Intelligent Design and Evolution Awareness Center

Icons Still Standing

Version 2.4 (last updated 3/14/02); Jonathan Wells Comes Up Clean, Despite Harsh Criticism

By Casey Luskin†

A response to "Who's the real fraud?" * (forerunner of "Icon of Obfuscation") by Nic Tamzek, a rebuttal to Jonathan Wells' book *Icons of Evolution* (see www.iconsofevolution.org), as distributed by dissenters attending Jonathan Wells' lecture at UC San Diego on January 29th, 2002.

Introduction:

Nic Tamzek is a friendly, though concerned graduate student who likes to debate intelligent design proponents, or "IDists", as he affectionately calls us J. Tamzek has written a response to Jonathan Wells' book, *Icons of Evolution* (see www.iconsofevolution.org), entitled, "Who's the real fraud?" * (viewable at "http://www-acs.ucsd.edu/~idea/tamzek1.htm"), which he, along with the help of others, prepared for Wells' lecture at UCSD. While we are honored that anyone would find an IDEA Club event worth taking their time to debunk, we are impressed with Mr. Tamzek's efforts to prepare and deliver such a comprehensive and well-referenced critique of *Icons of Evolution*.

There is now an internet version of "Who's the Real Fraud?" which has been retitled, "Icon of Obfuscation" *. It is different from the document passed out at Wells' talk at UCSD, as it has been expanded. This rebuttal contained here, unfortunately, is only meant as a response to the document distributed at Jonathan Wells' UCSD lecture, and is not meant to rebut the entire expanded web version (doing so would take significantly more space given the large number of internet links from which Tamzek bolsters his arguments on the web version) *.

Why this response?

The purpose of Tamzek's document is not only to rebut Jonathan Wells' technical points and arguments, but also to discredit Wells as scientifically illiterate and a deceitful scholar. According to Tamzek, Wells' work is "a travesty of honest scholarship," "insidious," "unfair," "[makes] distortions," "dishonest," "misrepresentati[ve]," "[portrays] argumentative sleight-of-hand" and "pseudoscientific". This purpose of this document is to respond to some of the scientific counter-arguments presented by Mr. Tamzek, especially as they relate to the alleged validity of various naturalistic theories of life's origin, and to also evaluate Tamzek's arguments raised against Jonathan Wells' general competency as a scientific writer. The document is intended as a rebuttal to Tamzek's document and hopefully will clarify some of Wells' points, and also will hopefully bring constructive dialogue over the "Icons of Evolution".

Miller-Urey Experiment:

The Atmosphere:

Tamzek is correct to assert that, "a key issue in the origin-of-life research is the oxidation state of the prebiotic atmosphere", for the presence of any free oxygen on the early earth would cause a non-reducing atmosphere, rendering origins of life experiments moot. Tamzek asserts that there is strong evidence for a reducing atmosphere on the early Earth, and that Wells provides an incomplete and out-of-date discussion of the issue.

While, there is no doubt that Stanley Miller obtained amino acids through certain reactive gaseous mixtures, it should be noted that Miller-Urey experiments were designed and conducted without considering the actual chemical composition of the atmosphere. Miller himself admits that "[i]t is assumed that amino acids more complex than glycene were required for the origin of life, then these results indicate a need for CH_4 (methane) in the atmosphere"[1] and "[w]e believe that there must have been a period when the earth's atmosphere was reducing, because the synthesis of compounds of biological interest takes place only under reducing conditions."[18] Yet Abelson found that, "geologists favor ... that genesis of air and oceans is a result to of planetary outgassing ... and ... produce and atmosphere consisting of CO_2, N_2, and H_2"[2]. Though Abelson wrote this in 1966, it has remained orthodox theory as Rode (1999) wrote, "modern geochemistry assumes that the secondary atmosphere of the

primitive earth (i.e. after diffusion of hydrogen and helium into space) had been formed by outgassing of volcanoes and therefore that it mainly consisted of carbon dioxide, nitrogen, water, sulfur dioxide and even small amounts of oxygen."[16]

Though Tamzek suggests the Earth's early mantle may have had a different composition than it does today, this claim goes against much modern geological thought. The basis many geologists use for dating the Earth rests on the assumption that chondritic meteorites are very representative of a "bulk Earth composition", the composition of the early Earth. These allegedly ancient chondrite "snapshots" of the mantle are in many respects similar to modern xenoliths from deep mantle. Canil (2002) actually found that vanadium redox states in peridotite-bearing mantle xenoliths and Archean cratons imply that Earth's mantle was just as oxidized in the Archean as it is today[109]. The paper concluded that, "such reduced [atmospheric] components [CO and H_2] are not supported by results of this and many other studies, which imply a scenario of Archean mantle redox not unlike that of today"[109] The paper retains a naturalistic origin of life by saying, "[l]ife may have found its origins in other environments or by other mechanisms"[109]. Wells is not at odds with modern geochemical thought or the scientific data to assert that primitive Earth volcanoes would have contributed to an oxygenic atmosphere.

Abelson goes on to say that there is "no evidence for ... but much against" an ammonia-methane atmosphere, noting that, "[a] quantity of ammonia equivalent to present atmospheric nitrogen would be destroyed [by ultraviolet radiation] in ~30,000 years."[2] He, and Lasaga et. al. found that methane gas would have left a signature of organic carbon in ancient sedimentary rocks, perhaps even due to a 1 to 10 m thick "primordial oil slick"[15] (after all, Miller-Urey experiments produced by far more tar than anything else, and if many prebiotics were produced, then tar should have covered the early earth), for which there is no geological evidence. Schopf notes that the Swaziland Supergroup (~3.2 Ga) contains inorganic carbon, "indicating that carbon dioxide, and not methane, may have been the dominant form of atmospheric carbon at this point in time"[16]. This challenges the importance of undersea thermal vents as a contributor of methane, which Tamzek says Wells "exclude[s]" wrongly.

Tamzek claims that hydrogen would have been contributed by undersea vents making the atmosphere more reducing, however hydrogen is so light that most researchers recognize it would easily float to the top of Earth's atmosphere where it would be lost into space. Regardless, Miller found that without methane, hydrogen based H_2 - N_2 - CO / CO_2 atmospheres produce nothing more than the amino acid glycine[1], and that this is most effective when hydrogen / carbon ratios are high > 2, very unlikely on the early earth. Without methane or ammonia, origins of life experiments are generally useless.

These facts alone are enough to justify Wells' assertion that the methane and ammonia-using Miller-Urey experiment "continues to be used as an icon" saying "we are given the misleading impression that scientists have empirically demonstrated the first step in the origin of life". In agreement with Wells would probably be origins of life researcher Robert Shapiro who said, "[w]e have reached a situation where a theory has been accepted as fact by some, and possible contrary evidence is shunted aside."[17] However, beyond Miller-Urey, Tamzek spends most of his rebuttal trying achieve the difficult task of using geological evidence to prove anything about the Earth's early atmosphere–much less that the atmosphere was reducing.

The Geological Evidence–Reducing, Oxic, or Inconclusive?

Tamzek gives geological evidence showing the lack of oxygen in the Earth's early atmosphere while Wells also provides a variety of mainstream lines of evidence pointing towards an oxygenic early atmosphere, a view shared by many other scientists. Regardless of one's perspective on this issue, this discussion will be prefaced with the words of Nasa Astrobiology Institute researcher Hiroshi Ohtomo who recently said, "[I]t will take many different lines of evidence to prove this [oxygen level on early Earth] one way or the other"[10], as this is a very difficult issue to asses with many lines of evidence often apparently in opposition.

A prime example of conflicting lines of evidence is Tamzek's implication that the presence of unoxidized cerium in paleosols (fossil soils) from 2.5 Ga[35] settle the case, even though red beds, admitted by Tamzek as "indicative of high amounts of oxygen", are found from the exact same period–2.5 Ga[19]. What are we to do in these situations? The bottom line is that geochemistry doesn't always take place in the presence of the atmosphere–both oxic and anoxic conditions can be simulated in environments removed from exposure to the atmosphere. For this reason, it is difficult to make any strong statements either way from geology. Using biological methods, however, we can

make a better approximation. The earliest estimate is that there are signs of life on earth about 3.8 Ga[11] (courtesy of our friends at Scripps Institution for Oceanography), with the earliest fossil bacteria are from about 3.5 Ga[20], which look like modern photosynthetic oxygen-producing cyanobacteria. Scientists who have conducted computer modeling of early oxygen production from bacteria have concluded that the atmosphere could reach near present-day levels within 30 Ma, despite what geological evidences seem to say! Thus, it is likely that from at least 3.5 Ga on, life on earth was indeed raising oxygen levels, countering Tamzek's claim that 2.5 Ga unoxidized cerium in paleosols is indicative of an oxygen-free atmosphere. Evidence for an early Archean atmosphere which was either reducing or oxidizing seems equivocal.

Tamzek asserts that the mineral uraninite, present on the early Earth, cannot form under "significant exposure to oxygen", however a recent publication from the Nasa Astrobiology Institute stated that its P.I. had observed the, "survival of uraninite ... under an oxic atmosphere" and instability of uraninite under an oxygen-poor atmosphere, which was said to be "supporting ... evidence for ... an oxic Archaean atmosphere."[7] Regardless, the origin of uraninite has also been a subject of controversy. Some researchers have found that the uranium conglomerates bearing uraninite have a texture and mineralogical makeup (uraninite, pyrite, molybdenite, and sulfides) one would expect if they were deposited by hydrothermal solutions, indicating that the uranium was deposited deep in the earth, far removed from the atmosphere, similar to what is observed happening in the origin of modern and more recently formed uraninite deposits[9] (which obviously occurred in an oxygenic atmosphere). Furthermore the uraninites occur at the bottom of basins, often near uncomformities, below uranium bearing rocks, where we would expect such hydrothermal deposits to be found. This led Davidson[9] to conclude that the uraninite bearing rocks are not placer (riverine) deposits, as is suggested by Tamzek. Wells is very justified in asserting that with regards to the atmospheric composition, "[e]vidence from the ancient rocks has been inconclusive".

Red beds, which first occur around 2.5 Ga[19], can also be used as an indicator of atmospheric content, for as Tamzek says, they are "indicative of high amounts of oxygen". However, "high amounts of oxygen" aren't necessary to inhibit pre-biotic chemistry--even a slightly oxidizing atmosphere, which would oxidize some rocks, such as "banded iron formations (BIFs)," could prevent pre-biotic synthesis chemistry. Early Pre-Cambrian (Archean) BIFs contain fully oxidized minerals grains of hematite and magnetite which were laid down in the primary strata[21, 22]. Tamzek claims that banded iron formations point towards a reducing atmosphere, but the question remains, how did these "incompletely oxidized" BIFs get "incompletely oxidized?" These could be evidence for oxygen on the early earth, simply because they show oxidation, and at least point away from a reducing atmosphere. Regardless, the thin poorly oxidized laminae of BIFs are reminiscent of those found in modern lake sediments, which form today even though our atmosphere is oxic. BIFs only require anoxic conditions to form and do not necessarily tell anything about the atmospheric composition. In fact, BIFs from about 2.0 Ga, when the atmosphere was supposedly becoming more oxygenic, look the same as BIFs from earlier pre-Cambrian BIFs[19]. Given that red beds--supposedly evidence of an oxic atmosphere, have been found contemporary with banded iron formations, it seems difficult to determine if the atmosphere strongly affects either of their formation, it is likely that neither are good indicators of atmospheric composition.

Not only is there weak evidence against an oxidizing atmosphere, but there is no evidence that the methane-ammonia atmosphere necessary for prebiotic synthesis ever existed[2, 3]. Tamzek's claims that the early earth had a reducing atmosphere contradicts admissions from the rebuttal to Jonathan Wells posted by the NCSE[4] and publicly stated by NCSE director Eugenie Scott[5] in a public lecture critiquing "Icons of Evolution". The NCSE acknowledges that the early atmosphere might have had oxygen and says that modern scientists have "changed the experimental conditions to reflect better knowledge of the Earth's early atmosphere"[4], which is why both NCSE director Eugenie Scott[5] and NCSE President Kevin Padian[23] have publicly stated that the early Earth's atmosphere probably contained oxygen.

Tamzek also suggests that enough pre-biotic monomers could have been delivered via meteorite impacts. While some organics have been found in meteorites in quantities similar to those expected from Miller-Urey type experiments[24], Anders noted that it is unlikely that many organic molecules would survive the shock of impact on meteorites with a mass of more than 10^{-8} gram, only which could be gently decelerated by the atmosphere such as not to heat up so much and destroy the monomers[13]. Anders concluded that meteorites are a poor vehicle for bringing organic carbon to earth, leaving the hopes of origins of life researchers in "cometary dust"[13].

Wells is not the only one to doubt scenarios of pre-biotic synthesis. So drastic is the evidence against pre-biotic synthesis, that in 1990 the Space Studies Board of the National Research Council recommended to scientists a "reexamination of biological monomer synthesis under primitive Earthlike environments, as revealed in current models of the early Earth"[3]. However, as for the soup itself, even if pre-biotic synthesis had occurred, the primordial soup is thought to have been extremely dilute[24], and this says nothing about its components, which would have degraded extremely quickly and most likely been destroyed less than every million years during sterilizing impact events common on the early Earth[25]. And of course once you get the soup, you're only a few steps out of countless needed for the origins of life.

In conclusion, Tamzek is justified in presenting his side of the issue with regards to the oxidation state of the Earth's early atmosphere. However, it seems clear that these are difficult issues to examine, and that it is perhaps better to go along with Jonathan Wells' statement that, "[e]vidence from the ancient rocks has been inconclusive" making Tamzek's charge that Wells provides a "psuedo-discussion" innocuous. Regardless, Wells is correct in finding that the textbooks do inappropriately claim strong evidence for pre-biotic synthesis.

Darwin's Tree of Life:

The Cambrian A-Bomb

Tamzek claims that Wells is running down a "well-worn" path by bringing up the Cambrian explosion as an objection to Darwin's theory. Tamzek says creationists say that in the Cambrian explosion, "animal phyla appeared suddenly, and without precursors, and all equally far apart from each other," however creationists would not be out of place to say such a thing. Yet creationists are not the only ones to make such statements, as there are many examples from the scientific literature and writings of evolutionists who have made similar statements. Indeed Richard Dawkins says, "[i]t is as though they [Cambrian fossils] were just planted there, without any evolutionary history"[110] and other evolutionists wrote, "[m]ost of the animal phyla that are represented in the fossil record first appear, 'fully formed' and identifiable as to their phylum in the Cambrian some 550 million years ago...[t]he fossil record is therefore of no help with respect to the origin and early diversification of the various animal phyla..."[111]. Yet no evolutionary explanation for the Cambrian Explosion is given by Tamzek. Perhaps the Cambrian Explosion argument is "well-worn" because its such it is such an easy and unblocked path of argumentation to traverse.

Instead of providing an evolutionary explanation for the Cambrian explosion, Tamzek provides a quote from Christian geologist Keith Miller. The quote itself says nothing about the Cambrian explosion, but rather claims that evolution critics Michael Denton[28] and Phillip Johnson[29] are "inaccurate" in their treatments of macroevolution. However, the rest of Miller's document[27] provides no further references to Johnson and only a brief critique of Denton's arguments for typology. Miller's critique of Denton's typology, however, does nothing to solve the problem of the Cambrian explosion, for even if a couple of Cambrian fossils could make plausible transitions between certain phyla, there is still an evolutionary break between what wasn't in the pre-Cambrian, and the many diverse organisms which "appeared suddenly, and without precursors" in the Cambrian. This indeed challenges Darwin's "Tree of Life."

Go Figure

As far as Wells' diagrams go, Figure 3-4 in *Icons* admittedly is not a pretty figure, and isn't comprehensive, but it also isn't demonstrably inaccurate. Tamzek implies Wells leaves out data to support his argument however Wells doesn't claim to display the fossil record of *all* animal living phyla, only "*Major* Living Animal Phyla" (emphasis mine). Though Wells does not explicitly define the term, "major", a survey of the phyla excluded from the diagram[34] shows those left off the diagram are indeed the minor phyla, tending to have low species numbers and biodiversity, and all but one are explicitly called "minor" by biologists elsewhere[34]. Wells does have a justifiable criteria for selecting phyla to demonstrate the explosiveness of the Cambrian explosion, and his diagram mirrors those used when discussing the biological "explosiveness" of the Pre-Cambrian - Cambrian boundary in the mainstream scientific literature[36, 37].

Given that Wells' diagram includes *major* soft-bodied phyla of a late fossil origin such as Nematoda and

Platyhelminthes, Tamzek's charge that Wells leaves out soft-bodied phyla simply to strengthen his argument seems unfounded. In fact, a quick survey of the fossil record of major phyla shows that major soft-bodied phyla generally do have fossil records extending far back into the fossil record--sometimes back to the Cambrian / pre-Cambrian boundary, implying that if enough animals are there, then we do indeed tend to find an fossils regardless of their "hardness." [33] In fact, as Wells notes in *Icons*, that paleobiologists Valentine and Erwin state that the Cambrian explosion, "is real; it is too big to be masked by flaws in the fossil record" (*Icons* pg. 44). Despite very good general agreement with the UCMP diagram[33], Wells' figure is at odds with regards to the origin of the phyla Rotifera and Phoronida, as Tamzek notes. Whether or not Wells is truly wrong has not been verified by Tamzek. However, if indeed wrong on these two counts, this does not affect the strength of Wells' argument, but hopefully Wells' figure will be corrected in the next edition.

Darwin's Clock is Ticking

Tamzek notes that the molecular clock hypothesis is in great dispute, which is most pronounced when the molecular clock differs markedly from the fossil record (especially with regards to mammals[36], birds[36], and major animal groups[36, 37]). Cone snails[79], which Tamzek allegedly cites as an example of rapid evolution, provide little fodder for refuting creationist claims against the natural origin of genetic information, as it merely shows that there was strong selection pressure on cone snail mrRna. If evolution did occur, no novel functions were created apart from a few different destructive venoms--and these venoms have themselves had between 20-50 Ma to develop into their fairly similar forms. The paper actually admits its most striking example of alleged rapid change, which it calls a "focal hypermutation,"[79] is "mechanistically unexplained", making naturalistic explanations, at this point, impotent to account for the alleged genetic transformations.

This paper, like many others in the literature of evolutionary biology, bases most of its genetic evolution of biochemistry off of the mechanism of gene duplication. However, when trying to evolve something, the gene-duplication-explanation doesn't help the issue much, because once you duplicate a gene, you have a new piece of genetic information to play around with, but what good is that to you? If complex systems need specific parts, what sort of evidence is there that these duplicated genes will be the parts you need? Lynch and Conery found that the average gene duplicates about once every 100 million years[108]–that's pretty rare. If cone snails have a 1 year generation time, and the gene you need duplicates once every 100,000,000 generations, that doesn't give you a very good chance of getting it when you need it. Furthermore, it has been found that, "the vast majority of gene duplicates are silenced within a few million years, with the few survivors subsequently experiencing strong purifying selection"[108]. Another study showed are not very free to mutate around at all, that there is strong selection pressure on them[107]. This supports the statement by Conery and Lynch that the actual mechanisms by which gene duplication contributes to evolution are not very well understood:

> "However, it is unclear how duplicate genes successfully navigate an evolutionary trajectory from an initial state of complete redundancy, wherein one copy is likely to be expendable, to a stable situation in which both copies are maintained by natural selection. Nor is it clear how often these events occur."[108]

The bottom line is that the gene duplication explanation still leaves the details to the dice, and this pathway definitely hasn't been experimentally verified. All Espiritu *et al.* have found are protein homologies, and then inferred a vague ancestral pathway of gene creation. This explanation for the origin of real evolutionary novelty lacks a reliable mechanism and is little better than hand waving.

Tamzek implies that Wells is distorting methods of systematics in his Figure 3-6 because he uses a hypothetical dataset. However, Wells does not intend an exhaustive treatment of the subject, but rather aims only to give a basic idea of how clade-divergence events are chronologized through sequence similarity. He doesn't use a real dataset in figure 3-6 probably because real datasets are long, complicated, and might confuse the lay-reader. By constructing a short and simple artificial dataset containing a 4-nucleotide sequence in 3 organisms, Wells explains the basic principles behind of tree construction methodology just fine, and in no way misrepresents the methods of systematists.

Darwin Caught in the Thicket

The "root of the tree of life" does not bear witness to a last common ancestor, as Tamzek and the mainstream literature[76, 77] admit, however Wells' conclusions are not at all out of place. Tamzek claims that Wells is "distorting things" however Wells' statement about "uprooting the tree of life" comes from the title a review article in the mainstream scientific literature by W. Ford Doolittle which said that, "[i]t is as if we have failed at the task that

Darwin set for us: delineating the unique structure of the tree of life"[76]. Tamzek claims that biologists know that there was a purely natural origin for all 3 domains because base of the tree is "greatly complicated by lateral gene transfer, different rates of evolution ... and by the fact that eukaryotes are the result of symbioses between archaea and eubacteria". In fact the simple symbiosis hypothesis has recently been challenged[78]. Indeed Wells does note that gene sharing among microorganisms is perhaps a plausible explanation (pg. 53) but regardless, a prediction of Darwinian evolution has again failed, and we are left with an epicycle (an epicycle was an additional explanation used to resolve inconsistencies between the scientific data and predictions from the now-falsified geocentric model of the solar system).

Wells quotes W. Ford Doolittle (*Icons*, pg. 52) saying, "[m]olecular phylogenists will have failed to find the 'true tree,' not because their methods are inadequate or because they have chosen the wrong genes, but because the history of life cannot properly be represented as a tree"[77] which counters Tamzek's claim that the problem may lie in the fact that the base of the tree has no outgroup. Finally, Tamzek implies that "the entire debate is about the relationships between the three domains of life", so Wells is wrong to argue against a purely natural origin for these domains. However, Tamzek seems to assume that these domains have a hereditary "relationship" and natural origin in the first place, apart from any possible lines of evidence. After predictions from common ancestry fail, the hypothesis that the domains might have a separate (designed?) origin is still never considered.

Save the trees!

Tamzek implies that Darwin's tree of life looks simple and "tree-like" apart from the 'molecular thicket' at the root, however this is not the case. It is well recognized in systematics that very often phylogenetic trees based upon one gene or protein sequence, will lead to one tree, while a tree based upon some other biomolecule look quite different. And even more often, trees based upon biomolecules are at odds with trees created on macromorphological characteristics or the fossil record (and trees based upon different macromorphologies often differ from one another a well). Tamzek claims that the Eukaryote tree is well resolved through Baldauf *et al.* (2000)[99], however this paper escapes typical problems of conflicting trees because it creates one tree using a massive dataset of many protein sequences to statistically obscure the differences between the trees based upon individual proteins. By creating one "flimsy" tree through many genes, common ancestry cannot be strongly verified through independent converging lines of genetic evidence (admittedly, this is a good technique for creating a phylogeny if one already assumes common ancestry is true, however, as a test of common ancestry, it shows molecular evidence provides little support). In fact, it was found that single-gene phylogenies only "support subsets of the combined protein tree." In other words, the different genes, when taken independently, do not converge to make a nice neat tree.

Tamzek claims that the results of this article indicate that Eukaryote phylogeny is coming along "just fine", and that this paper provides a "perfectly traditional and tree-like" phylogeny of the Eukaryotes. As said before, the neatness of this tree is purely the result of statistical techniques and the combined dataset used in the paper. Regardless, Baldauf *et al.* actually found that their tree has "striking differences from SSU rRNA phylogeny"[99], and noted that past studies have also encountered conflicting trees. When faced with differing trees, Darwinists usually manage to retain common ancestry by explaining these discrepancies through differing rates of evolution, differing selection pressures, lateral gene transfer, or even convergent or parallel evolution. However, nonetheless, nice neat Darwinian trees are often hard to come by, and predictions from common ancestry fail, leaving us with epicycle after epicycle. Resorting to lateral gene transfer might not be necessary[99], but this paper shows that nice neat Darwinian trees are still elusive for the alleged ancestry of Eukaryotes.

Other organisms, whose alleged phylogenetic trees have run into the "thicket" problem, because nice neat Darwinian trees could not be produced by the observed character distributions, include (but are by no means limited to) relationships of major reptile groups[62], amniote groups (particularly with the placement of birds)[69], major placental mammal groups[64, 72], whales (both as an order within class mammalia[63,] and its sub-groups [65, 66]), songbirds[74], bats (as an order within class mammalia and its sub-groups)[64, 67, 69], rodents[64, 68, 72], lagomorphs (rabbits)[69, 72], artiodactyls sub-groups[72], insectivores[64, 72], chimps (their position within the order primates)[69], sea urchins[72], many major plant groups[71], angiosperm sub-groups[69, 71], marsupials (in relation to monotremes and placentals)[72], osteichthyans (in their alleged relationship to tetrapods)[69], some deuterostome phyla[69], and many Eukaryote groups (e.g. fungi[70, 99], plants[99], and metazoa[99]). Schwabe and Warr[73] found that proteins such as relaxin, insulins, adrenocorticotropic hormone, somatostatin, histocompatability antigens, neural glycoproteins and

microglobulin are distributed in both animal and non-animal groups in ways which differ markedly from Darwin's alleged tree of life.

Early in the molecular revolution there was some hope that molecular phylogenies of mammalian orders would match those created by morphology[64, 72], however as more data came in, the tree became less and less "Darwinian". In fact, in 1998, de Jong noted that:

> "the wealth of competing morphological, as well as molecular proposals [of] the prevailing phylogenies of the mammalian orders would reduce [the mammalian tree] to an unresolved bush, the only consistent clade probably being the grouping of elephants and sea cows."[72]

Systematist Colin Patterson also did a review of congruence between trees generated by morphology and trees created by molecular data and found that "congruence between molecular phylogenies is as elusive as it is in morphology and as it is between molecules and morphology"[69]. His study concluded that after reviewing trees based off of molecular and morphological data, their hopes of verifying morphologically derived trees were "dampened."[69] In fact, a recent comparison of the trees based off of morphology and trees based of of molecular data for the relationships of the animal phyla, have a number of striking differences[111]. This does not square well with Tamzek's claim that "[molecular] phylogenies are reliable and in reasonably good accord with phylogenies generated from other data." In closing, this reoccurring "thicket" problem shows that the tree of life, if all life is even inter-related, is surely very different from its portrayal in textbooks.

Homology in Vertebrate Limbs:

Homology goes Down and Under

Tamzek says that Wells' treatment of homology might "confuse his readers" and I have to admit that the first time I read the chapter, I was confused myself. Tamzek cites Amundson to provide a definition for homology as "detailed similarity of organization that is functionally unnecessary"[80]. It is this author's opinion that this definition is very good, because it leaves out any mention of homology being the result common ancestry. However, in doing so, this definition leaves the door open for many instances where homology is definitely *not* the result of common ancestry, which either refutes universal common ancestry or severely weakens homology's general ability to serve as evidence for common ancestry:

There are examples of extreme unnecessary similarity among unrelated marsupial and placental versions of mice[81], moles[81], squirrels[81], lemurs[81], rabbits[85], wolves[81], badgers[83], and cats[81]! Ocean carnivores from groups such as fish, dinosaurs, and mammals share striking similarities[82] as do hummingbirds and other unrelated songbirds[74] unpredicted from functionality alone. Distantly related blue-green algae and green plants[82] which surprisingly both use chlorophyll to photosynthesize, are unnecessarily similar. Also noteworthy is extreme convergence between unrelated South American anteaters, pangolins, marsupial anteaters, and monotreme anteaters[82]. Cephalopod and vertebrate eyes[84], and then different types of arthropod compound eyes[106] are also a good examples of "high convergence" of unrelated organs. The list could go on and on, where similarity of organization exists which is functionally unnecessary, *and* clearly not the result of common ancestry. Amundson may correctly assert that "homologies can be recognized and picked out by criteria other than common ancestry"[80] however the examples given here show that Amundson incorrect to say that, "[i]t is an empirical fact that homologies ... are arranged among in a pattern that is explainable by common ancestry"[80]. Not only do these examples show that homology isn't necessarily indicative of common ancestry, but these often unexpected examples of extreme convergence--well beyond that necessary from functionality--seem to point towards common design (where a Mind knew of the body plan, and was able to infuse that plan in clearly unrelated species), rather than common descent.

To be consistent in their treatment of the evidence, evolutionists now have a choice--they can hold on to homology as evidence for common ancestry, but admit the falsification of common ancestry for these examples, or they can simply say that homology itself does not serve as good evidence for common ancestry. Most likely they would choose the latter option, and say that homology still can serve as evidence for common ancestry, and sweep the counter-examples under the convergent evolution carpet. However, these counter-examples are not going away, and inconsistent handling of evidence tends to be unfit, in the long run, for survival in science.

Tamzek ← Darwin ←Linnaeus → Wells → Luskin

Tamzek says that functional similarities which fit predictions of common ancestry are "begging for an explanation", implying that common ancestry is the only possible cause. However, organisms were first classified by Carolus ("Carl") Linnaeus[86], the father of taxonomy and a creationist, much according to Amundson's "similarity of organization that is functionally unnecessary", over 100 years before Darwin wrote Origin of the Species. Linnaeus believed that such "homologies" were the result of created body plans, or blueprints, much like Plato's archetypes, which were indicative of the order which God brought into the created world. Over 275 years later, it is still entirely possible that homology, which sometimes fits common ancestry, is really due to common design, where the Designer used certain blueprints over and over again while creating certain organisms. Wells doesn't necessarily have grounds to choose the design hypothesis over the descent hypothesis, but it is clear that science has improperly decided that design is out of the question.

What's intelligent design got to do with it?

Finally, biologist Rudolph Raff[30] is quoted acknowledging that some of Wells' points about different genetic mechanisms producing homologous structures are not predicted by common ancestry. The implication, however, is that just because naturalistic explanations have failed, non-naturalistic explanations are still not allowed. Whether Raff is right or wrong, as Wells noted in his lecture at UCSD, intelligent design need not be accepted for the theory of evolution to be falsified. In fact, the phrase "intelligent design" is found nowhere Wells' book. In Wells' conclusion, he says nothing about design, but merely says that Theodore Dobzhansky was "dead wrong" to say, "nothing in biology makes sense except in the light of evolution" (*Icons* pg. 248), verifying that the point of Wells' book is to argue against evolutionary theory, not to postulate an intelligent design hypothesis. The design hypothesis may very well be true, however from *Icons of Evolution*, our only safe conclusion is that evolutionary theory often isn't. Rather than admit this fact, Raff critiques intelligent design theory, a separate issue. In fact, contrary to Raff's portrayal of intelligent design, arguments for design do not rely solely on the falsification of naturalistic theories, however this is a subject better left for a different paper.

Tamzek answers Wells' circularity charges, but in the process refutes common ancestry for the above examples, or weakens homology's from ever being able to provide discriminating evidence for common ancestry. This is the essence of Wells' argument, making Wells' treatment, confusing or not, worth taking seriously: homology isn't necessarily the result of common ancestry, in fact it sometimes challenges notions of common ancestry. Yet, despite relatively good treatments of homology from critics like Amundson and Wells, homology is still shown as evidence of common ancestry in textbooks. If only systematics would return to its state some 265 years ago when its founder, Carl Linnaeus, was publicly able to voice that common design is also a legitimate explanation for similarities found in organisms. Perhaps that time will one day come again.

Haeckel's Embryos:

The Embryonic Hourglass Figure

Tamzek graciously concedes that Haeckel's drawings do not belong in textbooks (essentially affirming the icon), however, he cites Raff (2001)[30] to imply that embryology still provides evidence for a shared evolutionary history among vertebrate classes. Raff implies Wells denies the "phylotipic stage" and "sharing of major structural elements and their topological elements" among vertebrate embryos, however Wells readily acknowledges that embryo similarities of the "phylotipic stage" do exist saying, "here [at the phylotipic stage] the various classes first exhibit the characteristics common to all vertebrates" (Icons, pg. 98). Wells' point, here, is that the paths developing vertebrates take to get to the "phylotipic stage" are very different, forming a pattern of development Raff himself says is shaped like an "hourglass"[32]. Wells notes this "hourglass" pattern is not predicted if all vertebrates share a common ancestor.

Homology in Vertebrate Embryos: not evidence for common ancestry

Tamzek quotes Richardson saying, "[d]ata from embryology are fully consistent with Darwinian evolution" as "[a]ll vertebrates develop a similar body plan [and] [t]his shared development plan reflects shared evolutionary history"[31]. Not only does this repeat the flawed argument that homology implies common ancestry, but as Wells notes, vertebrates may have a similar body plan, but all vertebrates do not develop a similar body plan in the same *manner*. It is this *differing manner of development* which actually challenges von Baer's law, and notions of common ancestry:

> "If the implications of Darwin's theory for early vertebrate development were true, we would expect these five classes to be most similar as fertilized eggs; slight differences would appear during cleavage, and the classes would diverge even more during gastrulation. What we actually observe, however, is that the eggs of the five classes start out noticeably different form each other; the cleavage patterns in four of the five classes show some general similarities, but the patterns in mammals is radically different. In the gastrulation stage, a fish is very different from an amphibian, and both are very different from reptiles, birds, and mammals, which are somewhat similar to each other. Whatever pattern can be discerned here, it is certainly *not* a pattern in which the earliest stages are the most similar and later stages are more different." (*Icons* pg. 96-97)

Richardson says this is not a problem for Darwinian evolution because "the mixture of similarities and differences among vertebrate embryos reflects evolutionary change in developmental mechanisms inherited from a common ancestor". However, looking at the data Wells presents in his Homology in Vertebrate Limbs chapter, we find that mechanisms controlling development are often not at all predicted by the phylogeny. Wells finds that the gene Distal-less controls development of appendages in the mouse, spiny worm, butterfly, sea urchin, and velvet worm, even though such appendages are not derived through a common ancestry. There is no reason why common ancestry would predict that the same gene would produce "legs" on so many very different types of organisms, when their alleged last common ancestor supposedly did not have legs. Others have found that this is also the case for similar genes controlling eye development in various types of organisms, which according to the traditional phylogeny, are thought to have evolved independently[113].

Richardson continues, saying we have evidence for common ancestry because we find "a strong correlation between embryonic developmental sequences in humans and other eutherian mammals, but weak correlation between humans and some 'lower' vertebrates". This observation would correlate with the alleged chordate tree, however the major tree branches Richardson discusses here were constructed from anatomical similarities of adult vertebrates in the first place. Richardson's argument thus essentially is, "the more similar the vertebrate, the more similar the ancestry; the more similar the ancestry, the more similar the embryology." This can be rewritten as, "the more similar the vertebrate, the more similar the embryology", an obvious statement which could be made without any knowledge or notions of common ancestry. The bottom line is that common ancestry must be assumed, and embryological similarities, like homology in vertebrate limbs, by themselves cannot provide support for common ancestry. All that remains is Wells' point that predictions made from common ancestry are not found in vertebrate developmental patterns.

Archaeopteryx: The Missing Link:

Grounded.

Tamzek claims that fossil theropod Dromaeosaurs (Protoarchaeopteryx and Caudipteryx) provide unequivocal evidence that birds evolved from dinosaurs. However, the skeptic must ask the question, is this really the case? These are interesting fossils, but they do not provide enough evidence to get the dino-bird hypothesis off the ground. In fact, the heavy tails and large bodies of theropod dinosaur bodies are the exact opposite of the type of organism we would expect to evolve into a flier[92].

According to the report in *Nature*[38], Protoarchaeopteryx, was a dinosaur with "down-like" feathers on its body, however one paleontologist called this down "dino-fuzz, [which] really could have nothing to do with the origin of feathers."[91] Regardless, down feathers have no function for flight on birds. The only "vaned, barbed, symmetrical feathers"[38] on Protoarchaeopteryx appear on its tail--no sign of feathers for flight. Caudipteryx has a few vaned and barbed remiges on one finger of the hand, but its arm is far shorter than that of a bird[39]--too short for flight. Because these organisms have some body structures which are well adapted to flight, but clearly didn't fly, these (and other) fossils have led evolutionists to believe that some of the primary complex structures specified for flying -- feathers, wings, and ossified bones – originated for a purpose other that flight[40]. There are no elegant explanations here, but rather wishful thinking trying to force-fit the data to an evolutionary model failing to explain the origin of flight.

Reptiles of a feather, don't flock together

In fact, feathers have been also found a non-dinosaur lizard-like reptile[90], however proponents of the dino-bird hypothesis think this feathered fossil is completely unrelated to the origin of birds and the alleged feathered dinosaurs. Why, then, should the alleged appearance of feathers on these post-avian Dromaeosaurs become the

definitive proof of the dinosaurian ancestry of birds? Perhaps these "feathered dinos" are just what their squamate counterparts are: reptile chimeras unrelated to birds.

To throw some other bones into the dino-bird hypothesis, although both theropod dinosaurs and birds both walk on 2 legs and have some skeletal similarities, differences such as digit configuration, pubis bone, pelvis shape, teeth, and internal organ setup (the avian respiratory system is unique and far different than of reptiles) have all been raised as differences which challenge the dino-bird hypothesis[43, 92]. Wells also notes that cladistical methods which have established this alleged relationship ignore the fossil record, assume an evolutionary history, and ignore major problems with the implications that dinosaurs evolved to fly from the ground.

Who's your daddy?

Tamzek claims that Wells' only gripe is that Archaeopteryx is not a true ancestor of birds, however Wells' criticisms go far beyond that. Wells notes that the geological layer which bore Caudipteryx and Protoarchaeopteryx radiometrically dates to about 120 Ma[41], while Archaeopteryx, the earliest known bird, is said to be about 150 Ma[42]--and even more modern looking birds appear soon after. In fact, the ordering of the fossil record has led some to suggest that these Dromeosaurs are not dinosaurs, but flightless birds descended from previous birds, such as Archeaopteryx.[43] Other alleged even more bird-like theropods, such as Velociraptor do not appear until some 70 m.y. after Archaeopteryx[92]. Later in the avian fossil record, the extremely rapid appearance of the major bird groups, about 70-80 Ma, preceded by a long period where bird fossils are few and far between[36] has been termed "bird evolution's big bang"[44] by some paleontologists who say that birds evolved "explosively"[44].

The alleged dinosaur ancestors of birds thus appear about 30 million years after the birds themselves, and we have no fossils documenting the diversification of the major bird groups. When considering the hypothesis that birds descended from dinosaurs, how sure can we therefore be sure that there really were reptilian ancestors of birds? From what, exactly, if anything, did birds evolve? Perhaps the weak constraints of evolutionary theory allow a hypothetical tree to still be constructed, but Wells is correct to assert that, "immense stretches of time are left with no fossil evidence to support cladistic phylogenies" (*Icons*, pg. 120). It is this lack of fossils which provides the basis for the Wells' critique.

Its Just So

Bird evolution is a great exercise in the storytelling of evolutionary theory. We are typically told "just so" stories by textbooks about how dinosaurs took to flight as birds. These stories, plausible though they occasionally may be, illustrate that evolutionary theory is a historical science, dealing with unrepeatable unobservable historical events. This is not a fault of evolutionary theory *per se*, but an inherent limitation of historical sciences investigating origins. Evidence for evolution must be based upon inference, and inferences make a much weaker argument than evidence from repeatable observations.

These bird and dinosaur-like fossils may fit the evolution inference (if we ignore aforementioned difficulties), but why couldn't these few clearly mixed-trait forms be mosaics which were designed? Mozart created symphonies with regular patterns that would suddenly go off in a burst of clear creativity. Is it possible that a Designer has distributed various traits among organisms in a regular fashion, but with the occasional beautiful chimera, testifying to the creativity of the Designer? This argument for inferring design is truly no weaker than arguments from homology for inferring common ancestry. This fact, combined with other empirical difficulties presented here, make Tamzek's claim of, "clear evidence that a transition between the [dinosaur and bird] classes occurred" difficult to accept.

Creationists are not alone

Wells' usage of this icon surely represents a break from mainstream biological thought, however, creationists are not alone in asserting the inappropriate claims of an alleged dinosaur - bird link. After Archaeoraptor, a feathered dinosaur displayed on the cover of National Geographic, was shown to be a fake, Storrs Olson, curator of birds at the National Museum of Natural History said:

> "The idea of feathered dinosaurs and the theropod origin of birds is being actively promulgated by a cadre of zealous scientists acting in concert with certain editors at Nature and National Geographic who themselves have become outspoken and highly biased proselytizers of the faith. Truth and careful scientific

> weighing of evidence have been among the first casualties in their program, which is now fast becoming one of the grander scientific hoaxes of our age—the paleontological equivalent of cold fusion."[93]

Though it would seem in the minority, Wells does find himself in the company of other authorities who would also assert that Archaeopteryx and the alleged dinosaur-to-bird transition have become icons for evolutionists.

Peppered Moths and Darwin's Finches:

Let *me* tell ya 'bout the Birds and the Bees...

It should first be noted that with regards to the validity of evolutionary theory, it is this author's opinion that the issues surrounding the validity of the evolutionary story behind peppered moths and Darwin's finches are moot.

The fact is that regardless of whether or not the moth story is valid, there are examples of natural selection in literature. But this is not surprising, for natural selection is simply non-random death: it is a mathematical certainty given variation in a species and some selection pressure from the environment. But the mechanism behind evolution is more than just natural selection, for there must first be variation upon which selection can act. But where did this variation come from, and are the mechanisms for originating variation sufficient to account for great genetic changes claimed in evolutionary transitions? Even evolutionist vertebrate paleontologist Robert Carroll asks:

> Can changes in individual characters, such as the relative frequency of genes for light and dark wing color in moths adapting to industrial pollution, simply be multiplied over time to account for the origin of moths and butterflies within insects, the origin of insects from primitive arthropods, or the origin of arthropods from among primitive multicellular organisms? How can we explain the gradual evolution of entirely new structures, like the wings of bats, birds, and butterflies, when the function of a partially evolved wing is almost impossible to conceive?[112]

Evolution's problem lies in the mutation-selection mechanism, where mutations–the ultimate originator of all genetic variation–must somehow account for the origin of the vast and often irreducible complexity of life on earth. The need for mutations to build great complexity remains the Achilles heel for evolution.

Darwin's Finches, though a weak example of speciation and evolutionary radiation themselves[45], could never provide evidence for anything more than the slightest example of microevolution. Microevolution, or minor change within a species is also a well documented fact, readily accepted by creationists and evolutionists alike. Some of Darwin's Finches may be considered to be different species simply because they are reproductively isolated, however, this is a constructed definition of species which doesn't necessarily imply any significant transformation has occurred. Unlike microevolution, macroevolution--the ability to turn hominids into humans, reptiles into birds, or evolve complex biological structures–relies upon generally undocumented evidence. Even evidence for speciation might exist which still doesn't validate macroevolution, as it has not been observed to any large degree and biological complexity works against it. As opposed to temporary miniscule changes in the sizes of finch beaks, macroevolutionary claims of common ancestry and transitions between very different types of organisms are the controversial part of Darwin's theory.

Enough of my creationist rhetoric–does Wells get it right?

With regards to moths, Tamzek quotes Majerus who, in response to Wells, admits that the melanism hypothesis is "discredited", which is indeed what is taught in textbooks, validating Wells' general critique. In this 2000 response to Wells, quoted by Tamzek, Majerus says that differential bird predation is still responsible for the changing coloration of the moths. Yet, this same Majerus wrote in 1987, "it seems certain that most B. betularia rest where they are hidden.... [and] that exposed areas of tree trunks are not an important resting site for any form of B. betularia"[87], which would preclude the possibility that bird predation is an important factor in their selection. Majerus, an expert, seems to be either contradicting himself here, or retracting his claims.

Regardless of what moths really do, Wells was not unjustified in trusting Majerus, an expert (and others[88]), when Majerus implied that birds are not a factor in moth selection[87]. Majerus and others may disagree with Wells, however Wells himself is not completely ignorant on the subject of moths, as he had an opinion article published on the subject entitled, "Second Thoughts about Peppered Moths"[88] in the peer-reviewed journal, *The Scientist*.

As for finches, Tamzek claims that Wells' figure 8-1 isn't helpful for understanding the phylogeny of finches, however that is not what Wells claims it is meant to show. The figure only claims to pictorially represent the 14

finch species, and Wells asks the reader to note differences in finch beaks. Wells goes on to discuss how books for public education use the finch example as evidence of speciation[97], however it is clear from the figure 8-1 that the differences between the finches are very minor--even after millions of alleged years of finch evolution--and that only microevolution has occurred, regardless of what the finch phylogeny may ultimately be.

Tamzek says that there is "overwhelming evidence" that these finches adapted to their various islands from a single ancestral population, however a recent statistical analysis showed that stochastic modeling can explain the observed distribution of Darwin's finches just as well as a scenario based on radiation and common ancestry[45]. In other words, Darwin's finches appear to be a random conglomeration of birds, not a neat picture of natural selection in action.

From reading Tamzek, it would seem that Wells makes few claims or arguments about Finches which Tamzek would controvert. Wells' treatment of Peppered moths is not at all poorly referenced, but does indeed cite the experts to prove its main points.

El Niño meets La Brisa

Parenthetically, Tamzek critiques Wells' brief qualitative discussion of El Niño, however Wells' comments about El Niño are absolutely correct and the quote Tamzek provides from the NOAA website[46] is in no way in contradiction with Wells' statements about causes of the El Niño weather phenomenon. Wells' claims that El Niño is a "disturbance in winter weather patterns caused by unusually warm air over the Pacific Ocean" (*Icons*, Pg. 168). Similarly, the NOAA website says, "El Niño is a disruption of the ocean-atmosphere system in the tropical Pacific"[46]. This "disturbance" or "disruption" is best seen in the first figure on the NOAA website[46], where during the 1982 El Niño, the thermocline (mixing barrier between warmer upper waters and cooler deeper waters) dropped in the fall.

Tamzek implies that this change in the temperature gradient is what causes abnormal El Niño weather, making Wells' statement about Pacific wind changes incorrect. However, the NOAA website says that El Niño involves changes in the entire "ocean-*atmosphere* system"[46] (emphasis mine) and the figure shows that surface winds actually remain normal until late December when they drop sharply, stopping the westward push of water along the Pacific surface, thus causing the El Niño change in Pacific Ocean temperatures (which make for warm surfing in Southern California). Tamzek's quote is right, but Wells is also correct: there is indeed a disturbance in winter weather patterns and Pacific air flow, and this is what directly causes the El Niño weather patterns.

Four Winged Fruit Flies:

Antibiotic Resistance is Futile

Tamzek claims that antibiotic resistance is more than a trivial example of microevolution. However, while antibiotic resistance is a very real phenomenon shows the mutation-selection mechanism in action and represents the origination of miniscule to no significant information in the genome.

Antibiotics are chemicals which retard virus and bacterial reproduction by entering the microbes and inhibiting vital protein manufacture or destroying cell walls. Antibiotic resistance typically involves simple (often 1 or 2 point mutations[94]) mutations which cause substitutions in specific amino acids to slightly changes the structure of antibiotic target (the cell wall or ribosome -- the protein factory) such that the antibiotic is no longer effective in binding its target enzyme[94, 95, 96]. It does not involve a change in function, but rather a slight change in structure such that function is maintained and the antibiotic's structural effect upon the target is inhibited.

Some resistance also occurs if an enzyme in the target's host happens to interferes with the antibiotic such that it cannot reach it's target[95, 96]. Since replication, mutation, and gene swapping are so prevalent in micro-organisms, the right mutations often arise and get passed around quite quickly. Cell walls not affected by antibiotic drugs are easily selectable for once one out of countless bacteria microorganisms finds the simple mutation and becomes resistant, strong selection pressure often quickly kills off the other non-resistant microorganisms[96]. However, the processes behind antibiotic resistance do not involve the creation of new significant genetic information. Antibiotic (and pesticide) resistance does not tell how new biochemical pathways originate, how complex organ systems develop, or how macroevolutionary transitions can occur. The review of antibiotic resistance (Walsh, 2000)[96], cited by

Tamzek to imply that antibiotic resistance entails the origination of significant macroevolutionary change, actually speaks to the contrary.

Walsh cites 3 mechanisms of anti-biotic resistance: the overproduction of already-existing protein pumps to export antibiotic drugs (nothing new created here), minor functionally-moot structural changes in various proteins of target systems (this requires only a point mutation, and is not information-building), and destructive of the antibiotic by interaction with very slightly modified pre-existing enzymes of the organism (again, no new information is created and changes are minor, if any).[96] Though Walsh shows that bacteria have found innovative ways to survive attacks from antibiotic drugs, Walsh doesn't mention that bacteria, after becoming resistant, often face a "cost", which is a decrease in relative fitness compared to the original strain before introduction of the anti-biotic.

In none of these cases, however, has any significant information, useful for explaining macroevolutionary change, been added to the genome. In fact, Walsh implies that the very short time frame in which antibiotic resistance often develops testifies to the simplicity of the genetic and phenotypic changes entailed therein. Antibiotic resistance thus actually weakens the bacteria, and that in this case, evolution only comes at a fitness cost, and definitely doesn't represent the addition of new genetic information to the genome.

4 wings, 3 mutations, no flight

Contrary to Tamzek's charge, Wells does not completely deny that mutations can cause morphological changes–he only says that "mutations cannot explain the large-scale changes [and cannot] contribute to fundamental changes in an organism's shape and structure" (*Icons*, pg. 178, 182). In fact, an example of morphological change given by Wells provides the title of this chapter:

> "But four-winged fruit flies do not occur spontaneously. They must be carefully bred in the laboratory from three artificially maintained mutant strains [three specific mutations are needed]. Furthermore, the extra wings lack flight muscles, so the mutant fly is seriously handicapped. Four-winged fruit flies testify to the skill of geneticists, and they help us to understand the roles of genes in development, but they provide no evidence that DNA mutations supply the raw materials for morphological evolution." (*Icons* pg .178)

These fruit flies show how "morphological mutations" are not simple and are often poor mechanisms for adding functional biological structures. In genetics, genes can be thought of in two categories: master control genes and body part genes. Body part genes code for actual body parts while master control genes tell those body part genes when to be expressed and create their respective part. If a master control gene tells a leg-gene to grow out of the thorax in 6 places, then the fruit fly will develop 6 legs. However, without the "leg-gene" the master control gene is useless. "Body part genes" provide the raw material for evolution while master control genes simply activate body part genes. Fruit fly mutations deal only with mutations in master control genes and don't add "raw materials."

When a fruit fly develops an extra set of wings, it is because the master control gene for growing wing sets fired in 2 different places during the development of the fly. The "structure" in question is the wings, and the "raw material" lies in the genes for growing wings–not the mutation which caused the second set of wings to grow. It might be a relatively simple mutation to grow an extra set of wings, but it is not a simple mutation to code for an create the "body part gene" for the wing in the first place. Wells points out, though, that it still takes three specific mutations in the master control gene to get new a wing set, and even then the extra wings are non-functional. Even master-control gene mutations must be specific and complex to be beneficial to the fly.

Tamzek cites Bradshaw (1998)[98] as an example of morphological evolution refuting Wells' arguments, as morphological changes have been traced to just a few genetic loci. Hartl and Jones' *Genetics*, define a locus as, "a well-defined site ... in the chromosome, with the alleles of a gene"[100]. The paper traced the morphological changes only to the level of the genes' loci–however, this is not surprising, for a loci is simply the location of a gene, or cluster of genes, on a chromosome. Substitute the word "gene cluster" for "loci," and Tamzek's claims become "[morphological change has been traced to] one or a few gene clusters on the chromosomes". This does not imply that the morphological changes were caused by simple mutations, but just confirms standard genetic theory that one or a few genes tend to control minor morphological traits which determine body part sizes. We do not know if the mutations between the gene(s) are complicated, or if the multi-gene controlled traits also required complicated mutations which had to be orchestrated in a complex manner. The point is that it hasn't been established what sort of genetic changes are necessary to cause morphological changes, other than the obvious fact that the size of these flower parts are each controlled by one or a few chromosome loci.

If the mutations are in fact simple, we still have seen no novel structures added to the phenotype, and no "raw materials" added to the genome. These are changes in already existing "body-part genes" which cause minor phenotypic changes in size. Figure 2 of the paper shows that the morphological differences between the species simply represent different ends of a continuous but small spectrum of the sizes of various flower parts. The morphological differences between the monkeyflowers are minor, and if caused by evolutionary processes, are best called "microevolution". In fact, the two species are fully interbreadable, as the paper found that they produce fertile offspring. To claim any evidence for macroevolution from this paper is unwarranted.

Regardless of whether or not the fruit fly icon is common in textbooks, the overextrapolation in claims of the ability of simple mutations to cause great morphological change is common among evolutionists, and this chapter is a vital component of a book debunking exaggerated evidences used to prove evolution.

Fossil Horses and Directed Evolution:

Evolution by Nicer Jerks

Tamzek claims that fossil horses are good evidence of microevolution adding up to macroevolution. However, the steps themselves are not recorded in a gradual microevolutionary fashion, as is noted by biologist Richard Goldschmidt who said, "within ... the famous horse series, the decisive steps are abrupt and without transition..."[52]. Others have noted that the horse series is artificial, constructed of fossils clearly not related, leading to confusion in textbooks:

> The family tree of the horse is beautiful and continuous only in the textbooks. In the reality provided by the results of research it is put together from three parts, of which only the last can be described as including horses. The forms of the first part are just as much little horses as the present day damans are horses. The construction of the horse is therefore a very artificial one, since it is put together from non-equivalent parts, and cannot therefore be a continuous transformation series[59]

This horse series, which allegedly goes from Hyrocotherium (eohippus) à Orohippus à Epihippus à Mesohippus à Miohippus -> Parahippus à Merychippus à Dinohippus à Equus (modern horses)[60], is fraught with its own problems[61] from the start:

The origin of Hyrocotherium (eohippus) is unknown, as there are no fossils connecting it to its alleged condylarth ancestors. Hyracotherium, Orohippus, and Epihippus are all found from the same age of rocks and are very similar apart from a sequential decrease in size. Between Epihippus and Mesohippus, there is a morphological gap as the size increases about 50 percent and the number of toes on the front feet suddenly decreases from four to three. Mesohippus, Miohippus, and Parahippus are very similar and do not involve major evolutionary changes. The transition to Meryhippus involves a significant instaneous increase in size, and the transition to Dinohippus a sudden decrease to 1 toe. From there it's a straight shot to modern horses. This fossil series is not continuous, switches continents at points, and major changes are not documented by fossil evidence. The best that can be said for this alleged fossil evolutionary series is that it only provides a slightly less-jerky-than-usual account of the evolution, but is still lacking evidence documenting the major evolutionary changes and is at odds with the observed geographical distribution of the fossils[61].

Stormy weather

Tamzek suggests that if the weather is undirected, then meteorologists should rightly employ the same materialist philosophy Wells criticizes. However, the difference between the weather and evolution is that the processes controlling weather are be observed in the present to be based upon chance and law. The origin of biological organisms took place in the past, where the processes involved cannot be accessed. By assuming that only naturalistic processes were at work in the past, evolutionists make stronger philosophical statements than meteorologists, who can directly observe that naturalistic processes are at work in the present. Given that many unknowns about causes of weather will always exist, for we cannot know what is always happening in the sky, it is possible that God "makes clouds rise from the ends of the earth; [and] sends lightning with the rain"[58] after all! However, given that we observe weather in the present obeying natural laws, scientists are not unjustified in relegating explanations of present weather to the natural realm.

"Random and undirected" by any other name...

Tamzek charges that Wells wrongly deduces evolution's materialist philosophy from atheist biologist Richard Dawkins, an outspoken metaphysical naturalist who would be expected to bring his worldview into his science. However, this is not the case as Wells' first constructs his arguments from biologist George Simpson who rightly points out that if Darwinism is true, then, "man has to understand that he is a mere accident"[53]. Tamzek suggests the chance-based nature of the evolution does not mandate an anti-theist materialism, however such a suggestion would involve a contradiction of terms.

Of a viewpoint similar to that of Tamzek is biologist Kenneth Miller, a Catholic, who has stated in his biology textbook that evolution is "random and undirected"[54]. Tamzek seems to suggest that simply because Miller is a Catholic who believes in an all-powerful God, that these explicitly stated philosophical implications of evolutionary theory (i.e. that it is random and not directed) must have some other meaning! However, it is possible that Kenneth Miller himself has encountered a contradiction in his own belief system if he claims that God is somehow directing evolution, which he defines as a random process.

Miller must account for God's hidden action somehow, and he does this through postulating "quantum events", which would allow a "subtle God to influence events in ways that are profound, but scientifically undetectable to us"[56]. In a review of Miller's book in *Bioscience*, botanist Barry Palevitz notes that "according to Miller, the unpredictability of subatomic particles provides enough wiggle room for God to work miracles" as Miller is "using the exact same arguments as Behe [an advocate of intelligent design theory], except that instead of designing biochemical pathways, Miller's deity plays dice with quarks"[55]. Thus, Miller's non-materialist worldview doesn't really allow him to believe that evolution is truly a random, undirected process, for he believes that God manipulated the course of evolution by causing, "the appearance of mutations, the activation of individual neurons in the brain, and even the survival of individual cells and organisms affected by the chance processes of radioactive decay"[56]. Miller hardly believes that evolution is a true chance-based process, as would be impossible for any traditional theist.

There is no play on words here, and there is no middle ground where metaphysics is kept separate from science. Evolution is by definition a random process. If the first cell turned into humans solely through evolutionary processes, then humans are here on earth apart from any will or intention of a Creator God. If humans exist because of will or intention at any level, then some cause other than evolutionary processes is at least partially responsible for the physical origination of life on earth. Miller himself admits this, however fails to see a contradiction when he calls evolution "random and undirected" and claims it alone is the process which brought forth life on earth. Pure evolution, it would seem, is not an option for the theist whose God "foreknew" us "before the creation of the world"[57].

From Ape to Human: The Ultimate Icon:
Tamzek criticizes Wells' usage of this icon because it isn't found in textbooks. However, Tamzek assumes that all of the icons are to be found in textbooks. The "ape-to-human" drawing on the cover of *Icons* probably isn't found in textbooks because most textbook writers are informed enough to recognize it's a false icon (as did Tamzek's general biology professor). In fact, Wells never claims it is found in textbooks today. In his Appendix, "An Evaluation of Ten Recent Biology Textbooks", the "Ape to Human" icon is left off, probably because it wasn't present. However, this ape-to-human picture is prevalent in our society as an icon and many people surely believe it represents real fossil evidence.

Lots of firewood Tamzek criticizes Wells for not including an updated hominid phylogeny, Wells does not provide a more recent diagram of the alleged hominid phylogeny for his point is that, "individual fossils lend themselves to ... varied interpretations, ... and evolutionary history cannot be constructed from the fossil record". Therefore since the hominid fossil record provides a poor basis for creating phylogenies, we would not expect Wells to provide a diagram of the hominid phylogeny *du jour*. According to Wells, the latest phylogeny is little better representative of the facts than the famous "ape to human" icon itself.

Tamzek is correct to point out that Wells indeed does quote Gee regarding the pre-human fossil record from 10 to 5 Ma, before human evolution allegedly got started. However, even if this isn't, as Eugenie Scott said, "when humans evolved"[89], it still has a strong bearing on the alleged ancestry of humans, and would represent the first apes pictured in the icon. However, Wells does indeed give an accurate picture of the sparseness of later hominid fossils which are relevant to human evolution. Wells discusses "skull 1470" (Icons pg. 219) and quotes *Science*

writer Constance Holden on the more relevant hominid fossil record saying that "[t]he primary scientific evidence is a pitifully small array of bones form which to construct man's evolutionary history. One anthropologist has compared the task to that of reconstructing the plot of War and Peace with 13 randomly selected pages."[47]

Paleontologist Stephen Jay Gould would most likely concur with Wells as he once wrote, "[m]ost hominid fossils, even though they serve as a basis for endless speculation and elaborate storytelling, are fragments of jaws and scraps of skulls."[48] Roger Lewin would also be in agreement when he wrote, "the major problem has been the pitifully small number of hominid fossils on which prehistorians could exercise their interpretive talents"[75]. Wells is not at all dishonest to claim that the paucity of fossils useful for investigating the alleged hominid ancestry of humans causes subjectivity among researchers. Wells' statements are in line with what Gould and Lewin have said, and are not negated by a reduced level of the relevance found in Well's quotation of Henry Gee.

Missing: Link

Of the precious little that is found, the bottom line there are basically 2 types of hominid fossils: those of the genus *Homo* and those of the genus *Australopithecus*. Everything of the genus *Homo* (*Homo erectus*, *habilus*, *neanderthalis*, *sapiens*, etc.) have skulls and body shapes which are very similar to modern humans--often to the point that they could be within the possible range of modern human genetic variation. Everything else from the genus *Australopithecus* (from which the famous fossil "Lucy" is derived), looks much more like a chimpanzee (*Australopithecus* means "southern ape") There are "robust" forms of *Australopithecus* which are not very chimp-like, but these also look absolutely nothing like *Homo*, and evolutionists do not believe they are on the human line.

So what fossils are there to link the chimp-like members of *Australopithecus* with the fossils of the genus *Homo*, which basically represents modern humans? The answer is nothing. Between the two are great skeletal differences with regards to locomotion[49, 51] and a large gap in brain size[50], with nothing in between. The "missing link," it would seem, is still missing.

After providing quotes from a number of authorities, including Gee, noting the lack of hominid fossils and the subjective nature of the many phylogenetic trees of human evolution Wells is justified in asking "[g]iven the highly subjective nature of paleoanthropologoy--as acknowledged by its own practitioners--what can the field reliably tell us about human origins?" (Icons pg. 223). The answer, it would seem, is definitely not that we have unquestionably evolved from apes.

Conclusion:

Wells is not a fraud

Apart from his doubts of Darwinism, a review of Tamzek's charges against Wells reveals that there is not one established instance where Wells is wrong, and few where he is even clearly at odds with mainstream scientific thought. The only bona-fida error in *Icons* could be found in Wells' figure 5-3 on the Cambrian explosion, which Tamzek doesn't verify, and this alleged error itself would not affect the strength of Wells' arguments about the Cambrian explosion. How is it that Wells can be seemingly be in agreement with mainstream science in almost all of his arguments (even Eugenie Scott says that Wells is "usually technically correct"[89]), which ought to have a profoundly negative effect upon the evidence for evolutionary theory, yet Wells differs from mainstream science in his conclusion that evolution might be false? The answer most likely lies in Wells' interpretation of the data he collects in analyzing the level of errors in textbooks.

A Distaste for Design

Indeed, there are many people out there who are convinced that evolution is a solid scientific theory, apart from any of its philosophical or theological implications. Most likely the textbook writers Wells reviews are not atheist followers of the church of Richard Dawkins, but rather are simply scientists trying to produce textbooks in line with mainstream scientific thought. However, the question must be asked, how is mainstream scientific thought so entrenched in evolutionary theory? As we have seen from Wells' work, it certainly is not because of the evidence. Most likely, the reasons can be seen in the sorts of objections which biologists give when discussing evolution's competing theory of origins--design.

Tamzek cites biologist Rudolph Raff arguing against design saying, "as the influence of the intelligent designer

grows ... the relationships between the phenomena and explanations becomes increasingly arbitrary ... [until] one reaches a point where all biological features are 'special creations' and other explanations become unnecessary." [30] Raff does not want God, or teleology out of his life, Raff simply wants design and teleology out of science. In fact, design theorist William Dembski would see Raff's arguments as typifying the reasons for the exclusion of design from science:

> "What has kept design outside the scientific mainstream these last 130 years is the absence of precise methods for distinguishing intelligently caused objects from unintelligently caused ones. For design to be a fruitful scientific theory, scientists have to be sure they can reliably determine whether something is designed. Johannes Kepler, for instance, thought the craters on the moon were intelligently designed by moon dwellers. We now know the craters were formed naturally. This fear of falsely attributing something to design only to have it overturned later has prevented design from entering science proper."[101]

What would solve Raff's problem, however, would be a rigorous criteria which allows scientists to know when to detect and infer design, and when not to. If such a method could be found, then what is best explained naturally remains explained naturally, while what is best explained through design, becomes explained through design. As Dembski subsequently says, "[w]ith precise methods for discriminating intelligently from unintelligently caused objects, scientists are now able to avoid Kepler's mistake"[101].

These methods for detecting design have been a subject of great controversy, as many claim they still are not rigorous, and produce false positives, false negatives, or come from false motives[102]. Dembski retorts that these problems can be solved[103]. Regardless of who is right, one thing is clear: it is often difficult to distinguish between the past action of natural processes, such as evolution, and the past action of non-natural processes, such as design. In fact, after seeing the anti-evolutionary evidence presented in this paper, one could just as easily argue that Raff commits his own mistake--improperly relegating *all* explanations to the natural realm, even when predictions from naturalistic theories are failing, adding epicycle after epicycle to preserve the naturalistic explanation.

Given the epistemological quandaries afflicting everyone from all sides of this issue, one has to wonder which arguments represent the middle road. Raff, and Tamzek, say it all belongs in the natural realm. In *Icons*, Wells says nothing about intelligent design, but simply claims that evidence for evolutionary theory is lacking, and shows many examples where predictions from evolutionary theory are not met in the scientific data. During Wells' talk at UCSD, Wells indicated he is willing to go with the evolutionary explanation if it is warranted by the evidence, he just doesn't think it is. Dembski too is quite comfortable with evolutionary explanations, in fact during a talk at UCSD in 2001 he said, "as far as the Darwinian mechanism goes, blessings to it". Dembski would argue further that design, combined with evolution, is necessary and warranted to explain the origin of many biological features.

Thus it would seem that members of the "ID movement" are actually quite open minded and tolerant in the approach to the design-evolution issue, allowing for explanations to lie in both the natural and non-natural realms, or both the teleological and materialistic realms. In contrast, many scientists seem closed off to half of the issue: design. In being unwilling to try to sort out these epistemological quandaries, they leave all explanations of biological origins to the natural realm, be it the most accurate and fruitful course of investigation, or not.

Step into the light

In conclusion, Tamzek quotes Theodosius Dobzhansky, a theistic evolutionist, to show that one can believe in God and in evolution. In the quote Tamzek provides, Dobzhansky seems to be arguing only against a young-earth perspective, which is not at all what Wells advocates. In fact, Wells might even agree with Dobzhansky that religious texts are not "textbooks of astronomy, geology, biology, and anthropology". Where Wells would disagree, is that one's conclusion therefore ought to be that, empirically speaking, God had no direct effect upon the creation process, and that God created everything through undirected evolution. Biblical Scripture may say little about the details of the actual processes God used to create, however it is clear that God intended things to be as they are[57]. Dobzhansky would be hard pressed to fit the randomness of evolution into God's purposefulness. For the theist willing to dare to give up academic credibility by acknowledging counter-evidences to biology's sacred cow[105], these problems can be solved. Had Dobzhansky lived to see the birth of the intelligent design movement, perhaps he too as a theist would have embraced its more open-ended approach.

In contrast to Tamzek, Wells uses Dobzhansky's quotes for purely scientific purposes--to show that Dobzhansky's

famous quote--"[n]othing in biology makes sense except in the light of evolution"[104]--represents a departure from the scientific method, as it presumes that everything in biology must fall under the evolutionary paradigm:

> "[S]cience at its best pursues the truth. Dobzhansky was dead wrong, and so are those who continue to chant his antiscientific mantra. To a true scientist, nothing in biology makes sense except in light of the evidence." (*Icons*, pg. 248)

Wells' point is that the evidence--not a paradigm--should be controlling our understanding of the data. After a look at weaknesses in the most common lines of evidence used to support evolutionary theory, at least 2 things are clear: evidence for evolutionary theory is surely lacking in some important places, and *Icons of Evolution* will be a royal pain in the fanny for evolutionists for years to come.

References Cited:

1. Stanley Miller and Gordon Schlesinger. Prebiotic Synthesis in Atmospheres Containing CH_4, CO, and CO_2. *Journal of Molecular Evolution* 19:376-382 (1983).
2. Abelson, Philip H. "Chemical Events on the Primitive Earth," from the *Proceedings of the National Academy of Sciences, USA*, Vol 55 Pg. 1365-1372 (1966).
3. The Search for Life's Origins. National Research Council Space Studies Board, National Academy Press: Washington D.C., 1990, pg. 66, 67, 126).
4. "Responses to Jonathan Wells's Ten Questions to Ask Your Biology Teacher" from the NCSE, as posted on their website at http://www.ncseweb.org/resources/articles/7719_responses_to_jonathan_wells3_11_28_2001.asp.
5. Statements made by Eugenie Scott, director of the NCSE at her lecture rebutting Jonathan Wells' book "Icons of Evolution" at the California Science Teachers Association annual conference in Palm Springs, Ca on October 26th, 2001 entitled "Icons of Evolution: The Good, Bad and Ugly".
6. Personal Communication with Mr. Tamzek and others who collaborated in writing "Who's the Real Fraud?".
7. "Executive Summary of NAI team Research Projects and Accomplishments" (for the year June, 2000 - June, 2001) available at "http://psarc.geosc.psu.edu/annreports/Exec_Summary.pdf".
8. Hiroshi Ohmoto, professor of geochemistry in the College of Earth and Mineral Sciences and director of the Penn State Astrobiology Research Center as quoted in "Penn State Researchers To Explore Origins of Life" as found at http://www.psu.edu/ur/NEWS/news/originsoflife.html.
9. C.F. Davidson. 1965. Uranium in ancient conglomerates. *Proceedings of the National Academy of Sciences* 53:1194; 1964. Geochemical aspects of atmospheric evolution. *Economic Geology* 59:168.
10. *The Chemical Composition of the Earth's Original Atmosphere* by John C. Walton [Lecturer in Chemistry University of St. Andrews, Fife, Scotland] *Origins* 3(2):66-84 (1976).
11. Evidence for life on Earth before 3,800 million years ago. S.J. Mojzsis, G. Arrhenuis, K.D. McKeegan, T.M. Harrison, Ap.P. Nutman, and C.R.L. Friend. *Nature*, 384:55 (Nov 7, 1996).
12. Chemical Events on the Primitive Earth by Philip Abelson. *Proceedings of the National Academy of Sciences* (Geophysics) vol 55, pg. 1366, (1966).
13. Anders, Edward. Pre-biotic organic matter from comets and asteroids. *Nature*, 342:255 (November 16, 1989).
14. Lasaga, Antonio, H. D. Holland, M. J. Dwyer. "Primordial Oil Slick". *Science,* Vol 174, pg. 53-55 (Oct 4, 1971).
15. Schopf, J. William in *Exobiology* (edited by Cyril Ponnamperuma), North-Holland Publishing Company: Amsterdam-London, 1972 in the Precambrian paleobiology chapter, Pg. 27.
16. Rode, B.M. "Peptides and the Origin of Life". *Peptides* (20) 1999. Pg. 773-776. Rode goes on to state that amino acids have been made in the presence of oxygen, however this claim is based upon his reference 7 (Hanic, F, and Morvova, M., Eleventh symposium on elementary processes and chemical reactions in low temperature plasma, Low Tatras, Slovakia, 1998), and we dispute Rode's claim. Not only is reference 7 referenced incorrectly by Rode, but it pertains to unpublished research which appears to come from a single poster presented at an obscure conference in Europe, the title of which says nothing about the production of amino acids in the presence of oxgyen, which, if true, would be a groundbreaking discovery for pre-biotic synthesis. An article written later by Hanic and Morvova present their findings of reference 7 , but the article says nothing about amino acids having been produced in the presence of oxygen. Rode's claim is also at odds with findings of many other origins of life researchers. For these reasons, we are skeptical of Rode's claim of amino acid production in the presence of oxygen.
17. Shapiro R.D., "*Origins: A Skeptic's Guide to the Origin of Life*" Summit: New York NY, 1986, as quoted by in *Icons*.
18. Miller, S.L., and Orgel, L.E., *The Origins of Life on the Earth*, Englewood Cliffs, Prentice Halt, p. 33 (1974).
19. Davidson, C.F. Evolution of the Earth's Atmosphere in *Proceedings of the National Academy of Sciences, USA*,

53:1194-1205.
20. Schopf, J.W., Microfossils of the Early Archean Apex chert: new evidence of the antiquity of life. *Science*, 260, 640-646, 1993.
21. S. Moorbath, R.K. O'Nions, and R.J. Pankhurst. 1973. Early Archaean age for the Isua iron formation, West Greenland. *Nature* 245:138.
22. M.G. Rutten. 1971. *The origin of life by natural causes.* Elsevier Publishing, Amsterdam., pg. 276.
23. *The Talented Mr. Wells* by Kevin Padian and Alan Gishlick, as posted at " http://ib.berkeley.edu/courses/ib160/padian.html. It appears to have possibly been a source document for some of Tamzek's references and arguments. Padian cites Rode (1999), reference 16 in this document as evidence for amino acids in the presence of oxygen. See reference 16 for an explanation.
24. Miller, S. L. (1992). "The prebiotic synthesis of organic compounds as a step toward the origin of life." in *Major Events in the History of Life* (Schopf, J. ed.) (London: Jones and Bartlett Publishers).
25. Miller, S.L. and Levy, M. The stability of the RNA bases: Implications for the origin of life in *Proc Nat Acad Sci* vol 95 pp 7933-7938 (July 1998) and statements made by Stanley Miller at a UCSD Origins of Life seminar class on January 19, 1999, which was attended and notated by the author of this article.
26. Wolman, Y., Haverland, W. J., and Miller, S. L., "Nonprotein Amino Acids from Spark Discharges and Their Comparison with the Murchison Meteorite Amino Acids" *Proceedings of the National Academy of Sciences USA*, Vol 69:4 pp 809-811 (April 1972).
27. Miller, K., "The Precambrian to Cambrian Fossil Record and Transitional Forms," *Perspectives on Science and Christian Faith* Available at http://www.asa3.org/ASA/topics/evolution/PSCF12-97Miller.html.
28. Michael. Denton, Evolution: A Theory in Crisis (Bethesda, MD: Adler & Adler, 1985).
29. Phillip. E. Johnson, Darwin on Trial (Downers Grove, IL: InterVarsity Press, 1991).
30. Raff, Rudolf A., "The creationist abuse of evo-devo." *Evol Dev*, 3(6): 373-374 (2001).
31. Richardson, M. K. (1998). "Letter." *Science*, 280(5366): 983.
32. Raff, R. A. "The Shape of Life: Genes, Development, and the Evolution of Animal Form" (Chicago: The University of Chicago Press), pg. 197.
33. UCMP online Chart of First Appearances of Metazoans at http://www.ucmp.berkeley.edu/phyla/metazoafr.html.
34. Survey of phyla excluded by Jonathan Wells in *Icons of Evolution* Figure 3-4: Tardigrada (400 species[a], "minor"[a]), Priapulida (9 species[a], "minor"[a]), Ectoprocta (4000 species[a], "minor"[a]), Nematomorpha (320 species[b], "minora[4]), Gastroticha (430 species[b], "minor"[a]), Acanthocephala (1150 species[b], "minor"[a]), Loricifera (10 species described[b], "minor"[a]), Kinorhyncha (150 species[b], "minor"[a]), Sipuncula (320 species[c], "minor"[a]), Nemertini (also "Nemertea," 900 species[d], "minor"[a]), Echiura (~140 species described[a], "minor"[a]), Placozoa (never found in native habitat[e], 2 species described[e], "minor"[g]), Mesozoa (33 species[f], "minor"[g]), Gnathostomulida (80 species[i], "minor"[g]), Urochordata (said to have "few" species[h]).
    a. Unit on Minor Invertebrate Phyla at the University of Paisley Biomedia section of the Biological Sciences Website, an online biology library, at http://www-biol.paisley.ac.uk/courses/Tatner/biomedia/units/mino1.htm.
    b. UCMP website "Introduction to the "Aschelminth" Phyla" at http://www.ucmp.berkeley.edu/aschelminthes/aschelminthes.html.
    c. UCMP website "Introduction to Sipuncula" at http://www.ucmp.berkeley.edu/sipuncula/sipuncula.html.
    d. UCMP website "Introduction to the Nemertini" at http://www.ucmp.berkeley.edu/nemertini/nemertini.html.
    e. UCMP website, "Introduction to Placozoa", at http://www.ucmp.berkeley.edu/phyla/placozoa/placozoa.html.
    f. Phylum Mesozoa at the General Research Program Fauna Iberica website at http://www.fauna-iberica.mncn.csic.es/htmlfauna/faunibe/zoolist/mesozoa.html.
    g. Expert Center for Taxanomic Investigation UNESCO-IOC Register of Marine Organisms Website at http://www2.eti.uva.nl/database/urmo/credits.html.
    h. University of South Carolina Department of Biological Sciences Introductory Biology II online notes at http://www.biol.sc.edu/courses/bio102/f99-3234.html. Taught by professor Richard G. Vogt.
    i. Acoelomate Animals page on Pike's Peak Community College Biology Department website at http://www.ppcc.cccoes.edu/dept/BIO/BIO/bio137/08Flatworms.htm.
35. Murakami T., Utsunomiya, S, Imazu, Y, Prasad, N., "Direct evidence of late Archean to early Proterozoic anoxic atmosphere from a product of 2.5 Ga old weathering." *Earth and Planetary Science Letters* 184:523-528 (2001).
36. Cooper, A., and Fortey, R. "Evolutionary explosions and the phylogenetic fuse" *Tree* Vol 13, No 4, pg. 151-156

(April, 1998).
37. Knoll, A. H. and Carroll, S. B. "Early animal Evolution: Emerging Views from Comparative Biology and Geology". *Science* Vol 284:2129-2136 (June 25, 1999).
38. Qiang, Ji, Currie, P. J., Norell, M. A., Ji, S. "Two feathered dinosaurs from northeastern China." *Nature* Vol 393:753 (June 25 1998).
39. Padian, K., "When is a bird not a bird?" *Nature* Vol 393:790 (June 25, 1998).
40. *Scientific American*, "Taking Wing" by Kate Wong (Jan 2002), at http://www.sciam.com/2002/0102issue/0102scicit3.html.
41. "Cretaceous age for the feathered dinosaurs of Liaoning, China." *Nature* 400:58-61, July 1, 1999.
42. "Archaeopteryx: An Early Bird" on the UCMP website at http://www.ucmp.berkeley.edu/diapsids/birds/archaeopteryx.html.
43. Noted in an extremely well referenced article, "On The Alleged Dinosaurian Ancestry Of Birds" by Ashby Camp at http://www.trueorigin.org/birdevo.asp.
44. "Chinese Discovery Shows Famous Fossil Not Ancestor Of Modern Types Of Birds" by David Williamson, from UNC-CH News Services, November 15, 1996.
45. Sanderson, J, G. "Testing Ecological Patterns" in *American Scientists*, Vol 88:332-339 (2000).
46. "What is an El Niño?" from the National Ocean and Atmospheric Administration (NOAA) website at http://www.pmel.noaa.gov/tao/elnino/el-nino-story.html".
47. Holden, Constance. "The Politics of Paleoanthropology" *Science*, 8-14-81, p.737.
48. Gould, S. J., "The Panda's Thumb", 1980, p.126.
49. Collard, M. and Aiello, L. C. From forelimbs to two legs. *Nature* (March 23, 2000) 404:339-340. For a similar conclusion, see also "Further Evidence of Lower Pleistocene Hominids from East Rudolf North Kenya" by R.E. F. Leakey in *Nature* (May 28, 1971) 231:241-245.
50. Falk, D. "Hominid Brain Evolution: Looks can be Deceiving," *Science* Vol 280:1714 (1998).
51. Marchal, F. "A New Morphometric Analysis of the Hominid Pelvic Bone" *Journal of Human Evolution* (2000) Vol 38:347-365.
52. Goldschmidt, Richard B. [Prof. of Genetics and Cytology, University of California] (1952), "Evolution, As Viewed By One Geneticist", *American Scientist*, Vol. 40, No. 1, pp. 84-94.
53. George Simpson as quoted by Jonathan Wells in *Icons of Evolution*, Pg. 203.
54. Evolution, as descrbied in Miller and Levine's textbook, *Biology.* (quoted in *Icons of Evolution*, pg. 206).
55. "Falling off a tightrope: Compromise and Accommodation in the War between Creationism and Evolution," a review of Finding Darwin's God (by Kenneth Miller) by Barry Palevitz in *BioScience*, October 1, 2000, No. 10, Vol. 50; Pg. 926.
56. Miller, K, *Finding Darwin's God: A Scientist's Search for Common Ground Between God and Evolution*" (2000).
57. God. Ephesians 1:4: "For he chose us in him before the creation of the world to be holy and blameless in his sight." (NIV), Romans 8:29: "For those God foreknew he also predestined to be conformed to the likeness of his Son, that he might be the firstborn among many brothers." (NIV)
58. God. Psalms 135:7: "He makes clouds rise from the ends of the earth; he sends lightning with the rain and brings out the wind from his storehouses." (NIV)
59. Prof. Heribert Nilsson, Synthetische Artbildung, Verlag CWE Gleerup, Lund, Sweden, 1954, pp. 551-552.
60. Talk.Origins Fossil Horses FAQ as found at http://www.talkorigins.org/faqs/horses/horse_evol.html.
61. "What about the evolution of the horse?" by Helen Fryman, an extremely well referenced article at http://www.carm.org/evo_questions/horsevolution.htm.
62. Hedges, S. B., Poling, Laura L., "A Molecular Phylogeny of Reptiles," *Science*, February 12, 1999, Vol 238:998-1001.
63. Normile, D., "New Views of the Origins of Mammals, (a report on the International Symposium on the Origin of Mammalian Orders, July 21-15, 1998) *Science*, vol 281:773-774 (1998).
64. Novacek, Michael J., "Mammalian phylogeny: shaking the tree," March 12, 1992. *Nature*, vol 356:121-125.
65. Milinkovitch , M C., "Molecular phylogeny of cetaceans prompts revision of morphological transformations". *Trends in Ecology and Evolution* 10: 328-334 (August 1995).
66. Hasegawa , M., Adachi, J., Milinkovitch, M. C. "Novel Phylogeny of Whales Supported by Total Molecular Evidence," *Journal of Molecular Evolution* 44: S117-S120 (Supplement 1, 1997).
67. Smith, J. D., and Madkour , G., "*Penial Morphology and the Question of Chiropteran Phylogeny, Proceedings of the 5th International Bat Research Conference*" (Texas Tech Press), pp. 347-365 (1980).
68. "Molecular Systematics of Rodents" on the Molecular Systematics page of Ronald M. Adkins, professor of

biology at http://www.bio.umass.edu/biology/adkins/Systematics.html. Link includes further references.
69. Patterson, C., Williams, D. M., Humphries, C. J. "Congruence Between Molecular and Morphological Phylogenies". *Annual Review Ecology Systematics* 24:153-88 (1993).
70. A new place for fungi? By Ricki Lewis. *Bioscience* 44:6 pg. 389-391. Fungi here are said to be genetically more similar to animals, although morphological studies had previously place them as allegedly more closely related to plants. Regardless, the ancestry here is assumed through homology, and there is no independent fossil evidence or otherwise of plants, fungi, and animals having a common ancestry. Common ancestry is established through assumption alone.
71. Crane, P. R., Friis, E. M., Pedersen, K. R. The origin and early diversification of angiosperms. *Nature* 354:27-33 (1995).
72. De Jong, W. W. Molecules remodel the mammalian tree. *Tree* Vol 13, No 7, pg. 270-274 (July 7, 1998).
73. Schwabe, C., Warr, G. W., "A polyphyletic View of Evolution: The Genetic Potential Hypothesis." *Perspectives in Biology and Medicine*, 27, 3, Spring 1984 pg. 465-484. See also "On the validity of molecular evolution" by Christian Schwabe (TIBS 11 - July 1986 pg. 280-283).
74. Jarvis, E. D., Ribeiro, S., da Silva, M. L., Ventura, D., Vielliard, J., and Mello, C. V. Behaviourally diven gene expression reveals song nuclei in hummingbird brain. *Nature*, 406:628-632 (August, 10, 2000).
75. Lewin, Roger. "A new focus for African prehistory", *New Scientist* (September 29, 1977) 792-794.
76. Doolittle, W. F., "Uprooting the Tree of Life", *Scientific American* 90-95 (2000). Also available at http://www.sciamarchive.org/pdfs/1432930.pdf".
77. Doolittle, W. F. Phylogenetic Classification and the Universal Tree. *Science*, Vol 284:2124-2128 (June 25, 1999).
78. Hartman, H, and Fedorov, A. The origin of the eukaryotic cell: A genomic investigation. *Proc. Natl. Acad. Sci. USA*, Vol. 99, Issue 3, 1420-1425, February 5, 2002.
79. Espiritu, D. J. D., Watkins, M., Dia-Monje, V., Cartier, E. G., Cruz, L. J., Olivera, B. M. "Venomous cone snails: molecular phylogeny and the generation of toxin diversity." *Toxicon* 39:1899-1916 (2001).
80. Amundson, R. "Homology and Homoplasy: A Philosophical Perspective." Nature Publishing Group (2001).
81. Evidence for Evolution backgrounder at http://www.txtwriter.com/Backgrounders/Evolution/EVpage14.html, website of biology textbook author George Johnson (whose textbook, "*Biology: Visualizing Life*" is rated in Wells' textbook evaluation (pg. 249)).
82. Zoology 441a class website, by professor Paul Hanford, at http://instruct.uwo.ca/zoology/441a/evo.labs.html, from the University of Western Ontario Website.
83. Convergent Evolution Examples- Ecological Equivalents an evolution class website at Bellarmine University on the web at http://cas.bellarmine.edu/tietjen/Evolution/convergent_evolution_examples.htm.
84. Fish vs. Cephalopods, as seen on the Organismic Biology class website (by Charles Brokaw) on the Caltech website at http://www.cco.caltech.edu/~brokawc/Bi11/cephalopods.html. See also The Fact of Convergence by Arthur C. Custance at http://custance.org/old/evol/3ch2/3ch2.html.
85. Marsupial Nutrition by Ian D. Hume as reviewed at http://www.earthlife.net/mammals/pub/cambup.html.
86. Linnaeus, Carl, *Systema Naturae* (1735).
87. Howlett R.J., Majerus M., "The understanding of industrial melanism in the peppered moth (Biston betularia) (Lepidoptera: Geometridae)" *Biological Journal of the Linnean Society* 30: 31-44 (1987).
88. Wells, J., "Second Thoughts about Peppered Moths", *The Scientist* 13[11]:13, May 24, 1999. See http://www.the-scientist.com/yr1999/may/opin_990524.html.
89. Scott, E. C., "Fatally Flawed Iconoclasm" *Science* 292:2257-2258 (June 22, 2001).
90. Jones, T. T., Ruben, J. A., Martin, L. D., *et al.,* "Nonavian feathers in a Late Triassic Archosaur" *Science* 288:2202-2205.
91. Comments by Alan Feduccia in "More on the Origin of Birds" from Reuters, as posted on the ABC News website at http://abcnews.go.com/sections/science/DailyNews/dinosaur_bird001207.html.
92. Comments by Alan Feduccia in "Sometimes a Bird is just a Bird" by Cynthia Reynolds as posted at http://exn.ca/Dinosaurs/BirdDino-Disagree.cfm.
93. Open letter from Storrs Olson, curator of birds at the National Museum of Natural History to Dr. Peter Raven, Secretary Committee for Research and Exploration National Geographic Society on November 11, 1999. Also posted at " http://www.answersingenesis.org/docs/4159.asp.
94. HIV Resistance to Antiretroviral Drugs from the HIV / AIDs research center on the Journal of the American Medical Association Website Library at http://www.ama-assn.org/special/hiv/library/readroom/other96/vella.htm#virology.

95. Levy, Stuart, "The Challenge of Antibiotic Resistance", *Scientific American*, March 1998 as posted on the Scientific American website at http://www.sciam.com/1998/0398issue/0398levy.html.
96. Walsh, C. "Molecular mechanisms that confer antibacterial drug resistance." *Nature*, Vol. 406 (N6797): 775-781 (2000). See http://walsh.med.harvard.edu/pubs/pdfs/482.pdf for the "pdf".
97. *Science and Creationism: A view from the National Academy of Sciences* (2nd edition), Nat Acad Press, 1999. Available at http://books.nap.edu/html/creationism/.
98. Bradshaw, H. D., Otto, K. G., Frewen, B. E., McKay, J. K. and Schemske, D. W., "Quantitative trait loci affecting differences in floral morphology between two species of monkeyflower (Mimulus)." *Genetics*, V149(N1): 367-382 (1998). Available at http://www.genetics.org/cgi/content/full/149/1/367.
99. Baldauf SL, Roger AJ, Wenk-Siefert I, Doolittle WF. "A kingdom-level phylogeny of eukaryotes based on combined protein data." *Science* Vol 290(5493):972-7 (2000 Nov 3).
100. Hartl, D. L., and Jones, E. W., *Genetics Principles and Analysis*, (4th edition, Jones and Bartlett Publishers) pg. 132.
101. Dembski, W. A., "Introduction: Mere Creation", *Mere Creation Science Faith & Intelligent Design*, edited by William Dembski (InterVarsity Press, 1998) pg. 16.
102. There are many sources which present such criticisms. For some examples, see criticisms as linked on Wesley Elsberry's "William Dembski" page, at http://inia.cls.org/~welsberr/ae/dembski_wa.html.
103. Dembski, W. A. *No Free Lunch* (Rowman and Littlefield, 2002).
104. Dobzhansky T., "Nothing in biology makes sense except in the light of evolution", *American Biology Teacher* 35:125-9 (1973).
105. Description of evolutionary theory given by Phillip Johnson in "The Death of Darwinism", *Campus Alert*, Vol 4:1, pg. 3 (September 1995).
106. Oakley, T. H., and Cunningham, C. W. "Molecular phylogenetic evidence for the independent evolutionary origin of an arthropod compound eye". *Proc. Natl. Acad. Sci. USA*, Vol. 99, Issue 3, 1426-1430 (February 5, 2002). Abstract available at http://www.pnas.org/cgi/content/abstract/032483599v1.
107. Huges, Austin L., "*Adaptive Evolution of Genes and Genomes*". (see chapter 7, "Evolution of New Protein Function" pp 143-180. (Oxford University Press, New York, 1999).
108. Lynch, M., Conery, J. S., "The Evolutionary Fate and Consequence of Duplicate Genes" *Science* 290:1151-1155 (Nov 10, 2000).
109. Canile, Dante, "Vanadian in peridotites, mantle redox and tectonic environments: Archean to present" *Earth and Planetary Science Letters* 195:75-90 (2002).
110. Dawkins, Richard, The Blind Watchmaker, 1986, pp. 229-230.
111. Barnes, R.S.K., P. Calow, P.J.W. Olive, D.W. Golding, J.I. Spicer. *The Invertebrates: A New Synthesis*. (Blackwell Scientific, 2001, 3rd Edition).
112. Robert Carroll, Patterns and Processes of Vertebrate Evolution, Cambridge: Cambridge University Press, 1997, pp. 8-10
113. For a review of this issue, see Travis, John. "Eye-opening Gene: How many times did eyes arise?" in *ScienceNewsOnline*. 10 May 1997.

*: **The Evolution of "Who's the Real Fraud?":** For anyone confused about the different versions of "Who's the Real Fraud?" which have existed on the internet, or have now found a similar document under a different name, "Icon of Obfuscation" (at http://www.talkorigins.org/faqs/wells/), hopefully this brief discussion will give an account of what has happened. Please note that this footnote is *not* trying to imply that any wrongdoing been occurred because "Who's the Real Fraud?" has changed, it simply is trying to give an account of the changes to alleviate any confusion on the part of the reader.

To this author's knowledge, "Who's the Real Fraud?" first publicly appeared as "version 1.0", when distributed as a handout at Jonathan Wells' lecture at UCSD on 1/29/02. At that time, the document stated that "This handout has some of the high points from a larger document (including references) that is under preparation and will be posted on the web at: http//www.antievolution.org/people/wells_j/tdo_wells.htm." Soon after, "Who's the Real Fraud?" was indeed posted at "http//www.antievolution.org/people/wells_j/tdo_wells.htm", which claimed that the document was an expanded internet version of a document originally prepared for Wells' lecture at UCSD.

However, it was not until past midway through the completion of this response, that this author became of aware that the URL (http://www.antievolution.org/people/wells_j/tdo_wells.htm) hosting Tamzek's response held highly

expanded web version of "Who's the Real Fraud?", much larger than the handout. At the time of completion of this document (late February), the latest version posted at "http//www.antievolution.org/people/wells_j/tdo_wells.htm" was "version 2.1". However, the day after the release of this document, the URL "http://www.antievolution.org/people/wells_j/tdo_wells.htm" no longer held "Who's the Real Fraud?", but rather stated, "Nic Tamzek's critique of "Icons of Evolution" has moved" and had a link redirecting people to visit "http://www.talkorigins.org/faqs/wells/". The document found at "http://www.talkorigins.org/faqs/wells/", is similar, though expanded, to version 2.1 of "Who's the Real Fraud?", and has been retitled, "Icon of Obfuscation".

This rebuttal, however, has been prepared and was originally intended only as a response to version 1.0, the document passed out to members of the audience at Wells' UCSD lecture. While this rebuttal does discuss many points made in Tamzek's latest posted internet version, it is not meant to rebut the entire expanded web version 2.1 or the version "Icon of Obfuscation" (available at "http://www.talkorigins.org/faqs/wells/"), which includes figures, links, and information from a variety of other internet critiques on Jonathan Wells' work. For the reader's reference, a version of the original document which was passed out at UCSD, "Who's the Real Fraud?" "version 1.0", has been posted at "http://www-acs.ucsd.edu/~idea/tamzek1.htm".
Back to top.

†: The author of this document has a B.S. and M.S. in Earth Sciences from UC San Diego and is affiliated with the Scripps Institution for Oceanography Paleomagnetics Laboratory. Author is co-founder and community advisor of the IDEA Club at UC San Diego (http://www-acs.ucsd.edu/~idea), and co-director of the recently formed IDEA Center (www.ideacenter.org). Please feel free to send any comments or thoughts to the author via e-mail at casey@ideacenter.org. Thank you for taking the time to read!

This document can also be viewed on the Access Research Network at http://www.arn.org/docs/wells/cl_iconsstillstanding.htm.