

Acceptance of New Ideas in Science

(Presented at the May 19, 2009 meeting of the Paleontological Society of Austin by Hugh Downs and Wally Downs.)

Hugh

Knowing the nature of this audience and the amount of expertise that is probably present, Wally and I may find ourselves in the position of a man in a story about the Johnstown Flood. This was, one of our country's most famous floods, with much loss of life. In the story, this man owned a rowboat and as the waters rose, he started rowing around to see if he could do some good. At one point he spotted an elderly couple on the roof of their house with water up the eaves. He rowed over to them and got them safely aboard and to high ground just as their house collapsed and was swept away downstream. He was rightly proud of this act and the old couple was most grateful.

Well, this man lived a long and otherwise undistinguished life, during which his avocation was to gather a crowd wherever he could and give a speech on how he rescued the old couple in the Johnstown Flood.

He finally died and went to Heaven, where St. Peter, at the gate, explained that on entering Heaven every new arrival could name anything he or she had always wanted and hadn't gotten - anything he had wanted to do or to do again - and that was just for starters.

The man brightened up and said, "Yes, there is something. I'd like it if I could assemble everyone in Heaven and let me give my speech about how I rescued this old couple in the Johnstown Flood.

St. Peter said, "That can be arranged, but I should warn you, Noah will be in the audience."

When I completed the remarks for my portion of this speech, I gave them to my secretary and asked her to take out anything that was irrelevant, inaccurate, legally actionable or filthy -- and she did... [Pause] So - in closing - I would like to say one thing:

Here's Wally!

Wally

Don't worry...He'll be back.

New ideas have always had an acceptance problem, dating back from the Pythagoreans to the present time. Within the Pythagorean group over two thousand years ago, the person who proved that the square root of two was irrational was not only thrown out of the club, but was cast into the sea and drowned. The Pythagoreans were also familiar with the five regular geometric solids (*tetrahedron*, *cube*, *octahedron*, *dodecahedron*, and *icosahedron*) which they identified with the four elements of the ancient world, earth, fire, water, and air, but kept the *dodecahedron* hidden from the public because it was composed of twelve pentagons and was believed to pertain to things celestial. The *dodecahedron* was too mysterious and powerful for ordinary people [Hold up a *dodecahedron*.]

The world was not exactly thrilled when Sir Isaac Newton proved that white light was a continuous spectrum of colors which could be displayed as a rainbow, and that it could also be re-assembled to produce white light by passing it through another prism. John Keats lamented Newton's discovery saying that Newton had taken the beauty, mystery, and poetry out of the rainbow. It is difficult to understand why Keats thought such knowledge could detract from the beauty of rainbows.

Galileo was not awarded a medal for the advancement of scientific knowledge when he demonstrated that objects fell at the same rate regardless of mass. Those who witnessed the demonstration went away muttering, "We must stop this meddling fool."

The concept of continental drift took some time to catch on. It had long been noticed how well Brazil fits the East-African coastline, but there was no coherent theory as to what caused the continents to separate. Alfred Wegener developed the idea of drifting continents into a serious theory in 1912, but it wasn't until after WWII, when extensive mapping of the ocean floors revealed the outlines of the plates, spreading centers and subduction zones, that the concept was accepted. The term Continental Drift was replaced with Plate Tectonics because the continents were riding on these plates.

The textbook for my first geology course was published in 1938. It dismissed the

concept of continental drift in one short paragraph, stating that there had been a hypothesis that since the continents showed some superficial coastal conformity, they must have been together in the past and somehow drifted apart, but this has been discredited. (The same textbook gave a description of the Piltdown Man.) Within thirty years all of the geology books were rewritten to include plate tectonics. Considering the evidence in its favor and the number of questions that it answered, there was little opposition to the acceptance of plate tectonics in a remarkably short time. It explained the mechanism for volcanism and earthquakes, and explained the order in which flora and fauna were disbursed and isolated.

It is fortunate that the acceptance of plate tectonics was handled entirely with the scientific community and did not involve serious theological beliefs except with the most entrenched fundamentalists. Historically, things have gotten nasty when science has come up against powerful religious authority.

Hugh has listed some of the discoveries that unsettled people, and how far back in history they go.

Hugh

Over the centuries we have had a succession of rugs pulled out from under us - and this has eroded the comfort of our superstitions and prejudices. The fact that the earth turns out to be spherical and not flat has been known since the Ancient Greeks, but there was no wide public acceptance - or even understanding - of the idea until science began to get into full swing. And this is just in the last two or three hundred years. (The Flat Earth Society, headquartered in Lancaster, California, has become so successful internationally that there was talk that they might be going global.)

Then it became known that the earth was spinning. Spinning! This meant that the sun doesn't rise and set, it just looks that way. (Part of the opposition to the idea of a spinning earth was that if that were true, the wind would sweep everything away.)

Worse yet was that the earth was seen at last as a member of a family of planets that went around the sun. This was the heliocentric universe that upset the established religion to the point of lethal punishment of its proponents. Galileo was put under house arrest for the remainder of his life, and his compatriot, Giordano Bruno, was burned at the stake for voicing similar opinions. (We should note that when Bruno was burned at the stake, bags of gunpowder were placed

around his neck to blow his head off when the flames reached that high. This was done to limit his suffering and Wally thinks that this act may mark the beginning of *Compassionate Conservatism*.)

The next rug to be pulled out was that among the planets around the sun, the earth was not the largest, but one of the smaller ones. Ouch!

Things went from bad to worse when the sun and its family of planets were seen to have no position of particular importance in the galaxy we inhabit. We are located in the suburbs - way out on the fringes of one of the spiral arms. How can we claim importance under these circumstances? [*ad lib*: If we were to build a scale model where the entire solar system was the size of a dime, we would find it located in a galaxy that (in the same scale) would scrawl over most of Alaska.]

But in spite of the grandeur of our Milky Way Galaxy, I think the final nail in the coffin of our comfort came when it was seen that this galaxy is just one of hundreds of billions of galaxies extending to distances and occupying a volume so stupendous that we are left with a suffocating sense of humility at how minuscule we are.

When I was fifteen, I wrote a paper on the connection between the Lorenz-Fitzgerald contraction equations and Einstein's Special Relativity, which he developed in 1905. I showed it to my Uncle Hugh, after whom I am named. He denounced it, telling me that Einstein was an upstart and would be disproved shortly and that Newtonian Mechanics would be re-instated. Uncle Hugh was a science teacher and the Superintendent of Schools at Cambridge, Ohio, but he was among the handful that held out for a long time against Relativity. The new idea had a tough time fighting to get accepted.

To show what a trap loyalty can be, years later I read an article in Time Magazine that an Italian physicist believed he had found a flaw in Einstein's theory. My immediate reaction was, "Who is the upstart who dares challenge Einstein?" And then I realized I was in danger of becoming my Uncle Hugh, so I backed off.

How sad it is that new ideas frighten us. It may be that what really scares us is not the new ideas but the intellect with which we are endowed. For many people it would be a little more comfortable if we could "dumb down" things a bit and not allow them to rob us of the comfort of tradition, habit, and attractive superstitions.

There is some appropriate inertia involved in the advancement of scientific knowledge, and due caution should be observed when accepting new ideas until they have been thoroughly tested. Daniel Boorstin pointed out in his book **The Discoverers** that one of the greatest impediments to the advancement of knowledge is the belief that we already have that knowledge. For example, if everyone is convinced that the world is flat, no one will look for evidence that the world is round. But progress is slower than it ought to be even with this caution.

Max Planck observed, *“An important scientific innovation rarely makes its way by gradually winning over and converting its opponents...What does happen is that the opponents gradually die out and the growing generation is familiarized with the idea from the beginning.”*

We find humans in the 21st Century turning against what we have found out about our larger environment and turning against the very ability to make new discoveries.

One of the things that seems most dismaying is the time frame - staggering lengths of years, centuries and millennia that make up our epochs, periods and eras historically, biologically, and finally cosmologically. These are extremely long stretches of time and have made us retreat into the time frames taught by the scriptures.

I know that some of you are acquainted with Wally’s scaling aid for understanding the vastness of geologic time. Since we tend to fall into a trap of thinking that all numbers ending with “-illion (million, billion, trillion) are up there sort of in the same ball park - we have trouble getting a handle on the true length.

[Holding up a meter stick.] A meter stick is a handy device for demonstrating a time scale. It is one thousand millimeters long, so each millimeter represents a thousand years, thus one meter represents a million years. On this scale a human life would be less than 0.1 millimeter, and the Roman Empire would be at two millimeters long. To reach the end of the age of Dinosaurs would require sixty five meter sticks on end!

Some scientific findings tax more than our ability to comprehend size. Evolution appears to be the principal finding in this regard.

Wally

Probably the greatest problem with the acceptance of evolution is that it directly involves *us*. If it were confined to plants and “lower” animals, evolution would probably be as acceptable as plate tectonics or the Big Bang theory, but it is hard for people to realize that we are the direct result of evolution. Since the evidence for this is incontrovertible, the only course of action has been to suppress the information, a tactic that is still being used. This was expressed in a letter written by the wife of the Anglican Bishop of Worcester who wrote to a friend:

Descended from apes! My dear, let us hope that it is not true, but if it is, let us pray that it will not become generally known.”

Twenty six years after the publication of **The Origin of Species**, Gilbert and Sullivan made reference to Darwin in their opera **Princess Ida**:

*“While the Darwinian Man, though well behaved
at best is only a monkey shaved!”*

Fundamentalists have relied heavily on the argument that since no one was present at the Creation, no one really knows what happened, therefore creationism is as valid as evolution. This appears to be a satisfactory ending to any such discussion and gives creationists the illusion of having won an argument, but it falls far short of a logical resolution. It is interesting to note that many evolutionary scientists are far better acquainted with the Bible than fundamentalists are with Darwin.

A letter from a minister in Oklahoma to Albert Einstein stated (or commanded):
Professor Einstein take your crazy fallacious theory of evolution and go back to Germany where you came from, or stop trying to break down the faith of a people who gave you a welcome when you were forced to flee your native land.”

The famous biologist Theodosius Dobhansky said, *“I am a creationist and an evolutionist. Creation is not an event that happened in 4004 B.C. It is a process that began billions of years ago and is still under way.”* This would appear to satisfy both religion and science, and is, in fact, already accepted by all but the most entrenched fundamentalists who are committed to faith-based ignorance.

On the lighter side, there are several institutions in our neighborhood that appear at

first to be of some geological interest, but on closer examination are not quite what I had expected:

There are paintings on one of the walls in the **Inner Space Caverns** north of Austin on I-35 that depict a variety of extinct animals. There is serious doubt as to their antiquity that would keep them from being in the same class as the paintings found in the caves of Lascaux, France, and Altamira, Spain. First, the paint used appears to be from Sherwin Williams. Second, they are painted on a poured-concrete wall. Third, one of the animals is a *glyptodont* sporting blue polka-dots. The polka-dots may be authentic, but *glyptodonts* were typically South American.

The Continental Collision Repair Company is located at the corner of Lamar and Highway 183. One would think that it would be doing something about the damage done when continents collide as they have been doing for billions of years. On investigation I found that all they do is repair automobiles and have never heard of Plate Tectonics.

My favorite was the **Cambrian Animal Clinic** in San José, California, that looked after the health of our family cat while I lived in that area. I had expected it to have been established five hundred million years ago and to have specialized in the treatment of *trilobites* and *eurypterid*, possibly attempting to save them from extinction. It was disappointing to find that it was just a veterinary clinic that was operating in an area of San José known as Cambrian Park.

Lately there has been a trend among evangelicals to recruit people with credentials in science, who for some reason are willing to fit all of creation into a time-frame of six to ten thousand years, as calculated by the *begats* and *begots* listed in the Old Testament. These are the young earth creationist geologists who have an annual conference at Cedarville University in Cedarville, Ohio. It is alarming that this conference is well attended by credentialed geologists and paleontologists with advanced degrees from Harvard, UCLA, and universities in Virginia, Washington and Rhode Island. Once they leave the universities they revert to fundamentalism and can now be called on as expert witnesses in litigation over the inclusion of Creationism and Intelligent Design in public schools. In the scopes trial in 1925 the creationists did not have a single credentialed supporter.

How does the brain work that can learn scientific fact and bury them somewhere in the mind so they will not rise up and challenge religious tenets?

Martin Luther, although he denounced Roman Catholic dogma, was quite leery of intellect or free thinking. He said, *“Reason is the greatest enemy that faith has. It never comes to the aid of spiritual things, but more frequently than not struggles against the divine Word, treating with contempt all that emanates from God...Reason should be destroyed in all Christians.”*

Temporal powers can make use of this kind of thinking, however: Two thousand years ago Seneca the Younger said, *“Religion is regarded by the common people as true, by the wise as false, and by the rulers as useful.”* My, how things have changed in two thousand years!

It may appear that we are judging religion too harshly, but we must acknowledge that humans are quite capable of placing their faith in weird things that have nothing to do with religion. To list a few: astrology, numerology, Scientology, Flat and Hollow Earths, Velikovskian catastrophism and “good” vibrations coming somehow from crystals. Physics professor Lew Epstein noticed that during exams several students held crystals over their heads with the left hands while writing with the right, and one enterprising student fashioned a copper spiral skull-cap with a hook on top to hold his crystal. Vibrations from the crystals were supposed to enter the brain from the top and make the students smarter.

In the 13th Century John Duns Scotus wore a conical hat which he believed would channel energy into his brain. Actually, he was very wise and taught that faith and scientific truth should be pursued independently, but John Duns Scotus is remembered now only for his conical hat - the traditional Dunce cap.

A disturbing percentage of the current population appears to prefer mysticism to logic. There have been examples where psychics have been de-bunked only to have the followers of the psychics turn against the de-bunkers for undermining their comfortable but misplaced trust. Astrology has been repeatedly exposed as worthless, yet its devotees are increasing as well as the number of books and magazines on the subject, including one book aptly titled **Astrology for Dummies**. This misplaced confidence and lack of critical analysis unfortunately carries over into other aspects of their lives (and ours,) such as their blind faith in political leaders, some of whom are blatant scoundrels.

Although new scientific ideas have not always been accepted immediately, some clearly unscientific ideas seem to gain unwarranted acceptance, sometimes reaching cult status. Most homeopathic medicines fall into this category. One French company sells millions of dollars worth of flu medicine (*oscillocochinum*) that, according to the label describing the dilution process, contains none of the active ingredient (Barbary duck-liver extract.) It does, however, contain the *vibrations* of the active ingredient. The company now claims to have been able to isolate and record these vibrations and is making them available to download from the Internet. (I'm serious.) Personally, I find I cannot tell the difference between duck-liver vibrations and white noise!

This kind of nonsense is not new. The August 1846 issue of **Scientific American** included a recipe for *Homeopathic Soup*. I know that this was more than 150 years ago, but it must have been hard for intelligent people to believe this even back then:

“Take two starved pigeons, hang them up by a string in the kitchen window so the sun will cast a shadow of the pigeons in an iron pot on the fire, holding ten gallons of water. Boil the shadow over a slow fire for ten hours, and then give the patient one drop in a glass of water every ten days.”

No mention was made of how to keep the shadow falling on the boiling water for ten hours.

Hugh has lectured on the debate between Science and Religion and the incompatibility that denies any level playing field for such a controversy. He said that is is not comparing apples to oranges. It is more like apples and tennis balls! Canonical scripture, in order to be considered science, needs to submit to testing and to be subjected to analytical examination. It cannot survive that. It needs dogma to survive. Science has no dogma. Every scientific fact is vulnerable to amendment or destruction when proof comes along that it is wrong.

Hugh

Mark Connelly once said, *“The luxury of intellect is that you can hold opinions instead of convictions. Opinions you’re free to change, but convictions you’re sort of stuck with.”*

The very meaning of the word *faith* is cloudy. If someone believes that God gave him a brain, but that he should not use that brain in order to protect his faith, then *doubt* or *uncertainty* are better words for what he is calling faith. Real faith will not be afraid of science.

It might be worth observing here that science is actually a faith-based activity. Every scientist I know, or have read about has faith in the value of investigation. It is worth trying to find out about the universe - its laws and constants, its behavior, its origin and its destination. The universe is not absurd. If a scientist didn't have that faith, why would he continue to investigate? Wouldn't he or she be better off taking up chess or folk dancing - anything?

Einstein once said that the most incomprehensible thing about the universe is that it is comprehensible. The faith of the scientist is that the truths he uncovers may be of value to all humans.

The Dalai Lama, when I visited him in his exile home in Dharmasala, India, said to me, "*Investigation is more important than belief.*" This from the leader of the Tibetan people, a world religious leader.

The scientific method frequently goes against "common sense" and against the way we think things should be. I did not like the Big Bang Theory when it was being argued in the 1960s - thinking it would be much nicer if the universe were in a steady state. Evidence supports the Big Bang Theory and does not support a steady state Universe.

The late Arthur C. Clarke, when asked about the controversy between the Big Bang and the Steady State Universe, before the verdict was in, said, "*I personally support the Steady Bang Theory.*"

Thinking about the size of the universe as well as its origin and the amount of time that has gone by since it all started may make our heads hurt. But thinking about the future and trying to predict it is even more challenging. J. B. S. Haldane wrote, "*The principle characteristic of futurology is failure of imagination.*" We always fall short in some way when we try to predict the future. Neils Bohr cautioned that "*Prediction is very difficult - especially about the future.*"

Predictions about man's ability to fly are abundant and were made by some of the leading scientists of the day. In 1850 it was predicted that air travel between the United States and Europe would remain forever impossible because the air in a

balloon could not be kept hot all the way across the Atlantic.

Lord Kelvin said flatly in 1895 that heavier than air flying machines are impossible, and Thomas Edison in the same year said, *“It is apparent to me that the possibilities of the aeroplane, which two or three years ago were thought to hold the solution to the flying machine problem have been exhausted and that we must turn elsewhere.”*

And guess who said this: *“Man will not fly for fifty years.”* It was Wilbur Wright in 1901 - just two years before he flew!

There is an interesting account of the first crossing of the English Channel. When a small French airplane, a Bleriot, landed on the English side of the channel, there was no protocol for such an event. British immigration and customs officials were totally unprepared and had to contact the Home Office about how to handle the situation. The instructions they got were to send the pilot back to France and to ignore the entire incident, because such an event would probably never happen again.

My favorite example of failure of imagination in trying to foresee the future is the occasion of a long-distance telephone call - the first one ever - set up by Alexander Graham Bell not long after he had invented the telephone. By wire, a call was set up between Boston and New York, and an elected official on the Boston end waxed rhapsodic about the device, saying, *“This is a marvelous invention! I foresee a time when every city will have one!”*

The size of the universe and the span of time since its birth are stupendous. Richard Dawkins compares young earth creationists’ belief to that of established science in his book the **Blind Watchmaker**:

“If a story were to be written at a rate of one century per page, how thick would the book of the universe be? In the view of the Young-earth Creationist, the whole history of the universe, on this scale, would fit comfortably into a slender paperback. And the scientific answer to the question? To accommodate all the volumes of history at the same scale, you’d need a bookshelf ten miles long. That gives the order of magnitude of the yawning gap between true science on the one hand and the creationist teaching favored by some schools on the other. This is not some disagreement of scientific detail. It is the difference between a single paperback and a library of a million books... The Young Earth view is not only false, but is petty, small-minded, parochial, unimaginative, unpoetic and downright

boring compared to the staggering, mind-expanding truth.

It is possibly our collective egos that make some of us back off from the realization that we are only a small part of incomprehensibly large universe. It is more comforting to believe that a Creator's main concern is to keep humans from going astray. We tend to think of ourselves as large frogs in a relatively small pond, but with our increasing understanding of astronomical distances and geological time we are coming to realize that we are more like minute plankton in a vast and wonderful Cosmic Sea.

Dawkins observation is brilliant and very well written, but to my mind falls somewhat short of what some of the newer and most respected students of scientific philosophy are currently coming up with. Along with Richard Denett, Richard Gott and the late Stephen Jay Gould, the Dawkins statement can be regarded as a reflection of the fashionable despair of Bertand Russell. He believed that the universe is pointless and hostile, and life, consciousness and intellect are flukes. The new crop of physicists are now bold enough to embarks of formidable projects such as studying human consciousness and the nature of volition. The heavy hitters Roger Penrose, Paul Davies, Lawrence Krauss, Brian Greene and Johnjoe MacFadden are making some progress with *M* Theory, Emergence Theory, and even new versions of String Theory, which can't be tested yet, but which is seductive in the beauty of its equations.

Out of their new work has come hints that maybe, as tiny as we are in the vastness of the physical universe, we may be uniquely important. To start with, we can say that we are at the center of the universe, since the visible horizon is 13.7 billion light years away in all directions. (This is tricky because any place you would find yourself in the universe you will be at the center, just as wherever you are on the surface of the earth, there is a finite and equal amount of surface area all around you.) The human brain is the most complex entity known in the universe. If there are other such complex things elsewhere, then what is important is the complexity, because the universe has been tending toward increased complexity since it was born. We now as humans have the brain power not only to move toward understanding the world, but toward manipulating it. Our technology may be feeble at this stage, but people like Freeman Dyson have envisaged future civilizations which may have developed sidereal engineering to the point that they could harness the entire output of their parent star - the total radiated energy - or down the line to do the same with a galaxy. It's fanciful, but a lot of science

fiction does become scientific fact.

If the universe is indeed coming to understand itself, through mind, then we may be more important than we thought, even if our Cosmic home is larger than we feel we need it to be.

End

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