computational control that work inside or in close proximity to the patient, could be connected to a large, offsite computer. In this way considerable extra computational power could be brought to bear on the problems at hand, without risking harmful side-effects such as warming up the patient at the wrong time. Power to operate the on-site devices could be transmitted via carbon nanotubes.

So what will we do, presuming we have the necessary tools for nanoscale operations at low temperature? Our little tools and the offsite support become instruments for excavation, analysis and restoration. Merkle and Freitas suggest we start with the circulatory system, clearing it out of solidified or vitrified fluids or other obstructing, nonessential material. In this way we obtain a network of tunnels for accessing any point in the brain to within 20 micrometers or a few cell diameters. Other parts of the body should also

be adequately accessible, in many cases to within the same distance.

An exciting proposal in the paper is the use of a so-called "vasculoid."[82] As opposed to Freitas' early thinking on "respirocytes" which would work alongside of other, naturally occurring blood components, the vasculoid is essentially an artificial circulatory system that would transport oxygen, food molecules, glucose, hormones, etcetera through the vasculature, and do so even in a state of cardiac arrest, as would be found in cryonics patients. Merkle and Freitas propose adapting the vasculoid to operate at low temperatures, using the cleared out vascular system which could still serve as its "vasculature," to carry out necessary operations of excavation and tissue repair.

The problem of fracturing is to be handled in a two-step fashion. Starting at a low temperature, a "stable support sheet" is constructed in each gap between two adjacent fracture planes (or other surfaces). The support sheet maintains stability as the tissue is warmed. Then, with the greater fluidity that occurs at a higher temperature, another operation is performed, to simultaneously remove the support sheet bit by bit and bring the fracture surfaces together and join them. In the end, the tissue becomes whole and intact as if no fracture had occurred.

One expected problem is that some proteins will probably have been denatured during the cryopreservation process. A bit of heartening news here is that "most proteins should spontaneously recover."[83] If critical functioning doesn't return, properly shaped proteins could be introduced when an appropriate temperature is reached so that normal cell activity can take over and complete the recovery process.

As the cryonics patient is warmed and increasing fluidity returns, other problems are expected. The processes that were used in the cryopreservation, coupled with changes prior to clinical death, will probably result in abnormal levels of various cell or tissue chemicals: sodium, potassium, glucose and oxygen, ATP, et cetera. The very chemicals ("cryoprotectants") used to protect against the normally damaging effects of ultra-low temperatures, may or may not be optimal at any particular repair temperature. So it may be wise to replace them with more appropriate and/or newly developed cryoprotectants.

Due to the relatively easy access to any cell and/or tissue bed in the body, coupled with the substantial computer power available offsite, the process of repair, revival, and rejuvenation will probably be totally automated. The control system of the vasculoid/cell repair devices should be able to adjust levels of chemicals, deal with rates of warming, and do repair of fractures when an appropriate temperature is reached. So in short, with proper programming and devices, it will be largely a "hands off" operation like a plane on autopilot, with little if any human intervention needed.

As warming proceeds there will be a point where the patient is not yet functional but in a state of moderate hypothermia. Now unnecessary devices including the vasculoid, if it is still there, would be removed. The patient would then be taken to normal body temperature with full return of consciousness and awareness. To the person revived, the intervening time since arrest and cryopreservation will seem only an instant, even if centuries had passed.

The efforts of Ralph Merkle and Robert Freitas to address the problem of reviving cryonics patients should be heartening to anyone who is interested in cryonics. The 2008 paper continues a long quest that will go on until the goal is reached.

Chana Phaedra and "Reconstructive Connectomics"

Holding a Master's Degree in Cognition and Neuroscience, Chana Phaedra is president of Oregon-based Advanced Neural Biosciences, Inc., founded in 2008. According to the LinkedIn website, ANB's research areas are "improving outcomes for sufferers of cerebral ischemia and bridging the gap between neurophysiology and cryobiology." Through ANB, Phaedra and her research partner, Aschwin de Wolf, are contracted by cryonics organizations, including ANB's initial supporter, the Immortalist Society, to investigate cryonics procedures and how they might be improved. Starting with a very modest $20,000 grant, the company has grown over seven years to a half-million dollar annual research budget.

Phaedra published a paper, "Reconstructive Connectomics" (*Cryonics* Jul. 2013)[84], whose title borrows terminology her research partner, Aschwin de Wolf, introduced in the same magazine two months before, in an editorial, "Resuscitation Research Can Start Now!"[86] Phaedra's paper seconds the case, she tells us, "to pursue meaningful cryonics resuscitation research today."

The "connectome" is "a comprehensive description of how neurons and brain regions are interconnected," essentially, a "wiring diagram" for the brain. Connectomics seeks to map that wiring, thus treating the brain as an interactive whole system, analogous, in a much more complicated way, to a massive telephone wiring/switching system. The complexity comes from basic properties: "The human cerebral cortex alone contains on the order of 10^{10} neurons linked by 10^{14} synaptic connections. By comparison, the number of base-pairs in a human genome is 3×10^{9}." (Wikipedia[85]).

Research in connectomics has obvious implications for cryonics. Detailed information gathered about how the brain works and how it is wired together, whether at the gross anatomical, microscopic, or biochemical level, and that wiring's moment-to-moment and overall functioning, can provide significant clues to how a brain might be repaired from any damage. The damage could have happened before cryopreservation, during the process, or after. (In addition, connectomics knowledge will be quite useful in working on medical conditions in the living state!)

Connectomic information would help us in

working backward from the state the brain is in to its original, undamaged state. By analogy, a damaged automobile may tell a trained mechanic what parts are malfunctioning and exactly in what ways. Aschwin de Wolf, originator of the phrase "reconstructive connectomics," had this to say in "Resuscitation Research Can Start Now!":

> A major obstacle to strengthening the case for cryonics is the perception that meaningful research aimed at resuscitation of cryonics patients cannot be done today. Attempts to be more specific than evoking the need for a technology that can manipulate matter at the molecular level are considered to be vague and unproductive. … The first thing that needs to be recognized is that if we want to say something *specific* about the nature and limits of repair we need to be able to *characterize* the damage in detail.[87]

In the specifics of damage that may occur in cryonics, Phaedra speaks of general damage categories as follows:

> Much work has already been done in characterizing damage in cryonics. In brief, damage falls into the following categories: damage incurred prior to cryopreservation (i.e., "pre-mortem damage"), cerebral ischemia, cryoprotectant toxicity, ice formation, chilling injury, and dehydration. The question of utmost importance in considering these forms of damage is whether we should expect any of them to destroy (our ability to reconstruct) the connectome.[88]

Phaedra's answer to whether the forms of damage will prove insurmountable is a definite "No." She notes that if *more* than just knowledge of the connectome will be needed, such as more detailed information at the synapse level, and/or details of microtubules, ion channels, neurotransmitters, et cetera, further research can establish this. In the words of Theodor Meynert, the German-Austrian anatomist/neuropathologist of the 1800s:

> "If we are acquainted with the principles upon which this mechanism [the brain] operates, we may infer its function from its structure, regarding the former as a natural outcome of the latter."[89]

The converse should also be true with sufficient knowledge. Observing the function in enough detail over a wide enough theater of possibilities should allow one to infer what structure, both normal and abnormal, must be there. Someone studying a damaged brain thus has many potential ways to infer what specific structures are damaged and how they are damaged. This is a long way from simply "evoking the need for a technology that can manipulate matter at the molecular level"[90] which, as de Wolf correctly points out, is for many people too generic a "repair solution" for them to take cryonics seriously.

Knowledge which already exists in great quantities about the proper anatomical structures that should exist in a functioning brain, combined with knowledge that will be gathered through the relatively recent field of connectomics, can be combined with other knowledge from cryobiological and physiological studies to form what is known as "Fault Tree Analysis."

At first, of course, this type of analysis will be somewhat limited, depending on the amount of knowledge in any particular area. "Branches" of the fault tree may be very sparse in terms of information and proposed actions. Over time, however, those same branches can gradually be filled in and expanded with real world and specific approaches to dealing with the problems in placing individuals in solid-state hypothermia. Fault Tree Analysis can help provide rational decisions on specific alterations in approaches used in dealing with cryonics patients. As de Wolf writes about one specific type of concern in cryonics, the toxic effects of chemicals used to protect tissue from the effects of the "super-cold" liquid nitrogen that patients are stored in:

> "If someone would claim that cryonics is hopeless because of the "toxicity" of the vitrification agents we can ask for more specifics about what kind of biochemical damage is being alleged and why such alterations irreversibly erase identity-critical information." [91]

(One might also add, "and/or, specifically why such alterations are believed to make the ability to regain normal function unlikely or impossible").

The point of all this is that, even at the present, still-early point in its history, cryonics can make advances from the generic vision of Robert Ettinger toward actual implementation of resuscitation protocols. A continued emphasis on dependable and verifiable scientific information and technological development will gradually make headway and provide increasingly solid underpinnings of progress. This would include amelioration, as far as possible, of problems that can currently be dealt with or, at the very least, recognition of what those problems are or are likely to be. Practices to deal with them can be tentatively developed and then improved. Existing technological developments and practices could be adapted from other fields as well. Fault Tree Analysis is one case in point. Fracture Match, currently used in modern forensics, could possibly be another.

It is known, for instance, that even for something as mundane as duct tape, tearing a piece results in a unique pattern of fracture that allows matching one side of the torn tape with the other side. Murderers who thought they had "gotten away with it" have been brought to justice through such telltale clues. Knowledge such as this may possibly be used to help determine that fractured segments of cells/tissues have not just come apart in random, inscrutable ways. Inferring what ought to be there from what still is there might then be feasible. Quoting from Thomas Donaldson's 1987 *Cryonics* article, "Neural Archaeology," Phaedra writes:

> "Reconstructive connectomics is the

modern-day realization of what Thomas Donaldson termed "neural archeology," a concept described in detail in his 1987 article of the same name. In general terms, Donaldson equates the task ahead of cryonicists with that encountered by traditional archeologists. Though space limits our ability to consider this prescient article in full, let us look at a most illuminating section:

"The first thing done in examining an archeological site is to carefully plot the relation of all the fragments to one another. Debris has a structure too. We discover this structure by looking at the relations of its parts to one another, not just by looking at the parts. (Archaeologists in Central America complain constantly that valuable artifacts are taken away and sold, with no record of where they were found, in relation to what.) If a protein has two degradation parts, we can learn a lot by knowing where these parts are found in the remains of a cell.

"In fact, one way of looking at cryonics is that it is simply a way of making such a detailed record. Here is a patient's brain, in the condition it was when we lost him."[92]

Winding up her 2013 paper by discussing the most primitive form of cryonics, a "straight freeze" without cryoprotection, Phaedra optimistically concludes: "Even such 'worst case scenarios' may not be as bad as we think."[93]

Moving in on the Ultimate Goal

The inability of Robert Ettinger to provide specific details of how cryonics patients will be revived has given way to in-depth thinking by other smart, educated and dedicated people. Their imaginative and well-considered proposals continue to shed strong light on what started out as basically a glimmer of hope. This is not to say the problems are not formidable. Nanotechnology is still pretty much in its infancy, the strenuous efforts of many notwithstanding, including, at the thought level and close to home, Merkle, Drexler and others. Still, in the various scenarios that have been proposed through the years for preventing or repairing the damage sustained by cryonics patients, we see the groundwork for more substantial advances yet to come. The suggestions, as outlined above by several obviously competent, involved researchers in relevant fields, foster the optimistic conclusion that progress is ongoing and will continue.

The Wright Brothers didn't simply invent the "flying machine" one afternoon while thinking about it for an hour or two. Instead centuries' worth of brilliant precursors figured in the task, from Leonardo da Vinci onward (and, no doubt, some before him). And the two brothers themselves spent many hours on the problem before they solved it. Numerous routes were tried, discarded, then picked up again, in whole or part, as they seemed useful and/or more knowledge was gained. Dead ends when they occurred still added something to the knowledge base. Some apparent dead ends no doubt turned out to be re-explored when additional insight was gained. As in most human endeavors, it was sometimes "one step forward, two steps back." But the goal was reached and humankind has been, overall, the better for it.

Similarly, the effort to apply nanotechnology and cryobiology to cryonics involves many minds over many decades (at least) and will not bear the hoped-for fruit of cryonics resuscitation overnight. Instead it will seem highly forced, convoluted and futile in the eyes of many, yet progress is ongoing and has been for five decades now, both from the theoretical and the experimental sides of the problem.

We have considered various proposed approaches for repair, rejuvenation and resuscitation of cryonics patients.

There was Jerome White's modified virus, Mike Darwin's "anabolocyte," Thomas Donaldson's "repair bacteria," Brian Wowk's "cell repair device," Ralph Merkle's "offboard repair" scenario, the "SCRAM" method of Mikhail Soloviev, and the "realistic" repair proposal of Greg Fahy. Other proposals came from Robert Freitas, Thomas Donaldson, Tad Hogg, Aschwin de Wolf, and Chana Phaedra, the latter two dealing with connectomics. The different proposals made thus far are real and substantive, even if speculative. They show that cryonics is far from "an act of faith" but is, at bottom, an endeavor based on realistic and hard-nosed thinking. Whatever one thinks of any particular approach, these or others, we can be especially heartened that, as Eric Drexler has written in a newer book from 2013, *Radical Abundance*, "Every major nation now supports nanotechnology research."[94]

As Ralph Merkle said in response to Greg Fahy's critique of Merkle's "Molecular Repair of the Brain":

> This exchange on the subject will not be the last, nor should it be. As repair scenarios become more detailed, there will be more points of disagreement, not fewer. Consensus does not emerge at once, full blown. Instead, it emerges bit by bit, a single piece at a time, as the various issues are argued and discussed in greater and greater detail."[95]

No doubt true—and no doubt there will be further excellent exchanges in the future as nanotechnologists and cryobiologists continue to trade information and debate. This is how excellent science has always been done and how, it is reasonable to contend, cryonics ought to be done also.

Some General Controversy in Nanotechnology

No field of scientific endeavor is without its share of controversy; nanotechnology is no exception. In a 2001 article in the well-known, widely respected magazine *Scientific American*, Dr. Richard Smalley, who had won

a Nobel Prize in chemistry in 1996, argued that the development of assemblers as proposed by Eric Drexler was simply not feasible.[96] The position of Smalley seems strange indeed since he wrote of nanotechnology, a year later, that "It holds the answer, to the extent there is one, to our most pressing material needs including energy, health, communications, transportation, food, and water."[97] Further, in August 2000, Smalley had remarked in a National Public Radio interview: "It is true that it seems as though almost anything can be done if one can position atoms in the right place, but it's not going to be simple and overnight."[98] Eric Drexler had never maintained, of course, that the development of assemblers would be "simple" or "overnight."

Nevertheless, for some time a debate raged between Drexler and Smalley as to the basic feasibility of Drexler's concept. Others weighed in on the discussion, among them Ray Kurzweil, noted inventor and futurologist. In his book *The Singularity Is Near*, Kurzweil wrote " … if Smalley's critique were valid, none of us would be here to discuss it, because life itself would be impossible, given that biology's assembler does exactly what Smalley says is impossible."[99]

Kurzweil's observation reminded this author of something once remarked by well-known cryonics pioneer Curtis Henderson. Though he never saw combat, Henderson had been trained as a fighter pilot near the close of World War II. He said it was always amazing to him how reputable scientifc figures in the centuries before the Wright Brothers could maintain that a heavier than air flying craft was impossible "with birds flying around their heads every day." Similarly, Smalley seemed to be arguing from the standpoint of being a living example of what he said couldn't be done.

In 2003, the Center for Responsible Nanotechnology also added their voice to the discussion:

> Smalley's strategy, both in the 2001 *Scientific American* article and in the current debate, has been to equate Drexler's proposals with something unworkable and then explain why the latter can't work. Thus Smalley's comments do not directly address Drexler's proposals, but attempt by example to show fundamental problems with his underlying theory. However, both of Smalley's attempts have failed, and the second failure is noteworthy for what it reveals about the weakness of Smalley's position.[100]

Further, Eric Drexler had, during the controversy, published a point-by-point rebuttal to Smalley's position, to which Smalley never replied. Regrettably, Smalley succumbed to cancer at age 62 in 2005 (with no interest in cryonics, to the author's knowledge).

Whatever one's viewpoint, the fundamental standard in any scientific dispute is what does the evidence say. Carl Sagan very well explained this in his book *Broca's Brain*. Paraphrasing, he pointed out that there was no essential difference between believing in DNA or in UFOs, in sorcery or in nuclear physics, in a lot of other things *except for the evidence*. That standard is what has to apply to cryonics and to Drexler's concept of assemblers or Smalley's critique of it.

There has been progress in the factual and evidentiary basis of nanotechnology, both in general and, recently, in the very specific area that Drexler originally referred to, now frequently known as Molecular Nanotechnology or MNT. In his famous 1959 talk, Richard Feynman gave the resolution of electron microscopes, useful in determining an atom's position, as about ten angstroms. Today, the same general type of electron microscope (there are different "families" of them), can resolve around a half an angstrom. An instrument Feynman said needed to be improved and which might be crucial for progress in nanotechnology, was enhanced several fold. Another, even better instrument for revealing fine scale, the scanning tunneling microscope or STM, makes it possible to image individual atoms but also to manipulate them. STMs were long in use for atomic manipulations at the time of Smalley's objections, one famous, early example being the 1990 effort of IBM's Almaden Research Center in San Jose, California. There the letters "IBM" were spelled out in 35 xenon atoms on a nickel substrate. The STM, of course, is now far too big and cumbersome to be of much use for cryonics resuscitations, yet it is a strong sign of ongoing progress, and there are others. Over the years, numerous reports of applications based on nanotechnological thinking have appeared. Each advance, however small (pardon the pun!), adds credence to this dynamic and interesting field.

If nanotechnology, as it appears, will ultimately attain the dream of Drexler's MNT, Michael Rieth's remark in his book, *Nano-Engineering in Science and Technology*, becomes quite relevant: " … if we can build anything in any quantity, the practical question of 'What can we build?' becomes a philosophical one: 'What do we choose to build?' … "[101] One thing we, as human beings, will surely build are devices to aid the sick and injured among us. Our nanotechnology must work at the subcellular level to help physicians in unprecedented ways. Dr. Sam Bhayani, a surgeon who works with the revolutionary DaVinci robotic surgery system, is already saying that system makes him feel like "the Six Million Dollar Man … it makes me faster, better, stronger …."[102] The DaVinci surgery system allows the surgeon to be in any location in the world as long as the unit is hooked up via a telecommunications link to the mechanical end that would service the patient. Bhayani goes on to say "I imagine a future where robots don't only go into the body and take out tumors but also can go into our genes and alter how we produce tumors, alter our longevity … that nanotechnology is going to happen in the next hundred years, it's just on the cusp of today … "[103]

Bhayani's focus is on surgery and other normothermic medicine, but involves the ability to work with sub-cellular structures, to repair those structures, to replace molecules where they need replacing, and to move molecules

from their incorrect to their correct position. The more or less identical technology will be useful in the revival, repair, and rejuvenation of cryonics patients. Further, some very recent evidence indicates that Bhayani may be way too conservative in his time estimate of "the next hundred years," plus striking a severe blow against Smalley's anti-assembler argument. It is that the first molecular assembler has actually been developed! The advance was reported by David Leigh and his team at the university of Manchester School of Chemistry.[104] The device developed by Dr. Leigh and his group is primitive compared to the body's "natural assembler," the ribosome, that works inside living cells, and also to Drexler's idealized concept of an assembler. Yet it is a big, big step in the right direction.

An analogy with aviation comes to mind. The magnificent aircraft that routinely cruise the skies today are long removed from the rattling contraption of fabric, wood, wire, and chains that the Wright brothers first coaxed aloft at the turn of the last century. That, however, was the prototype of today's great mechanical birds and we are similarly confident that today's scientific minds are on the right track in perfecting the assembler—and even if another route entirely from Leigh's work is ultimately chosen. This work will continue, regardless of what anyone may say or think.

Eric Drexler and "Radical Abundance"

In 2013 Eric Drexler published *Radical Abundance: How A Revolution in Nanotechnology Will Change Civilization*. This book is an excellent companion and addendum to his earlier work, *Engines of Creation*, which appeared in 1986. It is a cautionary note but also is filled with hope for better days ahead for the whole human race. In an interesting sideline Drexler reports that the word *nanotechnology* he used, for the controlled manipulation of matter at the atomic scale, came into his head between the first and second drafts of *Engines*; in *Abundance* his preferred term is *Atomically Precise Manufacturing* (APM).[105]

In high school Drexler was concerned over the pressing question (still a valid one) of whether modern civilization could be sustained given its finite resource base. Oil reserves cannot last forever, as one for instance, given the gargantuan consumption our society demands and the geologically slow rate that nature produces new oil from dead organic matter. Drexler studied the book *The Limits to Growth* by Donela H. Meadows; there it said that economic growth would eventually be halted by the world's limited resources. But Drexler saw a serious flaw in the argument: nowhere did it consider resources off-planet, neither in the solar system nor beyond it. NASA at the time was engaged in a vigorous space exploration effort, including manned lunar landings, while attempting to make spacefaring a routine endeavor. As Drexler put it:

> "The restricted vision embodied in *Limits to Growth* raised questions that led me to explore what might be found outside the world it had framed—to look outward, at first,toward deep space, but later inward, to explore the potential of technologies in the nanoscale world.[106]

Drexler contacted Dr. Gerard K. O'Neill, an MIT professor whose 1976 book, *High Frontiers: Human Colonies in Space*, offers daring plans for extending human civilization beyond the confines of our planet. At a time when NASA vehicles were cramped for living space, O'Neill proposed miles-wide, sun-orbiting habitats with spin-induced artificial gravity so humans could begin colonizing the "high frontier" under something like familiar conditions. Drexler, however, wondered what resource base would sustain such an effort. The space colonists would need the usual food, clothing, shelter and many other things. Majoring in "interdisciplinary science," Drexler studied everything from plant physiology to vacuum metallurgy with much in between related to space settlement. One particularly interesting topic was lightsails/solar sails, miles-wide rotating structures in space with thin, reflectve panes which are pushed around by the pressure of sunlight. Data indicated that lightsails using aluminum sheets 100 nanometers (or about 300 atoms thick) would work.

300 atoms across is pretty tiny; another step or two and you are working right at the atomic level. Drexler patronized the MIT library system to study up on this. The wonders of the molecular world were fascinating, along with the concept of building things with atomic precision. Calling himself an "information omnivore,"[107] he hit on a burning question: "What could be built using the machines that nature's own machines could be programmed to build?" Beyond this was a further question: "What could be built using machines that could be built using those machines?" and so on.[108]

> Indeed, looking at the molecular machinery of life, we find that proteins can fit together to form motors, sensors, structural frameworks, and catalytic devices that transform molecules; protein-based devices also copy and transcribe data stored in DNA. Most important of all, machine systems built of biomolecules can serve as programmable manufacturing systems that build components for new molecular machines.[109]

In short, APM ought to be possible starting from nature's own tools developed in and for living systems. And APM, in Drexler's view, will underwrite the fourth of the great historical revolutions that have shaped civilization, the worthy successor of the agricultural, industrial, and information revolutions. The first two of these sparked the one that followed, and so we expect that the information revolution, the explosive growth in computerized control and data processing and exchange, will set the stage for the revolution in the human condition wrought by APM. High quality goods and complex, automated services should then be ours at extremely low cost. Currently many manufacturing operations are automated and re-

quire little in the way of human intervention. Continuing this trend, in the ultra-high tech world of APM, computerized manufacture from common and inexpensive raw materials should give us a world in which many problems of industrial civilization will be greatly minimized or disappear. More expensive and scarce materials such as iron, lead and tin could be replaced by more abundant and cheaper ones, such as carbon, nitrogen, oxygen, and silicon, which will also befriend the environment. (Mining interests might suffer but that should be a relatively minor issue.)

One plus would be the ability to do complex manufacturing on a local basis, instead of depending on lengthy supply chains to get raw materials from supplier to consumer. It should make abundance widespread, notwithstanding the economic disruptions that would have to be managed along the way, from the shutdown of industries of long standing that are no longer essential. Inevitably, there will be losers as well as winners. (An old cartoon that illustrates the general point shows the chairman of a failing company back in the 1960s dressed up in late 1800s garb, exclaiming to his Board of Directors, "I don't understand it! Why are we losing money? We make absolutely the best candle snuffers in the world!") But the benefits overall should far outweigh the downsides.

One heartening thought is that no new physics should be involved. The APM revolution will be based on engineering not any new science.

As Caltech physicist Sean Carroll puts it:

> "Over the last four hundred or so years, human beings have achieved something truly amazing: we understand the basic rules governing the operation of the world around us. Everything we see in our everyday lives is simply a combination of three particles—protons, neutrons, and electrons—interacting through three forces—gravity, electromagnetism, and the strong nuclear force. That is it; there are no other forms of matter needed to describe what we see, and no other forces that affect how they interact in any noticeable way. And we know what those interactions are, and how they work … As far as our immediate world is concerned, we know what the rules are."[110]

Once you know "what the rules are" the job is then to begin applying them to the desired aims. No doubt great improvements in individual engineering capabilities must occur before APM can be feasible. But once it happens the prospects are vast indeed, including substantial improvements in human health, for are we not made of atoms also? There, as Ralph Merkle put it, the job is to make sure to "*change arrangements of atoms that are 'unhealthy' to arrangements of atoms that are 'healthy'*"(emphasis again added). The relevant physics is well-understood. So it is then an engineering problem to make sure the "right atoms are in the right place" for a particular solution, a task for which APM is particularly suited since that is, at bottom, its basic design principle and goal.

Which doesn't, of course, make the problem simple. It's nearly three decades since *Engines* appeared, but APM is still basically on the drawing boards. And the problems aren't just technical either. Social and political issues also come into play, as in any human endeavor, and even semantics raises impediments. While to Drexler himself nanotechnology meant atomically precise manufacturing or fabrication, others broadened the meaning to include anything pertaining to the atomic scale. In the confusion, sound science and engineering too often gave way to science-free fiction.

> In retrospect, a clouded perception of facts marked the start of a perfect storm of dreams, nightmares, and confusion. The dreams boosted efforts to bring federal funding, while the nightmares threatened to block it, and confusion ensured misguided responses.[111]

To make things worse:

> "… neither facts, nor up-to-date concepts, nor technical publications could anchor discussions to reality."[112]

The result was, for a while, a loss of opportunities. Fortunately, here as in many other venues, the "Dark Ages" lasted a while but not forever:

> "Struggles fade, new leaders rise, opinions change, and actions follow. Even in the United States there's been a strong rebound from the times I've described."[113]

Another of the basic problems is a fundamental difference between the way science and engineering work at achieving their results. A scientifc theory, no matter how well constructed and how authoritative its original proponent (even the great, revered Albert Einstein), just needs one solid but contrary example to bring the whole edifce crashing down. A case in point is the belief, prevalent around 1900, in the "ether" as a medium for propagating light waves. This theory was dispelled by experiments showing something far more strange and subtle: the speed of light measured constant in all inertial reference frames, independently of their motion relative to other frames, something that could not happen with the ether theory as formulated. The theory simply died on the vine (albeit reluctantly for some), to be replaced by Special Relativity. In engineering, however, one design failure doesn't mean that all designs will fail. Instead, concrete reasons and, frequently, already known general methods of failure, are examined, the design is strengthened or altered as needed, and the whole project begins again, albeit in a slightly new direction.

An example of this in the traditional engineering world was the failure, in the 1950s, of the Lockheed Electra L-188 passenger airliner. Two crashes in which a wing on each aircraft came off in flight, resulting in the death of all aboard, were due to a problem involving "whirl mode flutter"which was, at the time, quite well-known to the engineering community. After the problem was inves-

tigated and this method of failure was determined to be the cause, structures on the aircraft were redesigned. With these highly successful modifications, some versions of this plane, such as the PC-3 Orion military aircraft, fly into hurricanes during weather and research-related flights today.

Regrettably, the breakup of the wing structure due to a mode of failure that was already well-understood led, in part, to low sales of this aircraft and its eventual discontinuation as a regular passenger airliner (although some still fly in passenger service in remote locations). At bottom, though, the problem wasn't a scientific one but an engineering one which required engineering thinking to solve it.

Which is why, ultimately, folks in the engineering community are generally better suited when, as in APM, systems-based engineering is needed to move things forward. This isn't to denigrate scientific qualifications or work in the least. It's just that engineering is a type of thinking that is as specialized and recondite in its own way as scientific thought. And when you're in another area of specialty than your own, it's very easy to make mistakes in your reasoning, even if you're well-educated and highly intelligent.

As an example of this in cryonics, a Ph.D. cryobiologist who is an opponent of cryonics wondered aloud on a nationally televised program where the blood to revive cryonics patients was going to come from. Any blood banker in day-to-day hospital work could have told him. The cryobiologist was not lacking in high-level competence and qualifications for his specialty. It's just that this particular issue was not in his areas of expertise, due to our modern need for highly specialized work assignments.

In *Radical Abundance* Drexler talks about the scientist who wrote that nanogears and other moving parts of nanotechnological devices could not work in some circumstances since they would be "gummed up" by biomolecules: "The answer, of course, is to keep gears in a gearbox, and to place all the critical moving parts inside a sealed shell."[114]

It's easy to criticize this scientist who didn't think of the answer or the cryobiologist who didn't think of the earlier one. It's just, again, that science isn't engineering and engineering isn't science. The two are deeply intertwined and exchange information and influence, but still have rather different ways of thinking and approaching goals. Anyone from either side, no matter how intelligent or competent, is going to have limitations in specialties not his own.

A more mundane example of the problems of thinking outside one's areas of expertise is seen in the movie *Von Ryan's Express*, a fictional film set in World War II Italy. There, a group of Allied POWs riding a commandeered train are trying to escape to neutral Switzerland. A section of track ahead of them is hit by German aircraft, rendering it impassable. Meanwhile a train behind them full of German troops is in hot pursuit, though still some distance away. Voices murmur, What to do? Lay new track! Yeah, where from? From behind the train! uh—yeah, makes sense … . You tear up track behind the train—you don't need it anymore nor do you want the guys behind you to have it—and use it to repair the damage ahead, so you can move forward. (The train does finally make it to Switzerland, with some, at least, of the POWs escaping to freedom.)

Once the answer is thought of, as above, it seems obvious. The average moviegoer, however, will be distracted by all the rapid-fire action in not-too-familiar settings so that this solution is likely to be a surprise, in a situation that appears hopeless. In this case, if you aren't thinking like a railroad worker, the answer isn't readily apparent.

Similarly, if you're a scientist and not used to thinking like an engineer (and vice versa), it's all too easy to make mistakes in judgment in what can and can't be done outside your specialty. In addition, for even highly trained and experienced personnel in any field, such as aviation, a moment's distraction or confusion can lead to sometimes deadly errors.

With engineers in charge the path to APM may be feasible yet still not "easy and quick." A parallel case is the launching of the first artificial Earth satellite, Sputnik 1, in October 1957. Work going back to the 1800s preceded this landmark event. A pioneer of space flight, Konstantin Tsiolkovsky, played an important, preliminary part, working out orbital details and other requirements in a paper published in 1903, a few months before the Wright brothers made their first, historic flights at Kitty Hawk. (Though largely self-taught, Tsiolkovsky was for a while instructed by scientific immortalist philosopher Nikolai Fedorov. He was also was inspired by the science fiction of Jules Verne). Tsiolkovsky died in 1935, long before Sputnik was launched or Apollo 11 roared into orbit on its journey to the moon. But his determination to search for answers to what has been one of humanity's greatest exploits, his working in what are, to us, primitive conditions with no Internet or other easy, electronic communication, is a shining example of what Drexler calls "exploratory engineering"[115]

Exploratory engineering is not, Drexler reminds us, a guaranteed superhighway to all we might desire. Instead it charts a path between engineering as presently practiced and what has not been achieved but is still, as far as one can tell, permitted by physical law. It means constantly questioning your designs and whether your attempts at what you are trying for are reasonable based on existing engineering (and scientific) literature and known scientific fact.

This has to be coupled with the constant caution of making sure your chain of logic in deriving your engineering concepts is sound and solid. It also means, as in the case of Tsiolkovsky, having the courage of your convictions and the willingness to have your concepts and designs subjected to the criticism of your peers (and others). It also means being subjected to naysayers who may be well-intentioned and seemingly highly qualified,

but also could be dead wrong. (The case of the scientist concerned about "gumming up" nanomachinery comes to mind.) In short, it's no place for dreamers who dismiss the real concerns with waves of the hand, but instead is for those whose bent is the long, hard work needed to turn dreams into reality.

And Eric Drexler and others certainly have begun to do just that. The possibilities outlined in *Radical Abundance* are numerous: from tremendously improved computing devices and software to cheap sources of power, medical technology that modern day health care workers can only dream about, and other things not even touched on here. As Drexler puts it in his writings about the time of "a perfect storm of dreams, nightmares, and confusion": "The opportunities are greater today than ever before."[116]

The Future of Nanotechnology and Cryonics

The bottom line for cryonicists will be the effect of nanotechnological efforts in two areas. The first is the more restricted area of technologies needed to revive, repair, and rejuvenate cryopreserved humans. The second will be to ensure that these recovered patients will be adequately supported and provided for as they reenter society, with provision for fellow humans who would be important to them. Drexler is right in remarking, about the future of nanotechnology: "Timelines, pathways, and ultimate potential will remain persistent unknowns."[117] Still, as this and other technologies become available, those that are tested and found safe and useful will be more or less automatically put to use in ways that have always been of concern to humans. Applications in agriculture, power generation, the use of non-polluting raw material resources, the development of stronger and better materials for use in construction, aviation, and myriad other places, etc., will transform the plight of humans.

Besides this, there is medicine. Medical knowledge and treatment has been and will continue to be of great concern to humanity. This certainly applies to those of us who are involved in cryonics—and we are fortunate. For we should benefit from much the same technology that will become available for more general medical application: the same instruments and devices and the ability, with the assistance of nanotechnology, to enlist both diagnostic and therapeutic techniques and regimens unheard of today.

As Eric Drexler puts the future of nanotechnology:

> "Today a radical abundance of symphony and song—and words, and images, and more—has brought luxuries that once had required the wealth of a king to the ears and eyes of ordinary people in billions of households.
>
> It seems that our future holds a comparable technology driven transformation, enabled by nanoscale devices, but this time with atoms in place of bits. The revolution that follows can bring a radical abundance beyond the dreams of any king, a post-industrial material abundance that reaches the ends of the Earth and lightens its burdens."[118]

There are, basically, two areas of work essential to cryonics improvement and ultimate success. One is increasing the capability to safely store tissues and organs (and, ultimately, one hopes, organisms) at cryogenic temperatures. This goal can be summed up as "damage free cryonics." It would not, of course, be the full fruition of Robert Ettinger's statement of fact plus his assumption. But cryonics patients, after cryopreservative procedures had been applied and they were safely stored at low temperature, would be no worse off than when the cryonics team first got to them. The damage to the patients would be limited to whatever disease or injury they were suffering from combined with whatever period of ischemic damage occurred due to delays in getting to them. One would hope that, as time passes and cryonics gains more acceptance, the amount of ischemic damage would be kept to a minimum due to more available teams with faster response. Tissue ischemia is also a big concern of conventional medicine. Interventions by highly competent researchers, with specifics as yet unknown, may occur independently of cryonics and reduce this difficulty to a minium.

The other area of work is in developing full capabilities of reviving, repairing, and rejuvenating those who have already undergone solid-state hypothermia (again, one of the phrases for the "end state" of cryonics patients). The "bad news" is that there is no way to predict exactly when either one or both of those areas of work will reach their maximum effectiveness. The "good news" is that, for those already cryopreserved, time has been suspended and centuries can pass in pursuit of the needed technology. For those who are yet to be cryopreserved, the further "good news" is that each day that passes brings new opportunities for improving cryonics protocols and possible resuscitation procedures. With or without any urging from cryonicists, Eric Drexler, Ralph Merkle, David Leigh, and others mentioned here (and, no doubt, yet to be born), will continue determinedly and doggedly to work in their respective fields wherever the facts and evidence lead them. The work will go on whatever each person's opinion of cryonics is. It will fully complement the equally important efforts of another man of science who was also the "father of cryonics," Robert Ettinger himself. What is now generally known as nanotechnology (or, as Drexler now prefers,

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About The Author

York W. Porter, born in 1952, attended Berea College in Berea, Kentucky for two and a half years and, in the Fall 1974, began working in a rural Kentucky hospital in the Department of Radiology. Diversifying through the years, Mr. Porter worked for one year on an ambulance crew and spent several years in a hospital laboratory setting, plus about a year doing respiratory therapy work. He has worked fairly continuously in the field of medical radiography, working as a staff tech at various times in four rural Kentucky hospitals, primarily in the fields of general radiography and computed tomography. He also has worked in the past, on rare occasions, at a Magnetic Resonance Imaging (MRI) center. He is the President of the Immortalist Society, at the time of this writing, and serves also as the Executive Editor of Long Life Magazine, the "house publication" of the Immortalist Society.

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Theo Rogers is Our Next "Millionaire"

Introduction by Jim Yount

Theo Rogers is the 5th of our hypothetical "millionaires." In this series, prominent cryonicists are asked the question: If you had a million dollars to spend for cryonics, either to enhance your own chances of ultimate second life or to generally help the cryonics movement, how would you use your million?

As authors of these articles we look for individuals who have both a good knowledge of cryonics and who have a background in money management. Theo Rogers fits both categories quite well. Theo first decided that he'd rather go into a cryostat than a coffin while still a toddler, after seeing a story on cryonics on TV. The Rogers family followed up on Theo's interest by cryopreserving the family dog when Theo was still at university. He is a long time member of both the American Cryonics Society and the Cryonics Institute.

Theo has achieved degrees in psychology and linguistics, a graduate certificate in banking and finance, and a master's in wealth management. Theo is also an accomplished author, and has published a number of well received articles and even a nonfiction book. He is currently working on his first novel.

--- Jim Yount

If I Had A Million Dollars,

by Theo Rogers

For the early 21st century cryonicist, there is one pressing question that stands out above all others: How do we build an economic and organizational framework that will work as intended for a period of decades, and possibly even centuries, in our absence?

There are two reasons why I consider this our most pressing problem:

1. I believe that we are indeed decades, and possibly more than a century, away from the successful resuscitation of even the best preserved of our vitrified peers.

2. I do not believe that at this stage in the game, with or without my million dollars, any cryonics organization has the resources to significantly hasten the arrival of the technology necessary to bring about that resuscitation.

Let's pause for a moment and consider both those statements.

I don't think too many cryonicists this side of Futurama would take issue with the first of my claims. I'm also going to go out on a limb and say I think I'm on fairly solid ground with the second one too. If we go with the cryonic orthodoxy and figure the most likely route to successful resuscitation is advanced medical nanotechnology, the development of that technology is a project likely to span both decades and countless scientific careers, including at least one or two certifiable geniuses along the way. Now, to be clear, I personally believe that this technology *will* one day arrive. But I also believe that for the purposes of bringing that day any closer, a million dollars barely rates as a drop in the bucket.

Of course, it is possible that someone will find some kind of a short cut to resuscitation, as hinted at by the experiments with frozen cat brains that Marta described in her article. But I'm also inclined to suspect that the kind of resuscitation we'd get would be sloppy at best, and highly likely to produce a resuscitation that none of us would want. I'd rather spend an extra few decades in a cryostat than a nursing home. Plus, like Marta, I love cats. I have two beloved feline furchildren of my own who've already preceded me into those cryostats – and if all goes according to plan, one day I'm going to have to look them in the eye. And by the time that day comes, it's entirely possible that I'll be explaining

myself to beings possessing *at least* human level intelligence.

Not that I'm saying that it'll never be a good idea for cryonics organizations to spend money on resuscitation research. But I am saying unless we have *hundreds* of millions, or better yet, *billions* of dollars to play with, the time to spend money on that project is after the basic research has all been done. Not before. Otherwise we're just tilting Quixotically at windmills.

Or, to look at it another way, if cryonics is an ambulance into the future, for now, for right now, our primary focus has to be on doing everything we can to help our ambulance make it all the way to that future.

"Simply put, if we ourselves are ever to span the centuries, we must first build organizations that can do the same."

Plus, it's worth considering the possibility that in much the same way that many of today's cutting edge researchers are just itching to clone a mammoth, by the time we do find ourselves on the cusp of resuscitating vitrified patients, the project itself may be deemed "sexy" enough to attract some of the finest minds in medicine. Even without the custodians of those patients ever having to spend a dime.

At least not for the first few! Once it becomes routine of course it's a different story. But for now at least, I'd say that just getting to the point where it is routine is a big enough goal for us. Just so long as we bear in mind that we will need to set aside funding for resuscitation at some point.

Okay then. If we're not going to spend our million on R&D, what are we going to spend it on? How exactly do we maximize the chance that our humble ambulance will become a carriage that rolls on through the centuries, long enough to carry us beyond death in style worthy of the highest of high Gothic fiction?

Here are three suggestions...

1. Marta was onto something with that whole lobbying idea...

An organism that survives long term does so because it is well adapted to its environment. But of course, that can be a two way street: many successful organisms, most notably humans, adapt their environment to suit them.

So how can we better adapt our environment to suit us?

In her own article, Marta talked about how easy it is for a judge, a bureaucrat, or a legislator to take the conservative option and "just say no," consigning vitrified patients to the grave. Clearly, there is a role for political lobbying here. But public officials themselves need not be the sole targets of our lobbying. If the wider society comes to believe that cryonics is, at the very least, a reasonable thing to try, and that it is as much a person's right to choose cryonics as burial or cremation, then going against that tide by saying "no" becomes a lot harder.

Plus, I think it wouldn't exactly hurt if we could recruit from among the great and the good.

What – you think a judge, a bureaucrat, or a legislator wouldn't get a little nervous about ruling that Einstein's brain, or Shakespeare's, or Churchill's should rot in the ground instead of being preserved?

2. How about a whole fleet of ambulances?

I don't want to turn this article into a plug for any particular cryonics organization, but one reason I became involved with the American Cryonics Society (ACS), and am planning on organizing my own suspension through them, is because I figure it's a good way of hedging my bets.

In order to understand my thinking here, you need to understand that unlike the Cryonics Institute (CI) or Alcor, the ACS doesn't have any suspension facilities of its own. It does do an annual engineering audit of CI, but... more on that later. For now, my point is this:

Let's say that when I kick the bucket, the ACS sends me to CI, which is where it's currently sending its members. Now, let's say that at some later date, the ACS itself collapses. In this scenario, I'm no worse off than if I'd gone directly to CI – or at least, no worse off save for the fact that my personal trust will be a little poorer. The important thing is that my chance of resuscitation hasn't gone down at all.

But now let's say that it's CI that undergoes organizational collapse. In this case, if the ACS still survives, there's at least a chance they could run some kind of rescue operation on their members, and transfer us to another facility.

In short, what we have here is a system with built-in redundancy: my chance at resuscitation is no longer wholly dependent on picking just one cryonics organization and hoping that it makes it all the way to the finish line. Instead, I've opted for an arrangement in which if either organization makes it through, I have a pretty good chance.

Now, my real point is this: one could easily imagine setting up multiple organizations, legally independent entities, whose entire purpose is to function as "redundant ambulances," rescuing the patients of failed cryonics facilities. Perhaps funded by something like an insurance premium from members, be those members individual cryonicists or member organizations.

We could even think about writing into the constitution of each "ambulance" organization the rule that it is required to splinter off a certain portion of its assets into a new and legally distinct ambulance entity once its assets exceeded its obligations by a certain percentage. So our ambulances become self replicating legal entities.

I'd say a million dollars could serve as pretty decent seed capital for something like that.

3. Financial as well as engineering audits

In her article in this series, Marta Sandberg mentioned that the ACS does regular audits of CI. But it's important to be clear about exactly what kind of audits we're talking about. To date, the ACS has only ever done *engineering* audits of CI. So they go, poke around, count the cryostats, and make sure the bodies and the liquid nitrogen are all where they're supposed to be (I suppose it shows that I'm not an engineer).

But this is only half the story. There's also the matter of auditing the books. The accounts.

The money.

The thing about audits, particularly of the accounting kind, is that everyone agrees that *other people* need to be audited. Nobody wants to be audited themselves. Nobody. It's a colossal pain, and if you know you're not crooked, you also know it's a complete waste of time and money.

But here's the thing: ***if audits aren't set up by people who don't need to be audited, by the time people who do need to be audited start running things, it'll be far, far too late.***

So I'm making a plea to the honest people who are running the show to spend some money setting up a process of regular financial audits – and to do so while it's still a complete waste of time and money. Because one day you'll very likely be the ones in the cryostats. And then... it may or may not be a complete waste of time and money.

Now, one more word about audits.

The tricky thing about auditors is that they're often hired, paid, and fired by the very people they're supposed to audit. This naturally creates some conflicts of interest. If you look at... oh, I don't know: let's just say every single marketing textbook every written, what businesses are supposed to do, and indeed, *must* do in order to survive, is find out what their customers want and give it to them. But of course, if an auditor does that, what they naturally do is give every single client's accounts a clean bill of health – regardless of whether it's deserved or not.

If you check out some of the biggest financial scandals of the past decades, you'll see this same kind of relationship repeated over and over again: financial services businesses simply giving their customers what they want. In fact, this not only happens with auditors, but with a great many so-called "experts" whose supposed role is to provide independent financial assessment. Like the ratings agencies who gave "toxic" mortgage backed securities a AAA. They were just giving their clients--the sellers of those securities--what they wanted. Or even a suburban firm of financial planners who steered the people who came to them for advice into whatever investment products paid the *planners* the highest commission. From the heights of Wall Street to your local mall, we see this relationship repeated over and over again. Whenever the "advisor" is paid by the very person whose accounts or whose product they're advising on, it's trouble.

Does this mean auditing is a complete waste of time? Not necessarily. But it does mean that we need to be careful about how auditors are hired, paid, and fired. My own view is that auditors of public companies should be appointed by a government agency rather than hired by the companies themselves. This might not be an option right now for cryonics, but there are still rules that we can put in place that offer some protection.

Auditors need to have an "arm's length" relationship with the organizations they're auditing. Auditors, even retired former auditors, should never serve on its board, or be otherwise on its payroll.

Auditors need to be changed regularly. When the relationship grows too close, there is more potential for corruption. To say nothing of an ongoing revenue stream the auditor might be more motivated to protect by turning a blind eye to any irregularities. Auditing firms and businesses closely associated with them should also never be allowed to accept any non-auditing work from the entity being audited – this just gives the one being audited too powerful of a tool to use to either bribe or punish the auditor.

And... let's not forget, in this article, I have a hypothetical million dollars to play around with. Well invested, that could be used to set up a decent revenue stream with which to independently fund regular auditing of the major cryonics providers. If they go along.

The Big Picture

The fact that CI and Alcor have now been functioning for decades without a totally crippling incident is of course of enormous credit to the people running them. They have done a great service to the cryonics community. But if cryonics is to live up to our hopes of it becoming a truly century-spanning endeavour, that cannot be where the discussion ends. Rather, I would hope, it should be where it begins.

The same, of course, could be said of this article. Feel free to reject every single one of my specific suggestions. But if I've got you thinking more deeply, more seriously, and more critically about what it will take to keep an organization running to plan for a century or more, then as far as I'm concerned, it's mission accomplished.

Looking Back:
L.A. Law And Arguing For Cryonics

(Editor's note: The Immortalist Society Vice-President, Deb Fleming, made an excellent suggestion a while back that Long Life should have a regular column called "Looking Back" in which articles of interest from prior issues appear. The column below, from the February, 1990 issue of The Immortalist, as Long Life magazine was known in those days, is one such offering).

Introduction by York W. Porter, President Immortalist Society

From the Fall of 1986 until the late Spring of 1994, television viewers, at least in the USA, were able to watch a program by the name of "L.A. Law". Differing in approach and content from the usual legal dramas that had been a staple of television ever since its inception, L.A. Law brought a complicated story line filled through the years with numerous cast members, plots and subplots. Winning 15 Emmy awards and being well received by critics and viewers alike, the show was a big hit of its time and still great to watch even today. For cryonicists, one of the episodes from January of 1990 brought a pleasant change from the sometimes portrayal in some of the early media that cryonics is some sort of a cult or fringe group instead of consisting of the quite intelligent and rational folks that generally make up its core. In that episode, a judge grants a petitioner's right to have a premortem cryonics suspension instead of having to wait until her brain tumor progressed further and she entered clinical death. For the younger version of me, well, I couldn't believe what I was seeing. Part of the result was, I'm sure, due to plot and story line needed to keep television shows interesting and widely viewed. But part of it came, as I understand it, from the fact that the folks on the television end took the simple and intelligent step of actually talking to some well-informed cryonicists. Wish more folks would do the same before they begin spouting off half-baked information.

I'm sure some of the legal dramas that have appeared down through the years seem to practicing attorneys like some medical shows do to me, sort of "not quite correct" due to the need of the show to gather in viewers. Whatever its merits technically, the show was, at bottom, about advocacy.That is what each of us, as persons interested in this outstanding application of technology, should be doing. We are all advocates for cryonics and we need to be aware of aspects of that advocacy. In this article from February of 1990, an attorney who wished to remain anonymous writes about advocacy for cryonics in a court of law. The lessons from my point of view, however, also have application in other venues as well.

While the goal of allowing cryonics procedures to start being applied before one enters clinical death has yet to be attained, evidence on the cryonics side of the scales held by the "Lady of Justice" statue continue to mount. In the meantime, however, we need to be cognizant of continuing to advocate for those positions we know are right and moral and beneficial to our fellow cryonicists and ourselves. The advice given here can still be an excellent guidepost to that.

Pre-Mortem Freezing—Part 4: The L.A. Law Episode

The weekly television show *L.A. Law* (NBC, Thursday nights) had a story line devoted to cryonics on the episode broadcast on January 4, 1990. For those who missed it, here's a brief summary: a young woman was dying of a cancerous brain tumor. She had been through radiation therapy before, but the tumor was growing again, and the doctors agreed that she would die within a year. Within a few months she would begin losing her memory, and her mind, to the tumor. So she wanted to be frozen as soon as possible, while she was still in reasonably good health and spirits, without waiting for the tumor to spread through the rest of her brain.

It was the legal dilemma; the state didn't want to approve what it repeatedly referred to as "euthanasia" or "suicide", but there was nothing else medicine could do to save her.

In the end, the judge agreed that she had the right/freedom to be cryonically suspended now, instead of having to wait until the tumor destroyed her brain.

Sound familiar? It should, to readers of *The Immortalist*. Indeed, *The Immortalist* can take credit for provoking that story line and getting that issue out in front of the public on a primetime, award-winning show, which surely caused that issue to be debated in thousands if not millions of homes. In April of 1989, *The Immortalist* ran an article that specifically described that development and suggested that people who are dying should have the right which *L.A. Law* endorsed. Follow-up articles appeared in the May and June 1989 issues.

To the best of my knowledge, those articles were the first publication anywhere that explored the issues in enough depth and detail to make people realize there are serious legal rights involved which can be defended in a court of law. I suspect someone brought those articles to the attention of the writers of *L.A. Law*, and they responded by devoting a story line to it.

So, hats off to *The Immortalist* for publishing those articles.

But the real prize won't come from a TV show, or any other publication. It'll come when someone who is dying persuades a real court to recognize their right to privacy, autonomy, and religious freedom, by conceding that dying people have the right to decide what to do with the rest of their lives. I suspect it will happen before the decade is out, possibly within the next three to five years.

It's worthwhile to analyze the legal tactics shown on that episode of *L.A. Law*. Some of the maneuvers were either purely fictional, designed solely to play with the story line, or they were lousy legal strategy and should be carefully avoided by anyone fight this battle in court.

Some specific points:

1. The attorney representing the dying woman allowed the opposing side to make repeated references to "suicide" and "euthanasia". Indeed, the woman's attorney even referred to the process of cryonic suspension by using words such as "dying" and "death".

   Don't make that concession; fight it in any way possible. That issue is at the heart of the debate, so don't give it away. Any time anyone in court refers to cryonic suspension using words such as dying, death, suicide, or euthanasia, object and insist that the person use more accurate and appropriate terminology. People can call it freezing, cryonic suspension, or any other technically accurate phrase, but they cannot accurately call it "death" any more than they can call it "death" when bacteria are frozen and thawed.

   The dictionary defines death as "the permanent ending of life". That is what the word means; that's what people think of when they heard the word death. With the possible exception of Jesus Christ, no organism has ever "died" and then come back to life. By contrast, freezing is not irreversible, so it cannot be equated with death. Unless the opponents of cryonic suspension can prove to a court's satisfaction that cryonic suspension will lead to the permanent ending of life, they cannot properly or accurately refer to cryonic suspension as death.

   Some state laws define death by arbitrary, easily measured standards, such as when the heart stops beating, or when brain waves cease. But those laws are admittedly limited, arbitrary, and incomplete. They were adopted in order to give courts "bright-line" standards to follow in murder cases, wrongful death lawsuits, etc. Any number of doctors will agree that simplistic legal definitions of death break down and do not accurately apply in cases of medical treatment for the terminally ill. Therefore, simplistic legal definitions of death either should be avoided entirely in cases involving medical care for the terminally ill, or they should be used only if everyone openly recognizes their limitations and inaccuracies.

2. On the TV show, the so-called "expert witness" called by the dying woman's attorney worked for the cryonics company that wanted to freeze her. Obviously, he was not an objective and impartial expert, since his company stood to profit by doing the operation. In that type of situation, if you need an expert, hire someone who is financially impartial. For example, scientists and doctors at several universities (such as the University of California at Berkeley) are doing work on cryonic suspension and revival. They would make much better expert witnesses.

3. The so called "expert witness" on the TV show got tangled up in a ridiculous debate over whether a human head might

be attached to the body of a horse. That possibility is total nonsense, and it should have been labeled and rejected as nonsense as soon as the state attorney asked about it. Don't speculate on fringe issues; don't take the bait if the opposing attorney tries to tangle you up in debates that will clutter, confuse, and distract from your valid points. If a question or assertion by the opposing side is nonsense, call it nonsense and act like it's time to move on to the next real issue, without giving the false issue time to sink in and make an impact as though it is real and valid.

4. Although the word "insurance" was mentioned at one point during the TV trial, that issue was quickly dropped. In real life, expect heavy participation by any insurance company that might have to pay the bill. They're likely to send a lawyer who will try to represent the insurance company as an involved party during the court hearing. You'd better get your position coordinated with them before the hearing begins; at the very least, know what they're going to say.

Those are some of the main points. But this is just a response to a TV show. When the real test comes and it's time to go to court, all kinds of issues will arise that can't be covered in a short article. It'll take skill and strategy.

But then consider what is at stake. On one level, these court cases could do more to advance the cause of cryonics than anything that has happened during the last ten years. On another level, if people dying from incurable disease genuinely want to be cryonically suspended and can pay for it, they should have the right to do what they want while they're still in reasonably good health, rather than being forced to wait until their brains or internal organs are destroyed by disease. That's one of the ways I would define freedom, and I challenge anyone to offer a better definition in that situation.

The main thrust of the Bill of Rights is to protect citizens from abuses by government, because attorneys and bureaucrats who work for the government become too accustomed and develop rather peculiar ideas about freedom. A good example is Wooley v. Maynard, 97 S.Ct. 1428 (1977). A state had a motto on its license plates that read "Live Free or Die". One otherwise law-abiding citizen didn't like that phrase, so he covered it up using adhesive tape. He thought "living free" meant not having to carry around and display someone else's slogan. But he got arrested and prosecuted by state officials who apparently thought the real meaning of freedom was that everyone had to carry around the state motto on their cars. That case went all the way to the U.S. Supreme Court (the state lost), because the bureaucrats and attorneys working for the state never saw the absurd contradiction in what they were doing.

Think about that phrase. If you're a cryonicist, think about it twice: "Live free, or die".

(The author, an attorney, prefers to remain anonymous.)

Robert Ettinger: *The Legacy Continues*

Introduction by York W. Porter, President of the Immortalist Society and Executive Editor of Long Life Magazine

Robert Ettinger on Morticians and Cryonics

Robert Ettinger, as the "father of cryonics" was not only interested in the theoretical aspects of his concept. He was also very interested in seeing that the means were developed in order to carry it out. He was one of the founders of the Cryonics Institute, whose sole purpose is to engage in the preparation and storage of cryonics patients in a safe and effective manner until future help becomes available. In this article from December of 1995, he discusses his viewpoint on the use of an existing network of professionals and how they may be integrated into the carrying out of cryonics.

Morticians and Cryonics

By: R.C.W. Ettinger

Regardless of optimism or pessimism about chances in various circumstances, everyone agrees it is important to minimize delays in treatment of cryostasis patients. The Cryonics Institute sheep head work suggested that not just promptness of cooling, but also promptness of washout and perfusion, may be more important than the details of the procedures, within fairly broad limits. So how do we assure the best combination of minimum delay and optimum procedure?

Some organizations advocate and offer teams of professionals traveling to the site of death, preferably on standby before death occurs. One of the main problems with this is the very high cost—especially if these are long or repeated standbys and distant locations.

Another main problem is the inherent slowness of response to distant locations. Airline schedules alone can add many hours to the potential delays.

Some organizations, or their local auxiliaries, attempt to improve matters with teams of local volunteers or adjunct organizations at least to provide "stabilization" services. So far, the results of this do not seem impressive, and there is an inherent problem with volunteers and their competing personal priorities and work schedules.

The Cryonics Institute approach is to develop a network of cooperating morticians, equipped and trained for washout and perfusion in addition to their other functions. We believe this offers multiple benefits, and few if any irremediable drawbacks. In no particular order:

1. We have the benefits of working with recognized professionals in the "death" field, having the "establishment" on our side and thus bypassing many potential problems.
2. We have teams potentially available just about everywhere,

who are professional and yet do not have to depend on a high volume of cryostasis business for their livelihood.

3. These are people already with basic education and training in anatomy and surgery and simple types of perfusion. Their training and aptitude may not generally match those of surgeons or perfusionists—mortuary college standards are not as high as those of medical schools—but demands on them are also much narrower. To learn and practice any specific procedure—even a complex and precise one—does not require the breadth or depth of an M.D. surgeon. One might say that an M.D. (or D.O. or D.V.M.) surgeon is usually over-qualified for such work, while the mortician can be trained in it fairly readily.

4. Morticians can be hired for a fraction of the going rates for physicians or perfusionists. Even repeated and extended standbys become relatively affordable when the help is local and non-medical. Morticians also have scales of help available—licensed funeral directors for surgery, students and apprentices as cheaper helpers, office people for the telephone and paper work. We merely have to adapt a network, not create one.

5. Morticians are much less likely to turn up unavailable owing to prior commitments or different priorities. They are used to calling in colleagues as fill-ins, and many of them have more blanks in their schedules than physicians.

6. CI has already had patients prepared in this manner, with apparently satisfactory results, although work still needs to be done to standardize evaluation of performance.

7. As opposed to the general reluctance of physicians, many morticians welcome this work as a challenge and a broadening of appeal and a chance to do something more significant. In England, CI paid for the first transport unit built by Barry Albin, and he has since built four more at his own volition and expense, as well as contributing heavily to public relations there with many media exposures. The fact that he himself is not a cryonicist more likely than not adds to his effectiveness, rather than detracting from it. It tends to show recognition and acceptance even by those not personally involved, a kind of ecumenism that tends to deflate hostility.

8. The outstanding question remaining in some minds will perhaps be this:

   When/if CI offers more complex procedures at higher cost, will the morticians measure up? Will it cost too much to train and equip them? We can't have wholly definitive answers yet, but I think the outlook is positive.

   Meanwhile, we already have in some locations, and (preferably with the help of local members) can obtain in many other locations, morticians with the ability to perform current CI procedures of washout and perfusion, in addition to other functions. In the coming year(s) we expect substantial expansion.

Technology of Revival, part III - *continued from p34*

Atomically Precise Manufacturing), was not even named back when Ettinger wrote *Prospect* in the early 1960s. Today it offers a solid rationale for how cryonics can ultimately succeed in its life saving mission. The continued work by dedicated professionals in cryobiology offers the "other side of the coin" in the continued scientific improvement and, we believe, ultimate success of the world-changing concept of cryonics.

Robert Ettinger stated in *The Prospect of Immortality* (emphasis added): "Most of us now living have a chance for personal, physical immortality. This remarkable proposition—which may soon become a pivot of personal and national life—is easily understood by joining one established fact to one reasonable assumption. *The fact:* At very low temperatures it is possible, *right now,* to preserve dead people with essentially no deterioration, indefinitely. (Details and references will be supplied). *The assumption:* If civilization endures, medical science should eventually be able to repair almost any damage to the human body, including freezing damage and senile debility or other cause of death. (Definite reasons for such optimism will be given).[119]

The "fact" that Ettinger mentions in this world-changing book was already well-established in the 1960s when he wrote. Since then there has been continuing work by numerous researchers: Eric Drexler, Ralph Merkle, David Leigh, Brian Wowk, Robert Freitas, Greg Fahy and many others. Their efforts cover both cryobiology and nanotechnology. In addition there is ongoing effort to apply the lessons learned by persons in the various cryonics organizations and their associates worldwide. In this way Ettinger's "assumption" comes closer to fact every day and the connection between cryonics, cryobiology, and nanotechnology has gotten and will continue to get stronger with every passing year.

Final Thoughts

York W. Porter - Executive Editor

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Go Fly A Kite..

Days of my youth, looking back on them, were full of the wonderment of my early years. Simple things seemed to fill the hours with wonder. Everything from just blowing bubbles and watching them float away in the air to feeling the warmth of the sun on my skin kept my childhood mind occupied with thought and curiosity about the universe and all the myriad amazing things therein. I notice the same sort of general approach in terms of wonderment and general curiosity in the attitude and actions of young puppies. Virtually all things in the world are new and interesting to them and they run and play and bark with the unbounded enthusiasm of living creatures new to their surroundings.

Alas, the curiosity and "newness" to the world of my early youth has given way, I'm sad to say, to doing the things any adult has to do to get through the daily chores and tasks of the world. Things that I gave my full thought to in the days of my youth now simply are, frequently and very regrettably, just another "blur" going by as I'm moving from one chore to another in my daily routine. Still, sometimes the thoughts of my youth come back to me in unexpected and somewhat odd forms.

As regular readers of this column will know, I am somewhat enamored with railroads. Part of this comes from when I was still a curiosity filled youngster instead of a more jaded adult. As well as living within a few miles of working railroad lines that transported coal by literally the millions of tons over the years from the coalfields in the hills of the western part of Virginia where I grew up, I was also privileged to have a Grandmother who lived on a small hill just above a set of railroad tracks. At the bottom was the local depot that served her little community. Now sadly torn down due to the advent of the widespread use of the automobile and the resulting lack of need to act as a shipping and receiving point, the depot was a not infrequent stop for the trains that rolled through that area at that time on the Norfolk and Western Railroad.

In my case, I was a very lucky fellow to visit "Grandma" and to stand

on my tiptoes in her back yard and see the top of the locomotives as they sat waiting for freight to be discharged from the bellies of the freight cars they were pulling. After a short break, their engineers put them "in gear" and they headed off into the distance taking me, at least in my imagination, off with them headed for the exotic places the rails were connected to and which I had only heard about.

In the days of his youth, my father's family had been the recipient of a piano that was unloaded at the little N&W depot. The piano, to my wonderment when told about it as a young boy, was shipped all the way in from one of those "exotic places", the city of Chicago, Illinois, a place I was not to visit until I was well into my adulthood.

And the whole thing was made even more wondrous when I came to the gradual realization that the tracks and the rails and the whole operation in general hadn't just existed since the beginning of time. Seeming to have "always been there" to the child I was, the man I gradually became eventually realized the enormous amount of "blood, sweat, and tears" that it had taken down through the decades in order to make this marvel of modern civilization a necessary reality and a vital service to the major industry in my section for the country back in those days, which was the mining and shipment of the coal that was abundant in the region.

And it was a hard fought battle. One has to remember that much of the initial work of setting up railroads was done in the days in which muscle power, whether man or beast, was a substantial part of the operation of things. Roadbeds had to be graded, so called "ballast" in the form of gravel, had to be spread, and drainage and other structures like tunnels, water towers for the constantly thirsty steam locomotives of the 1800's and early 1900's, etc. had to be provided for, with all these things again built or developed by the muscle power of man and animals. In the very early days of railroading, there were numerous obstacles to be overcome, some of them involving natural wonders thousands and thousands of years old.

One of these was the gorge at Niagara Falls. Separating the state of New York in the United States from the province of Ontario in Canada, the Niagara River formed a natural barrier to interaction and commerce between the two regions. As the "Internet" of their day, in terms of being the latest "high tech" endeavor of the time, the railroads offered the promise of greatly increasing what commerce and interaction that did already exist by boat and more circuitous routes between this area of the United States and the corresponding area in Canada.

One of the problems, however, was the state of bridge building of the day, since such a structure would obviously be needed to span the wide gap that the Niagara River represented. The engineering of structures, while having made numerous strides by the mid 1800's, still wasn't the "high tech" venture we think of today where very powerful computers, with very well designed and intricately developed software, check and double check calculations and provide visual representations that designers can use to insure the safe building and utilization of a proposed structure of any kind, bridge or other.

As a matter of fact, bridges designed and built by entirely human calculations and effort and that were under nowhere near the stresses that were necessary to withstand by having to carry a fully loaded train had actually collapsed in spite of their apparent proper design and construction. Some of the American experts in the field of engineering feared that no bridge of any reasonable cost and design would ever be up to the task. The initial proposal to bridge the river was made somewhat more problematic in their eyes by the fact that the bridge was proposed to be a suspension bridge. While quite prevalent in Europe, suspension bridges were not in vogue in Canada or the USA at the time. William Hamilton Merritt, however, a prominent Canadian businessman and politician of the early to mid-1800s, initially impressed by a letter from his sons who were traveling in Europe and who had encountered a suspension bridge in Switzerland, decided that such a bridge was to be used to cross the Niagara River.

Finally, four engineers submitted their designs and proposals for a suspension bridge equal, it was hoped, to the task. One of these engineers was John Augustus Roebling. Roebling would later become the designer of a still standing suspension bridge that crosses the Ohio River at Cincinnati. He was also the designer of the now world-famous Brooklyn Bridge though, due to an accident, he didn't live to see its completion and his son, Washington Roebling, finished that job.

John Roebling, however, ultimately lost the initial bid to build the structure over the Niagara River to one Charles Ellet, jr. who had been born and raised in Pennsylvania but who managed, through his own substantial efforts, to become educated in a prestigious school of engineering in Paris. Coming home with the ability to be known as the first U.S. born citizen who was formally educated in the field of civil engineering by a school in Europe, Ellet made it his ambition to build suspension bridges in his native country.

Destined to die at the relatively young age of 52 as the captain of a Union warship in the Civil War, Ellet had as one of his initial proposals the bridging of the Potomac River with a suspension bridge. While there is little doubt in hindsight that the proposal would have worked quite well, his youth and inexperience, coupled with what was apparently a somewhat impetuous nature, led the "powers that be" to reject the proposal outright.

In order to obtain more credibility, Ellet began his career working with railroad and canal companies. He also began to contribute

Engraving of the kite-flying competition that laid the foundations (cable) to build the Niagara Falls Suspension Bridge. Date: circa 1883

articles about suspension bridges to various technical publications. These efforts gradually brought him credibility and he was successful at building his first suspension bridge over the 135-mile long Schuylkill River in his native state of Pennsylvania.

Ellet was a handsome man who also had the helpful gift of being a fine orator. Apparently he used those qualities, in part, along with some theatrics to help him present his proposals. His formal training in Paris, however, also led him to be well grounded in the practicalities needed in the construction of real-world structures and their use.

In the case of the suspension bridge over the Niagara River, for instance, Ellet was well aware of the then prevailing thinking about the dangers of bridges, and suspension bridges in particular. Rather than propose a situation where trains would travel totally unimpeded in their movement over his bridge, he decided that the safest method was to break the train up. The heaviest part of any train, the locomotive(s), would not proceed across the bridge. The railway cars would, instead, be hauled over on the single track of the bridge by either horses, cables, or by much lighter locomotives that were specifically designed for the short distance the bridge would represent. The cars would then be coupled to another locomotive on the far side of the river and proceed.

Before all the work could begin, however, one problem needed to be solved. Suspension bridges have the necessity of having heavy and thick cables to be eventually placed as supports for the roadway of the bridge that is being constructed. In order to do that, some sort of line has to be placed, as the very first step, over the chasm the bridge is designed to cross. Numerous ideas were thought up in order to send an initial line over the river. Everything from attaching a line to a cannonball, to using rockets, to towing a line with a steamship was thought of. Finally Ellet thought of the absurdly simple idea of having someone fly a kite across the chasm and then attaching bigger and bigger strings and then ropes and then wire cables in succession and dragging them across. A 16 year old boy by the name of Homan Walsh crossed to the Canadian side and finally got a kite to fly across the gorge, collecting a small financial reward offered by Ellet. With this small line as a starting point, the initial construction of the great suspension bridge was begun.

Ultimately serving as part of the route for slaves being guided by the Underground Railroad to freedom in Canada, the Niagara River Suspension Bridge was used from 1855 and was more or less continuously used until its replacement due to the heavier weight of modern trains in the last few years of the 1800s. While John Roebling later replaced Ellet in the completion of the bridge, it was Ellet's initial efforts that ultimately led to its construction. That included the ingenious idea of having someone to " Go fly a kite" as the very first step in its construction. Sometimes the simplest approach to things is the best. The simplest approach for you and your loved ones in terms of significantly extended physical life is to become involved in the wonderful idea of cryonics that Robert Ettinger thought up decades ago and which is growing in support every day. Join us as soon as you can. Use this simple concept of Ettinger's, as Ellet did the simple concept of using a kite, to form your own bridge to the future and the enormous promise and extended life that it will offer. You'll be very, very glad that you did!

Immortalist Society

Annual Financial Report

September 01, 2016 through August 31, 2017

I. Beginning Balance $31,934.00

II. Income

Final Payment from Cryonics Institute For Previous Magazines Published	$5180.00
Donations	$6327.83
Amazon Smile Program	$59.52
Subtotal Revenue	$11,567.35
Total Assets to This Point (Beginning Balance Plus Income)	$43501.39

III. Disbursements

ANB Research Program	$17000
Long Life Expenses	$9,351.19
Electronic Withdrawal Fees	$243.50
Subtotal Disbursements	$26594.69
Balance Forward	16906.70

ADDENDUM

Projected Additional Revenues

Dues and Donations	$3751.08
Advertising	$4000.00

Projected Additional Revenues (Continued)

ACS Reimbursement for Magazine Production	$4618.54
Total Additional Projected Revenue	$12369.62
Projected Balance	$29276.32

Cryonics Institute Statement of Assets, Liabilities, and Fund Balance

resulting from cash transactions

June 30, 2017

	General	Contract	Patient	COMBINED
ASSETS	Operations	Prepayments	Care	TOTAL
Current Assets				
Checking accounts	654,711.22		0.00	654,711.22
Savings/Paypal accounts	10,584.32	0.00	0.00	10,584.32
Total Current Assets	**665,295.54**	**0.00**	**0.00**	**665,295.54**
Property, Equipment, And Other Assets				
Land	62,500.00			62,500.00
Building	236,596.36			236,596.36
Building improvements	229,155.37			229,155.37
Cryostats	625,342.36			625,342.36
Laboratory and office equipment	86,613.87			86,613.87
Furniture	16,523.80			16,523.80
Subtotal	1,256,731.76	0.00	0.00	1,256,731.76
Less: allowance for depreciation	(873,691.19)			(873,691.19)
Total Property, Equipment and Other Assets	**383,040.57**			**383,040.57**
Investments				
Cash balances in investment accounts		(181,407.56)	108,294.17	(73,113.39)
Investments, at current market value		675,495.50	3,311,462.80	3,986,958.30
CDs, at current market value		1,595,551.47	0.00	1,595,551.47
Total Investments	**0.00**	**2,089,639.41**	**3,419,756.97**	**5,509,396.38**

Note: Prepaid cryopreservation fees received before March 31, 2004 were recorded as income. After March 31, 2004 prepaid fees were recorded as a liability. All are refundable, pre-mortem. As of June 30, 2017, the remaining total of prepaid fees received before March 31, 2004 was $341,093.89. This amount is in addition to the Refundable Prepaid Contracts liability below.

TOTAL ASSETS	**1,048,336.11**	**2,089,639.41**	**3,419,756.97**	**6,557,732.49**
LIABILITIES AND FUND BALANCE				
Liabilities				
Withheld and payroll taxes	4,464.27			4,464.27
Refundable Prepaid Contracts	0.00	1,589,331.55		1,589,331.55
Total Liabilities	**4,464.27**	**1,589,331.55**	**0.00**	**1,593,795.82**
Fund Balance				
Contributed capital	3,121,254.34	154,096.99	1,689,995.07	4,965,346.40
Accumulated balance (deficit) 12/31/2016	(2,047,550.51)	253,456.47	1,454,487.48	(339,606.56)
Net revs (exps) 6 months ended 6/30/2017	130,313.40	(222.90)	208,106.33	338,196.83
Transfers	(160,145.39)	92,977.30	67,168.09	0.00
Total Fund Balance	**1,043,871.84**	**500,307.86**	**3,419,756.97**	**4,963,936.67**
TOTAL LIABILITIES AND FUND BALANCE	**1,048,336.11**	**2,089,639.41**	**3,419,756.97**	**6,557,732.49**

Cryonics Institute Statement of Revenues and Expenses
resulting from cash transactions
or the six months ended June 30, 2017

	General Operations	Contract Prepayments	Patient Care	COMBINED TOTAL
REVENUES				
Cryonics services	338,622.49			338,622.49
Research grants	1,666.08			1,666.08
Dividends	0.00	9,060.26	27,690.86	36,751.12
Interest	0.00	8,202.66	1.11	8,203.77
Long term capital gains			49,026.00	49,026.00
Loss on disposition of asset	0.00		0.00	0.00
Net gain/(loss) on investments	0.00	(17,485.82)	135,049.34	117,563.52
Total Revenues	**340,288.57**	**(222.90)**	**211,767.31**	**551,832.98**
EXPENSES				
Advertising	9,393.91			9,393.91
Bank charges	3,504.60	0.00	3,347.09	6,851.69
Cryogens	24,864.62			24,864.62
Cryonics services and supplies	22,998.11			22,998.11
Depreciation	27,590.00			27,590.00
Facility supplies and services	0.00			0.00
Insurance	9,420.65			9,420.65
Interest	0.00		313.89	313.89
Legal and professional services	2,912.52			2,912.52
Maintenance and repair	5,216.11			5,216.11
Office supplies and services	3,081.99			3,081.99
Penalty	0.00			0.00
Pension	6,204.00			6,204.00
Research and development	2,201.10			2,201.10
Salaries and wages	70,686.75			70,686.75
Services-administrative	6,460.00			6,460.00
Taxes	(4,174.08)			(4,174.08)
Telephone	5,984.57			5,984.57
Travel	7,704.79			7,704.79
Utilities	5,829.28			5,829.28
Federal Corporate Income Tax	96.25			96.25
Total Expenses	**209,975.17**	**0.00**	**3,660.98**	**213,636.15**
Operating revenues over (under) expenses	130,313.40	(222.90)	208,106.33	338,196.83

Cryonics Institute Statement of Cash Flows

resulting from cash transactions

for the six months ended June 30, 2017

	General Operations	Contract Prepayments	Patient Care	COMBINED TOTAL
Cash Flow From Operations				
Net revenues (expenses)	130,313.40	(222.90)	208,106.33	338,196.83
Add back non-cash expenses and revenues:				
Loss on disposition of asset	0.00			0.00
Depreciation and amortization	27,590.00			27,590.00
Total Cash Flow From Operations	**157,903.40**	**(222.90)**	**208,106.33**	**365,786.83**
Cash Flow From Other Sources				
New memberships	75,933.08			75,933.08
Bequests received	142,472.79			142,472.79
Fixed asset purchases	(56,645.00)			(56,645.00)
(Decrease) in withheld and payroll taxes	(1,910.01)			(1,910.01)
Increase in contract prepayments-net	0.00	106,760.71		106,760.71
(Increase)/Decrease in CDs	0.00	(159,017.23)	0.00	(159,017.23)
Other transfers	(160,145.39)	92,977.30	67,168.09	0.00
Decrease/(Increase) in investments		(228,364.94)	(542,152.00)	(770,516.94)
Total Cash Flow From Other Sources	**(294.53)**	**(187,644.16)**	**(474,983.91)**	**(662,922.60)**
TOTAL INCREASE (DECREASE) IN CASH	**157,608.87**	**(187,867.06)**	**(266,877.58)**	**(297,135.77)**
Changes In Cash Accounts				
Checking accounts	149,688.29	0.00	0.00	149,688.29
Savings/PayPal accounts	7,920.58	0.00	0.00	7,920.58
Cash in brokerage accounts		(187,867.06)	(266,877.58)	(454,744.64)
TOTAL INCREASE (DECREASE) IN CASH	**157,608.87**	**(187,867.06)**	**(266,877.58)**	**(297,135.77)**

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