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CRYONICS

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CRYONICS PATIENT STORAGE: A BRIEF HISTORY

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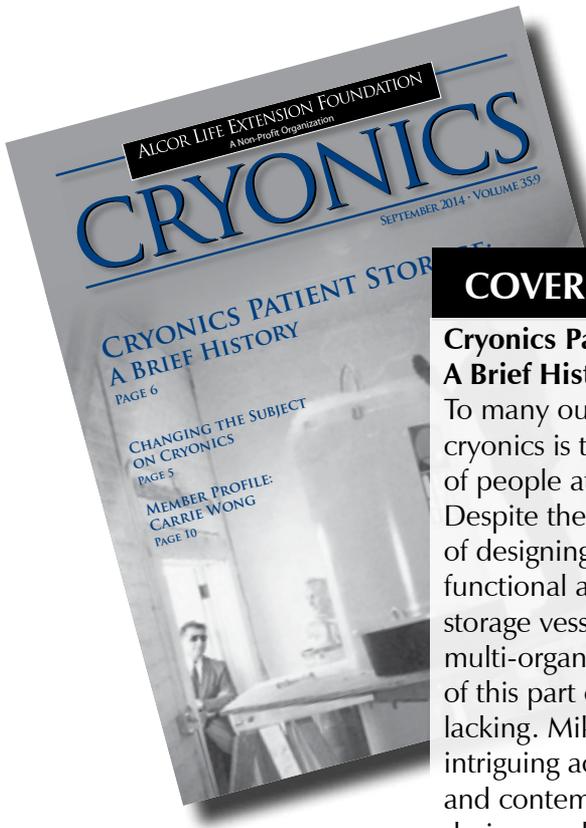
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CRYONICS



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Cryonics Patient Storage: A Brief History

To many outside observers, cryonics is the long-term storage of people at low temperatures. Despite the central importance of designing and maintaining functional and safe cryogenic storage vessels, a historical, multi-organization perspective of this part of cryonics has been lacking. Mike Perry provides an intriguing account of historical and contemporary patient storage designs and the key people responsible for designing them.

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Ann Deblasio's demar is consecrated by Rev. Saverio Mattei August 15, 1969, at CSNY's facility at the Washington Memorial Park cemetery in Coram, NY.

5 QUOD INCEPIMUS CONFICIEMUS Changing the Subject on Cryonics

One of the most challenging phenomena in discussing cryonics is the tendency of critics to change the subject to non-related, or only superficially related, topics. While we cannot completely avoid this "tactic" there is a lot we can do to prevent this outcome by presenting cryonics as a neutral, life-saving, critical care technology without bundling it with "something else."

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The Lifespan Society in British Columbia, Canada, has been a hotbed of life extension and cryonics activism for awhile now. In this profile, we get to meet Carrie Wong, who currently leads the organization, and learn about her life, her wide range of interests, and her thoughts on the nature and future of cryonics.

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CRYONICS

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QUOD INCEPIMUS CONFICIEMUS



Photo: Cryo-Care Equipment Corporation at 2340 E. Washington St., Phoenix, AZ.
Dr. Bedford's "home" in 1970 or 1971.



CHANGING THE SUBJECT ON CRYONICS By Aschwin de Wolf

Every Alcor member has experienced this. What appears to start as a discussion about the feasibility of cryonics quickly turns into a conversation about “overpopulation,” “selfishness,” “immortality,” “mind uploading,” “transhumanism,” etc. This predictable course of events is quite frustrating to the cryonics advocate but rather convenient for the critic because the actual technical and rational arguments in favor of the practice no longer need to be scrutinized. I would be the first to admit, however, that this response often reflects a form of anxiety associated with cryonics that a critic does not want to deal with. But I think we should also recognize that often we have only ourselves to blame when someone tries to change the subject.

Since the beginning of cryonics the field has always been associated or even bundled with “something else.” Specifically, many public advocates of cryonics have also strongly advocated physical immortality, transhumanism, or the idea of substrate-independent minds (“mind uploading”). In particular, transhumanists are prone to present cryonics as just one component in a broader set of beliefs. While such an approach can be great for community building between like-minded people, it can present a serious obstacle to reaching out to the rest of the world. Not only does such rhetoric have limited appeal to the rest of us, it is not consistent with the idea of cryonics being an

experimental critical care procedure.

I became painfully aware of this phenomenon when I read a “refutation” of cryonics by the economist Bryan Caplan that was essentially a critique of mind uploading. Now, *some* cryonics advocates do believe in substrate-independent minds, but mind uploading is not an essential part of cryonics and suggesting otherwise will just provide a convenient excuse to avoid discussing the merits of cryonics at all. I have seen many, many other such examples where a skeptical investigator simply confined himself to offering a critique of immortality or transhumanism and left it at that. Why does this happen?

I think we often do a lot ourselves to “prime” our presentation of cryonics to produce such a response. Could you imagine if someone introduces a new life-saving technology while also advocating socialism, atheism, or immortality? We would feel obliged to point out that medicine should have universal aspirations and not be tied to political or (anti-)religious notions. It should not be any different in the case of cryonics.

In fact, recognizing this neutral and universal aim of cryonics will also provide us with sensible responses to counter some of the arguments that are made against it by asking why cryonics is held to different standards than other experimental medical procedures. “Selfishness? Our desire is to make cryonics available to all and save lives.” “Immortality? All we are saying is that

we should replace our existing, dated, definition of death with a more rigorous definition.” “Transhumanism? The belief systems of *some* cryonics advocates have little bearing on its feasibility?” There are many arguments against cryonics that make little sense, or would even be considered abhorrent, if used against more mainstream experimental treatments and it is important to consistently reiterate this position. But it is going to be challenging if we keep presenting cryonics in a matter that induces the listener to change the subject.

One objection I have heard against this perspective is that it is rather fear-driven, if not cowardly. Instead, we should not be embarrassed about our beliefs and be honest about our ultimate objectives and convictions. I think this argument is mistaken because it assumes that cryonics advocates are a homogenous group with identical beliefs and values. As cryonics keeps growing, this will become more and more untenable. The real risk is to waste such growth opportunities by essentially encouraging an inward-looking, conformist outlook.

Looking at this issue from the perspective of individual survival, such public indulgence with other controversial ideas strikes me as counterproductive. If your survival depends on the exercise of some personal restraint, and resisting the desire to argue all kinds of other issues that you care about, can you not do this? Would you rather be “right” but dead? ■

CRYONICS PATIENT STORAGE: A BRIEF HISTORY

By R. Michael Perry



For cryonics to succeed, adequate patient storage is essential. By the 1960s, when the practice of cryonics started, dry ice (solid carbon dioxide) was readily available and furnished a temporary means of cryogenic storage. Patients could be placed in a large, insulated box, packed with the cold white solid, and stored for extended periods. But the temperature of dry ice, -78°C (-109°F), though cold by ordinary standards, was still warm enough to raise concerns for long-term storage, and the greater cold of liquid nitrogen, -196°C (-320°F), was desired. Containers for storage of human-body-sized objects at liquid nitrogen temperature were created largely as a byproduct of the cryonics movement. These containers appeared in several varieties. First there were horizontal *capsules*, mainly a relic of the earliest years. In these the patient or patients were securely bolted or welded inside an inner chamber and not easily accessible except through a fill channel used for servicing with liquid nitrogen. These containers were soon eclipsed by upright *dewars*, which in their basic form resembled the familiar thermos bottle with a removable cap on top allowing access to the insulated space inside. Both types of container were mainly of steel with welded construction. Finally, a third type container, the *cryostat*, was developed at one organization (the Cryonics Institute). This container was of fiberglass and resin rather than steel, upright in its main form like the dewar but with thicker walls filled with a different insulating material. Here

we take a look at the progress in patient storage from the early horizontal capsules to the more recent upright containers in different versions. As usual, the survey is brief and cannot do justice to all that is of interest; further details will be found in the references.

THE FIRST HUMAN CRYOGENIC CONTAINERS.

In the September 1965 issue of *Freeze-Wait-Reanimate*, newsletter of the Life Extension Society, there is letter from Robert Ettinger with a hopeful opening sentence: “A Phoenix Business man, E. Francis Hope, tells me he plans to build a cryogenic interment installation, and has contracted for land between Phoenix and Tucson.”¹

As it happened, there were at this time two young engineers in the Phoenix area, both MIT graduates, who worked at the AiResearch Manufacturing company where they had tested components of Saturn missiles. Ted Kraver had joined Ev Cooper’s cryonics-promoting Life Extension Society a few months before and was an enthusiast himself. On seeing the notice in the newsletter, he and his friend and associate, Frank “Rick” Rickenbacker, looked up Hope. “With our engineering background,” Ted recalled, “I thought there might be some possibility of personal involvement . . .”²

A basic problem had to be solved: how to keep a human-sized object in liquid nitrogen for as long as possible before the nitrogen would have to be replenished. The

problem in essence had actually occurred many years before, in the late nineteenth century, when James Dewar and other researchers were first experimenting with liquefied gases such as nitrogen and oxygen. The very cold liquids would boil away rapidly in the containers then available, so a special, new type container was needed, one in which the leakage of heat from outside to inside the container would be minimized. What Dewar came up with was a double-walled glass container or flask, with the space between the walls, the *annular space*, evacuated. This, the first “dewar,” was roughly the size of a modern thermos bottle, and made on the same principle. The vacuum largely stops heat conduction and convection, but there is a third form of heat transfer, by radiant energy (light, especially infra-red), that is not affected by vacuum. Making the surfaces of the container reflective helps with this problem, the radiant energy being largely prevented from reaching the interior of the vessel where the liquid is stored. (There is still a problem with heat leaking in through the opening in the top of the vessel, which may have a cap or stopper to minimize this problem, though with liquefied gases evaporation is always occurring and provision must be made for evolved gas to escape from the container.) In the roughly seventy years since Dewar invented his famous flask, dewars had proliferated, some of considerably larger size than the original, and made of metal not glass, though none quite suitable for

the purpose now at hand. The problem was how to scale up the dewar, in some approximate form, to a vessel large enough and shaped right to hold a human body (even if we do not call it a “dewar” here but reserve that term for a later innovation that is more similar to Dewar’s original invention).³



James Dewar in the 1890s developed the famous flask that bears his name, for the purpose of storing very cold, liquefied gases. Cryonics storage containers, under various names, are extensions and refinements of Dewar’s basic idea.

Photo Credit: http://en.wikipedia.org/wiki/James_Dewar#mediaviewer/File:Dewar_James_flask.jpg

The two engineers set to work. In spare time over the next two months they constructed the first capsule for whole-body, human cryogenic storage. A commercially available steel tank 32 inches in diameter and eight feet long was used as a starting point for the horizontal, outer shell of the capsule; this would be mounted on casters. Inside this large pipe the patient would rest in a slightly smaller, cylindrical, inner shell—a second pipe—suspended from thin rods to minimize heat leakage and surrounded by multiple layers of glass matting (glass fiber paper) and reflective aluminum foil. The inner shell was closed at one end while the other end had a bolted-on cap or “head” with a lead gasket for an airtight seal when it was fastened in place. Inside the inner shell were slide rails on which a stretcher was mounted for holding

the patient. When in use the inner shell would be filled with liquid nitrogen and the patient submerged. The outer shell like the inner one was closed at one end and capped on the other with a bolted-on head. (A neoprene rubber gasket was used initially on this head but replaced with a lead gasket before the first human use.) The closed end of the outer shell had channels for (1) servicing the inner shell with liquid nitrogen, measuring temperature, and permitting boiloff of liquid nitrogen to the surrounding atmosphere, and (2) pumping air or gases from the annular space between the inner and outer shells. This latter step was needed to “harden” the vacuum in the annular space, considerably reducing the boiloff of liquid nitrogen from the inner shell. The head of the outer shell was held in place by air pressure when the annular space was evacuated. (With loss of the vacuum, however, the head would come loose, a recurring problem.) In fact the construction of the capsule caused persistent leakage of gases into the annular space requiring frequent pumping to re-harden the vacuum and lower the boiloff rate.³

Ed Hope meanwhile, focusing on the business end of the venture and supplying necessary capital, created Cryo-Care Equipment Corporation, the first company to actually manufacture human cryogenic storage units. The original plan



From left: Ed Hope, Frank “Rick” Rickenbacker, and Ted Kraver, the three principals of Cryo-Care Equipment Corporation. Ted and Rick were working for AiResearch Corporation in Phoenix, where they had tested Saturn missile components, when they became involved in Ed Hope’s venture to manufacture the first containers for storage of cryonics patients in liquid nitrogen.

Photo Credit: <http://chronopause.com/chronopause.com/index.php/2011/02/09/thus-spake-curtis-henderson-part-3/index.html>

was simple—just manufacture and sell the capsules, and let others deal with how they would be used (this despite the letter in *Freeze-Wait-Reanimate*). As usual, what really happened did not entirely fit expectations. (Some of this will be related peripherally here, as we focus on the capsules and their technology; a fuller treatment must wait.)⁴

The first capsule made a memorable appearance at the 1966 Third Annual Freeze-Wait-Reanimate Conference of the Life Extension Society, held in Washington, D.C., on January 1. A black, female, laborator-mix dog named Bel had been anesthetized and frozen for the occasion. The capsule in a trailer was shown in a restaurant parking lot while the conference was going on inside in an upstairs room. The outer and inner heads had been removed showing the dog resting in the capsule’s inner shell in a plastic bag, chilled with liquid nitrogen pooled below. The spectacle attracted much media attention and made the restaurant owner unhappy and, one presumes, wary of future events of this nature.⁵

As for Bel, one sees little about her fate afterward; a reasonable guess is she was cremated. The capsule, however, was not really ready for serious use, despite the heroic efforts that preceded its appearance at the conference. (Kraver and Rickenbacker both had full-time jobs in the aerospace industry. They were not paid for their moonlighting efforts with Cryo-Care but were stockholders in the company, along with Hope. If and when it made a profit they might also benefit; it never did however.) The two engineers who had already volunteered so much labor worked on the capsule for another month then sent it to John Flynn, who had organized a New-York based company, Biopreservation, to offer human cryopreservation services. Flynn exhibited the capsule on the Merv Griffin show, but his company was short-lived and never cryopreserved or stored anyone. The capsule also made an appearance, accompanied by Ed Hope, on the Mike Douglas show. It eventually found its way to Curtis Henderson in Sayville, Long Island, who headed the Cryonics Society of New York. There it stayed on the property for many years gathering rust. Other than the brief showcase storage of the dog at the conference the capsule does not appear to have done any actual cryogenic service.⁶

With the first capsule gone, the two designers set to work on the second. It had many improvements, including aluminized mylar insulation, much easier to apply and more functional than the foil-and-glass matte it replaced, again reducing the boiloff. Suddenly a man in the Los Angeles area (name withheld) wanted his recently deceased mother frozen. She had been embalmed and stored in a mortuary refrigerator for about two months when, in April 1966, Cryo-Care was contacted and their one cryocapsule now on hand was purchased. Unfortunately, there was no one to carry out the encapsulation and freezing but the Cryo-Care people themselves, so they reluctantly proceeded. The woman was placed in the inner capsule, the inner head was bolted on, an insulation cap was affixed, and the outer head was bolted on. Next, the inner capsule was filled with LN₂, and a vacuum “pulled” on the annular space to get the boiloff rate down. The woman remained in this capsule for a few months at the Cryo-Care facility, then her son decided to have her removed from preservation and buried, ending the first human cryonics-related freezing.⁷

The next cryonics freezing was that of James Bedford in January 1967, a landmark event sometimes considered the first “true” cryonics preservation. Though crude, it differed from the unnamed woman’s in that it was planned for in advance and some attempt was made at perfusing the body at clinical death with a cryoprotectant to reduce the damage of cryogenic cooling. In this case the patient was frozen and chilled to dry ice temperature by a cryonics organization (the Cryonics Society of California) then sent to Cryo-Care. Once again Cryo-Care reluctantly became involved, the task now being to encapsulate the patient and further cool him to LN₂ temperature.⁸

At this time the capsule the woman had occupied (#2) was available, and also a new outer tank intended for capsule #3, as soon as the new inner tank was finished. As a stopgap measure the inner tank of the older capsule was transferred to the new outer tank and Bedford was placed inside and cooled with LN₂. The old inner tank was particularly leaky and frequent or continuous pumping on the annular space was required to maintain a vacuum. Finally the new inner tank was ready. It was made of stainless steel where the earlier ones had

been aluminum, and it had a welded-on rather than bolted-on head. The welding was a delicate operation with the patient inside, but one that, if done correctly, insured no leaks from the inner cylinder to the annular space. The outer head now had a rubber O-ring, sealed with silicone grease, to provide an airtight connection with the outer tank. Even this did not guarantee a permanent vacuum but if a vacuum pump was used periodically the container performed quite well, its liquid nitrogen boiloff only about 5.5 liters per day. Finally, the instrumentation paneling on the end of the outer tank was improved and a vacuum gauge was added as standard equipment.⁹

Cryo-Care would build two more capsules: for Louis Nisco in September 1967 and for Steven Mandell in July 1968. (Nisco was another in-house straight freeze like the woman; Mandell was handled entirely by the Cryonics Society of New York which had the capsule sent to them.) It appears that these last two capsules were largely similar to the Bedford capsule. They worked better than earlier Cryo-Care models but were still prone to vacuum softening through leakage and needed frequent pumping. Late in 1968 Cryo-Care transferred the Nisco capsule to Robert Nelson’s facility in Chatsworth, CA and the care of the Cryonics Society of California. (There a grim fate awaited; eventually three other needy patients were put in the capsule alongside the original occupant, then all four were lost as funding ran out. A similar fate struck the occupants of the Mandell capsule, Mandell himself and two other patients who were later added.) James Bedford remained at the Cryo-Care facility until 1969, when his son transferred him to Galiso, Inc., a cryogenics company in Anaheim, CA. Ed Hope decided that supplying cryocapsules was not a profitable venture, and discontinued the operation.¹⁰

James Bedford, still at Galiso in April 1970, was transferred to another horizontal capsule, built roughly along the lines of the Cryo-Care unit, but

more reliable with lower boiloff and less need to pump and harden the vacuum. This capsule continued in operation until May 1991, by far the longest service of any horizontal unit. Then Bedford, now at Alcor Foundation in Riverside, CA, was transferred to a tall upright “Bigfoot” container, where he remains today.¹¹

THE FIRST UPRIGHT PATIENT DEWAR

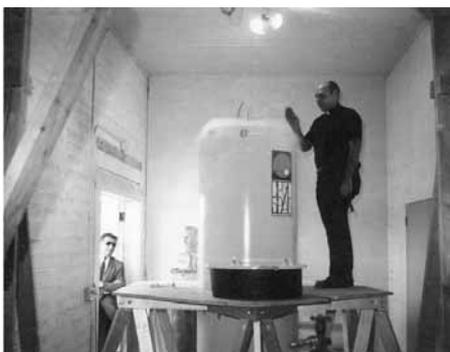
By August 1969 Curtis Henderson, president of the Cryonics Society of New York, had had nearly a year’s experience with Cryo-Care Capsule #5 after the freezing of Steven Mandell. Despite the succession of improvements, the Cryo-Care capsules had major drawbacks. It was hard to seal in the patient by welding under cold conditions, particularly when this was “in the field,” at some cryonics facility with its own limited resources and expertise rather than Cryo-Care’s laboratory. An electrically operated vacuum pump was needed to keep down the boiloff rate, and the capsules themselves took up a lot of floor space. The patient was not easily accessible, and such vital data as the level of liquid nitrogen in the sealed inner container could not be directly observed.¹²

Meanwhile there was another patient, Ann Deblasio, who had been frozen at Curtis’s facility in January 1969 and was now stored on dry ice. It was time to move her to the safer storage of liquid nitrogen and



Steven Mandell’s capsule at CSNY’s facility in Coram, NY, the last and most advanced capsule manufactured by Cryo-Care. The closed end is forward and is where liquid nitrogen was introduced and vacuum pulled when necessary. A vacuum pump is hooked up (brown hose).

Photo Credit: <http://chronopause.com/chronopause.com/index.php/2011/02/10/thus-spake-curtis-henderson-part-4/index.html>



Ann DeBlasio's dewar with occupant newly placed inside is consecrated by Rev. Saverio Mattei August 15, 1969, at CSNY's facility at the Washington Memorial Park cemetery in Coram, NY. (The family was Catholic and desired this service.) The container was the first of the dewar type to be used for cryonics purposes, a usage which continues today, particularly at Alcor. Also present, from left, Nick DeBlasio, husband of Ann, and mortician Fred Horn who helped with CSNY cases.

Photo Credit: <http://chronopause.com/chronopause.com/index.php/2011/02/10/thus-spake-curtis-henderson-part-4/index.html>

Curtis, rather than contract with Cryo-Care for another horizontal unit, instead decided to obtain an upright unit, a dewar, from a commercial supplier, Minnesota Valley Engineering. MVE at the time did not have what was needed but, as it turned out, such a unit was constructible fairly quickly and easily by modifying an existing dewar of theirs, the A-9000. This as it was stood waist-high and was mainly used for storage of tissue samples such as cattle semen and culture cells. The modification consisted of "stretching," putting in side panels to increase the height. The resulting container stood eight feet tall with a diameter of 31 inches. As in the familiar thermos bottle with its easily removable cap, the annular space, lining the sides and bottom, was self-contained and separate from the insulated lid. The latter could be removed and a patient placed inside the container without compromising the vacuum, unlike the old capsules. It could comfortably hold two patients placed back-to-back on stretchers. The boiloff was about 5 liters per day, comparing favorably with a Cryo-Care vessel. On top was a split lid; one half could be removed to observe the interior and refill with liquid nitrogen while leaving the dewar partly covered. (Some later versions of the unit had the lid in one piece.)¹³

LATER DEWARs AND CRYOSTATS

Unfortunately, the DeBlasio dewar would also eventually fail (not at CSNY however), in this case due to mishandling which compromised the vacuum and neglect which caused this problem to go unnoticed for too long. The two patients then inside were lost but the dewar was cleaned and repaired, and once again performed well. Similar dewars were used at Alcor in the 1980s for whole body patient storage, and one is still in use for whole-body cooldowns. (A shorter version also did service for neuros or head-only patients, and is still in use at Alcor.) In 1990 a larger sized unit, the "Bigfoot," was designed at Alcor, again starting with a shorter, off-the-shelf unit and stretching it by adding side panels. (An unstretched version of a bigfoot is also used at Alcor for "intermediate temperature storage" of a few neuropatients, humans and pets, using cold nitrogen vapor rather than liquid nitrogen in the hope that tissue cracking would be minimized at this warmer, but still very cold, temperature.) The first Bigfoots had a lid or "cork" with 14 inches of Styrofoam

lid and an outside diameter of 43 inches, and holds four whole-body patients with room for a center column that holds five neuro patients. (Alternatively, a "pod" or aluminum box for holding a whole-body patient inside a dewar can be given interior shelving and otherwise adapted to hold ten neuropatients. A whole body patient is stored in a sleeping bag inside a pod while a neuropatient is inside a cylindrical aluminum container or "neurocan.")¹⁴

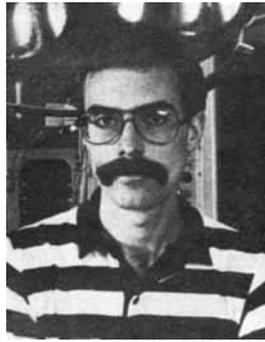
Though Alcor has been the main benefactor of the modern patient dewar (currently 13 Bigfoots are in service there, seven of the older, shorter units and six taller units) dewars have also been used at and fabricated under direction of other organizations such as Trans Time and KrioRus. Another organization that makes use of cryonics storage technology, the Cryonics Institute, has developed its own containers in-house along a different pathway from either the early capsules or the steel dewars. These cryostats, as they are called, are made primarily of nonmetallic components, fiberglass and resin, and differ in structural details.



*Bigfoot dewars at Alcor, September 2014. All but leftmost are the newer, taller type.
Photo Credit: R. Michael Perry, personal collection*

as insulation; later it was found (by Paul Wakfer when he worked for Cryospan Corporation in Rancho Cucamonga in the 1990s) that a taller dewar with a lid having 24 inches of Styrofoam would lower the boiloff rate from about 14 liters per day to about 10 or 11, if well-constructed. A modern Bigfoot dewar at Alcor stands about 10½ feet tall with this extra-thick

The technology is largely the creation of one individual, Andy Zawacki, who has been the CI facility engineer for many years. The first cryostats date back to the 1980s. These were bullet shaped, dome-capped cylinders holding one or two patients. The patients were sealed inside and the inner chamber could only be accessed by cutting open the cryostat and removing the dome. (The



Principal designers. From left: Hugh Hixon, assisted initially by Mike Darwin, is the main designer of the Alcor Bigfoot dewars, while Andy Zawacki is the principal creator of the CI cryostats (shown with rectangular cryostat in background, lid open, not in use).

*Photo Credits: Hugh Hixon: <http://www.alcor.org/AboutAlcor/meetalcorstaff.html>; Mike Darwin: *Cryonics*, April 1986, cover; Andy Zawacki: Michael Perry, personal collection*

dome would then be reattached with epoxy resin.) The cryostats had stout inner and outer shells of resin-fiberglass composite. The annular space, which was about a foot thick compared with an inch or so with a Bigfoot dewar, was filled with perlite, a light insulating material made from hydrated volcanic glass. (When the freshly quarried perlite is heated to about 900°C it softens and the water of hydration is driven off, in the process causing the remaining mineral to expand to approximately ten times its former volume. The resulting material is a far better insulator than an extruded polystyrene foam such as Styrofoam, though not self-supporting and subject to atmospheric moisture contamination unless protected.) In the cryostats, chips of perlite the size of small pebbles lay loosely in their confining space so that vacuum could be applied to further improve the insulating capability.¹⁵

Later cryostats were constructed along the same insulating principles and also of fiberglass-resin composite (using various types of resin) but of different sizes and shapes, and with removable lids. Most of these were “hard shell, soft vacuum” or HSSV units in which the shells were stout enough to resist the surrounding air pressure when the space between them was evacuated and the vacuum was hardened to the level of normal use (softer than in a dewar, as noted above). There were large, rectangular units in which patients in sleeping bags were stacked horizontally three or four layers deep in liquid nitrogen, which provides buoyancy to prevent any crushing weight pressing down from above. Some of these are still in use though no new ones have been constructed for several

years. The last of the bullet-shaped cryostats was too tall for the cramped building space in which it was constructed so instead of being upright like the other cylinders it was nearly horizontal, actually slanted at a 20° angle, so the patients’, heads, downward as usual, would be covered in liquid nitrogen as long as possible in an emergency. It was retired in 2004, after sixteen years of service, and its two occupants transferred to one of the newer, upright cylinders. The present CI facility has a high ceiling and can accommodate these taller and wider HSSV cryostats, which stand about ten feet tall like a Bigfoot dewar and hold six patients each.

In practice the cryostats need to be vacuum-hardened at two-month intervals, over a period of two or three 16-hour days, unlike Bigfoot dewars, which can go for years without any such treatment. The vacuum used in cryostats is “softer”—up to 100 microns or so (1 micron of mercury pressure = about 1.3 microatmospheres) versus 1 micron or less for a dewar. Nevertheless, the boiloff performance is



*Cryostats at the Cryonics Institute, September 2011
Photo Credit: R. Michael Perry, personal collection*

good, about 750 liters of liquid nitrogen per patient per year when filled to capacity, versus about 1,000 liters per (whole-body) patient per year for an Alcor Bigfoot. (A full Bigfoot however will additionally contain five neuropatients in the center column. If you count that as half a whole-body patient, the yearly consumption is about 900 liters per whole-body patient. Only whole-body preservation is done at the Cryonics Institute.) Presently the cost of liquid nitrogen in bulk is around 13-20 cents per liter depending on location and supplier, so 1,000 liters would cost in the neighborhood of \$130-200. In practice the cost will be higher because nitrogen is not delivered directly to a patient container but instead to a bulk tank from which it must be transferred, and transfer loss can be considerable. (A full analysis of the cost of patient storage, however useful and necessary, is beyond the scope of this article.)¹⁶

FINAL THOUGHTS.

It is nearly half a century since people were first stored cryogenically with the hope of eventual restoration to healthy consciousness. A number of storage technologies have been considered and two main approaches have been developed and are now in use at the leading cryonics organizations: the dewar at Alcor and the cryostat at the Cryonics Institute. In both types of containers patients are stored head-downward in liquid nitrogen using upright cylindrical, double-walled containers in which the space between the walls (annular space) is filled with an insulating material and also is evacuated to decrease heat permeability and reduce the boiloff of liquid nitrogen. A dewar is made of stainless steel, a cryostat of fiberglass and resin composite, and there are many other technical differences between the two though both accomplish the same basic task of keeping patients safely in liquid nitrogen. Each form of container has its advocates and detractors. Each will probably be superseded as efforts continue to reduce the cost without compromising the quality of patient storage. For we must never give up in searching for ways to make our practice more affordable and thus more widespread. ■

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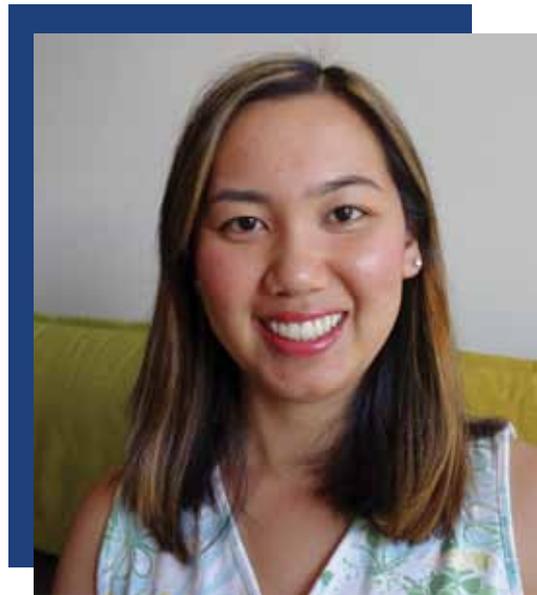
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MEMBER PROFILE: CARRIE WONG

By Chana Phaedra



Carrie Wong is one of Alcor's new members in 2014.

Part of the growing constituency of life extension advocates and activists in British Columbia, Carrie Wong splashed into cryonics head first upon learning about it when she attended a meeting of the Lifespan Society of British Columbia at the University of British Columbia (UBC) in the fall of 2012. Though she had already graduated from UBC in 2011, Carrie had tagged along with her friend Mary Craver, a law student at UBC who had been invited to the meeting by fellow law student and Lifespan Society founder Keegan Macintosh. Keegan gave a presentation introducing cryonics while another speaker and UBC student, Dano Morrison, spoke about nootropics.

"It was an extremely enlightening evening and I made up my mind at that moment that I would attend Lifespan Society meetings," Carrie says. "The concept of cryonics clicked for me immediately; I was already somewhat familiar with transhumanist thinking and made up my mind a while ago I would attempt to live as long as possible. I was a futurist and atheist so basically I had no cultural or religious hang-ups so it was very easy for me to accept cryonics."

Carrie grew up in Vancouver, British Columbia, one of two children of Chinese parents. "I didn't really have a peer group to introduce me to cryonics and related ideas before I attended that meeting," she explains. "I had only read about things on the internet. I feel like I already had the main idea—I was fairly optimistic about

technology, for example. Technology is the only way to progress. People aren't going to change, so we have to let technology make the improvements for us. It's easier to find technological solutions. Instead of having wars over resources, let's find a way to make resources more abundant. Hopefully with minimum government interference."

Carrie attended a cryonics conference held by the Institute for Evidence Based Cryonics in Portland, OR, in 2013 and was alerted to Alcor's associate membership program by Aschwin de Wolf, which appealed to her. As an associate member Carrie received Cryonics magazine, which allowed her to read in more detail about the various aspects of cryonics. And, with her sound philosophical and scientific background (an honors degree in geology with a minor in philosophy), cryonics fueled Carrie's passion for thinking about the possibilities of the future. She started her Alcor paperwork in December 2013 and became a member in February 2014.

From the start, Carrie worked to foster fellowship within the local cryonics community. "I considered Cryonics Institute briefly because it was less costly but I decided to join Alcor based on the cryonics community in Vancouver, British Columbia. Most cryonicists in B.C. are Alcor members while the majority of cryonicists in Ontario are with CI. I did it out of a sense of solidarity and community."

And though Carrie claims that she was content with being a passive cryonicist,

when she found herself being asked to continue the Section 14 challenge against the anti-cryonics law in B.C. (prohibiting the sale of cryonics services in British Columbia) she did not stand idly by, but took up the reins of the movement as Executive Director of the Lifespan Society in March of 2014.

"I'm now the go-to person for the Section 14 challenge," Carrie explains. "We are now moving forward with a much lower-budget version of our initial plan. We believe that if a court case is actually pending it will be easier to raise funding, so we held a board vote and are going to go ahead with the court challenge. It is important for B.C. cryonicists to get rid of this law before we make a standby company. But it's probably going to be years before we get anywhere with that."

Sometimes Carrie finds it difficult to believe how much her cryonics arrangements have affected her life in such a short period of time. "If I went back in time and talked to myself 5 years ago and told me what I was up to, my 20-year-old-self would laugh and say I was crazy," she chuckles. "But there are no half-measures in my life and I took this challenge on wholeheartedly."

In fact, she put her career in gold-exploration geology on hold in order to continue the Section 14 challenge. "The stakes in cryonics always seem so high, but I guess the more I get into it the more frustrating it becomes that Candian



The Lifespan Society of British Columbia at Maker Faire Vancouver.

cryonicists don't have the standby services that they need. I understand Toronto got an Alcor standby kit recently and I know how generous the cryonics community has been towards Canadian cryonicists but we still have some major problems."

It is perhaps because of the particular issues facing B.C. cryonicists that Carrie considers standby and stabilization the most challenging issue in cryonics. "Ischemic damage is frightening and occurs so quickly. There is no forgiveness when time passes," she laments.

Secondly, she thinks that cryonics suffers from a lack of decent marketing and profitability. "I have been told over and over that cryonics is not profitable business but I don't know why it can't be," she ponders. "I'm no Peter Thiel, but I don't like hearing that things are not possible." Carrie believes that people of Chinese cultural background could more easily be sold on cryonics because they are not very religious and have fewer opinions on the afterlife. "Perhaps we should be marketing to Chinese Americans and Chinese Canadians," she ventures. "But also looking at forming connections with China."

Another of the Lifespan Society's ambitious projects this year is the Longevity and Genetics conference they are hosting November 15, 2014, in Vancouver. Confirmed speakers thus far include biogerontologist and cryonics advocate Dr. Aubrey de Grey and biotechnology researcher Dr. Clinton Mielke, who will talk about his work in obesity genetics.

Outside of cryonics, Carrie has identified as libertarian since the age of 18. "I would

say the primary motivations in my life are living rationally and living free," she says. "Without actually being alive, no other goals are possible so defeating aging and living long should always be a priority."

She also indulges her artistic side and enjoys drawing, painting and writing poetry. "I've been drawing all my life, but stopped in university," she sighs. "I thought I would be a graphic designer when I was a kid. Or a philosopher or an artist. I fought with my parents about it a lot, but ultimately wound up going into science." But then Carrie brightens when she describes her boyfriend as an "amazing artist" who inspired her to start drawing and painting again.

Traveling is another of Carrie's passions. "Traveling is a big part of my life and I love traveling all over the States to meet my online friends. I have been to New York City twice, Seattle, Chicago, San Diego, San Francisco, Fort Lauderdale, Las Vegas, New Jersey, and other places. I get the travel bug often and I try to leave town a few times a year."

One of Carrie's favorite traveling memories is attending the "Teens and Twenties" cryonics conference in Florida last year. "Just being with all the coolest, most interesting people I've ever met was an amazing experience," she gushes.

It may come as no surprise that Carrie's favorite childhood memory is of her first journey to a distant land, when her family went to Hawaii when she was twelve. "It's the first time I remember thinking 'This is a completely different place.' I was blown away; it was such an eye opening experience. Even the air smelled different.

Of flowers and paradise." And, though she dislikes the cultural pressure placed on her as the eldest to be more responsible than her brother (who is only a year her junior), some of her other favorite memories are of playing video games with him.

When it comes to indulgences, Carrie admits "I guess I have had a weakness for the drink, but I mostly drink a life-extending amount of booze." She says her go-to drink is Jameson whiskey, "sometimes on the rocks, sometimes neat."

Lastly, Carrie likes hanging out with her friends, and says she regularly spends her time with four or five other Alcor members in Vancouver. "I'm dating an Alcor member and I met 30 other Alcor members at the Teens and Twenties event," she states. "I was amazed at the quality of young cryonicists I met in Florida. I've never been in a room so packed with accomplished and intelligent people at such a young age. I have to say: Don't ever change. (Also, you can add me on Facebook: Carrie Eclectic)." ■

For more information on the Section 14 challenge in British Columbia, please see the article "Cryonics in Conflict: 25 of Activism in British Columbia, Canada" by Carrie Wong and Keegan Macintosh in the August 2014 issue of Cryonics Magazine.



Her zest for art renewed, Carrie recently completed this painting of jellyfish.

RADICAL LIFE EXTENSION:

How can some people not understand that it is not "bad" to change some things in nature?

By David Pizer

Just because something is "natural" does not automatically mean it is good. But this seems to be a hard point for many to accept, at least when certain unfamiliar possibilities are being considered.

How many times, when you are talking about cryonics, transhumanism, reversing aging, extending life-spans, or curing diseases with new technology, does someone blurt out that it is "bad" to try to change nature? Nature does some good things and some bad things for humans. It is the moral imperative of those humans, who want to improve things for other humans and themselves, to try to eliminate the bad things "Mother Nature" does and help promote the good things she does. Here is a hypothetical example: A five year old child develops a natural disease that we can't cure and dies. That is a natural thing that happens often. Is it a good thing?? Name one good thing about a lovely young human being cut down by a mindless disease or other terrible act of nature at the age of five!

Today we can cryopreserve that child at legal death. Then, if things go right, we can store her/him in a form of cryo-suspended animation until sometime in the future when that child might be reanimated and continue her/his life. If you were the child would you want nature to kill you at age 5 or would you rather have a chance, even if it were a slim chance, to circumvent it? What if you were a parent and it was YOUR child?

"It is not hard to imagine that after humans have developed protocols for radically extending life most religions will assume that such extension is a good thing."

Humans change the bad things in nature all the time and most of us consider it good when we can make

things better. We cure diseases, we grow food where it does not grow naturally, we develop surgical techniques and protocols to fight cancer and other horrors of nature, we develop norms in our societies to help us withstand and overcome nature's threats and hardships. Fighting and war are acts of human nature, which were necessary when humans were evolving from our more primitive state of existence, and were not as powerful as some of the creatures we had to compete with for survival. It is the present nature of humans to fight and go to war. Would it be a bad thing if we changed that part of human nature and replaced it with an intensified desire for peace and cooperation?

It is natural to kill other animals and eat them. Would it be bad if we could change nature and grow the meat we crave like we grow plants, without having to grow a whole animal and then butcher it? No more raising cows and pigs to later slaughter and eat them, from now on just pick your steaks and

chops off a meat tree. Would you like to see us change nature to help the other animals we share Planet Earth with?

“It is we who want this radical extension and improvement of life who hold the moral high ground!”

What if a meteor were heading in a “natural” course to collide with Earth and wipe out the human race and all other life? Should we try to intervene to knock it off course or destroy it, or just let nature take its course?

Some people claim there are religious arguments against our extending the natural life-spans of humans. I don’t think that there are any valid ones, but some people say they “feel” it is against religious teaching to radically extend life as we would like to. I submit that most religious sourcebooks like the Bible, the Gita, the Koran and others, treat extra-long life as a good thing to be sought after. Further, suicide is considered a bad thing by most religions. It is not hard to imagine that after humans have developed protocols for radically extending life most religions will assume that such extension is a good thing. Even today, if a person planned to reject an affordable and effective treatment for a natural disease and die early, reputable religious authorities would strongly disapprove and insist on a rethinking. Better for you, they would say, to accept the cure and extend your life beyond what

has become its disease-driven course. In effect they would be cautioning against too much respect for something just because it is “natural.” Indeed, we see that religions support life extension and a lot of religions own or support the hospitals where man-made medicines and procedures defeat natural diseases.

Some people mention God in talking about nature and how we got here. There are two main points of view on this. Either we came from an accident, such as an evolutionary process, or we were created as some form of intelligent design, perhaps by a God. If life is an accident, then why not treat the bad effects of that accident, the main bad effect being the death that occurs at the end of life? If life is a gift from God or other benign Intelligence, why not protect that gift and keep it in as good condition as possible? It seems that if actions speak louder than words, protecting the gift of life by extending it to preserve that gift might show the Giver how much you appreciate that gift.

Then there are people who say that 60 to 90 years is the oldest age a person should want to live to because it is natural to die around that age. But I submit that between ages 60 and 90 a person is finally beginning to understand how to live a good life and get along with others and understand how to enjoy life to its fullest. At these mature ages, you finally achieve the important things in life: family, friends, health, wisdom, education, how to get along with others, and other things you probably did not understand or realize as well when you were younger. So now that you have this

wisdom it is time to be able to live and enjoy life to the fullest. But how can you do that if you have natural failing health and the natural prospect of a soon-to-be death?

I submit that death is never a good

“Just because something is “natural” does not automatically mean it is good.”

thing when the person at risk has the option of having additional healthy, enjoyable life. I submit that after 60 years of living and learning, a person is now better able to enjoy life and make a contribution to the community or humanity at large. So we need to extend health and life far beyond the natural end-point at age 60, 90 or 110.

Frankly, I am sick and tired of people claiming that trying to extend healthy, enjoyable life beyond the natural limits is a bad thing. My position is that not trying to extend life beyond the natural limits is the bad thing! It is we who want this radical extension and improvement of life who hold the moral high ground!

Learn more by attending the **End Death—2014 Cryonics Convention** this November www.venturist.info. Find more in the FaceBook Group **WE ARE CRYONICISTS**.

If you agree there is no wrong and much good in trying to live as long as YOU want to, PLEASE PASS THIS MESSAGE ON. ■

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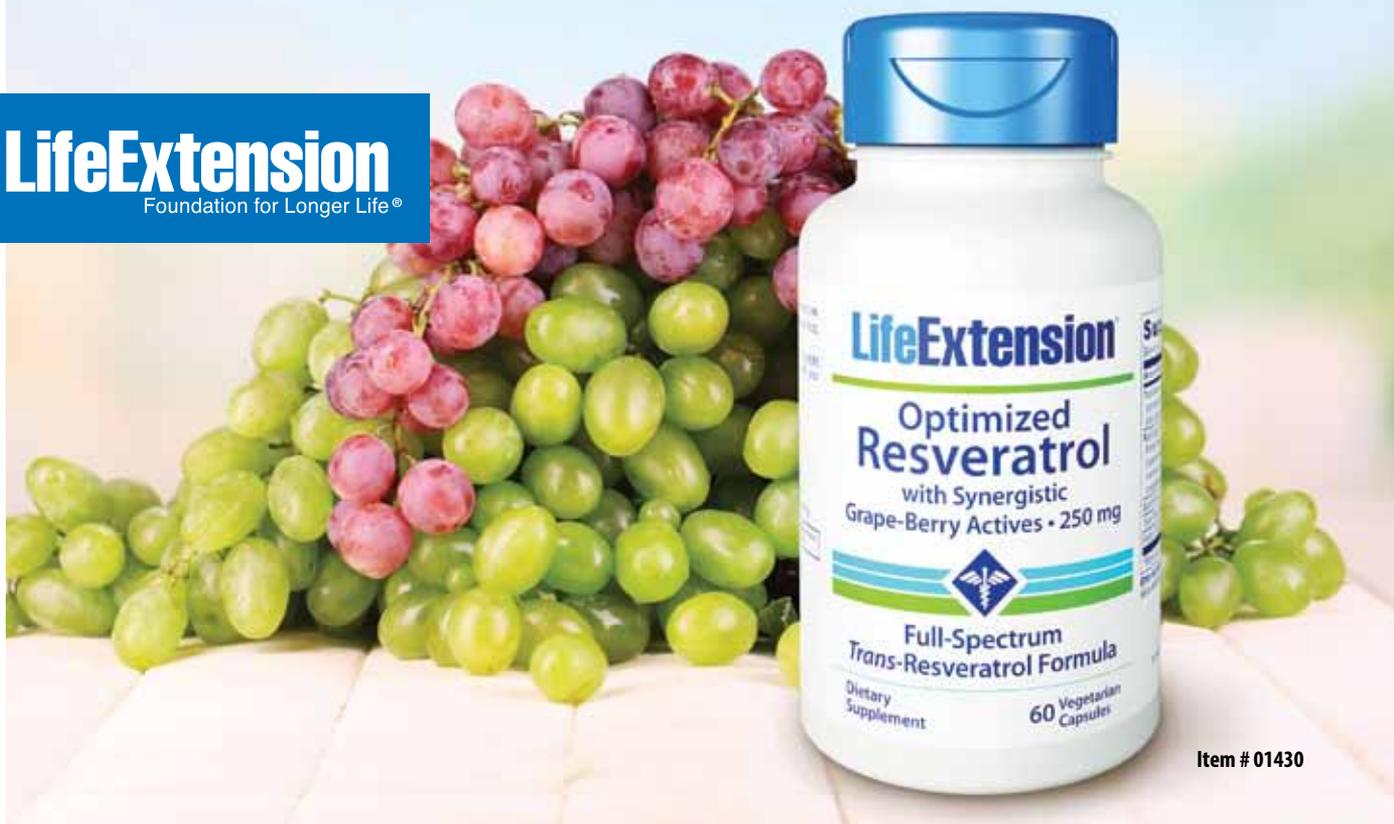
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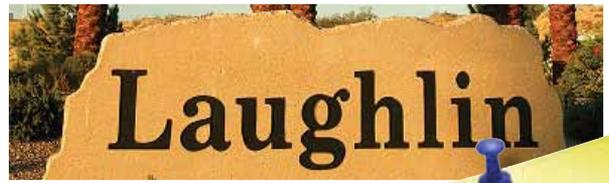
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We look forward to getting to know you.

Announcing...

This Year's Cryonics Convention



This year marks the 50th anniversary of the publication in 1964 of *The Prospect of Immortality*, by Robert Ettinger, the book which started the cryonics movement. If you want to find the best information from authoritative sources about the current and foreseeable state of the cryonics movement as of this year, you have an excellent opportunity this coming November. The Society for Venturism is announcing its second Cryonics Convention at Don Laughlin's Riverside Resort in Laughlin, Nevada, to be held November 7, 8 and 9, 2014 at the Resort's Starview Room, a conference facility which offers a panoramic view of the Colorado River and the desert mountains beyond. The Starview Room also has space for the attendees' dining and for exhibition tables.

The convention will feature speakers who will discuss developments of interest to cryonicists, transhumanists, futurists and life extensionists. Some scientists who work in cryobiology and in the science of aging will report on their cutting-edge research. Other speakers representing Alcor and other cryonics organizations will report about developments at their respective organizations. Yet other speakers with long involvement in cryonics will discuss the history and philosophy of the cryonics movement on its 50th anniversary, the movement's current status, and where we would like to see it go in the coming years. And Mr. Laughlin himself will appear to take questions from the audience about anything, which he will answer with his humor and shrewd business sense, just like he did at last year's convention. The Society for Venturism will publish a list of speakers and their presentations in about a month at the Venturists' website: <http://www.venturist.info>.

Mr. Don Laughlin, a longtime cryonicist, has worked with the Society for Venturism to make the convention very convenient and affordable. The registration fee, payable to the Society for Venturism,

is only \$75. You have to reserve your own room accommodations through the Riverside Resort (details to be announced) at special low rates by mentioning that you are coming to the convention. Mr. Laughlin has arranged to provide all the meals for the attendees at special discounted rates inside the Starview Room so that you don't have to go down to the busy casino for your meals. The Starview Room also has a cash bar to provide beverages.

Attendees who have appropriate products or services they would like to offer or sell to cryonicists—books, T-shirts, supplements, CD's, magazines,

etc.—will also be able to reserve free table space at the convention.

So mark your calendars in November for this event, and keep on the lookout for the updated information about the convention at the Venturists' website, <http://www.venturist.info>. If you would like more information, email Mark Plus, Secretary of the Society for Venturism at mark.plus@rocketmail.com. You can also call him at (928) 273-8451. ■

Why Should You Join the Venturists?

The Society for Venturism is one of the oldest organizations (established in 1986) which defends the rights of cryonicists to be cryopreserved.

Membership in the Society for Venturism offers the following benefits:

1. Venturist members receive the Venturists' Religious Objection to Autopsy card. This offers possible protection from an autopsy which would compromise the quality of your cryopreservation.
2. The Venturists have a Backup Trust which could offer possible protection of your cryopreservation in case your cryonics organization can no longer keep you cryosuspended.
3. The Venturists offer possible Constitutional protection of your right to cryopreservation because of their church status.
4. The Venturists hold regular, affordable conventions which are open to everyone in the

cryonics community. These offer excellent opportunities to hear talks by scientists about their research into cryonics and life extension; they also provide a way to meet and network with cryonicists, transhumanists and life extensionists from around the world.

Membership in the Society for Venturism is very affordable, with an annual donation starting at \$25 a year. Full membership requires being signed up with a recognized cryonics organization, and affirming the Venturists' Principles: (1) To try to do what is right; and (2) To work for the worldwide conquest of aging and death. You can find the membership application and ways to donate on the Venturists' website, www.venturist.info. For more information, contact Mark Plus, Secretary of the Society for Venturism: mark.plus@rocketmail.com, phone (928) 273-8451. Or write to: Society for Venturism, 11255 S. Highway 69, Mayer, AZ 86333, USA. ■

Yale Researchers Reconstruct Facial Images Locked in a Viewer's Mind

Using only data from an fMRI scan, researchers led by a Yale University undergraduate have accurately reconstructed images of human faces as viewed by other people. "It is a form of mind reading," said Marvin Chun, professor of psychology, cognitive science and neurobiology and an author of the paper in the journal *Neuroimage*. The increased level of sophistication of fMRI scans has already enabled scientists to use data from brain scans taken as individuals view scenes and predict whether a subject was, for instance, viewing a beach or city scene, an animal or a building. "But they can only tell you they are viewing an animal or a building, not what animal or building," Chun said. "This is a different level of sophistication." One of Chun's students, Alan S. Cowen, then a Yale junior now pursuing an advanced degree at the University of California at Berkeley, wanted to know whether it would be possible to reconstruct a human face from patterns of brain activity. The task was daunting, because faces are more similar to each other than buildings. ...

Bill Hathaway / Yale University
25 March 2014

<http://news.yale.edu/2014/03/25/yale-researchers-reconstruct-facial-images-locked-viewer-s-mind>

Qualcomm's Neuromorphic Chips

A pug-size robot named pioneer slowly rolls up to the Captain America action figure on the carpet. They're facing off inside a rough model of a child's bedroom that the wireless-chip maker Qualcomm has set up in a trailer. The robot pauses, almost as if it is evaluating the situation, and then corrals the figure with a snowplow-like implement mounted in front, turns around, and pushes it toward three

squat pillars representing toy bins. Qualcomm senior engineer Ilwoo Chang sweeps both arms toward the pillar where the toy should be deposited. Pioneer spots that gesture with its camera and dutifully complies. Then it rolls back and spies another action figure, Spider-Man. This time Pioneer beelines for the toy, ignoring a chessboard nearby, and delivers it to the same pillar with no human guidance. Powered by only a smartphone chip with specialized software, Pioneer can recognize objects it hasn't seen before, sort them by their similarity to related objects, and navigate the room to deliver them to the right location. It is all because it is simulating, albeit in a very limited fashion, the way a brain works.

MIT Review
23 Apr. 2014

<http://www.technologyreview.com/featuredstory/526506/neuromorphic-chips/>

\$5.6 Million Grant to Develop Next Generation Neural Devices

Lawrence Livermore National Laboratory recently received \$5.6 million from the Department of Defense's Defense Advanced Research Projects Agency (DARPA) to develop an implantable neural interface with the ability to record and stimulate neurons within the brain for treating neuropsychiatric disorders. The technology will help doctors to better understand and treat post-traumatic stress disorder (PTSD), traumatic brain injury (TBI), chronic pain and other conditions. Several years ago, researchers at Lawrence Livermore in conjunction with Second Sight Medical Products developed the world's first neural interface (an artificial retina) that was successfully implanted into blind patients to help partially restore their vision. The new neural device is based on similar technology used to create the artificial retina. "This DARPA program will allow us to develop a revolutionary device to help patients suffering from neuropsychiatric disorders and other neural conditions," said LLNL's project leader Satinderpall Pannu, director of the

Lab's Center for Micro- and Nanotechnology and Center for Bioengineering, a facility dedicated to fabricating biocompatible neural interfaces.

Kenneth K Ma, LLNL

11 Jun. 2014

<https://www.llnl.gov/news/newsreleases/2014/Jun/NR-14-06-03.html#.U6OJifkVog8>

Single Dose Reverses Autism-like Symptoms in Mice

In a further test of a novel theory that suggests autism is the consequence of abnormal cell communication, researchers at the University of California, San Diego School of Medicine report that an almost century-old drug approved for treating sleeping sickness also restores normal cellular signaling in a mouse model of autism, reversing symptoms of the neurological disorder in animals that were the human biological age equivalent of 30 years old. The findings, published in the June 17, 2014 online issue of *Translational Psychiatry*, follow up on similar research published last year by senior author Robert K. Naviaux, MD, PhD, professor of medicine, pediatrics and pathology, and colleagues. Naviaux said the findings fit neatly with the idea that autism is caused by a multitude of interconnected factors: "Twenty percent of the known factors associated with autism are genetic, but most are not. It's wrong to think of genes and the environment as separate and independent factors. Genes and environmental factors interact. The net result of this interaction is metabolism."

UC San Diego Health System
17 Jun. 2014

<http://health.ucsd.edu/news/releases/Pages/2014-06-17-single-dose-reverses-autism.aspx>

Modeling How Neurons Work Together

Researchers from the University of Cambridge, working in collaboration with the University of Oxford and the Ecole Polytechnique Fédérale de Lausanne (EPFL), have developed a new model of a neural network, offering a novel theory of how neurons work together when performing complex movements. The results are published in the 18 June edition of the journal *Neuron*. The results could not only enhance understanding of the complex dynamics at work in the brain, but aid in the development of robotic limbs that are capable of more complex and natural movements. “There is a remarkable synergy in the activity recorded simultaneously in hundreds of neurons,” said Dr Guillaume Hennequin of the University’s Department of Engineering, who led the research. “In contrast, previous models of cortical circuit dynamics predict a lot of redundancy, and therefore poorly explain what happens in the motor cortex during movements. Our theory could provide a more accurate guess of how neurons would want to signal both movement intention and execution to the robotic limb.”

University of Cambridge (UK)
18 Jun. 2014

<http://www.cam.ac.uk/research/news/modelling-how-neurons-work-together>

A Step Closer to Bio-Printing Transplantable Tissues and Organs: Study

Researchers have made a giant leap towards the goal of ‘bio-printing’ transplantable tissues and organs for people affected by major diseases and trauma injuries, a new study reports. Scientists from the Universities of Sydney, Harvard, Stanford and MIT have bio-printed artificial vascular networks mimicking the body’s circulatory system that are necessary for growing large complex tissues. “Imagine being able to walk into a hospital and have a full organ printed – or bio-printed, as we call it – with all the cells, proteins and blood vessels in the right place, simply by pushing the ‘print’ button in your

computer screen,” says study lead author and University of Sydney researcher, Dr Luiz Bertassoni. “We are still far away from that, but our research is addressing exactly that. Our finding is an important new step towards achieving these goals. At the moment, we are pretty much printing ‘prototypes’ that, as we improve, will eventually be used to change the way we treat patients worldwide.”

EurekaAlert / University of Sydney
30 Jun. 2014

http://www.eurekaalert.org/pub_releases/2014-06/uos-asc062914.php

Researchers Regrow Human Corneas

Boston researchers have identified a way to enhance regrowth of human corneal tissue to restore vision, using a molecule known as ABCB5 that acts as a marker for hard-to-find limbal stem cells. This work, a collaboration between the Massachusetts Eye and Ear/Schepens Eye Research Institute (Mass. Eye and Ear), Boston Children’s Hospital, Brigham and Women’s Hospital and the VA Boston Healthcare System, provides promise to burn victims, victims of chemical injury and others with damaging eye diseases. The research, published this week in *Nature*, is also one of the first known examples of constructing a tissue from an adult-derived human stem cell. A restored functional cornea followed transplantation of human ABCB5-positive limbal stem cells to limbal stem cell-deficient mice. Transplants consisting of human ABCB5-positive limbal stem cells resulted in restoration and long-term maintenance of a normal clear cornea, whereas control mice that received either no cells or ABCB5-negative cells failed to restore the cornea.

Massachusetts Eye and Ear
2 Jul. 2014

http://www.masseyeandear.org/news/press_releases/recent/2014_Nature_Growing_Corneas/

Consciousness On-Off Switch Discovered Deep in Brain

For the first time, researchers have switched off consciousness by electrically stimulating a single brain area. Although only tested in one person, the discovery suggests that a single area – the claustrum – might be integral to combining disparate brain activity into a seamless package of thoughts, sensations and emotions. It takes us a step closer to answering a problem that has confounded scientists and philosophers for millennia – namely how our conscious awareness arises. In a study published last week, Mohamad Koubeissi at the George Washington University in Washington DC and his colleagues describe how they managed to switch a woman’s consciousness off and on by stimulating her claustrum. The woman has epilepsy so the team were using deep brain electrodes to record signals from different brain regions to work out where her seizures originate. One electrode was positioned next to the claustrum, an area that had never been stimulated before. When the team zapped the area with high frequency electrical impulses, the woman lost consciousness.

Helen Thomson / NewScientist
2 Jul. 2014

<http://www.newscientist.com/article/mg22329762.700-consciousness-onoff-switch-discovered-deep-in-brain.html#.U8MBTvdXkc>

Scientists Find Key Piece in Brain Tumor Puzzle

Scientists at the Montreal Neurological Institute and Hospital, McGill University and McGill University Health Centre have shown that a member of the protein family known as SUMO (small ubiquitin-like modifier) is a key to why tumour cells multiply uncontrollably, especially in the case of glioblastoma. The SUMO family proteins modify other proteins and the SUMOylation of proteins are critical for many cellular processes. Identifying SUMO’s role in the cancer cell growth will lead to a new strategy for glioblastoma treatment. Glioblastoma is the most common

and lethal brain cancer. Current standard treatments include surgical resection, adjuvant chemotherapy and radiotherapy. Despite the treatments, patients survive about a year and half. The cancer continues growing in part due to the presence of the cancer stem cells. It is critical to understand cancer growing pathways in the stem cells for development of stem cells targeted therapies. Dr. Anita Bellail is lead author on the paper published in *Nature Communications*.

McGill Reporter / Anita Kar
4 Jul. 2014

<https://publications.mcgill.ca/reporter/2014/07/scientists-find-important-piece-in-the-brain-tumour-puzzle/>

New, Powerful Molecular Sensor

Nanophotonics experts at Rice University have created a unique sensor that amplifies the optical signature of molecules by about 100 billion times. Newly published tests found the device could accurately identify the composition and structure of individual molecules containing fewer than 20 atoms. The new imaging method, which is described this week in the journal *Nature Communications*, uses a form of Raman spectroscopy in combination with an intricate but mass reproducible optical amplifier. "Ours and other research groups have been designing single-molecule sensors for several years, but this new approach offers advantages

over any previously reported method," said LANP Director Naomi Halas, the lead scientist on the study. "The ideal single-molecule sensor would be able to identify an unknown molecule — even a very small one — without any prior information about that molecule's structure or composition. That's not possible with current technology, but this new technique has that potential."

Jade Boyd / Rice University News and Media

15 Jul. 2014

<http://news.rice.edu/2014/07/15/rice-nanophotonics-experts-create-powerful-molecular-sensor-2/>

A Roadmap to Resuscitation

Successful rejuvenation of cryonics patients will require three distinct technologies: (1) A cure for the disease that put the patient in a critical condition prior to cryopreservation; (2) biological or mechanical cell repair technologies that can reverse any injury associated with the cryopreservation process and long-term care at low temperatures; (3) rejuvenation biotechnologies that restore the patient to good health prior to resuscitation. OR it will require some entirely new approach such as (1) mapping the ultrastructure of cryopreserved brain tissue using nanotechnology, and (2) using this information to deduce the original structure and repairing, replicating or simulating tissue or structure in some viable form so the person "comes back."

The following list is a list of landmark papers and books that reflect ongoing progress towards the resuscitation of cryonics patients:

Jerome B. White, "Viral-Induced Repair of Damaged Neurons with Preservation of Long-Term Information Content," Second Annual Conference of the Cryonics Societies of America, University of Michigan at Ann Arbor, April 11-12, 1969, by J. B. White.

Michael G. Darwin, "The Anabolocyte: A Biological Approach to Repairing Cryoinjury," *Life Extension*

Magazine (July-August 1977):80-83. Reprinted in *Cryonics* 29 (4th Quarter 2008):14-17.

Corey Noble, "A 'Realistic' Scenario for Nanotechnological Repair of the Frozen Human Brain," in Brian Wowk, Michael Darwin, eds., *Cryonics: Reaching for Tomorrow*, Alcor Life Extension Foundation, 1991.

Ralph C. Merkle, "The Molecular Repair of the Brain," *Cryonics* 15(January 1994):16-31 (Part I) & *Cryonics* 15(April 1994):20-32 (Part II).

Ralph C. Merkle, "Cryonics, Cryptography, and Maximum Likelihood Estimation," First Extropy Institute Conference, Sunnyvale CA, 1994.

Aubrey de Grey & Michael Rae, "Ending Aging: The Rejuvenation Breakthroughs That Could Reverse Human Aging in Our Lifetime." St. Martin's Press, 2007

Robert A. Freitas Jr., "Comprehensive Nanorobotic Control of Human Morbidity and Aging," in Gregory M. Fahy, Michael D. West, L. Stephen Coles, and Steven B. Harris, eds, *The Future of Aging: Pathways to Human Life Extension*, Springer, New York, 2010, pp. 685-805.

Chana de Wolf, "Reconstructive Connectomics," *Cryonics Magazine*, July 2013.



Item# 01808

How Much Curcumin Are You Absorbing?

Curcumin is an active compound derived from the Indian spice **turmeric**. It has been widely acclaimed for its diverse health-promoting effects on nearly every organ system in the body,¹⁻⁶ including its support for the body's natural inflammatory response system.⁷ But most curcumin is neither *absorbed* well nor *retained* well in the blood—posing a challenge to those who wish to maximize its benefits.⁸

Life Extension® took the lead in resolving this issue several years ago by introducing **Super Bio-Curcumin**® containing **BCM-95**®, a patented, *bioenhanced* preparation of curcumin that has been shown to reach up to **7 times higher concentration** in the blood than standard curcumin.⁸

Now, an exciting **next generation** curcumin formula has become available! **Advanced Bio-Curcumin**® with **Ginger & Turmerones** provides additional compounds that **further** boost absorption of curcumin's highly beneficial phytonutrients!^{9,10}

UNRIVALED POTENCY AND ABSORBABILITY

In addition to **BCM-95**®, this **curcumin** formula contains:

- 1. Turmerones:** After curcumin is extracted from turmeric, what remains is **turmeric oil** rich in compounds called **turmerones**.^{11,12} Combining **BCM-95**® with a high content of **turmerones** provides health consumers with more beneficial **turmeric** compounds that further multiply absorption.⁹ Scientists have shown that these potent **turmerones** not only support curcumin absorption, but significantly increase the amount of curcumin **inside** the cell as well!⁹
- 2. Ginger:** Curcumin and **ginger** are close botanical relatives. Research demonstrates that they have overlapping and complementary health benefits,¹³ and scientists are focusing on the therapeutic effects of *combining* these two plants.^{14,15} **Advanced Bio-Curcumin**® with **Ginger & Turmerones** provides a supercritical extract of ginger standardized to the greatest concentration of ginger compounds—including beneficial gingerols and shogaols.
- 3. Phospholipids:** This new curcumin formula also contains **phospholipids**, a type of emulsifying molecule known to greatly enhance absorption of poorly soluble active compounds.¹⁰

The powerfully enhanced bioavailability and potency of **Advanced Bio-Curcumin**® with **Ginger & Turmerones** is superior to conventional curcumin supplements. This product represents the most powerful and cost-effective way to supplement with—and receive the full benefits of—this very critical nutrient.

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Turmeric Phospholipid Blend	630 mg
BCM-95® Bio-Curcumin Turmeric 25:1 extract (rhizome) [total curcuminoids complex with essential oils (380 mg)], Turmeric oil (rhizome) [providing 60 mg total turmerones], Phospholipids	
Ginger CO₂ extract (root)	200 mg
[providing 60 mg gingerols]	

Each softgel of **Advanced Bio-Curcumin**® with **Ginger & Turmerones** provides **400 mg** of **BCM-95**® **Super Bio-Curcumin** plus an array of turmerones and phospholipids.

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Caution: Do not take if you have gallbladder problems or gallstones. If you are taking anti-coagulant or anti-platelet medications, or have a bleeding disorder, contact your healthcare practitioner before taking this product.

MEETINGS

ABOUT THE ALCOR FOUNDATION

The Alcor Life Extension Foundation is a nonprofit tax-exempt scientific and educational organization dedicated to advancing the science of cryopreservation and promoting cryonics as a rational option. Being an Alcor member means knowing that—should the worst happen—Alcor's Emergency Response Team is ready to respond for you, 24 hours a day, 365 days a year.

Alcor's Emergency Response capability includes specially trained technicians and customized equipment in Arizona, northern California, southern California, and south Florida, as well as many additional certified technicians on-call around the United States. Alcor's Arizona facility includes a full-time staff, and the Patient Care Bay is personally monitored 24 hours a day.

ARIZONA

FLAGSTAFF:

Arizona without the inferno. Cryonics group in beautiful, high-altitude Flagstaff. Two-hour drive to Alcor. Contact eric@flagstaffcryo.com for more information.

PHOENIX

VALLEY OF THE SUN:

This group meets monthly, usually in the third week of the month. Dates are determined by the activity or event planned. For more information or to RSVP, visit <http://cryonics.meetup.com/45/> or email Lisa Shock at lisa@alcor.org.

AT ALCOR:

Alcor Board of Directors Meetings and Facility Tours—Alcor business meetings are generally held on the first Saturday of every month starting at 11:00 AM MST. Guests are welcome to attend the fully-public board meetings on odd-numbered months. Facility tours are held every Tuesday and Friday at 2:00 PM. For more information or to schedule a tour, call Marji Klima at (877) 462-5267 x101 or email marji@alcor.org.

CALIFORNIA

LOS ANGELES:

Alcor Southern California Meetings—For information, call Peter Voss at (310) 822-4533 or e-mail him at peter@optimal.org. Although monthly meetings are not held regularly, you can meet Los Angeles Alcor members by contacting Peter.

SAN FRANCISCO BAY:

Alcor Northern California Meetings are held quarterly in January, April, July, and October. A CryoFeast is held once a year. For information on Northern California meetings, call Mark Galeck at (650) 969-1671, (650) 534-6409 or email Mark_galeck@pacbell.net.

FLORIDA

Central Florida Life Extension group meets once a month in the Tampa Bay area (Tampa and St. Petersburg) for discussion and socializing. The group has been active since 2007. Email arcturus12453@yahoo.com for more information.

NEW ENGLAND

CAMBRIDGE:

The New England regional group strives to meet monthly in Cambridge, MA—for information or to be added to the Alcor NE mailing list, please contact Bret Kulakovich at 617-824-8982, alcor@bonfireproductions.com, or on FACEBOOK via the Cryonics Special Interest Group.

PACIFIC NORTHWEST

A Yahoo mailing list is also maintained for cryonicists in the Pacific Northwest at <http://tech.groups.yahoo.com/group/CryonicsNW/>.

BRITISH COLUMBIA (CANADA):

The contact person for meetings in the Vancouver area is Keegan Macintosh: keegan.macintosh@me.com.

OREGON:

The contact person for meetings in the Portland area is Aschwin de Wolf: aschwin@alcor.org

See also: <https://www.facebook.com/portland.life.extension>

ALCOR PORTUGAL

Alcor Portugal is working to have good stabilization and transport capabilities. The group meets every Saturday for two hours. For information about meetings, contact Nuno Martins at n-martins@n-martins.com. The Alcor Portugal website is: www.alcorportugal.com.

TEXAS

DALLAS:

North Texas Cryonauts, please sign up for our announcements list for meetings (<http://groups.yahoo.com/group/cryonauts-announce>) or contact David Wallace Croft at (214) 636-3790 for details of upcoming meetings.

AUSTIN/CENTRAL TEXAS:

We meet at least quarterly for training, transport kit updates, and discussion. For information: Steve Jackson, 512-447-7866, sj@sjgames.com.

UNITED KINGDOM

There is an Alcor chapter in England. For information about meetings, contact Alan Sinclair at cryoservices@yahoo.co.uk. See the web site at www.alcor-uk.org.

If you are interested in hosting regular meetings in your area, contact Alcor at 877-462-5267, ext. 113. Meetings are a great way to learn about cryonics, meet others with similar interests, and introduce your friends and family to Alcor members!

WHAT IS CRYONICS?

Cryonics is an attempt to preserve and protect human life, not reverse death. It is the practice of using extreme cold to attempt to preserve the life of a person who can no longer be supported by today's medicine. Will future medicine, including mature nanotechnology, have the ability to heal at the cellular and molecular levels? Can cryonics successfully carry the cryopreserved person forward through time, for however many decades or centuries might be necessary, until the cryopreservation process can be reversed and the person restored to full health? While cryonics may sound like science fiction, there is a basis for it in real science. The complete scientific story of cryonics is seldom told in media reports, leaving cryonics widely misunderstood. We invite you to reach your own conclusions.

HOW DO I FIND OUT MORE?

The Alcor Life Extension Foundation is the world leader in cryonics research and technology. Alcor is a non-profit organization located in Scottsdale, Arizona, founded in 1972. Our website is one of the best sources of detailed introductory information about Alcor and cryopreservation (www.alcor.org). We also invite you to request our FREE information package on the "Free Information" section of our website. It includes:

- A fully illustrated color brochure
- A sample of our magazine
- An application for membership and brochure explaining how to join
- And more!

Your free package should arrive in 1-2 weeks. (The complete package will be sent free in the U.S., Canada, and the United Kingdom.)

HOW DO I ENROLL?

Signing up for a cryopreservation is easy!

- Step 1:** Fill out an application and submit it with your \$90 application fee.
- Step 2:** You will then be sent a set of contracts to review and sign.
- Step 3:** Fund your cryopreservation. While most people use life insurance to fund their cryopreservation, other forms of prepayment are also accepted. Alcor's Membership Coordinator can provide you with a list of insurance agents familiar with satisfying Alcor's current funding requirements.
- Finally:** After enrolling, you will wear emergency alert tags or carry a special card in your wallet. This is your confirmation that Alcor will respond immediately to an emergency call on your behalf.

Not ready to make full arrangements for cryopreservation? Then **become an Associate Member** for \$10/month (or \$30/quarter or \$120 annually). Associate Members will receive:

- *Cryonics* magazine by mail
- Discounts on Alcor conferences
- Access to post in the Alcor Member Forums
- A dollar-for-dollar credit toward full membership sign-up fees for any dues paid for Associate Membership

To become an Associate Member send a check or money order (\$10/month or \$30/quarter or \$120 annually) to Alcor Life Extension Foundation, 7895 E. Acoma Dr., Suite 110, Scottsdale, Arizona 85260, or call Marji Klima at (480) 905-1906 ext. 101 with your credit card information. You can also pay using PayPal (and get the Declaration of Intent to Be Cryopreserved) here: <http://www.alcor.org/BecomeMember/associate.html>



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