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THEY DON'T GET NO RESPECT
by Kent Harker

[Since its inception in 1948, UFOlogy has sought scientific respectability. It has gained some when its ranks have added names from the scientific community. Dr. James Harder, professor of engineering at UCB addressed BAS monthly meeting (please see Michael Sorens's article on page 5 for the details of that meeting).

I sent Dr. Harder a copy of my article in early February and invited him to offer a rebuttal which would be published unedited in "BASIS". No response.]

Dr. Harder is a respected, qualified member of the scientific "establishment" who finds himself in a minority. Of course, there is nothing disreputable in this, as Dr. Harder recognizes. He merely views himself as in the avant garde. He pointed out that new discoveries are usually opposed at first and cited examples.

But there was a key statement by Dr. Harder that stopped me cold. He said, "Observation always supersedes theory." The implication is clear insofar as UFOs are concerned, and his dictum is correct as it applies to the scientific method. If theory states that a bird with a wing-area-to-body-weight ratio less than 2.33 CANNOT fly, observation of a hummingbird aloft with a ratio of 1.91 supersedes the theory. It is a counter-example, and the theory must fall or be revised.

As Dr. Harder applies this to the question of alien presence, he makes a couple of -- unwarranted, I think -- assumptions. One is that skeptics have some theory that there cannot be an alien presence. The most critical of UFOlogy (Robert Sheaffer, for example) do not take such a stance; Sheaffer could be persuaded and he will tell you the kinds of things it would take to change his mind.

But the most crucial, and, I think, the most unreasonable of Harder's assumptions, is that UFO observations are reliable. In fact I found it astonishing that an individual of Dr. Harder's preparation and standing could so blithely allow the definition of "observation" in the strict scientific sense to be applied to what has been (and is) reported in UFODom. SCIENTIFIC observation requires rigorous standards and controlled conditions.

Let's see if that scientific standard is as carefully followed in UFOlogy as would be taught in Dr. Harder's classroom at UC Berkeley. How credible is the eye of a human observer -- an eyewitness -- when highly emotional phenomena are involved?

At the dedication of the canonization of Saint Charbel, the first Lebanese Catholic to be sainted, there was eye-witness testimony that the arm of the memorial statue raised as if to bless the assembled throng. It was not one or two that attested to this miracle -- hundreds did so. Now, molecular theory states that the particles of matter, irrespective of how apparently rigid the nature of the material they compose, are constantly in random motion. It is essentially unthinkable that all those billions of billions of molecules just happened to have moved in the same direction all at the same time, resulting in the marble arm being elevated.

So the Church would call it a miracle, and we would have to agree.

If.

If the observations were reliable. I have no doubt whatever that all those observers would pass a whole battery of lie-detector tests and that any hypnotized participants would "remember" that they, too, had witnessed the same event. I am certain that all of those witnesses believe what they alleged and just as certain Dr. Harder would not disagree with me.

The reliability of eye-witness accounts is a subject of great psychological and legal concern. It is so easy to destroy the testimony of an eye witness in a criminal case that both prosecution and defense are very cautious about how it is done. A recent case comes to mind that was aired on "60 Minutes" in which a man was tried and convicted on eye-witness accounts. He was poorly defended (a public defender) and Safer and crew found proof that the man was not even near the scene of the crime at the time. The eye-witnesses were not lying. They were honest people -- honestly mistaken when they positively identified the defendant.

What about when the account is second-hand? Would this be acceptable under the evidential requirements of a science lab? Particularly when the admission of such observations might require a significant change in the scientific model? Are we ready to jettison some deeply-entrenched, well-tested physics that says large masses passing through the sound barrier must be accompanied by a sonic boom when a "competent observer" (an Air Force pilot) files such a report in which a UFO accelerates at an estimated 100 Gs without a sound? Do we wish to ignore those same laws (Einsteinian physics) that require anything plastic to be quickly converted to mashed potatoes in such an acceleration?

We can question the theory or we can question the observation. As long as the observations are made in less-than-controlled

circumstances, the laws of parsimony require suspicion of the latter before we set about turning things upside down.

Dr. Harder's stance seems to rest upon two kinds of observation: Typical eye-witness reports and hypnotic recall. It is my contention that Dr. Harder is not expert in either of these areas, and that he is liable to heavy errors because of that lack of expertise. (I have no doubt that he may be an expert hypnotist, but this is not what I mean. I refer to the domain of psychology, brain physiology, and related bio-psychological fields.)

The problems of eye-witness accounts are then exacerbated by the problems of recall. The public has a notion that the mind is like a tape recorder, and if one can successfully (via hypnosis, for example) rewind the tape, what comes out when it is played back is 100% accurate. How does observation of the I-saw-it-with-my-own-eyes variety stack up? Here is a tiny sample of the documented cases in which (1) the reality was known, and (2) the observational accounts of the event have been carefully recorded:

The planet Venus has been cleared to land at some major airports, shot at, and mistaken for a freight train.

On March 12, 1978 (Sheaffer, 1981) thousands witnessed a "fleet of UFOs" with a mother ship (or two, three or four mother ships, depending upon which witness) about the size of a 747 was headed on a collision course with a Brazilian military base. The UFO armada leveled off at 2,000 feet (or 500 feet according to some) and then disappeared. It was reported so low that one observer, a pilot, saw portholes in the cigar-shaped vessel.

Astronomers very quickly documented that it was a large and brilliant fireball meteor.

Night-flying advertising aircraft are often mistaken as UFOs and usually described as saucer-shaped, enormous sized, and emitting a flood of brilliant, continuous light, and moving slowly, or hovering, without sound.

Weather balloons, flying at altitudes in excess of 60,000 feet are reported to be enormous UFOs hovering at 1,000 feet in every color imaginable.

An important hoax conducted on March 28, 1970 ("SI", 1980) at Cradle Hill, England, a popular gathering place for UFO observers, showed the extent of eye-witness unreliability. This case is important in that the circumstances were carefully controlled.

At 11 p.m., a 12-volt, high-intensity purple spotlight was directed at Cradle Hill from 0.75 miles away. It was stationary, and turned on 5 sec., off for 5 sec., and on again for 25 sec. At Cradle Hill a collaborator switched on a phony magnetic-field sensor (many UFO enthusiasts expect a strong magnetic field as a secondary confirmation of UFOs) at a predetermined time to synchronize with

the light, and the field-detection buzzer was activated so that the group of about 30 UFO observers thought a strong field was present.

The collaborator then took two exposures of the light over two previously exposed frames, each containing a fake UFO and then took two real, time-lapse pictures. There were street lights and several other reference point in all exposures. Negatives and prints were turned over to various UFO groups throughout the world.

The first two photos showed the fake UFO in two different positions far to the right of the spotlight (recorded by the second exposure) with a much higher light intensity than the stationary purple beam. All of the eye-witness accounts corroborated the photographic evidence, stating that they observed the object moving, that it was very bright, and that it was visible for one to one-and-a-half minutes.

The perpetrators kept the hoax secret for two years, during which time the photographs were extensively analyzed and declared to be authentic. One specialist, Pierre Guerin from the Astrophysical Institute in France, declared, "In my opinion there is no question of the object photographed being in any possible way the result of faking.

The history of UFOlogy is one in which these same scenes are repeated with dreary regularity.

So what about the other side of Dr. Harder's observations, the hypnotically-recalled experiences of UFO abductees?

The literature on the validity of hypnotic recall is usually in professional journals; those not in the trades, as it were, would have to exert special effort to follow the work that has been done. The information that has come out for public consumption appears in the context of court cases because the judiciary has had to decide if such testimony is admissible. The verdict is that there is so much subjectivity that serious errors may be introduced, so hypnotic recall is inadmissible in a court of law. Why Dr. Harder allows it in a science laboratory is something that needs to be explained.

Some of the best analyses for public consumption have been done in the latest issue of the "Skeptical Inquirer", and the reader is urged to study the full account of the neuro-psychological problems involved with hypnotic regression in that publication.

A great summation is embodied in the statement from U. of Kentucky psychologist Robert A. Baker's article ("SI", 1988) "The Aliens Among Us: Hypnotic Regression Revisited" in which he said, "...hypnosis is a situation in which people set aside critical judgment (without abandoning it entirely) and engage in make-believe and fantasy; that is, they use their imagination." Baker goes on to point out that if the hypnotist is sympathetic and supportive, the suggestible patient will (unconsciously) provide

whatever he or she perceives the hypnotist wants.

Dr. Harder might counter with a case he reported in which a mother and daughter related the same abduction incident in great detail under hypnosis. The women had no memory of any abduction in their conscious state, so they could not have collaborated in any way, according to Harder. He offers that the close agreement on the details tends to rule out a prosaic explanation. I agree with Michael Sorens when he suggests we leave it to "BASIS" readers to see if a UFO abduction is the only other possibility.

Alas, UFOlogy has not advanced very much since the first flying saucers were observed wafting through our atmosphere in 1948. J. Allen Hynek, astronomer and pre-eminent UFOlogist, died without seeing a realization of his prediction that UFOlogy would soon achieve scientific respectability, and UFOlogy is in about the same state as it was when he became a believer. The supermarket tabloids and specialty groups generally remain the principal repository of UFOmania.

References:

(Sheaffer, 1981): "The UFO Verdict: Examining the Evidence", Robert Sheaffer, Prometheus Books, 1981.

("SI", 1980): the "Skeptical Inquirer", Vol. IV, No. 3.

("SI", 1988): the "Skeptical Inquirer", Vol. XII, No. 2.

RAMPARTS

["Ramparts" is a regular feature of "BASIS", and your participation is urged. Clip, snip and tear bits of irrationality from your local scene and send them to the Editor. If you want to add some comment with the submission, please do so.]

There is faith and there is faith.

The widow and kids of Carl Stevens get top honors. The "Mercury" took the story from the AP wire about the Stevens family. Carl, you see, has not been alive since 1979. But his corpse was kept in the upstairs bedroom of the home nevertheless. Each day Mrs. Stevens faithfully changed his clothes and bedding. Friends and relatives were told Carl was sick, and they were never allowed to see him because "they had a black soul" (which would presumably interrupt the healing process). Carl's two children appeared to be well-adjusted teens, both of them honor students.

When the sheriff finally got a court order to enter the home, they found Carl neatly tucked in his fresh clothes and bedding a mere skeleton with a thin covering of skin. (There were no details about any severe B.O. Mrs. Stevens might have noticed on hubby.) The

Sheriff, never one to overstate the facts, observed, "Let's just say they have abnormal belief in the power of healing."

MATH PRODIGIES?

Skeptic Dr. Philip Rice sent an article from the "Chron." that caught his eye. We have all heard of or witnessed the wonders of the so-called lightning human calculators -- those whizzes who can compute faster than their electronic counterparts. There is nothing paranormal about this ability -- but. But, within limits. Philip wondered if there were something "rotten in Denmark," as he put it, to the whole thing when he read that the Institute of Noetic Science (INS) was working with some of these remarkable people, so he sent the article to "BASIS".

The article documented an Indian woman, a Ms. Devi, who performed some prodigious mathematical feats: "The cube of 121? 'One seven seven one five six one,' she replied instantly." This is not really very spectacular if one knows a few tricks. 121 is 11 squared, so it is the same as 11 raised to the sixth power. There are short-cuts to do multiples of eleven.

Devi was asked if she could only work with whole numbers and so she asked for a fraction. She was given the task of extracting of the third root of 12,812.904. "'That,' she said without hesitation, 'is the third power of 23.4.'"

As a former mathematics instructor, this editor was astounded at the number and its third root.

Cubing 121 is no big deal. Knowledge of a few mental tricks, some studied practice and most can perform arithmetic operations very rapidly. Going the other direction is another matter, i.e., extracting higher roots. The thing that is more remarkable than Devi's alleged power to perform such feats is the choice of a non-integral number with rational roots. (Integers are positive and negative counting numbers, and rational numbers are those that can be expressed as a ratio of integers. The square root of three, for example is irrational, i.e., it cannot be expressed as a ratio of integers.) In fact, the probability of a RANDOMLY-CHOSEN, non-integral number whose cube root is rational is effectively zero. The "selected" number is virtually certain to have been a plant.

Tricksters hope we won't look in from the back end, but that's exactly what Dr. Rice did in his comments to "BASIS". He thought it a little strange that the root is sequential, i.e., 2-3-4. Take .234, 2.34, 23.4, or 234, cube it and then feed the answer in reverse through a plant. Mnemonics are the most likely explanation here, not phenomenal ability. Philip showed how easily the same scheme can be worked with other three-digit sequences.

"BASIS" then wrote to the "Chronicle" with these analyses and

called the INS to see if they would be interested in tests under controlled conditions. We don't expect any of our counter to this nonsense to appear, and, as we further expected, the INS will not return any calls. After the fourth call in as many days, their answering machines were off and we were able to talk to a human. Her only comment was that remote viewing had been scientifically demonstrated under controlled conditions and ESP was an established fact. She seemed genuinely astonished that there were any people who disbelieved.

Our thanks to Dr. Rice and the rest of our alert readers. The media will continue hearing from us on things like this, and we think they will begin listening if we keep up the heat. Keep sending in the nonsense, and continue writing the newspapers.

LUCKY FOLLOW-UP by Richard Cleverly

After my article on the psychic who offered, in full-page ads, lucky numbers for only \$1 (P&H), I saw the ad again on the back page of the family supplement insert of the Sunday paper. Same lady, a Madame Daudet. -- all good psychics are Madame, with an "e", or Reverend.

Her ad promised "lucky numbers" that would bring untold wealth for only a buck. What do I have to lose? Well, a dollar. But that's only for P&H. In my first article I reasoned a sophisticated scheme, so I decided to check things out by sending THREE letters to the good Madame, and lest she track me with duplicate addresses, one was from my P. O. box, another from my home, and a third from my office.

I was unprepared for what I got.

The \$1 was for P&H all right -- a bulk-mail envelope with cursive writing on it stating, "Here is the personal and confidential information you recently requested." I wondered if the carrier thought I might be into porn. It was so full of personal and confidential information I couldn't find the number she promised me. I spent almost thirty minutes (I know, I wasted the dollar, and now I'm throwing good after bad by spending time actually expecting to find what she promised, but this is a Cause, you know) before I found it.

In what looked like a hand-written note addressed "Dear Friend," she said she hoped she could call me her dear friend because as soon as she received my inquiry she began researching my aspects and had found some truly remarkable things. Deeper in the packet was a titillating sample of the Secrets of the Ages, prepared "Just for you" (but addressed "Dear Seeker of Happiness and Good Fortune"). If this had cost me more I would not share the intimate things she gave me with the rest of you raving skeptics. What I am

about to reveal is at great peril to my good fortune. Ah, the sacrifices for the cause of Truth.

"Your letter to me was one of special communication. As soon as I held it in my hand, I felt a sense of urgency, which made me consider your case on a priority basis." she continued.

Just go to your bank, put a crisp dollar bill on the counter, informing the teller you would like to make a deposit, and see if you get that kind of respect. Come to think of it, it did take her about three months to respond. Then again, it takes time to do that kind of specialized research on my aspects, the kind you would only do for a dear friend. Well, Mme. Daudet promised she would soon reveal my special number that "shines with particular brilliance in Your [she even capitalized my personal pronoun, thank you] astral heaven."

Now this is where I am violating a sacred trust she placed upon me. She said, "Part of your most important number is 2, and its complementary 3." In fact it is so personal and confidential that "it must never be revealed to anyone else, and if you do, you run the risk of losing part of its power."

A 2 and a 3. Two? Twenty-three? Thirty-two? 3,322?

I don't suppose I should feel hurt if everyone else on the block got those same numbers. I mean what with only 10 digits it surely wouldn't mean there is anything impersonal that we millions happen to share the same miracle numbers. Just, please, share your lottery prize if you win it with my numbers. But these aren't my ONLY lucky numbers. She has more for me. I remember now that she didn't say in her original ads she would give me ALL my lucky numbers for the \$1.

She was so taken with my case that she was "inspired to continue studying your personal case, and I have found that my first instincts have been confirmed: You are entering a truly excellent period of your life, a solar period, a period of warmth and brilliance."

To get the rest of the numbers that go along with my two lucky numbers, and to get a complete numerological horoscope to help me take full advantage of the opportunities that await me in the truly excellent period, I need to RUSH the enclosed validation card to her together with my check for \$35. Of course, she will accept Visa. Whaddaya expect for a buck? Bon Dieu! I almost forgot. I get a special surprise if I respond within 10 days: "A miraculous Lourdes Medal from the sacred shrine at Lourdes, France."

Well, I passed.

One week later. My box is full of mail from astrologers, psychics, and spiritualists. Norvell, "the greatest Astrologer of our time" promises -- guarantees -- he will give me lucky numbers. (The guy's

sharp. He just guarantees he'll give me the numbers, not that they will be lucky.) The Lottery Research Center in New York sends a package that has so much printing on the envelope I wonder if there is anything left to say on the inside. "This privileged information is being released to you immediately: (Remove Contents)."

I was glad they reminded me to remove the contents in case I had forgotten he had more to say.

I don't know what Norvell would think about it, but in the same delivery was Lynne Palmer's solicitation and it says SHE is the "world's most successful astrologer." Since she doesn't use upper case on her title, maybe that's how she and Norvell sort it out. She MUST be better, because she has more writing on her envelope. Lynne is the clear winner in the writing-on-the-outside category. (I wonder if there might be some law that says the importance of the material on the inside is in inverse proportion to the amount of writing on the outside.) There are about six postcards from numerologists in the Minor Leagues -- they don't have the budget for the big mailings.

This is the ultimate indignity. The Gaul tart had the gaul to sell my name on mailing lists. Probably helped her cover her losses for the measly dollar I sent her. Come to think of it, it was three dollars, and I never did hear on the other two. Her data base must sort on name, because I used the same name and birthday to see if she would give the same computer printout for the same birthdays.

Why I ever thought there would be anything as sophisticated as I suggested in my first article is beyond me now. Sorry.

Madame Daudet has the lucky numbers, all right. She's got mine and all the rest of we suckers that mailed in our \$1. Au revoir, money.

JANUARY MEETING

by Michael Sorens

At the January 26th meeting, held at the El Cerrito Library, we had the pleasure of hearing Dr. James Harder give a most eloquent presentation on UFOs. A professor of engineering at UC Berkeley, and a Fellow of the American Association for the Advancement of Science (AAAS), Dr. Harder proclaimed himself a skeptic, while at the same time espousing the belief that UFOs do, in fact, exist.

He began his talk by reminding us that there were skeptics as late as 1902 who refused to believe the Earth was round. And that there were skeptics, led by the pre-eminent physicist Robert Miliken in 1946, who declared that rocket travel to the Moon was impossible. He hoped that we, his audience, were not those kinds of skeptics. Dr. Harder indicated that he himself was the kind of skeptic that required evidence to support a theory.

Citing a comparison he made to astrologers, it would be a straightforward task to test whether the "cosmic twin" theory holds any water (i.e., two people born at the same time, same latitude, etc., and hence under the same sign will turn out similarly). One has merely to examine birth records of a certain area from 15 or so years ago to locate potential cosmic twins, then examine the current school records, criminal records, etc., of those same people today. This type of study will provide a small, and perhaps significant, amount of evidence relating to astrology.

Dr. Harder challenged that theory is useful, but observation and experiment take precedence. In the well-known Trindade case, a UFO was observed by approximately one hundred witnesses who were on a boat in Brazilian waters. Photographs were taken, quickly developed, and shown to the eyewitnesses, who generally agreed that, yes, that was what they had seen.

Dr. Harder conceded that it may not have been a UFO; perhaps, he suggests, it was mass hysteria. But why, he contends, did it affect the film as well as peoples' minds? It is somewhat harder to dismiss his notion that just because the photographer was a specialist in trick photography is no reason to assume that trick photography had been used. (This strikes me as akin to going back to a used car dealer to purchase an additional car, after your mechanic informed you that the seller must have been aware of major problems with the first vehicle you purchased from him.)

There have, in fact, been alternate explanations about what occurred: Prominent skeptic Robert Sheaffer cited a version of the story that purported that only the photographer and a friend saw the UFO. They drew the attention of bystanders, but the craft had flown off. Going off to a darkroom, they later emerged with their pictures. This does tend to leave just a bit of room for skepticism in this particular case. Dr. Harder later agreed that eyewitnesses are not the best form of evidence, but in this case he suggested that the eyewitness reports did constitute sufficient proof.

A member of the audience contended, however, that extraordinary claims require extraordinary proof, a statement with which Dr. Harder agreed. He went further though, to inquire whether this kind of evidence should at least make the case worthy of further study.

Another person brought out how his grandson, Eric Tejada, was able to prove that UFOs have not visited us, bringing along a clipping from the "San Francisco Examiner" showing his grandson in front of his eighth-grade class while presenting his proof.

Assuming an average speed of 200 miles per second, it would take over 18,000 years for a visitor from the nearest star to reach Earth. Such a generation-ship might encounter many problems such as raising young, having the knowledge to educate children, genetic problems of interbreeding, food supplies, and energy resources. These problems, Eric concluded, would make the possibility of alien visitation so unlikely that it could be considered impossible.

Professor Harder conjectured that perhaps an alien technology could find the means to get to Earth, and if they were that advanced, they would probably be smart enough to learn English. And, perhaps, they would have good reasons for not wanting themselves to be seen, either because they were benevolent and wished to let us develop on our own, or because they were evil and were secretly plotting the invasion of our planet. Several in the audience countered that the aliens weren't doing a very good job of hiding if we are to believe the thousands of sightings annually.

As one case study, Harder presented the following case: One of the designers of the P51 fighter aircraft claims to have observed a UFO in broad daylight, while riding as a passenger in an automobile on a country road. After watching it for several minutes, he observed it accelerate and disappear through the clouds; his later calculations indicated that it was accelerating at approximately 100 Gs and reached a velocity of 9,000 to 11,000 mph by the time it reached the cloud cover.

Astonishingly, the craft was utterly silent. Astronomer Norm Sperling raised the objection to Prof. Harder that physics dictates that there must be a sonic boom if such an event occurred. Dr. Harder asked, "Is your theory better than his observation?" This question is left as an exercise for the reader. (Keep in mind that the observer had no special instruments, was riding around in a car, and may or may not have had a notebook. Show your work.)

Dr. Harder presented a number of other interesting cases, though it was at times questionable whether he was making a case for or against the existence of extraterrestrials. Is it so unusual, for example, that under hypnosis two people will relate a similar tale about an alleged UFO incident, when they did not recollect anything before the hypnosis? Perhaps.

If, as in this case, the two people in question were mother and daughter? One can hardly wonder. Harder's estimate of a 0.2% probability of this happening by chance alone raised red flags to ardent skeptic and magician Bob Steiner, along with others in the audience -- Harder appeared unconcerned that such a precise numerical figure should have some basis in calculation using common statistical techniques.

In conclusion, I must applaud Dr. Harder for his eloquent manner and his ability to lead a lively discussion with unruffled feathers, but I must challenge him to present more rigorous evidence for his claims. Furthermore, science demands that a theory not be discarded wantonly in the face of weak evidence to the contrary; either much stronger evidence or a better theory must be offered in exchange.

TALK IT UP

by John Taube

In a recent KGO talk show with Bill Wattenburg as host, a lady called, and the conversation went like this:

Lady: A year ago I was told that I had cancer and I had only six months to live. With prayer, positive thinking, and a strong will to live, I cured myself.

Wattenburg: I am going to cut you off right there. What you are saying is demeaning to the thousands of people who have died from that fatal disease. It is scientifically established that for a thousand cancer patients given a determined period of time to live, a small percent will enjoy remission. What accounts for a small percentage to be lucky had not been determined at this time. There is not one shred of evidence, however, that prayer, positive thinking, will to live, or laying-on-of-hands plays any part in remission. So I am going to cut you off and thank you for calling.

John: I am sure that Bill would agree that when one is diagnosed as having a fatal disease, that person should not be discouraged to pray or do anything else that makes him or her feel better. But it must be put in perspective: Prayer, positive thinking, etc., have no significant therapeutic value, but they may at least help the person feel better.

But, some misguided pseudo-practitioners do irrevocable harm to people who have serious, non-fatal diseases by discouraging them from following the advice of their physicians. When these practitioners resort to faith-healing, for example, in many cases they make a non-fatal disease a fatal one.

["BASIS" comment: When is a disease considered fatal?]

SECOND LAW VS. CREATIONISM

by Jim Ardini, (Diablo Valley College)
and Dick Kidd, (S. F. Community College)

As physics teachers, we often encounter the assertion that the 2nd Law of thermodynamics precludes evolution, and, therefore forces acceptance of special creation. This has happened so often that we have written the following, which is distributed to students when we study thermodynamics. Scientific creationists claim the 2nd Law denies the possibility that a closed system can spontaneously become more "organized."

Since life forms on earth are more highly organized than their inanimate precursors, it could not have arisen without divine intervention, they say.

The 2nd Law states that "the entropy of an ISOLATED system always remains the same or increases." Creationists such as Dr. Gerald

Aardsma, physicist at the Institute of Creation Science in Santee, CA, state it as "the entropy of a closed system always remains the same or increases." (See Discover, Oct. '87.) However, a closed system is not the same as an isolated system. To clarify this we begin by defining a "system." It is any collection of objects around which a real or imaginary boundary is placed.

If we are given three objects, a cat, a dog, and a hydrant, we could create a system of the cat and dog, the dog and the hydrant, or of all three. Next we distinguish between an isolated system and a closed system. An isolated system is one across whose boundary nothing can pass, i.e., energy, matter, or force. The closed system to which the creationists refer is one across whose boundary matter cannot pass, only energy such as light or heat. It is important to realize that the 2nd Law refers only to isolated systems and not to closed systems.

Next, two loose, but popular descriptions of entropy will be used: Entropy is a measure of the "disorder" of a system, or the "unavailability of energy to do work." Thus, when the available energy or order of a system decreases, its entropy will increase, and when the order exhibited by a system increases its entropy decreases.

Imagine a room with a refrigerator which is internally at room temperature and which has a tray of tepid water in the freezer. We shut the door of the refrigerator and start the compressor by plugging it into a battery. Next the room in which the fridge and battery are located is insulated and sealed so that it is an essentially isolated system. The temperature of the water in the freezer will drop and the heat removed from the water will be pumped into the room. Soon the water freezes into ice. The water molecules in the ice are more highly organized than they were as liquid water; because their organization will be greater, the entropy of the water is less.

However, as this happens, some of the energy in the battery will no longer be available. Therefore, the entropy of the battery will increase. Since the room becomes warmer, the molecules of the air will crash about more turbulently, in a more disorganized fashion. This results in an overall entropy increase in the room. Thus, the water* (and air) in the refrigerator will have a decrease of entropy while the battery and air in the room will suffer an increase of entropy.

According to the 2nd Law, the entropy of the sealed, room -- an isolated system -- must increase or remain the same. However, when real processes are considered, the entropy will not remain the same it will always increase. Hence, the entropy of the battery and air of the room will increase more than the entropy of the water will decrease.

The 2nd Law allows the entropy of a real, closed subsystem to decrease as long as the total entropy of the isolated system

containing it increases. The phrase "essentially isolated" was used because there is no real system which is ideally isolated. However, the "essentially isolated" system is one in which any slight residual interactions of the system with the outside will not significantly affect the numerical value of the entropy compared to the system's net change of entropy.

The earth's surface has never been an isolated system because it has always received energy from the sun. Therefore, there can be local decreases in entropy at the earth's surface while, at the same time, the entropy of the sun-earth system essentially an isolated system, increases. The evolution of living things is simply a local decrease of entropy and is not a violation of the 2nd Law.

An important experiment inspired by publications of A. I. Oparin in the 20s and 30s was carried out by Stanley Miller in the 50s. He produced, from simple precursors in a closed system, complex organic molecules required by life forms, rudely violating the "creationist's law of entropy."

Into a closed but not isolated system -- a sealed glass bulb containing a soup of raw chemicals -- he introduced ultraviolet light and high-voltage electricity, conditions that were believed to duplicate the early earth's surface. In short order complex organic molecules were produced -- a lowering of the closed system's entropy. Among these compounds were several amino acids, essential ingredients in the chemistry of life.

Already more than six-dozen varieties of organic molecules have been detected in comets, meteorites, and both galactic and extragalactic dust clouds. These latter are examples of entropy decreases on a cosmic scale. (A summary of much of this evidence is given in the March 88 issue of "Discover".

The creationists and their fellow ultra-fundamentalists, having a corner on the truth, realize that scientific principles can be correct only if they are congruent with their version of Revealed Truth. Thus, they must alter or deny any principles that conflict with that Truth. Galileo fell before the fanatical onslaught of their seventeenth-century counterparts. A terrifying intellectual chill gripped southern Europe after his trial, and the Enlightenment was almost savaged in gestation.

Here, in twentieth-century America, these zealots are succeeding in banning many great literary classics from Shakespeare to Steinbeck. But, worst of all, is their attempt to force the oxymoronic "scientific creationism" into the nation's science classrooms and the minds of youth. This is a perversion of the content and methods of science, and we must resist.

*Since change of entropy equals the heat transferred to a system divided by the temperature of the system, the entropy change of the water is negative since heat leaving the water is negative by

convention. This should prevent arguments that the change of entropy of the water should actually be positive because there will be less available (heat) energy in the water -- a problem created by conflicting applications of the two popular definitions of entropy.

UNDERWATER ARCHAEOLOGY: GOODBYE COLUMBUS

Marco Maniketti, underwater archaeologist, will be the featured speaker at the April BAS meeting.

In 1985, underwater archaeologists were searching for the wreckage of Columbus's last two ships. The project was offered "help" from the Mobius Society, a group capable of "remote sensing". The members of this clan alleged that they could use their psychic abilities to locate the sunken remains. They were encouraged to submit their information, and, in time, they claimed a 75% success rate even though the wreckage was never found! Mr. Maniketti witnessed the whole experiment and the attempts to justify their failures.

Marco will make his presentation complete with photographic slide details of this experiment, showing how remote viewing "works", and why people continue to believe in it.

Remote viewing, pioneered largely by Bay Area physicists Targ and Puthoff, has been something of a mainstay of psi, so Marco's observations are an important contribution to skeptical understanding.

Opinions expressed in "BASIS" are those of the authors and do not necessarily reflect those of BAS, its board or its advisors.

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