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## An Engineer Looks at the Creationist Movement

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This paper is based on a presentation given in Cedar Rapids, Iowa, to the Iowa Academy of Sciences on Saturday, April 25, 1981. The observations are derived from the extensive interactions I've had with creationists and anti-creationists over the past 3 to 4 years. These interactions include written correspondence, careful evaluation of manuscripts and published papers, many conversations, attendance at hearings and debates on creationism, and participation in two creation/evolution debates. The opinions expressed are my own, not those of my university or department.

As a professor who taught thermodynamics to engineering students for many years, I first entered the creation/evolution controversy in 1978. I was motivated to combat what I then considered—and still consider—to be the promotion of grossly erroneous if not deceitful arguments concerning entropy and the second law. I viewed this as being particularly serious, not only because thermodynamics is an important engineering science (in fact, it began as an engineering analysis by Carnot) but also because I found that it was the engineers in the creationist movement who were shaping the apologetics based on the laws of thermodynamics. Indeed, I have since found that engineering educators, senior engineers, and registered professional engineers are perhaps the most prominent leaders of the creationist movement. As an engineering professor and a registered engineer myself, I felt it would be professionally irresponsible to let this travesty continue without comment.

This paper attempts to expose the nature of the creationist movement, the role that professional engineers have played in its leadership, and the level of scientific incompetence (particularly in thermodynamics) that these creationist engineers have exhibited both in public speaking and in print. I would hope that similarly revealing exposés will also be forthcoming from such non engineering perspectives as biochemistry, biology, paleontology, physics, etc. but these I will leave to those professionals whose expertise and teaching responsibilities fall in those areas.

### The Nature of the Scientific Creationism Movement

There are many facets to "scientific creationism" and the movement can be discussed in any of several ways. However, it is best viewed as a loosely connected group of fundamentalist ministries led largely by scientifically incompetent engineers. It is not dedicated to the furtherance of science, education, or intellectual development; but rather to the undermining of these and to advancing the Protestant fundamentalist dogma known as Biblical inerrancy. Based on a fiercely anti-humanist, theological outlook, creationism amounts to an evangelical system of apologetics and polemics. It seeks to promote the Bible as being literally true, but does so largely by obfuscating and attacking any scientific understanding which seems to threaten their view. Though it is dressed up with scientific terminology and references to scientific journals, it is a counterfeit imitation of scientific discourse based on misrepresentation of facts. These and similar allegations may also be inferred from the writings of others,<sup>1-21</sup> many of whom represent a fundamentalist Christian perspective on science.<sup>12-21</sup>

My own formal training overlaps significantly some of the areas which the creationists have addressed. In addition to doing research as well as graduate and undergraduate teaching in thermodynamics,

I also hold a B.S. and M.S. in mining engineering which, of course, is inextricably related to the geology and the origin of sedimentary deposits. In my view, the level of confusion, obfuscation, and incompetence reflected by the foremost creationist "experts" both in thermodynamics<sup>22</sup> and in geological interpretation is appalling. And here again others strongly agree.<sup>6, 13, 15-18, 20</sup> Of course, the creationists do not concur with my characterization of their movement. This may be inferred from the following assertions by Duane T. Gish, Associate Director and Vice-President of the San Diego based ICR\* ministry:<sup>23</sup>

... "The creationist movement is not a fundamentalist ministry led by incompetent engineers. Rather, it is a movement led by highly competent scientists, many of whom are biologists. As a matter of fact, biologists probably constitute a higher proportion of all scientific categories within the creationist movement. . . ."

Most responsible engineers will wish this were so, but I'm afraid it is not. We can understand to some extent why engineers—who are comparatively ignorant of biological processes, genetics, etc. and who are infatuated with arguments from design—might fall vulnerable to the theological arguments from design. Excuses of this sort, however, can hardly be offered on behalf of biologists, for they have long ago been apprised of the sterility of arguments from design, of teleology and so on in the realm of biology. But let us return to Gish's assertions.

First of all, there can be little doubt that the foremost creationist organizations\*—ICR, CRS, CSRC, BSA, and the SOR groups on campuses about the country—are essentially ministries. They frequently refer to themselves as ministries and as housing writing ministries, educational ministries and so on. As an example, the section on the ICR on page 100 of the 78/79 catalog for Christian Heritage College, where ICR is based, describes ICR almost exclusively in terms of the various educational ministries housed within it.

Are the creationist agencies connected? Here again we find in their own literature strong evidence of loose inter-connections. Much of the literature is virtually identical in message. Also, one often finds the tracts and books of different creationist groups being advertised and sold at events sponsored by others and they also share many speakers. The SOR campus ministries are particularly well stocked with slide/cassette presentations and tracts prepared by the ICR and CSRC ministries. But the most telling evidence of connectedness has to do with the overlapping memberships and especially the number of key officials—many of whom have been engineers—that ICR, CRS and CSRC have shared through the years. Henry M. Morris, a long time engineering professor, civil engineering department chairman, and professional hydraulic engineer,<sup>24</sup> has served as co-founder and/or president of all three of these organizations.<sup>24, 25</sup> He was also co-founder and has been vice-president and president of Christian Heritage College.<sup>25</sup> Moreover, creationism is taught at CHC for college credit by Gish and Morris, who have held professorships in apologetics there.

\*ICR = Institute for Creation Research, CRS = Christian Research Society, CSRC = Creation Science Research Center, BSA = Bible Science Association, SOR = Students for Origins Research.

Are engineers really all that prominent in the leadership of the creationist organizations? The current ICR letterhead stationery lists fourteen "prestigious" technical advisors of whom four are engineers or engineering educators. In addition to D.R. Boylan—Ph.D. and Professor of Chemical Engineering and Dean of Engineering, all at Iowa State University<sup>26</sup>—there is also Ed Blick, former Associate Dean of Engineering at University of Oklahoma, now Professor of Aerospace, Mechanical and Nuclear Engineering there.<sup>27</sup> Also prominent on this Board of Technical Advisors is Harold R. Henry, Professor and Chairman of Civil and Mining Engineering at the University of Alabama. One of Dr. Henry's degrees is from the University of Iowa, while his Ph.D. in Fluid Mechanics is from Columbia.<sup>28</sup> Another technical advisor to ICR is Malcolm Cutchins, a Professor of Aerospace Engineering at Auburn, who holds a Ph.D. degree in Engineering Mechanics.<sup>29</sup>

A more recent ICR staff member is Henry Morris' son, John D. Morris, who holds a bachelors degree in Civil Engineering from VPI\* and a masters and Ph.D. in Geological Engineering from Oklahoma.<sup>30</sup> William Bauer, who holds a Ph.D. in Hydraulics from the University of Iowa, is President of his own engineering firm in the Chicago area and has been a vice-president and very active member of the Midwest Center of ICR.<sup>31</sup> As of this writing, the president of ICR Midwest is W.T. Brown, a retired colonel who holds a Ph.D. in Mechanical Engineering from MIT.<sup>32</sup> In their 1977 booklet<sup>34</sup> of testimonials entitled, *21 Scientists Who Believe in Creation*, the ICR listed the credentials and backgrounds of their (then) leading "scientists." Of these 21 creationist leaders, six (more than one fourth) either were, or had been, engineers or engineering educators, all with Ph.D. degrees.

So engineers certainly *are* very prominent in the leadership of the ICR ministries.

The Creation Research Society rarely uses the word "ministries" in describing itself, its missions and its goals, yet its prominent members are by and large the same as those of ICR. To join CRS you must swear to a statement of belief in the tenets of Christian fundamentalism.<sup>33</sup> The statement commits the undersigner to the belief that all assertions in the Bible are scientifically true. It is only after signing this statement that one may do research on creationism under the auspices of CRS. In this organization, as in ICR, engineers again play a prominent leadership role.

Henry Morris, a past president of CRS, remains prominent on the editorial board of the *CRS Quarterly*.<sup>34</sup> Also on this board is one of the creationists' foremost thermodynamicist/engineers, Emmett L. Williams who received his Ph.D. in Metallurgical Engineering from Clemson. According to the *CRSQ* masthead, Williams is currently vice-president of CRS.<sup>35</sup> The engineering representative on the CRS Board of Directors is the Dean of engineering at ISU, namely D.R. Boylan, who also serves on the Technical Advisory Board of ICR. These three engineers—Boylan, Morris, and Williams—have contributed extensively to the creationist version of thermodynamics through the *CRS Quarterly* and in a more recent book.<sup>35</sup>

Among other practicing engineers who populate the ranks of the creationist movement, there is General Electric engineer Luther D. Sunderland, who travels the country lobbying for creationism in schools to various state legislators. Richard G. Elmendorf of Baird-ford, Pennsylvania, a registered P.E. and a CRS member, has a standing offer of \$5,000<sup>36</sup> to anyone who can prove (to his satisfaction, of course) that evolution does not contradict thermodynamics. Significantly, perhaps, Richard is also something of a geocentrist, and as part of his "betting ministry" he offers \$1,000 to anyone who can prove (to him) that the earth is moving, either in rotation or translation! Engineers active in the creationist movement also include Stan Swinney, a self proclaimed Aerospace Engineer who

markets cassettes of his anti-evolution public lectures; Ben Darlington, retired engineer who spearheaded an effort to get creation taught in Florida schools; and Bill Overn, holder of a Bachelor of Electrical Engineering from U. of Minnesota and active creationist speaker and author with the Bible Science Association of Minneapolis.

Realizing that this must only be a partial list, I once requested a membership roster from CRS to see how many members there really were, and especially how many among them were engineers. This request was denied on the ground that CRS members might be put in jeopardy. The denial leads me to suspect creationist claims about the "large numbers of scientists" who have gone over to their view. Of the hundreds of thousands of M.Sc. and Ph.D. scientists total, I judge that creationists can claim only a small number: perhaps a few hundred individuals, with a significant share of these being more engineers than scientists.

In summary, I don't concur with those like Gish who pretend there are more biologists, or biochemists, or members of some other professional group than there are engineers in the leadership of the creationist movement. I know of no creationist biologists, biochemists, etc. who are deans or department heads in any of the major universities, but such is not at all uncommon amongst the ICR/CRS engineers as we have just seen. Only in fundamentalist schools and Bible colleges can creationists in the life sciences gain comparable faculty prominence.

#### Incompetence Allegations

The allegation of incompetence is always controversial, partly because of the seriousness of the charge and partly, too, because we are all incompetent in some areas. But being incompetent need not be regarded as a serious matter unless it can be documented in that area wherein one claims expertise or in which he or she publishes allegedly scientific papers. Even then, we should use something of a sliding scale depending on one's level of education. For example, we ought not be too harsh with an undergraduate thermodynamics student for being inept at the Ph.D. level. We *should* be harsh, however, if one flaunts himself as a Ph.D. scientist but exhibits incompetence at the undergraduate level. With creationists, interestingly enough, this is exactly what one finds. Moreover, they often exhibit very dismal command precisely in the subject areas wherein they profess to speak with authority. It is not convenient to document the many serious examples of this among creationists, but I will provide a single example from the area of engineering thermodynamics. I invite specialists in this area to check the soundness of my allegations and technical arguments.

The most error ridden thermodynamic analysis I have seen in print is the one by Creationist D.R. Boylan which appears on pages 133 to 138 in the Dec. 1978 issue of *CRSQ*.<sup>37</sup> As we discuss this paper, I want the reader to keep the following statement by Boylan in mind, for it was published the previous year (1977) as if to assure us of his scientific expertise:<sup>38</sup>

"In teaching on-campus and at church, I have found that an understanding of physical laws, particularly the First and Second Laws of Thermodynamics, is essential to the defense of biblical truths. The Second Law has been particularly helpful in developing an apologetic against abiogenesis. . ."

To begin with, Boylan virtually equates two of the most distinguishable introductory level concepts in engineering thermodynamics, namely *systems*<sup>39</sup> and *processes*.<sup>40</sup> In effect he directs his reader to "consider life processes as systems." This is like a would-be mechanic directing us to consider gas combustion (a process) as being like a tire or an engine, which are mechanical systems.

\*VPI = Virginia Polytechnic Institute

After teaching beginners the profound difference between a process and a system, the next most important issues are (A) how to define or describe the system (e.g. closed, open, isolated, etc.) to which one's analysis is to apply, (B) how to specify the system's boundaries, and (C) how to specify the nature of the processes taking place within or over these boundaries (e.g. are they reversible, irreversible, steady state, etc.). If these specifications are not done properly, the results of one's analysis can come out garbled or self-contradictory. Boylan's paper exemplifies such confusion because he fails to specify properly the system to which his analysis applies and the nature of the "life processes" of which he speaks. Only after I submitted a harsh criticism of the paper to *CRSQ*—which led to a heated correspondence<sup>41</sup> with editorial board members Gish and Williams—were the system process specifications made clear. Williams<sup>41</sup> proved to the satisfaction of both Gish and Boylan that the first and second law analysis and the derivation of the entropy change by Boylan are for an open system subjected to a special kind of steady state condition: the so called *steady state steady flow* (SSSF) condition. But this was also a blunder, since by the definition of steady state there can be no change in the entropy inventory (nor of any other extensive property) for steady state systems.<sup>42</sup> All these properties including entropy must remain steady or fixed in value. Hence, Boylan's central result—i.e. his erroneous formula for the entropy change—should have come out to be identically zero(!) and not the non-vanishing sum whose limiting cases he discusses at great length.<sup>37</sup>

In other words Boylan's analysis implies a profound and unmistakable self-contradiction. And yet it is clear from the subsequent correspondence<sup>41</sup> that neither Boylan, Williams, nor Gish realized this. In fact, at last contact, Gish inferred from Williams analysis that "there are no errors at all" in Boylan's paper<sup>41</sup> and actually suggested that I apologize for the criticisms I had submitted which I have not done. Also, as of this date (Spring 1982) no letters questioning Boylan's analysis have appeared in the *CRSQ*.

Several conclusions can be drawn from all this. First, one must conclude that Boylan, a Ph.D. and Professor in Chemical Engineering, has committed to print worse errors than those for which beginning thermodynamics students are penalized, if not failed, in their homework and examinations. Secondly, Williams, and especially Gish, are at least as devoid of thermodynamic understanding and knowledge as is Boylan. Thirdly, the same can be said for all the engineers in the *CRSQ* readership who read but did not question Boylan's analysis. If there were any who did submit criticisms, I have a feeling the public will be the last to know.

Thus Boylan's paper is best viewed as a poor attempt to make a scientific case for creationism. The paper is self-contradictory, and hopelessly garbled when viewed from the perspective of science. Equally audacious attempts to rationalize the geological column in terms of fluid mechanics and hydrological sorting have also been advanced by creationist engineers, particularly by Morris;<sup>43-46</sup> here again the confusion and obfuscation betray an apologetic approach to discourse.

In other words, the so called "scientific creationists" have done much to undermine the scientific credibility of creationism. They have inspired a vigorous counterattack from legitimate scientists who ordinarily are not easily moved to combat.

#### Explanatory Conjectures

Why have engineers become so important in the young-earth, "creation-science" movement? There are two major reasons: (A) the irresponsible attitude of engineers and their professional societies, and (B) the familiarity of engineers with certain difficult areas of science from which unintelligible but authoritative sounding "apologetics" can be developed.

Engineering societies seem to be uninterested in policing themselves, as regards either ethical irresponsibility or scientific incompetence. Thus engineers can publicly endorse ludicrous forms of pseudoscience without being publicly chastised by their professional societies. My experience<sup>47</sup> is that examining boards simply brand the embarrassing utterances as being outside their purview, even though the engineer involved may be flaunting his engineering status while proclaiming the most absurd distortions of engineering science. Were biologists, geologists, or paleontologists to endorse publicly a pseudoscience such as creationism, their chances of achieving or retaining prestigious academic positions would be greatly undermined, as would their chances for high office in professional societies. Only in Bible colleges, seminaries, and creationist ministries can the latter succeed as outspoken creationists.

Hence, when creationist groups try to promote their own credibility by flaunting the professional status of selected members, they find they mainly have engineers to select from. An example of such status flaunting is the ICR practice of listing their technical advisors, with status on their official stationery. This list contains more engineering educators who still hold respected academic positions than members of any other group, including physicists, biologists, or geologists. Other examples of creationist credential flaunting are also widely known.<sup>24,31</sup>

Another reason for engineers being so welcome to creationism derives from their backgrounds in the rather difficult subjects of thermodynamics and fluid mechanics. Creationism is so absurd scientifically that it cannot be defended by any rational arguments which are understandable to thinking laymen. Hence the need to develop confusing and yet authoritative-sounding arguments which are *unintelligible* to laymen. Clearly the second law, and especially entropy, are ideally suited for this purpose, as can be inferred from a humorous anecdote due to Tribus,<sup>47</sup> himself a famous engineer. According to Tribus, John Von Neumann, the renowned mathematician/physicist, was advising Claude Shannon about naming the uncertainty function he discovered in connection with modern information theory. Von Neumann confided as follows:

"You should call it entropy for two reasons. In the first place your uncertainty function has been used in statistical mechanics under that name, so it already has a name. In the second place, and *more important*, 'no one knows what entropy really is, so in a debate you will always have the advantage'." (emphasis added)

There is little doubt in my mind that it has been the engineers of the creation science movement—particularly Morris, Williams, and Boylan—who are responsible for fashioning entropy and the second law into one of the most effective debating tools available to the creationists. Indeed, in a 1979 article entitled "Educators Against Darwin", Hatfield summed up the creationists' view of the second law argument as follows:<sup>49</sup>

"... The famous second law of thermodynamics, which governs energy decay is even more important—indeed it is perhaps the favorite argument of creationists. In its classical form the law states the principle of entropy—that in any physical change, energy constantly decreases in utility, moving toward a final stage of complete randomness and unavailability. This descent, the creationists argue, eliminates the possibility of "a basic law of increasing organization which... develops existing systems into higher systems—that is evolution."

It is bad enough that this "thermopolemic" against evolution is thoroughly absurd, and that the proper explanation of the apparent

paradox has been known since the 1940's, when Schrödinger published it in his book, *What is Life*.<sup>50</sup> But the shameful irony stems from the connections with engineering both past and present. Thus thermodynamics—itsself among the greatest of physical disciplines—began in 1824 with an engineering analysis by the great French engineer, Sadi Carnot.<sup>51</sup> Yet today we have incompetent “modern engineers” corrupting these great ideas before an unwitting public. Meanwhile their irresponsible peers stand silently by, hoping sheepishly that as long as the battleground seems to be in biology, maybe no one will see the engineering connections. I hope that this paper has helped to expose the engineering incompetence and misconduct involved, and that the following conclusions and inferences aptly summarize the important issues.

### CONCLUSIONS AND INFERENCES

1. The so called “scientific creationism” or “creation science” movement is best characterized as a loosely connected group of fundamentalist ministries dedicated to (A) promoting their notion of Biblical inerrancy and (B) undermining all knowledge and understanding which conflicts with their views on scriptural inerrancy.

2. The leadership of the two most active “scientific creation” ministries, namely the ICR and CRS, is dominated by professional engineers and engineering educators, many of whom hold professorships and advanced degrees from reputable universities. But the predominance of engineers is not exclusive, and many other professional groups would do well to carry out their own investigations.

3. The arguments which “creation scientists” use to counter the well established facts and theories of science are not at all the scientific arguments they are purported to be. Instead, they are thinly disguised apologetics and polemics directed at many areas of science. Established findings refute tenets which creationists hold to be inerrant.

4. The public utterances of the top creation scientists—together with their published works, which appear in professedly authoritative “creation science” books and journals—provide unequivocal, documentable evidence that many of these authors are grossly incompetent, not only in the areas of science on which they expound without proper credentials, but also in their own professed areas of scientific and technical expertise.

5. Public schools that willfully adopt the educational materials produced by such incompetents deserve to be discredited, as do their responsible officials and staff.

6. It is the responsibility of knowledgeable scientists, of professional educators, and of their organizations, to expose the extent to which scientific incompetence and intellectual dishonesty prevail in the “creation science” movement. Only then can school officials be held fully responsible for allowing the forced teaching of creationism as science.

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