

**Scientific Controversies and Boundary Disputes: The Intelligent Design Movement
Network**

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University of Pittsburgh, 2012

Although anti-evolutionism has existed for well over a century, recent evolutionary critics have used non-theistic arguments to attempt to show that Darwinian evolution could not have produced some examples of biological complexity. Called “intelligent design” (ID) theory this movement claims to present genuine scientific facts that prove the inability of evolution to produce most biological structures, thus necessitating the infusion of ‘intelligently-designed’ structure or information into biological life. Despite claims of scientific legitimacy by the ID movement, evolutionary scientists, professional scientific associations, and scientific proponents have widely dismissed ID arguments as non-scientific reasoning dressed up in the terminology of science. Using Gieryn’s theory of boundary-work together with Frickel and Gross’ theory of scientific/intellectual movements (SIM), I examined the institutional relationship, if any, between science and the ID movement, using the inter-organizational network of ties between ID organizations and organizations representing other fields. I used several network theoretic measures to examine the extent of ties between the ID, creation science, and science fields. I found very sparse connections between ID and science, indicating strong institutional boundary-work by scientists. While there was some overlap between ID and creation science, I found considerable evidence that these two movements have distinct intellectual cultures. My findings suggest that, regardless of their origins, the intelligent design and creation science movements are two independent organizational communities.

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PREFACE

I was first exposed to scientific controversies while doing research for my master's thesis on the Wise Use movement, a countermovement to the American environmental movement. Both sides in the conflict utilized scientific studies to promote their movement goals, demonstrating both the importance of science in policy formation and the social construction of scientific knowledge. I came upon the intelligent design controversy by accident but, after reading *Darwin's Black Box* and *Uncommon Dissent: Intellectuals Who Find Darwinism Unconvincing*, I quickly became fascinated by the topic. The seemingly scientific (and putatively non-religious) rejection of evolution, while perhaps not convincing, nevertheless represents an interesting (and perhaps novel) example of a scientific controversy.

A seminar on the Sociology of Science provided the theoretical orientation for this project. The concepts of cultural networks, scientific/intellectual movements and the process of boundary-work all seemed highly relevant for approaching the ID controversy. My prior experience with the empirical study of social networks fit in well with this theoretical orientation.

For the purposes of this study I approached the intelligent design movement as a genuine scientific/intellectual movement. By analyzing the network of organizations surrounding the ID movement, I was able to show the empirical connections between intelligent design, creation

science, and mainstream scientific organizations. This allowed me to avoid using essentialist definitions. However, outside of this study I defer to and agree with the scientific experts who have concluded that intelligent design is not science.

1.0 INTRODUCTION

Charles Darwin published *On the Origin of Species* in 1859. Although others had already proposed the idea of biological evolution, Darwin's contribution of extensive, systematic evidence for evolution prompted widespread acceptance of biological evolution among the scientific establishment. Natural selection did not rely on any supernatural guidance; instead, the variation of species was a result of adaptation to environmental conditions, with the survival of those individuals with adaptations best fit to environmental conditions (and the extinction of those least-adapted). While this reduced- (or even nonexistent) role of God was resisted by religious leaders and some scientists, like Richard Owen and Charles Lyell, their main objection was to the application of this theory to humans; the old age of the earth (a necessary assumption for evolutionary theory) and the evolution of animals and plants was mostly uncontroversial (Numbers 2006).

The rise of Christian fundamentalism in the early 20th century United States brought about the 'creationist' attitude toward Darwinian theory. Their literal interpretation of the Bible and their belief in its inerrancy, led them to a wholesale rejection of evolution (as well as "deep time", the fact that the Earth is billions of years old). The six-day creation, a young Earth, and the creation of 'kinds' of animals all pointed to the impossibility of evolution (Scott 2004:92). The rise of "creation science" in the 1960's, which used quasi-scientific reasoning to 'prove' the

accuracy of biblical events, still relied on religious reasoning to counter the claims of evolutionary scientists.

In the early 1990's a new anti-evolution movement, focused on the perceived inadequacy of natural selection and with no overt references to the Bible or God, started to get public attention. While almost every individual advocate of this approach had their own particular argument, their overarching theory, "intelligent design" (ID), held that many biological structures and systems were too complicated to have been developed through natural selection. Therefore, these structures and systems had to have been somehow 'intelligently designed,' although there were no explicit public references to the 'intelligent agent' that would have made these designs. Phillip Johnson, an early leader of the ID movement, traced the origin of the movement to a conference in March 1992 (Forrest and Gross 2004:17); conference attendees included Michael Behe and William Dembski, future leaders of the movement.

What distinguishes the ID movement from earlier anti-evolution movements is its emphasis on scientific reasoning, and the absence of the Bible as an interpretative or factual text. Instead of taking religious beliefs (e.g., a six-day creation) and looking for evidence of this event, ID proponents use mathematical and (at least nominally) scientific reasoning to 'prove' the impossibility of evolution by natural selection, at least regarding some biological systems. Instead, they contend that certain biological systems represent the outcome of a design process, rather than an undirected evolutionary process. As William Dembski, one of the most prominent intellectual leaders of the ID movement put it: "[t]he fundamental claim of intelligent design is straightforward and easily intelligible: namely, *there are natural systems that cannot be adequately explained in terms of undirected natural forces and that exhibit features which in any other circumstance we would attribute to intelligence*" (Dembski 2004:27)(emphasis original).

Note that many ID proponents accept many scientific conclusions, including the old age of the Earth and much of evolutionary adaptation; what they object to is the origin of all life only through material mechanisms, particularly natural selection (Scott 1997).

The use of ‘scientific’ reasoning by ID is a potentially far more potent challenge to modern evolutionary theory than the earlier, religiously derived challenges. As Bruno Latour notes, scientific knowledge is seen as objective knowledge (1987: 182), and its uses for social action have become very powerful in our society. The current call for regulations to curb global warming is an excellent example of the power of science to affect the uses and control of social resources. Science, as an institution, has become an “obligatory passage point,” to use Bruno Latour’s terminology (1987). Latour is referring to the obligation of any person/group to use scientific knowledge to make a claim for action or for claiming knowledge of something. Thus, it is necessary to use scientific results or extant scientific knowledge in order to be seen as legitimate by decision-making authorities, the mass media or even the public itself.

Science is a network of individuals, organizations, theories, methodologies and other components, which “uses various cultural and structural markers to distinguish between that which is relevant and irrelevant to its work – at the moment, and until further notice” (Fuchs 2001: 86). Empirical evidence and hypothesis testing are the two most common cultural markers used to distinguish something as ‘scientific.’ Thomas Gieryn (1999) also finds that science is not a static institution, but rather an institution whose boundaries are constantly being redefined and under contention. These boundaries of science are used to “adjudicate scientific controversies,” and can be redrawn for each specific scientific dispute or claim of epistemic authority. But these boundaries, separating science from non-science, are often the center of the conflict itself. At issue is the definition of science and who can legitimately call themselves ‘scientists.’ The

victors of a scientific controversy, those who are able to draw scientific boundaries to their liking, are then able to take advantage of the legitimacy and authority that science lends to any claim or fact. Their theoretical traditions and research methods, their ‘paradigm’ to use Kuhn’s term ([1962] 1996), becomes ascendant. The losers in a scientific controversy lost all scientific status and resources. For example, after ‘phrenology’ was successfully defined outside of science as a pseudo-science, scientific positions were denied to its advocates (Gieryn 1983).

Frickel and Gross (2005) discuss a specific type of boundary dispute, what they call ‘scientific-intellectual movements’ (SIMs). SIMs are “collective efforts to pursue research programs or projects for thought in the face of resistance from others in the scientific or intellectual community” (Frickel and Gross 2005: 206). SIMs can arise from within existing scientific fields or can originate mostly outside of science and rely on a few high status scientists for credibility. SIMs have a somewhat coherent program for change, which is contentious in relation to established scientific practice. Though their aims vary in scope, generally they attempt to change the resource and reward distribution within a scientific discipline. The goal of a SIM is to establish a new discipline or carve out a niche for a sub-discipline within a larger one.

Frickel and Gross’ SIMs provide a point of departure for this study. I conceptualize the ID movement as a SIM, attempting to reduce the power and influence of evolutionary science and establish ID theory within the scientific domain. In reaction to the claims of ID, scientific proponents have deployed numerous boundary-work arguments (described in section 3.1) in order to socially define ID as ‘non-science’ and therefore deny it access to the resources of a scientific domain. Most studies have focused on such ‘rhetorical’ boundary-work (see, for example, Wainwright et. al, 2006; Gaziano 1996, Eden et al, 2006). This study focuses on a different form of boundary-work: the ‘expulsion’ of ID-sympathetic scholars from scientific

networks. Scientists and scholars who publicly accept ID theory risk losing their intellectual authority (i.e., trust in their scientific credibility by peers), as well as their employment within scientific institutions.

One way to analyze boundary-work is to examine where ID proponents are employed; however, this method presents two problems. One, focusing on employment limits the scope of analysis. Many ID proponents, though often highly educated, earn their living outside of the usual scientific avenues. They can publish books in non-scientific presses; they work for non-profit think tanks, etc. While many ID proponents may have attempted to gain employment in academic institutions, it cannot be assumed that all have. Two, the problem of identifying pro-ID (or ID sympathetic) scholars at postsecondary institutions would be challenging. This would involve a large survey of the writings and/or statements of scholars at postsecondary institutions in order to identify any that support ID, a quite daunting task. Thus, using academic employment as a measure of boundary-work could be misleading and would involve a large research effort.

In order to examine the institutional boundary-work between science and ID, the set of individuals recognized as intellectuals and/or leaders within the ID movement, as measured by organizational board, fellow, and advisory lists, will be used. This avoids the issue of academic employment, as this is not a requirement to be recognized by ID organizations. It also provides an unbiased source for identifying individuals as ID proponents, as the movement itself is used as the source. The resulting inter-organizational network of shared intellectual leaders within the ID movement will be used to examine the results of this boundary-work process. By examining the inter-organizational linkages between ID and various scientific and non-scientific fields, I estimate the extent of institutional boundary-work completed between ID and science, creation science, and other fields. I expect there to be little connections between ID and science but more

extensive connections between ID and creation science (see section 5.0 for more detailed research questions and hypotheses).

2.0 CREATIONISM AND THE INTELLIGENT DESIGN MOVEMENT

Eugenie Scott categorizes the American Creationist movement in three main phases: purely religious opposition to evolution, creation science, and now neo-creationism (Scott 1997: 265). The first phase consisted mostly of religious leaders or religious organizations objecting to the teaching of evolution because it represents a rival origin story, directly refuting a literal interpretation of the Genesis account of life's origin. The second phase involved the incorporation of scientific terms and methodology; creationism was now proposed as a rival scientific theory to evolution, rather than a strictly religious belief. (However, it was still motivated solely by evolution being a rival to Genesis, as opposed to scientific evidence independently pointing against evolution or towards Genesis.) The third phase is mostly characterized by the rise of the intelligent design movement, which has adopted the strategy of avoiding mention of God in order to bypass the separation of church and state legal issues that have so far defeated creationist attempts to teach creationism in school.

Though anti-evolutionism has existed in America probably since 1859, when *On the Origin of Species* was first published, the Creationist movement, at least one of any significant size, wasn't really born until the 1960's. While the infamous Scopes Trial was generally seen as a victory for evolutionary theory, the widespread popularity of creationist ideas meant that the subject of evolution was ignored or downplayed in biology classrooms for decades. It was the new push for scientific education post-Sputnik and the repeal of state laws banning the teaching

of evolution in 1968 that pushed evolution back into the public classroom (Scott 1997: 272). This sudden reversal of decades of teaching biology without evolution prompted a response from religious conservatives. The teaching of ‘creation science’ was advocated as a scientific alternative to evolution. When several legal decisions found creation science to be inherently religious (e.g., *McLean v. Arkansas* [1982] and *Edwards v. Aguillard* [1987]), the founders of intelligent design removed God from the argument, but retained the idea of a supernatural intelligent designer responsible for many examples of design in nature.

2.1 EARLY CREATIONISM

As noted above, the early creationist movement consisted primarily of religious-based protest against evolution. Evolution was seen as incompatible, to differing extents by various proponents of creationism, with the teachings of Christianity. However, the extent of this perceived incompatibility intensified during the early 20th century in America. As Numbers (2006) points out, the late 19th century creationists primarily objected only to the application of evolution to the origin of humans: “Creationists of the Victorian era generally assimilated the findings of historical geology to such an extent that today they seem intellectually closer to the theistic evolutionists of their time than to the scientific creationists of the late twentieth-century” (Numbers 2006: 16). Note that at this point uniformitarian Geology, the theory that the natural laws and geologic processes present now are the same throughout Earth’s history, introduced by Charles Lyell in 1830, was accepted by creationists. This would become a primary point of contention in the 20th century, especially among creationists espousing ‘creation science.’ Indeed, the elements of evolution not accepted by creationists at this point are rather small

compared to 20th century creationists (Numbers 2006: 26). For instance, the scientific explanations of the fossil record and the theory that the Earth is millions or billions of years old was accepted by late 19th century creationists. Louis Agassiz, a mid-19th century Harvard professor of geology and paleontology rejected Darwinian evolution, despite his own rejection of a single creation and his ice age theory as replacement to the Noachian flood (Numbers 2006:19). Both uniformitarian Geology and the ice age theory would be rejected by 20th century creationists, including Henry Morris (author of *The Genesis Flood*), who sought to return geological explanation to the Noachian flood and was an early advocate of creation science.

Evolutionary criticism began to change in the early 20th century with the rise of fundamentalism, especially in the United States (Scott 2004: 86). In this phase, creationists simply argued that evolution refuted the biblical account of creation and was therefore anti-religious or 'heretical.' This was the argument put forth at the Scopes Trial in 1925 and was sufficient to hold back the teaching of evolution for the first half of the 20th century. American fundamentalists had five main beliefs that separated them from mainstream Christians of the time: the inerrancy of Scripture, virgin birth of Christ, Christ's atonement for humanity's sins on the cross, Christ's bodily resurrection, and the objective reality of Christ's miracles (Scott 2004: 92). These beliefs set them apart from the Higher Criticism movement, which sought contextual interpretations of the bible as a product of human creation, as well as a divinely inspired text. The belief in the inerrancy of Scripture is the source of fundamentalist opposition to evolution. The six-day creation, the creation of life in separate and distinct 'kinds,' and the special creation of humanity in God's image; without significant textual interpretation all of these biblical accounts seem to categorically refute the possibility of evolution. Evolutionary theory requires a long stretch of time to allow random mutation and other evolutionary mechanisms to produce the

variations in biological structure present in recent times. Part of the evidence for evolution was the discovery of ‘deep time;’ the conclusion that the earth was millions or billions of years old, rather than a few thousand. If the earth and life were created in six days and the earth itself was only around 6,000 years old, this would mean there wasn’t enough time for evolutionary processes to produce the variations in flora and fauna found in the natural world. Thus, evolution was ruled out as a viable theory for explaining the origin of life.

The reference to living creatures being created in ‘kinds’ also was a source of anti-evolutionary belief. If God created the variation in flora and fauna in the initial creation of life, there was no need to turn to evolution to explain this variation. Thus evolution was not required to explain the source of biological diversity. Likewise, the special creation of humanity by God also offered an argument against evolution. Standard evolutionary theory claims that humans evolved in similar fashion as all other life and do not have any sort of special heritage. With evolution, humanity’s greater intelligence and other more or less superior characteristics are a result of evolutionary mechanisms, not any special creation or other supernatural occurrence.

2.2 CREATION SCIENCE

"Everyone knows the world is 6,000 years old. Look it up in any geology textbook that is also the Bible." – Stephen Colbert¹

¹ *The Colbert Report*, July 24, 2007.

With the new emphasis on scientific education in the 1960's, evolution was reintroduced into the public school curriculum. This precipitated a change in the creationist movement strategy. In order to challenge evolution in the public school, creationism had to be made 'scientific.' However, the main element of this new strategy, 'flood geology,' actually predated creation science. 'Flood Geology,' the melding of geological data and biblical scripture was actually the creation of George McCready Price in the 1920's. As Numbers points out, Price saw this scheme as a way to make Christian theology and scientific geology fully compatible with each other (Numbers 2006: 97). Price put special emphasis on the Noachian flood in his work, trying to find evidence of the flood's geological consequences. Price basically substituted scripture for Darwin's theory of evolution and Lyell's uniformitarian geology (Numbers 2006: 108).

Indeed, Price fully admitted that his main objections to evolution were "philosophical and moral" (Numbers 2006: 103). He viewed evolutionary science as a direct, ideological threat to Christianity; he saw evolution as a "doctrine [that] has become a religion with these men, a violent, anti-Christian religion" (Numbers 2006: 109). This belief, that evolutionary science was itself not only a form of religion, but also an anti-Christian secular religion, would be commonly held by creationists of the later 20th century.

Although Price articulated much of the ideological structure of scientific creationism, this form of anti-evolutionism did not gain much attention until the push for scientific education starting in the 1960's. Since the establishment clause of the constitution prevents public support of religious beliefs in the classroom, the standard religious argument was no longer of any use. Anti-evolutionism shifted to the use of scientific arguments and the creation science movement, led by Henry Morris, was born. Morris and John Whitcomb wrote and published *The Genesis Flood* in 1963, probably the most famous creation science book. The book uses a literal

interpretation of biblical events to interpret geological formations, claiming that the geologic evidence supports, rather than refutes, the biblical account of the earth's history. Morris went on to found the Institute for Creation Research in the early 1970's, which promotes Young-earth creationism research and is one of the foremost organizations in the creationism movement (Scott 1997: 268). ICR has its own graduate school, with degrees offered in science, and was responsible for the model resolution arguing for instruction in creation science along with evolutionary science (Scott 2004:105-106). Since the movement now used scientific arguments (at least nominally), creationists could now promote scientific and 'legal' arguments against evolution (Scott 1997: 273). This new tactic, at least initially, insulated creationists from legal challenges based on the establishment clause.

Creation science is one of the major forms of "young earth creationism," (YEC) the belief that the earth came into existence several thousand years ago (Scott 1997: 267). Young Earth Creationists take a literal interpretation of the Genesis account of creation; they believe God created all life in 'kinds' and that these kinds are mutually distinct and have not fundamentally changed since creation. They also believe the fossil record formed relatively quickly after the Noachian Flood, rather than forming slowly and showing biological change through time. These two beliefs form the main argument of creation science against evolution. The creation of biological 'kinds' explains the diversity of biological structures, while the Flood explains the distribution of fossil remains in the geologic strata. Thus, according to creation science, evolution is not required to explain biological diversity and the fossil record is not evidence of biological evolution.

The main goal of creation science was to compete with evolution in the classroom, an idea that originated with the Institute for Creation Research (Scott 1997: 273). Creation science

would be presented to students as an alternative or rival theory to evolution, and it would be up to the students to decide which explanation they preferred. By the early 1980's bills promoting "equal time" for evolution and creation science were introduced into 26 state legislatures. At least two were passed but were then overturned in 1987 when the Supreme Court decided in *Edwards v. Aguillard* that the equal time laws violated the separation clause of the First Amendment (Scott 1997: 274). With the defeat of equal time laws yet another strategy was needed to oppose evolution. This new phase, termed "neocreationism" by Scott, includes several new strategies designed to erase any link to religion from their arguments.

2.3 NEOCREATIONISM

Neocreationism is distinguished from earlier forms of creationism by the absence of religious statements or references to religion in its arguments. 'creation science' had failed as an anti-evolution strategy because of its explicit reference to religious texts and beliefs. Several court decisions had found religion to be a necessary part of 'creation science' and had therefore overturned laws mandating its presentation in public schools. Neocreationists aim to overcome that problem by avoiding religion and presenting their arguments solely as scientific or philosophical objections to evolution. Neocreationism includes the push to teach evidence against evolution as well as "initial complexity theory" and, most importantly for this study, intelligent design theory (Scott 1997: 277). This new strategy allows anti-evolution arguments to be considered for inclusion in public schools since the arguments are truly 'scientific' (at least nominally), having at most vague references to God or an 'intelligent designer,' thus potentially

avoiding disqualification by the First Amendment. The 2005 school board contests in Kansas² and Dover, PA³ attest to the potency of this strategy.

Neocreationism, according to Scott, is a repackaging of the arguments of creationism and creation science. The references to religion and supernatural occurrences have been removed, but the basic arguments of creationism remain (Scott 1997: 277). One Neocreationist strategy is ‘evidence against evolution.’ This strategy encourages teachers to include criticisms of evolution with the standard scientific curriculum. This is basically creation science with the biblical creation story omitted (Scott 1997: 277). Another strategy is to classify evolution as a theory, rather than a fact. This strategy takes advantage of the common use of the word ‘theory.’ Scientifically, a theory is a “logical construction of facts, hypotheses, and laws used to explain a natural phenomenon,” whereas the common use of ‘theory’ is to describe a “hunch.” (Scott 1997: 278). A counterpart strategy with the misuse of the term ‘theory’ is the use of disclaimers when presenting evolution. These disclaimers are used to qualify the teaching of evolution as not intended to influence personal religious beliefs (Scott 1997: 279). The latest element of neocreationism according to Scott is called intelligent design.

Intelligent Design is without doubt the most sophisticated and ‘scientific’ of all anti-evolution arguments and its proponents are almost all highly educated university professionals. Indeed, the movement has been referred to as ‘academic creationism’ (Shanks and Joplin 1999: 269). Though various forms of evidence are proposed by different people, the basic argument is that biological life, or certain elements of biological life, are so well-adapted and complex that Darwinian evolution and evolutionary mechanisms are insufficient to explain the origination of

² See http://en.wikipedia.org/wiki/Kansas_evolution_hearings.

³ See http://en.wikipedia.org/wiki/Kitzmiller_v._Dover_Area_School_District.

this complexity and adaptation. Based on this assumption, ID theorists infer the existence or actions of an ‘intelligent designer,’ who supplied biological life with this complex information at some point in the past. As Scott (1997: 280) puts it, “ID is a lineal descendent of William Paley’s Argument from Design, which held that God’s existence could be proved by examining his works.” Paley, a late 18th century English philosopher and Christian apologist, argued in *Natural Theology* (1802), that the existence of order in nature proved the existence of a designer (God). Paley argued that if a watch was found on the ground, the person finding it would infer a watchmaker, as a watch is too complex to have randomly assembled itself; likewise, the complexity of life infers a creator. In a similar fashion, instead of using the Biblical origin story as evidence of the creation of life, ID takes the current biological complexity and uses it as the evidence of some form of non-evolutionary origin.

The ID movement began in 1989 with the publication of the high school textbook *Of Pandas and People*, written by Dean Kenyon, a professor of biology at San Francisco State University, and Percival Davis, an instructor in life sciences at Hillsborough Community College in Florida (Scott 1997: 279). The book was published by the Foundation for Thought and Ethics, a Texas-based organization dedicated to promoting the Christian gospel (Numbers 2006: 375). *Pandas* was the first book published specifically promoting ID concepts, although the book was originally intended to promote creation science, switching to ID only after the recent Supreme Court ruling banning creation science from the classroom (Numbers 2006: 375-376). (For a graphical analysis of the revisions of the textbook see http://en.wikipedia.org/wiki/File:Pandas_text_analysis.png.)

Darwin on Trial, another prominent early ID book, written by the lawyer Phillip E. Johnson, was published in 1991 and was the first ‘intelligent design’ book to gain national

attention (Scott 1997:281). The book is a critique of Darwinian evolution, and, in particular, the philosophical naturalism that Johnson sees as both the basis of Darwinian evolution and as the goal of scientists to defend and impose on society. Philosophical naturalism, or metaphysical naturalism, is “the idea that there is nothing in the universe beyond matter, energy, and their interactions” (Scott 1997: 272). Johnson, unlike other ID luminaries, does not put forth any new contributions to ID theory, but rather devotes the book to criticizing evolutionary theory and metaphysical naturalism. He argues that both the logic of Darwinism and the evidence used to support these logical arguments are false and do not stand up to critical analysis. Johnson sees the scientific establishment as an institution that, in the process of defending its authority and power, has eliminated any possibility of calling evolution into question:

Naturalistic evolution is not merely a scientific theory; it is the official creation story of modern culture. The scientific priesthood that has authority to interpret the official creation story gains immense cultural influence thereby, which it might lose if the story were called into question. The experts therefore have a vested interest in protecting the story, and in imposing rules of reasoning that make it invulnerable. When critics ask, “Is your theory really true?” we should not be satisfied to be answered that “it is good science, as we define science” (Johnson 1993: 159).

Johnson is criticizing not just the details of evolutionary theory, but the working definition of modern science itself. He argues that science, at it is currently defined, is limited and biased toward a particular metaphysical outlook:

If the purpose of Darwinism is to persuade the public to believe that there is not purposeful intelligence that transcends the natural world, then this purpose implies two important limitations upon scientific inquiry. First, scientists may not consider all the possibilities, but must restrict themselves to those which are consistent with a strict philosophical naturalism. For example, they may not study genetic information on the assumption that it may be the product of intelligent communication. Second, scientists may not falsify an element of Darwinism, such as the creative power of natural selection, until and unless they can provide an acceptable substitute. This rule is necessary because advocates of naturalism must at all times have a complete theory at their disposal to prevent any rival philosophy from establishing a foothold (Johnson 1991: 156)

Here Johnson makes clear his problem with scientific inquiry, especially concerning biological science. He sees the adherence to philosophical naturalism as limiting the scope of inquiry of scientists, since they are barred by rule to not consider intelligence when trying to explain the source of biological information or any other scientific question. In addition, Johnson sees evolutionary theory as being incorrectly shielded from criticism because no rival theory of life has yet been formulated, at least one that conforms to the rules of science.

Critics of Johnson have pointed out that science does not promote philosophical naturalism, though individual scientists may hold this particular belief. Rather, science uses methodological naturalism, or the limitation of only using natural causes to explain the phenomena under study. In other words, science deals with proximate, natural causes, and does

not deal with ultimate/supernatural causes (Scott 2001). Johnson is taking issue with the practice of all modern science, since methodological naturalism is the guiding principle of modern science (Scott 1997: 272; Scott 2001).

Johnson's second point above, concerning the defense of evolution based on the fact that no rival scientific theory has been proposed, also deals with the practice of modern science, not any practice unique to evolutionary theory. Johnson ignores the numerous critiques of and changes to evolutionary theory, like Endosymbiotic Theory, popularized by Lynn Margulis, which argues that cellular mitochondria originated as separate organisms from the cell (Margulis 1981), or Punctuated Equilibria, proposed by Niles Eldredge and Stephen Jay Gould, which argues that evolution primarily occurs rapidly in small subpopulations, while the main populations experience little biological change (Eldredge and Gould 1972). Both of these theories were initially strongly resisted by the scientific community, but have since been accepted as viable contributions to their fields. However, the general acceptance of Darwinian evolution in the sciences notwithstanding, the practice of maintaining a scientific theory if there is no viable alternative, even if numerous evidence shows the theory may be incorrect, is a well-known practice in science. Indeed, Thomas Kuhn most famously described this practice in his book *The Structure of Scientific Revolutions* (1962). Because normal science (as Kuhn defines it) always operates under a paradigm, to discard the current paradigm a newer one is needed, which necessarily has advantages over the older paradigm (Kuhn [1962] 1996:77). Because paradigms give scientists focus to their research, it would be unproductive, even regressive, to discard a paradigm without adopting an alternative theoretical framework.

As noted above, Johnson does not propose any theoretical or empirical additions to either evolutionary theory or intelligent design theory. As such, the work is not fundamentally different

from earlier creationist works. However, as Scott notes (1997: 281), because Johnson was a tenured law faculty member at the University of California, Berkeley, and because he adopted a more moderate position on geological issues than creationists, *Darwin on Trial* was reviewed and read by a much wider audience than traditional creationist works. As such, Johnson really created the opening in the media and popular press for later ID works, primarily those of Behe and Dembski.

The most famous ID work is *Darwin's Black Box* by Michael Behe ([1996] 2006) of Lehigh University. The volume made it onto the New York Times Bestsellers list. Behe, a professor of biochemistry, argues that several biological systems at the cellular level, or even molecular level, are what he calls “irreducibly complex.” Behe defines irreducible complexity as

[A] single system composed of several well-matched, interacting parts that contribute to the basic function, wherein the removal of any one of the parts causes the system to effectively cease functioning. An irreducible complex system cannot be produced directly (that is, by continuously improving the initial function, which continues to work by the same mechanism) by slight, successive modifications of a precursor system, because any precursor to an irreducibly complex system that is missing a part is by definition nonfunctional (Behe 2006: 39).

Behe claims that irreducibly complex systems could not have arisen through Darwinian evolution; the random mutations of evolution could not produce such complex biochemical systems. He cites several examples, including the blood-clotting cascade, in order to show that

complexity of certain biochemical processes are, in his opinion, too complex to have originated through natural, random means. It is important to note that Behe does accept that evolution can explain many changes in biological structure through time, but that it cannot explain irreducible complexity:

To say that Darwinian evolution cannot explain everything in nature is not to say that evolution, random mutation, and natural selection do not occur; they have been observed (at least in cases of microevolution) many different times. Like the sequence analysts, I believe the evidence strongly supports common descent. But the root question remains unanswered: What has caused complex systems to form? No one has ever explained in detailed, scientific fashion how mutation and natural selection could build the complex, intricate structures discussed in this book (Behe 2006: 175-176).

Behe's next work, *The Edge of Evolution* (2007), moves away from his earlier irreducible complexity argument and instead focuses on the biochemical evolution of organisms, primarily humans. Using the example of human adaptations for combating malaria, especially the sickle cell trait, he argues that evolution's power is limited and there are problems that are too complex for evolution to handle (Behe 2007:53).

Critics of Behe argue that biochemical processes actually exhibit 'redundant complexity,' wherein most of the steps in a biochemical process are duplicated (Shanks and Joplin 1999: 276). This redundant complexity actually makes biochemical systems resistant to breakdown when one or more components are removed. Thus, rather than being vulnerable to breakdown, they are

actually quite robust. Others have pointed out that Behe assumes that the biochemical structures he examines have always existed in their current state (Forrest and Gross 2004: 83). Any number of changes could have occurred in the past that make the current structure appear to be irreducibly complex, yet still perfectly compatible with random mutation and adaptation.

A further criticism aimed at Behe is the lack of further research into irreducible complexity. Forrest and Gross (2004: 39) point out that not even Behe himself has started any research program looking into the phenomenon. The lack of peer-reviewed articles concerning irreducible complexity is another common criticism (also aimed at most ID theorists).

Another famous ID theorist is William Dembski, research professor of philosophy at Southwestern Baptist Theological Seminary. Dembski, who holds doctorate degrees in mathematics and philosophy, holds very similar beliefs as Michael Behe, but argues from a mathematical standpoint, specifically dealing with probability. His theoretical concept, “specified complexity,” is used to determine the probability of any event occurring based on time allowed and the level of complexity of the event itself (Dembski 2004: 317). Using his calculated “universal probability bound,” the highest possible complexity of events occurring since the estimated beginning of the universe, Dembski claims that there has not been enough time in order for Darwinian evolution to have produced all known biological complexity by known mechanisms (Dembski and Ruse 2004: 327).

Dembski first introduced his probabilistic argument for design in *The Design Inference: Eliminating Chance Through Small Probabilities*, which was supported by a grant from the Discovery Institute (Dembski 1998: xvi) and published by Cambridge University Press. In the book, Dembski introduces his ‘explanatory filter,’ which he claims can be used to determine if an event is due to regularity, chance, or design (1998: 62). Dembski points out that deciding on

design is an eliminative process; design is determined after regularity and chance have been ruled out (1998: 19).

Dembski makes it clear that the design inference detects only design, not causation, nor a causal narrative. “Nothing in this definition entails a causal story, much less an intelligent agent, much less still a supernatural or occult power. Taken in its most fundamental sense, the word *design* signifies a *pattern* or *blueprint*.” “Frequently the reason an event conforms to a pattern is because an intelligent agent arranged it so. There is no reason, however, to turn this common occurrence into a metaphysical first principle” (Dembski 1998: 226-277).

In their review of *The Design Inference*, Fitelson, Stephens, and Sober reject Dembski’s use of the universal probability bound, since it does not help to define the probability of actual events (1999: 485-486). They also reject the eliminative nature of the design filter and the placing of the design conclusion as its end result.

If those alternative theories had deductive consequences about what we observe, one could demonstrate that those theories are false by showing that the predictions they entail are false. If, in addition, the hypothesis of intelligent design were the only alternative to the theories thus refuted, one could conclude that the design hypothesis is correct. However, neither condition obtains. Darwinian theory makes probabilistic, not deductive, predictions. And there is no reason to think that the only alternative to Darwinian theory is intelligent design (Fitelson, Stephens and Sober 1999: 487)

The review ends with a more general criticism of the ID movement and its avoidance to date of fully exploring and formulating the design hypothesis. “Dembski’s Explanatory Filter encourages creationists to think that this responsibility can be evaded. However, the fact of the matter is that the responsibility must be faced” (1999: 487). They consider Dembski’s, and by extension, the general ID movement’s use of the design hypothesis as the default alternative to evolution as invalid and intellectually dishonest. This echoes the general criticism by mainstream scientists that intelligent design theory, in essence, ‘doesn’t explain anything.’

3.0 SCIENTIFIC CONTROVERSIES AND BOUNDARY-WORK

The Evolution-intelligent design controversy is a dispute over what can be called ‘scientific.’ Intelligent design (ID) proponents want to apply this term to their theories and concepts, thereby imbuing them with significantly greater legitimacy and authority. Why would the term ‘scientific’ provide these extra resources to ID theory? Because of the ‘epistemic authority’ of science. As Gieryn notes:

“science” often stands metonymically for credibility, for legitimate knowledge, for reliable and useful predictions, for a trustable reality: it commands assent in public debate. If “science” says so, we are more often than not inclined to believe it or act on it – and to prefer it over claims lacking this epistemic seal of approval (1999:1).

Science commands an authority over the understanding of the world. Labeling an idea ‘scientific’ means it is trustworthy; it has been formulated and tested through experimentation and put through review before arriving in the public sphere.

However, the authority and prestige of science does not itself define what is “science” or what can be called “scientific.” Robert Merton saw science as

...distinguished by its institutionalized norms – communism (the injunction to share findings promptly), universalism, disinterestedness, and organized skepticism – binding on scientists’ behaviors and judgments, internalized by them through socialization, reinforced by a system of rewards and sanctions, and functionally necessary for the efficient pursuit of certified knowledge (Gieryn 1999:26).

For Merton, these characteristics demarcate science from other areas of culture or social life. Science, as a cultural system, was the only area of social life to exhibit all of these traits. Thomas Kuhn described science as the “constellation of facts, theories, and methods collected in current texts” (1996 [1969]:1). For Kuhn, science progresses in two primary ‘phases’: “normal science” and “revolutionary science.” Normal science is the status of a field working under a paradigm; the scientists in this field all agree, more or less, with the overall interpretive frameworks of the field and work to further specify the findings of this paradigm (Kuhn 1996 [1969]:25). However, the explanatory power of any paradigm is limited and eventually enough empirical evidence is collected that disputes the validity of the paradigm, constituting a crisis in the field. During this crisis the ability of the current paradigm to handle new evidence is tested, while alternative paradigms are considered as replacements. If the old paradigm cannot explain new evidence, a new paradigm is chosen and the field adjusts to this new orientation. This process is called ‘revolutionary science’ (Kuhn 1996 [1969]).

However, recent work in the sociology of science has rejected the idea of essentialist qualities of science (Fuchs 2001:6). Bruno Latour, using his ‘actor network theory,’ defines technoscience as “all the elements tied to the scientific contents no matter how dirty, unexpected

or foreign they seem...” (1987:174). The actual process of science is much more complicated than the Mertonian norms would predict. He distinguishes between ‘science in-the-making’ (where controversies and technicalities are still being debated) and ‘ready-made science’ (where such issues have already been settled). Thus, what is commonly considered ‘science’ is really a sanitized narrative of a much more complex process.

Extending the work of Latour, Stephan Fuchs sees science as a self-defining cultural network. “[S]cience is a network of self-similar distinctions and observations, although degrees of self-similarity vary between the opposite extremes of fragmentation and unity. A culture ends where its distinctions cease to matter” (Fuchs 2001:19). Thus, science is a network of elements (theories, scientists, methods, organizations, tools, facts, etc.). These elements are considered ‘scientific’ because they have been incorporated into the cultural network of science. For example, the use of empirical data and testable hypotheses are the most commonly used cultural markers of science. However, there is nothing intrinsically ‘scientific’ to these elements; their status as ‘scientific’ is a result of “net-work,” the process whereby cultural networks “...render something similar or different from something else” (Fuchs 2001:55). The distinctions made by the scientific cultural network do more than just decide if certain ideas are ‘scientific’; distinctions affect who can legitimately practice science, often through organizational gatekeeping.

One must be a member of some organization, or network of organizations, to do science, for example. If one is not in an organization that does science, it is also hard to become one of those scientists circulating in the networks between organizations, moving from lab to lab, and research center to research center.

Whoever is not, in some way, a member of the organization cannot do research *there*. The material means are organizational, not private or personal, property. (Fuchs 2001:226) (emphasis original)

Thus, in order to do science, one must be accepted into the scientific cultural network, thereby gaining access both to legitimation and material resources. Elias notes that what he terms ‘scientific establishments’ are “...able to exercise a monopolistic control over resources needed by others. They control, and engage in, the production of a particular type of knowledge” (1982:40). Those not admitted into the hierarchies are termed “non-scientific” or “non-professional” (Elias 1982:23). However, if there are no essential qualities to science, how are the demarcations between the ‘scientific’ and the ‘nonscientific’ formed and maintained, particularly when elements outside the scientific cultural network attempt to appropriate its epistemic authority? Thomas Gieryn’s concepts of ‘boundary-work’ and ‘cultural maps’ show how this is accomplished.

Science, for Gieryn, is a “cultural space: it has no essential or universal qualities. Rather its characteristics are selectively and inconsistently attributed as boundaries between “scientific” space and other spaces are rhetorically constructed” (1999:xii). Cultural maps demarcate the ‘scientific’ from the ‘nonscientific’ (similarly to Fuchs’ notion of cultural networks).

These cultural maps locate (that is, give a meaning to) white lab coats, laboratories, technical journals, norms of scientific practice, linear accelerators, statistical data, and expertise. They provide the interpretative grounds for accepting scientific accounts of reality as the most truthful or reliable among the

promiscuously unscientific varieties always available. Maps of science get drawn by knowledge makers hoping to have their claims accepted as valid and influential downstream, their practices esteemed and supported financially, their culture sustained as the home of objectivity, reason, truth, or utility. Maps of science get unfolded and read by those of us not so sure about reality, or about which accounts of it we should trust and act upon. (Gieryn 1999:x)

Thus, cultural maps are defined for external use, when the validity of scientific knowledge-claims are challenged, or when elements of a non-science attempt to become part of science. By demarcating science from non-science, the epistemic authority and resources of science are preserved or extended (when the cultural map is accepted). ‘Boundary-work’ is the process of creating a cultural map of science.

Boundary-work is “the discursive attribution of selected qualities to scientists, scientific methods, and scientific claims for the purpose of drawing a rhetorical boundary between science and some less authoritative residual non-science” (Gieryn 1999:4-5). Thus, science uses selectively chosen attributes to label something as scientific or nonscientific. As with Fuchs, the distinctions resulting from boundary-work have real-world consequences, given the authority and resources available to various scientific fields (Gieryn 1983:781).

These rhetorical boundaries are not fixed or universal, like Merton’s scientific norms. Rather, they are (usually pre-existing) repertoires that scientists can call upon when needed.

[T]he contents of these maps of science become sociologically interesting precisely by their variability, changeability, inconsistency, and volatility – from

episode to episode of cultural cartography, few enduring or transcendent properties of science necessarily appear on any map (or in the same place). The contours of science are shaped instead by the local contingencies of the moment: the adversaries then and there, the stakes, the geographically challenged audiences (Gieryn 1999:5).

The characteristics (and hence, boundaries) of science at any given moment depend on the challenges facing science. Cultural maps change depending on circumstance and opponent. For example, different boundaries will be defined when defending the epistemic authority of science against threats by religion than when promoting ‘pure science’ over applied fields (Gieryn 1999).

In an analysis of particular interest to this study, Gieryn et al. (1985) compared the boundary work of scientists at the 1925 Scopes trial and the *McLean v. Arkansas Board of Education* decision in 1981. The Scopes trial in Dayton, Tennessee involved the prosecution and conviction of John Scopes for teaching evolution in public school (later overturned on a technicality). The *McLean v. Arkansas Board of Education* decision overturned an Arkansas state law mandating the ‘balanced-treatment’ of evolution and creation science in public schools. The first trial involved limiting the expansion of the role of science for religious reasons, while the second trial represented a threat to the legitimacy and importance (and thereby, material resources) of science by religious supporters. Thus, both represent overt scientific boundary-work at different time periods and situations.

Gieryn et al. found that the boundary work at the Scopes trial mostly involved differentiating science from religion: themes included comparing the real-world knowledge of

science with the allegories of religion, the constant revision of scientific knowledge versus the fixed nature of religious knowledge, functional differences, and the consensus of scientists on facts versus the fractious nature of religious belief (Gieryn et al., 1985:396-397). In contrast, boundary-work at the *McLean* decision differentiated science from creation science by highlighting the specialized training and certification of scientists versus the missing or inferior credentials of creation scientists, the skeptical nature of scientists versus the belief in Biblical inerrancy of creation scientists, the refusal of creation scientists to accept basic scientific knowledge-claims, and the disinterested nature of science versus the agenda of creation scientists to bring religion into public schools (Gieryn et al., 1985:401-406). Boundary-work at the Scopes trial, in essence, differentiated science and religion as two different but compatible knowledge systems, whereas in the *McLean* decision science was described as superior to creation science, which itself was denounced as a false science. Thus, while in both cases the primary issue was the legitimacy of teaching evolution in public schools, the boundary-work accomplished by scientific proponents was substantively different, reflecting the differing opponents and circumstances, as well as legal strategies.

Fuchs describes a similar process of ‘demarcation’ of scientific boundaries.

[D]emarcation is a social, not logical, activity. There are no “criteria” for demarcation, above and beyond that which actual sciences and specialties do to construct and protect their identities. Demarcation is a response to bounded rationality. It focuses the attention space on that which matters to a science or specialty, and on that which matters to it *most*. As always, demarcation does its work only until further notice, until a specialty changes, dies, or merges with

another one. Demarcations that is, are outcomes, not foundations. They cannot be decided in philosophy, once and for all, nor can they be researched there (Fuchs 2001: 91-92).

As with Gieryn, demarcations are an outcome of social processes, not inherent characteristics of a science. They are temporary boundaries and can change when needed. Fuchs also notes that “boundaries filter out vast sources of possible information without further consideration or justification” (2001:85). Methodological naturalism (Scott 1997) is an example of this self-selected filtering process; science ignores any evidence or argumentation for non-natural causation.

However, Gieryn does not consider boundary-work to be little more than instrumentalist in nature; rather, boundary-work reflects some characteristics of the practices and values of a given science. “To reduce ideologies of science to illusions concocted only to serve professional interests assumes an unrealistically gullible public and a cynical and *merely* instrumentalist scientific community” (Gieryn 1983:792) (emphasis original). Rather, boundary-work consists of a selection of contemporary scientific values, woven into a narrative.

Gieryn identifies three main forms of boundary-work: expulsion, expansion, and protection of autonomy. ‘Expulsion’ boundary-work is

...a contest between rival authorities, each of whom claims to be scientific. All sides seek to legitimate their claims about natural reality as scientifically made and vetted inside the authoritative cultural space, while drawing a map to put discrepant claims and claimants outside (or, at least, on the margins). Real science

is demarcated from several categories of posers: pseudoscience, amateur science, deviant or fraudulent science, bad science, junk science, popular science. Boundary-work becomes the means of social control: as the borders get placed and policed, “scientists” learn where they may not roam without transgressing the boundaries of legitimacy, and “science” displays its ability to maintain monopoly over preferred norms of conduct (Gieryn 1999:15-16).

Expulsion boundary-work is the process of defining distinct boundaries between what is scientific and what is not. Both sides of this contest claim to be scientific while defining the other side as un-scientific. The victors and their ideas are incorporated into the cultural space of legitimate science, while the losers are ‘expelled’ into other, non-scientific cultural spaces. Note that the result of this boundary-work is not limited to removing undesired practices and theories (and those who use them) from what is called ‘science.’ These boundaries also become a form of social control of those working within the legitimate scientific cultural domain; they map out what is legitimate scientific pursuit and what is illegitimate and therefore non-scientific. Scientists who cross these boundaries (by professional association with the non-scientific) face various forms of sanction (e.g., paper/book rejections, public stigmatization, loss of employment/grants, etc.). Thus, boundaries are useful both for keeping out the scientifically ‘unworthy’ and for maintaining discipline among those accepted into the scientific cultural domain.

‘Expansion’ boundary-work is

...when two or more rival epistemic authorities square off for jurisdictional control over a contested ontological domain. Those speaking for science may seek to extend its frontiers, or alternatively, spokespersons for religion, politics, ethics, common sense, or folk knowledge may challenge the exclusive right of science to judge truths. On these occasions, the interpretative task is not to distinguish real science from ersatz, but rather to distinguish science from (or identify it as) one of the less reliable, less truthful, less relevant sources of knowledge about natural reality (Gieryn 1999:16-17).

Expansion boundary-work involves constructing a distinction between legitimate science and some other, less legitimate knowledge system, in order to assume the knowledge-producing role of this other system. As the quote from Gieryn notes, both sides engage in a narrative battle, presenting their side as the superior system for understanding some phenomena, while portraying the opposing side as an inferior, or as the least relevant source of knowledge. Note that the other knowledge system does not claim the epistemic authority of science, maintaining its own identity during this contest. If the boundary-work defined by science is successful, the ontological domain of science expands at the expense of this other knowledge system (e.g., religion, folklore, etc.).

Finally, ‘protection of autonomy’ boundary-work is “[a] slightly different kind of boundary-work result[ing] from efforts of outside powers, not to dislodge science from its place of epistemic authority, but to exploit that authority in ways that compromise the material and symbolic resources of scientists inside” (Gieryn 1999:17). This boundary-work is constructed in response to a threat to the resources of science (e.g., funding, prestige, control over research,

etc.). This involves defining negative consequences that would result from some loss of autonomy, instead of defending the ontological domains or epistemic authority of science. These external threats could include budget cuts or an emphasis on applied research over basic research. They could also include forcing scientists to take responsibility for the social/environmental/health consequences of scientific advances (e.g., radioactive waste from nuclear power plants, chemical contamination of food/water, etc.). In such cases, the scientific boundary-work would “[exempt] members from responsibility for consequences of their work by putting the blame on scapegoats from outside” (Gieryn 1983:792). Thus, blame would be shifted to power companies or industrial manufacturing plants and away from science.

The evolution/ID conflict is without doubt an example of expulsion boundary-work. Both sides claim epistemic authority over the study of biological variation and origin. Both sides claim to be scientific, while attacking the scientific legitimacy of their opponents. ID proponents aim to have ID theory and concepts accepted within the scientific cultural domain and provide multiple arguments for why Darwinian evolution is not truly scientific. Evolutionary science, while already firmly within the scientific cultural space, impugns the scientific legitimacy of ID, thereby placing them outside the boundary of science as a ‘pseudoscience’ or ‘junk science.’ The boundary-work produced on behalf of evolutionary science makes a clear distinction between valid and invalid scientific work, providing sanctions for scientists who cross over to the invalid. Indeed, the major theme of the 2008 pro-ID move *Expelled* was the sanctions used to punish various academics who became associated with ID theory.

While the boundary-work surrounding evolution has taken various forms since *On the Origin of Species* was published, the current controversy between evolution and intelligent design is primarily concerned with differentiating evolution as a ‘science’ from the ‘non-

scientific’ ID. Many authors have contributed different ideas or concepts to this boundary-work on behalf of the scientific establishment. A brief sketch of this boundary-work follows.

3.1 BOUNDARY-WORK FROM THE SCIENTIFIC ESTABLISHMENT

The boundary-work on behalf of evolutionary science is outlined here and a brief look at the boundary-work on behalf of ID follows. These sections are overviews of the arguments regarding the scientific boundary between evolution and ID and are not intended to be comprehensive. The rhetorical conflict between evolution and ID is contained within many articles, books, statements, websites, trial testimonies, informational videos, full-length documentaries and other sources. A comprehensive examination of this boundary-work is thus beyond the scope of this project.

The boundary-work by proponents of evolutionary science has primarily consisted of listing reasons why evolution is truly ‘scientific’ while ID is not. As such, this is ‘expulsion’ boundary-work, since the goal is to establish evolution as the true science (as opposed to, for instance, establishing evolution as superior to creationism when considering biological diversity, an example of ‘expansion’ boundary-work). This boundary-work defines scientifically valued characteristics and attributes to evolutionary science, and then follows by attributing the opposite, scientifically un-valued characteristics to ID.

Probably the most frequently cited reason why evolution is ‘science’ is that it cites only empirical evidence, disallowing any reference to an ‘extra-natural’ causation (i.e., a miracle) (Ruse 1982, 2005). The formal term for this practice is ‘methodological materialism’ (or methodological naturalism), which “assumes that scientific epistemology is limited to

formulating explanations of the natural world on the basis of natural, rather than supernatural, causes” (Scott 1997:272). In contrast, ID is described as not just using non-natural causation in their theory, but as a whole a reaction *against* materialism.

Like all conservative Christians, they insist on a significant explanatory role for God, and in life having a divinely directed purpose and meaning. To them, evolution epitomizes the offensive, strictly materialist framework in which scientists practice science today. Science itself, however, is not objected to – only its materialism in regard to theologically sensitive issues. (Scott 1997:283)

Note Eugenie Scott’s clarification that ID does not object to the methods of science, or science as a knowledge system, just the methodological materialist axiom of modern science. ID proponents want a ‘God-friendly’ science, not no science. Michael Ruse goes even further when discussing the anti-materialism of ID proponents.

What is driving them is their opposition to naturalism as a philosophy. Every person promoting this position admits frankly that he sees Darwinism as the epitome of a “naturalistic” system that puts all down to blind forces working on inert matter. And every one of these people loathes naturalism because he sees it as a brief stop on the route to atheism. (Ruse 2005:257)

According to Ruse, the true reason for the anti-materialism of ID proponents is not the perceived inadequacy of materialist causation in science, it’s the perceived promotion of atheism

in scientific teachings. To ID proponents, if all scientific explanations leave out God, it becomes easier for those learning science to leave God out of all explanations. ID is more concerned with teaching evolution in public schools than with the scientific establishment (Forrest and Gross 2004:11). Indeed, the Discovery Institute's Center for Science and Culture was originally called the 'Center for the *Renewal* of Science and Culture,' reflecting the hidden goal of ID, according to Forrest and Gross (2004:13). Thus, not only does ID want to change one of the fundamental working assumptions of modern science, the movement is really motivated to make this change due to cultural values, not any real scientific concerns. This is in contrast to the 'disinterested' nature of 'real' science.

Evolutionary science is also given 'scientific' qualities, such as; it is explanatory, it has testability, and it is tentative (Ruse 1982). Science explains nature as it is, rather than trying to impose cultural values into scientific explanation. Science strives to make all theories testable by experimental and/or empirical evidence; ID proponents are not concerned with testing their theories. Scientific knowledge and theories are tentative, and will be replaced when newer, superior theories are proposed and tested. ID proponents refuse to accept scientific rejection of their theories.

The harshest critique of ID, however, is that it is simply a newer form of religious creationism and creation science (Scott 1997; Ruse 2005; Forrest and Gross 2004). Evolution is upheld as originating through traditional science, whereas ID is at root a religious belief. The direct references to God, creation and miracles have been removed, but the basic explanatory theme remains: life was intelligently designed (necessitating a designer) and this involved some form of non-natural mechanism (necessitating some form of miracle). As Eugenie Scott explains,

ID is just a modern form of William Paley's argument for design in *Natural Theology*, published in 1802:

ID is a lineal descendent of William Paley's Argument from Design, which held that God's existence could be proved by examining his works. Paley used a metaphor: He claimed that if one found an intricately contrived watch, it was obvious that such a thing could not have come together by chance. The existence of a watch implied a watchmaker who had designed the watch with a purpose in mind. Similarly, because there is order, purpose, and design in the world, naturally there is an omniscient designer. The existence of God was proven by the presence of order and intricacy. (Scott 1997:279-280)

Thus, rather than being the unavoidable conclusion based on recent scientific evidence, the idea that life is too complicated to have originated through natural means is an idea that predates *On the Origin of Species* itself. The particular evidence used to support this claim has changed over time, but the basic argument itself is identical.

3.2 BOUNDARY-WORK FROM THE ID MOVEMENT

ID proponents have responded with their own boundary-work, attempting to show the scientific value of ID and refute the cultural and religious accusations from critics. ID proponents respond to the accusation of violating methodological naturalism in two ways. The first is by denying that

ID violates methodological naturalism in the strict sense of using only empirical evidence for making knowledge claims. As Michael Behe put it in *Darwin's Black Box*:

The conclusion of intelligent design flows naturally from the data itself – not from sacred books or sectarian beliefs. Inferring that biochemical systems were designed by an intelligent agent is a humdrum process that requires no new principles of logic or science. It comes simply from the hard work that biochemistry has done over the past forty years, combined with consideration of the way in which we reach conclusions of design every day. (Behe [1996] 2006:193)

Thus, ID relies on scientific data to infer intelligent design of biological structures, making no reference to religious or ideological beliefs. Not only does ID refer only to empirical evidence, it also does not require a far-fetched interpretive framework to identify design, instead using ‘inferences of design’ that could be used in everyday life. Thus, the conclusion that life was intelligently designed is a straightforward conclusion arising from a review of data, not a predetermined assumption fit to the evidence.

Confronting the supernatural charge directly, William Dembski wrote:

The related concepts of irreducible complexity and specified complexity render intelligent causes empirically detectable and make intelligent design a full-fledged scientific theory, distinguishing it from the design arguments of philosophers and

theologians, or what has traditionally been called *natural theology* (2004:37)
(emphasis original).

Thus, empiricism is what distinguishes ID from philosophy and theology. While philosophers and theologians use various arguments to prove that life was designed, ID uses measurable, empirical evidence to do so. Dembski also refutes the cultural-motivation behind ID, while also acknowledging the interest many ID proponents have in the cultural rejection of evolution.

For the record, therefore, let's be clear that design theorists oppose Darwinian theory on strictly scientific grounds. Yes, we are interested in and write about the theological and cultural implications of Darwinism's imminent demise and replacement by intelligent design. But the reason design theorists take seriously such implications is that we are convinced that Darwinism is, on its own terms, an oversold and overreaching scientific theory. (2004:50)

While ID proponents oppose the cultural implications of materialist evolution (e.g., promotion of atheism), ID theory proper is constituted only of proper scientific evidence and reasoning. Critics of ID conflate personal beliefs with the scientific motivation to support ID theory.

The other response from ID regarding methodological naturalism is to criticize the universal acceptance of this principle by modern science. The 'mild' form of this argument finds this principle to be limiting the potential of scientific explanation. Behe urges that "scientists

should follow the physical evidence wherever it leads, with no artificial restrictions” ([1996] 2006:243). Dembski makes a similar claim: “Although methodological naturalism is a regulative principle that purports to keep science on the straight and narrow by limiting science to natural causes, in fact it is a straightjacket that actively impedes the progress of science” (2004:170). Rather than a working assumption that benefits science, methodological naturalism places ‘artificial’ limitations on science, narrowing its explanatory power and impeding its progress. These restrictions place limits on what interpretations can be made with the evidence, while ID rejects these limitations, allowing it to do ‘better’ science. Dembski defines the epistemology of ID as “pragmatic naturalism[, which] wants simply to understand nature and doesn’t care what entities are invoked to facilitate that understanding, so long as they prove conceptually fruitful” (2004:177).

The ‘stronger’ form of this reaction against methodological naturalism accuses scientists, evolutionary scientists in particular, of camouflaging their own secular religion/ideology as ‘science’ and rejecting any threat to this secular religion as ‘unscientific.’ As Phillip Johnson puts it in *Darwin on Trial*, Darwinian evolution is required in order to uphold this ideology:

Naturalism is not something about which Darwinists can afford to be tentative, because their science is based upon it. As we have seen, the positive evidence that Darwinian evolution either can produce or has produced important biological innovations is nonexistent. Darwinists know that the mutation-selection mechanism can produce wings, eyes, and brains not because the mechanism can be observed to do anything of the kind, but because their guiding philosophy assures them that no other power is available to do the job. The absence from the

cosmos of any Creator is therefore the essential starting point for Darwinism.

(Johnson 1993:117)

This materialist ideology holds non-material causation as scientifically ‘out-of-bounds’ not just for pragmatic reasons, but because it does not consider non-material causation possible. Darwinian evolution is therefore a reflection of this materialist ideology, rather than a true, scientifically demonstrated theory. Dembski directly accuses ID critics not just of promoting a materialist ‘theology,’ but also of psychologically projecting this onto ID proponents.

I submit that the preoccupation by critics of intelligent design with theology results not from intelligent design being inherently theological. Instead, it results from critics having built their own theology (or anti-theology, as the case may be) on a foundation of Darwinism. Intelligent design challenges that foundation, so critics reflexively assume that intelligent design must be inherently theological and have a theological agenda. Freud, if it were not for his own virulent Darwinism, would have instantly seen this as a projection. Critics of intelligent design resort to a classic defense mechanism: they project onto intelligent design the very thing that intelligent design unmasks in their own views, namely, that Darwinism, especially as it has been taken up by today’s intellectual elite, has itself become a project in theology. (Dembski 2004:46)

According to Dembski, modern science is built upon a materialist theology, and rejects ID as unscientific in order to protect the status of this theology. Thus, ID proponents essentially

reverse the accusation of ‘religious motivation’ back at evolutionary scientists, claiming that the rejection of ID is due to this materialist theology, rather than any scientific weaknesses of ID theory.

William Dembski has also responded to criticisms that ID theory deals with mechanisms (the actual ‘intelligent design’ at work) that cannot be empirically measured, therefore disqualifying ID as a science.

Intelligent design is compatible with what philosophers of science call a *constructive empiricist* approach to scientific explanation. Constructive empiricism regards the theoretical entities of science pragmatically rather than realistically. Accordingly, the legitimacy of a scientific entity is tied not to its ultimate reality but to its utility in promoting scientific research and insight. On this view, theoretical entities are constructs with empirical consequences that are scientifically useful to the degree that they adequately account for a range of phenomena. (Dembski 2004:65) (emphasis original)

ID mechanisms don’t need to be empirically observed or even conceptualized in a detailed manner; rather, it is sufficient (at least for the time being) to infer their existence based on their theorized effect (seeding designed elements into biological systems), since this allows science to progress. Thus, the indeterminate nature of ID mechanisms is not a flaw so much as a working necessity, similar to what other sciences have also done with hypothesized or unobservable mechanisms or entities. It is thus invalid to criticize ID for this practice.

Finally, ID proponents have also rejected the argument that ID is a newer form of creationism. For Dembski, there are two fundamental principles of creationism that ID does not support: the existences of “a supernatural agent who creates and orders the world” and the belief that the “biblical account of creation recorded in Genesis is scientifically accurate” (Dembski 2004:41). Passages cited above noted the denial of the Bible (or other holy books) as inspiration for ID theory. Dembski also rejects the first principle:

Nothing in this definition entails a causal story, much less an intelligent agent, much less still a supernatural or occult power. Taken in its most fundamental sense, the word *design* signifies a *pattern* or *blueprint*. The key step in any design inference is showing that an event conforms to a pattern. Frequently the reason an event conforms to a pattern is because an intelligent agent arranged it so. There is no reason, however, to turn this common occurrence into a metaphysical first principle. (Dembski 1998:226-227)

ID is in the business of detecting intelligently designed biological structures or patterns and does not concern itself with who or what the designer actually is. Behe echoes this description of ID: “Inferences to design do not require that we have a candidate for the role of designer. We can determine that a system was designed by examining the system itself, and we can hold the conviction of design much more strongly than a conviction about the identity of the designer” ([1996] 2006:196). Once again, the ID movement is about finding evidence of intelligent design (i.e., the results of the intelligent design process), rather than discovering where (or whom) this intelligence came from.

Dembski also defines a scope distinction between creationism and ID.

Creation asks for an ultimate resting place of explanation: the source of being in the world. Intelligent design, by contrast, inquires not into the ultimate source of matter and energy but into the cause of their present arrangements, particularly those entities, large and small, that exhibit specified complexity. (Dembski 2004:38-39)

Creationism looks for ‘deep meaning’ in existence, while ID has a much more proximate goal of examining biological structures for evidence of intelligent design. This more restrictive explanatory scope makes ID more ‘scientific’ while creationism (and creation science) less scientific and more religious.

3.3 BOUNDARY-WORK IN THIS STUDY

While Gieryn focused on the rhetoric of boundary-work in science, this study will focus on the institutional effects of the rhetorical boundary-work of both science and ID. When a boundary is successfully instituted between science and some other entity, the organizations and individuals within that entity are ‘expelled’ from ‘science’ as a whole. For example, after ‘phrenology’ was successfully defined outside of science as a pseudo-science (i.e., expulsion boundary-work), scientific positions were denied to its advocates (Gieryn 1983). Thus, if a boundary exists between science and ID, there should be no organizations or individuals associated with ID within the boundaries (or cultural network) of ‘science.’ Likewise, as ID has tried to define a

boundary between itself and creationism, there should be no ‘linkages’ between these two organizational fields. The following section lays out the conceptual framework for ID as a ‘scientific/intellectual movement.’

4.0 SCIENTIFIC/INTELLECTUAL MOVEMENTS

For this study, I conceptualized the intelligent design movement as a ‘scientific/intellectual movement’ (SIM). Frickel and Gross define SIMs as “collective efforts to pursue research programs or projects for thought in the face of resistance from others in the scientific or intellectual community” (2005:206). SIMs have an alternative research agenda that conflicts with the accepted practices of the particular field in which they work. This can include different theoretical foundations, methodologies, research foci, etc. In essence, SIMs advocate for an alternative paradigm (Kuhn 1969) to replace or even refute the current paradigm accepted by a scientific field. A paradigm is a theoretical and/or research program that attracts scientists to work within this program and defines a set of questions that scientists work toward answering (Kuhn [1969] 1996:10).

Frickel and Gross claim there are two types of SIMs, internal and partly external. Internal SIMs are led by young scientists trying to change the existing practices of a scientific field. Partly external SIMs are led by high-status scientists who can afford to make more ‘political’ claims regarding the field. In both cases, the goal of a SIM is to establish a new discipline or carve out a niche for a sub-discipline within a larger one.

Examples of successful SIMs include the rise in popularity of ethnomethodology as a reaction against the ‘grand theory’ of Talcott Parsons and other sociological theorists (Frickel and Gross 2005:212). Biochemistry and molecular biology are two examples of SIMs that were

successful in creating new cross-disciplinary hybrids (2005:208). Eugenics offers an example of a SIM that “blur[ed] the boundary between science and nonscience...” (2005:208).

Frickel and Gross list six key elements of SIMs. The first is that SIMs represent growing support for an alternative scientific paradigm.

At their core, SIMs have a more or less coherent program for scientific or intellectual change or advance. However conceptualized and implemented, these programs involve the transformation of thoughts or research findings into ideas and knowledge that are circulated widely within the intellectual community, subjected to scrutiny and contestation, embraced by some and rejected by others, and that may emerge from the process deemed credible or true (2005:206).

The replacement of the current paradigm (or elements of that paradigm) with the alternatives promoted by the movement is the primary goal of a SIM. This alternative paradigm is a necessary condition for a dissatisfaction with a field’s current practices to be a true SIM; even if there is widespread acceptance of the deficiencies of a current paradigm, if no alternative is available the current practices will be continued, as Kuhn (1969) pointed out. Thus, SIMs attempt to reform a given scientific field in a specific way, rather than simply reduce the importance of a field or even invalidate it.

These alternative paradigms are subjected to scrutiny and eventually will either be accepted or rejected by the field. However, all SIM members need not define this alternative paradigm the same way. Thus, there is room for interpretation or division within a SIM; they are not monoliths. Frickel and Gross do limit SIMs to scientific movements “whose knowledge core

participants are consciously oriented [to the SIM], regardless of their understanding of it” (2005:206). A SIM is an organized community with a shared goal, rather than a disparate set of individuals with similar opinions but no coordinated activity.

The second key element of SIMs is that their knowledge “core consists of intellectual practices that are contentious relative to normative expectations within a given scientific or intellectual domain (Frickel and Gross 2005:207). While this knowledge core may eventually be accepted in the field and become the overarching paradigm, its acceptance comes only after a period of contention with the previous theories or methodologies in a field. An uncontroversial innovation that does not challenge accepted wisdom will be incorporated into a scientific field if it passes the normal level of scrutiny (e.g., peer review, verification, etc). Thus, if there is no significant resistance to an innovation by the prevailing authorities in a field, there is no need to organize a movement to promote it.

A third element is the political nature of SIMs. “Precisely because the intellectual practices recommended by SIMs are contentious, SIMs are inherently political” (Frickel and Gross 2005:207). SIMs aim to change the distribution of power and rewards within their scientific field, usually to obtain and defend higher status positions for movement members as this helps to achieve the goals of the SIM.

Fourth, as alluded to above, SIMs are collective in nature.

Scientific/intellectual movements are constituted through organized collective action. The emergence of new social forms in science and academe invariably requires some level of spatial, temporal, and social coordination. The ideas of movement leaders take shape against the backdrop of their positioning in high-

status intellectual networks to which they had to be admitted by someone. To become influential, those ideas then had to make their way into publication, requiring the cooperation of peer reviewers, editors, and publishers (Frickel and Gross 2005:207).

Although in the context of science, this invokes the wider concept of social movements. Diani and Bison (2004) define social movement as “instances of collective action with clear conflictual orientations to specific social and political opponents, conducted in the context of dense inter-organizational networking, by actors linked by solidarities and shared identities that precede and survive any specific coalitions and campaigns.” They see social movements as “dense inter-organizational networks”, characterized by a “sustained exchange of resources.”

In this specific case, SIMs operate within intellectual networks, wherein access to and acceptance into such intellectual networks is the goal of SIMs. Fuchs defines science as a network of individuals, organizations, theories, methodologies and other components, which “uses various cultural and structural markers to distinguish between that which is relevant and irrelevant to its work – at the moment, and until further notice” (2001: 86). Publications in peer reviewed journals, academic appointments and full-fledged programs at academic institutions are indicators of acceptance into the network of science. Obtaining access to these resources, by gaining acceptance into the larger scientific network is what SIMs aim to achieve for their ideas and their members.

Because SIMs are collective in nature, Frickel and Gross point out that focusing on a single individual is not sufficient for understanding the characteristics of a SIM (2005: 208). While examining a single individual could provide an in depth analysis of their contribution to a

SIM, it would not provide an adequate picture of the SIM. This is not an issue here as this study attempts to look at the organizational network of the intelligent design movement.

Another key aspect of SIMs is their temporal nature. “Scientific/intellectual movements are episodic phenomena. Although historians may disagree about the precise moment of their birth or death, it is clear that SIMs exist as historical entities for finite periods” (2005:208). Frickel and Gross note that most SIMs start as “bold new intellectual programs” and end either by achieving some level of acceptance into their field or by “the effective disappearance of the movement from the intellectual scene” (2005:208).

Finally, Frickel and Gross note that “SIMs can vary in intellectual aim and scope” (2005:208). While some may emphasize under-examined topics or new approaches to well-known phenomena, of particular interest to this study are SIMs that attempt to redefine what is ‘scientific.’ These SIMs “aim to alter the boundaries of existing scientific or intellectual fields, such as biochemistry or molecular biology, two of the most prominent disciplinary hybrids of the 20th century. Still others blur the boundary between science and nonscience ...” (Frickel and Gross 2005:208). SIMs of the latter category (e.g., eugenics) attempt to expand the boundaries of science, bringing new elements previously considered nonscientific into the network of individuals, organizations, theories, methodologies and other components that make up science (Fuchs 2001:86).

The intelligent design (ID) movement can be conceptualized as a scientific/intellectual movement using these six key characteristics. The first characteristic, that SIMs promote an alternative research program is probably the most controversial of these characteristics. The theoretical foundations, assumptions, empirical methodologies, research subjects, even the very existence of the overall alternative approach are all highly contentious topics in this debate. ID

proponents point to mathematical probability (Dembski 1998, 2004) and biological complexity (Behe 1996) as their primary research topics. William Dembski, a leading ID intellectual, describes four fundamental beliefs of intelligent design as:

Specified complexity and irreducible complexity are reliable indicators or hallmarks of design.

Biological systems exhibit specified complexity and employ irreducibly complex subsystems.

Naturalistic mechanisms or undirected causes do not suffice to explain the origin of specified complexity or irreducible complexity.

Therefore, intelligent design constitutes the best explanation for the origin of specified complexity and irreducible complexity in biological systems. (Dembski 2004:42)

Thus, ID is the study of specified complexity and irreducible complexity in biological systems. Specified complexity refers to Dembski's own theory regarding the improbability of many biological systems forming through Darwinian mechanisms. Though a rather complicated concept, specified complexity is essentially a characteristic of an information pattern wherein that pattern could not have developed randomly (Dembski 2004:81-85). Dembski proposes the use of an 'explanatory filter' to eliminate other possible explanations for a pattern and therefore identify design as the origin.

The logic of the Explanatory Filter is eliminative – to infer design is to eliminate regularity and chance. Yet in practice, to infer design is not simply to eliminate regularity and chance, but to detect the activity of an intelligent agent. Though defined as a negation, design delivers much more than a negation (Dembski 1998:62).

Thus, if a pattern cannot be explained by regularity (i.e., due to the laws of physics) or by chance (e.g., random genetic mutations), the pattern displays specified complexity and therefore had to have been designed. This identification of design by examining patterns constitutes the mathematical probability research agenda of ID theory.

The other primary element of the ID program, irreducible complexity, is a contribution by Behe.

By *irreducibly complex*, I mean a single system composed of several well-matched, interacting parts that contribute to the basic function, wherein the removal of any one of the parts causes the system to effectively cease functioning. An irreducibly complex system cannot be produced directly (that is, by continuously improving the initial function, which continues to work by the same mechanism) by slight, successive modifications of a precursor system, because any precursor to an irreducibly complex system that is missing any part is by definition nonfunctional (Behe [1996] 2006:39)(emphasis original).

Irreducible complexity is a special case of specified complexity, wherein a multi-part biochemical process or machine ceases to function without any of its constituent parts and therefore could not have been developed from simpler forms through Darwinian evolution, as any simpler form would not function as a system. Although not entirely dropping the notion of irreducible complexity, Behe's recent work focuses on the improbability of natural selection producing complex biochemical systems (2007), thus bringing his work more in line with Dembski's theories.

The theoretical foundations and research approach of intelligent design have come under intense criticism by scientists (as well as nonscientists). These have ranged from critiques of specific ID claims to outright rejection of the movement as a whole due to theoretical or ideological reasons. For example, in discussing Behe's work, Jerry Coyne (2007) notes that Behe incorrectly requires all mutations to occur simultaneously and essentially uses the "God of the Gaps" argument, wherein God is posited whenever science fails to explain a particular phenomenon. Shanks and Joplin (1999) point to several evolutionary mechanisms, as well as mechanisms of self-organization, to show how 'irreducibly complex' systems could in fact have evolved, rather than design being necessary for their existence. Richard Dawkins (2007) points to the logical error inherent in the theory; if evolution is wrong, design must be correct, even if design itself is not tested or examined. Fitelson et al. (1999) provide a similar critique of Dembski's 'explanatory filter' and also point out the impossibility of eliminating all possible arguments for regularity and chance (among other critiques).

In addition to critiques of specific ID claims, scientists and philosophers have questioned the scientific nature of ID, as well as the intentions of its proponents. Eugenie Scott identifies ID as 'scientific creationism,' as it supports the creation model without relying on the Bible

(2004:138), or as a form of ‘neocreationism,’ as it is a new form of creationism without any terms linking it to formal creation science (1997:277). Michael Ruse points to the fundamental dislike of naturalism among ID proponents (and equates them with creationists).

The worry among creationists has never been transmutation as such but more the overall picture that it represents. And the same is true of the ID enthusiasts. What is driving them is their opposition to naturalism as a philosophy. Every person promoting this position admits frankly that he sees Darwinism as the epitome of a “naturalistic” system which puts all down to blind forces working on inert matter. And every one of these people loathes naturalism because he sees it as a brief stop on the route to atheism (Ruse 2005:257)

Echoing Ruse, Forrest and Gross claim that ID proponents are really interested in a broad cultural realignment. “[T]his movement seeks nothing less than to overthrow the system of rules and procedures of modern science and those intellectual footings of our culture laid down in the Enlightenment and over some 300 years (2004:10). Thus, far from only being concerned with aspects of evolutionary theory, these authors claim that ID is really a manifestation of broader cultural reaction against modernism.

As noted above, ID represents a research program contentious in relation to the current scientific establishment (second element of SIMs). However, not only are the ideas of ID controversial, the avenues of review and critique themselves are controversial. A common criticism of ID (and reason to deny it scientific status) is the lack of ID peer-reviewed papers and near total lack of ID books published by academic presses (*The Design Inference* by William

Dembski being an important exception here). Critics point to this lack of professional literature in support of ID and accuse ID proponents of avoiding real scientific review, preferring instead to make their case to the general public (Forrest and Gross 2004). In response, ID proponents accuse academic journals and printing presses of refusing their manuscripts simply because they provide evidence for design, rather than any true weaknesses in the arguments or methods (Numbers 2006; Dembski 2004). Thus, even the process of contention between the prevailing scientific paradigm, Darwinian evolution, and the alternative paradigm, intelligent design, is itself contentious.

Concern over the distribution of power (third element of SIMs) is certainly part of the ID movement. Although many of the proponents of ID are employed at colleges and universities, most of these are religious institutions, rather than public research universities. The lack of an established research program has been frequently cited as a weakness of ID (Forrest and Gross 2004), prompting the Discovery Institute to start its own privately funded ID research institute, the Biologic Institute (<http://www.biologicinstitute.org/>). More high status positions and research programs would undoubtedly serve to increase the legitimacy of intelligent design theory, especially for the public.

The fourth element of SIMs, their collective nature, also applies to the ID movement. Organizations, such as the Discovery Institute, work to spread the ideas of the movement, as well as connect various intellectuals sympathetic to ID. Intelligent design proponents cite the ideas of other ID proponents in their writings, indicating their shared research agendas and movement identity.

The temporal nature of ID (fifth element of SIMs) is well known. The movement started in the early 1990's, after the ID inspired textbook *Of Pandas and People* was published

(although the textbook was originally written with elements of creation science) (Forrest and Gross 2004; Numbers 2006; Scott 1997). As Scott (1997) notes, the ID movement grew out of the failures of earlier attempts to limit or remove the teaching of evolution in public schools. The consistent failure of legislation and school district policies, on the basis of the separation of the church and state in the first amendment, led proponents to strip all terms associated with creation science and remove any references to God. While there are some other recent external challenges to evolution, including teaching ‘evidence against evolution’ or disclaimers that ‘evolution is just a theory’ (Scott 1997), ID remains the dominant form of antievolution today (the founding of the Biologic Institute and the release of the Ben Stein movie *Expelled: No Intelligence Allowed* in 2008 are examples of the continuing influence and viability of ID).

Finally, Frickel and Gross noted that SIMs vary in their aims and scope. ID undoubtedly falls into the category of SIMs seeking to expand the boundaries of science. However, this boundary expansion is sought at two different levels. What could be called the ‘lower’ level deals with certain scientific concepts and theoretical arguments. For example, scientific acceptance of the explanatory filter/specified complexity (Dembski 1998) and irreducible complexity (Behe 1996) would improve the legitimacy of the ID movement. Granting scientific legitimacy to the ‘nuts and bolts’ of ID theory, even if nominally devoid of references to an intelligent designer, would immensely benefit the movement’s claim of scientific status.

However, scientific recognition of these concepts/arguments is only part of the aim of ID. At the ‘higher’ level, ID aims to change one of the fundamental characteristics of contemporary science, namely the self-imposed prohibition against appealing to causes that do not have a natural explanation. “Today, all science operates under a *methodological materialism* that assumes that scientific epistemology is limited to formulating explanations of the natural world

on the basis of natural, rather than supernatural, causes” (Scott 1997:272)(emphasis original). Thus, modern science rules out the possibility of attributing effects (e.g., laws of physics, structures of cells, etc.) to non-material (i.e., supernatural) causes. However, note the ‘methodological’ in the term; this exclusion of non-material causes is a working assumption of modern science, not a declaration of the non-existence of any causes other than material. As Scott notes, this denial of non-material causes is “*philosophical materialism (naturalism)*, the idea that there is nothing in the universe beyond matter, energy, and their interactions” (1997:272)(emphasis original). While some scientists promote this view (e.g., Richard Dawkins), this is not necessary for doing science. Thus, scientists work within the natural world, but may personally believe in the supernatural world, as long as they keep the supernatural out of their work.

The elimination of this prohibition against using non-material explanations is the larger goal of the ID (and also creation science) movement (Scott 1997; Forrest and Gross 2004). From the perspective of ID proponents, methodological naturalism is the primary impediment to the acceptance of intelligent design as a scientific possibility, not specific objections to ID concepts and arguments. As Dembski notes, the basis of ID is that “*there are natural systems that cannot be adequately explained in terms of undirected natural forces and that exhibit features which in any other circumstance we would attribute to intelligence*” (2004:27)(emphasis original). Thus, if ‘undirected natural forces’ are the only allowable causes in science, arguments that appeal to other forces are by definition not scientific. While this boundary regulation is uncontroversial within science, it is a common grievance among ID proponents, as well as a major criticism of science by ID proponents.

This desire to re-incorporate non-material causation into science makes ID a reactionary SIM. Frickel and Gross note that, while some SIMs want to introduce new ideas into scientific disciplines, others “urg[e] a revival of past ideas to counter what are perceived as pernicious current tendencies...” (2005:208). Thus, despite the proposed additions of specified and irreducible complexity, the overall goal of ID is to return science to its pre-Enlightenment phase (Forrest and Gross 2004) and to spark a wider ‘scientific and cultural revolution’ (Numbers 2006:382).

In addition to the key characteristics of SIMs, Frickel and Gross also discuss several propositions regarding the opportunities for SIM emergence and mobilization. These will help to explicate the ID movement. The first proposition is that a “SIM is more likely to emerge when high-status intellectual actors harbor complaints against what they understand to be the central intellectual tendencies of the day” (2005:209). This proposition is not supported by the emergence of the ID movement. Although most ID proponents are highly educated scholars in scientific/empirical (i.e., non-theological) fields, none of them can be considered ‘high-status intellectuals’ within their fields. The two main ID intellectuals, William Dembski and Michael Behe, are employed in small institutions (Southwestern Baptist Theological Seminary and Lehigh University, respectively) and do not have research programs or prominent students continuing their work.

As a result, the emergence of the ID movement has to be explained by other factors. Eugenie Scott cites the failures of the earlier creation science efforts at curtailing the influence of Darwinian evolution as the impetus for the ID movement. Thus, ID is really just a repackaging of creation science itself, with theological and biblical references removed (Scott 1997: 277). Numbers attributes the rise of ID to the financial support of conservative foundations and trusts

(2006:382). Forrest and Gross trace the beginnings of ID to a conference held at Southern Methodist University in 1992, which included Michael Behe, William Dembski, Stephen Meyer (one of few ID proponents to publish in a peer-reviewed journal) and Phillip Johnson (author of *Darwin on Trial*) as speakers (2004:17). Thus, the emergence of the ID movement had more to do with failed creationist strategies, outside funding and networking among ID-sympathetic scholars than with high-status intellectuals signaling a weakness in the current scientific paradigm.

The second, third and fourth propositions deal with conditions that make success more likely for SIMs. As the ID movement is an ongoing phenomenon, it is not possible to attribute any conditions to its success or failure. The ID movement has not failed (in the sense of dying off), nor has it succeeded, as ID concepts and theories have not been accepted within the scientific community. However, a brief look into the structural conditions surrounding the ID movement can help explain its persistence.

The second proposition is that “SIMs are more likely to be successful when structural conditions provide access to key resources” (Frickel and Gross 2005:213). Further, “[I]ike social movements, SIMs do not just happen, but once their key ideas are formulated, they must be orchestrated, coordinated, and collectively produced. For this to occur, opportunities for gaining access to resources are imperative.” These resources include employment, publishing and coordination among movement members.

Frickel and Gross note that access to resources may not be sufficient to benefit a SIM. “Opportunity structures that afford a SIM participants broad license to use available resources with relative impunity are better, from a SIM emergence perspective, than opportunity structures that place conditions on the use of available resources...” (2005:213). SIM members may have

access to journals, high-status employment, etc., but if they cannot use these to benefit the SIM then these cannot contribute to the SIMs success.

They also note that “[a]nother resource vital for SIM success is intellectual prestige. The SIMs that offer their participants ways to secure additional prestige above and beyond that which they currently possess, to maintain prestige when it is threatened, or to regain lost prestige have a greater likelihood of success than those that do not” (2005:215).

Finally, organizational resources are cited by Frickel and Gross as key to SIM success.

[F]or a SIM to be successful, it needs access to organizational resources, or what scholars of social movements call mobilizing structures. These are the “collective vehicles, informal as well as formal, through which people mobilize and engage in collective action” (McAdam, McCarthy, and Zald 1996:3). In the scientific and intellectual arenas, these forms include university departments, where the presence of multiple SIM members can ratchet up levels of productivity by allowing for localized information sharing, and where administrative personnel can be put to use in the service of the SIM (Mullins 1973). Other important organizational resources for SIMs include institutionalized channels of information flow among movement members such as occurs through publications, informal personal and institutional networks, and scholarly organizations (Frickel and Gross 2005:217).

While the ID movement has access to some of these resources, it lacks many of them. As noted above, while many ID proponents have academic employment, these positions are at small,

often religiously-oriented institutions. Many ID books have been published by non-academic presses, but few ID publications have made it through the peer review process (*The Design Inference* [Dembski 1998] and “Intelligent Design: The Origin of Biological Information and the Higher Taxonomic Categories” [Meyer 2004] are prominent exceptions). Intellectual prestige is without doubt a resource unavailable to ID proponents. Indeed, intellectual stigma, not prestige, is the reward to supporting ID theory.

ID does have access to some organizational resources, but not in the traditional academic context. As most ID proponents work at small, religiously-oriented institutions, access to academic departments is not of great advantage to ID, as the faculty and students are unlikely to hold or obtain high-status positions within scientific fields, and ID proponents are not employed at the same institutions. However, ID does have access to non-academic organizations, such as the Discovery Institute. These organizations serve as communication hubs for the movement, facilitating the spread of ideas both within the movement and to the public. The Biologic Institute, founded by the Discovery Institute, employs ID scientists and funds research efforts into ID, thereby circumventing established science altogether. Thus, while ID lacks peer-reviewed literature (with few exceptions), high-status academic positions, and intellectual prestige, it does have organizational resources that help maintain the movement. These organizational resources are the empirical focus of this study.

Frickel and Gross’ third proposition is that “[t]he greater a SIM’s access to various micromobilization contexts, the more likely it is to be successful” (2005:219). Micromobilization contexts are opportunities for movement members to personally interact with potential recruits. “Several micromobilization contexts for SIMs exist. For example, conferences and symposia offer space for this incubation of new ideas, findings, or problems among likeminded but

geographically separated thinkers” (2005:219). These resources appear to be limited in the ID movement. While several conferences oriented around intelligent design theory were held in the 1990’s (Forrest and Gross 2004) there does not appear to have been any conferences held in recent years. The Discovery Institute recently held seminars for college juniors, seniors or graduate students. These seminars provided overviews of ID ‘science’ as well as a program looking at the influence of science on society (<http://www.discovery.org/csc/summerseminar/>). Thus, ID has only limited access to micromobilization contexts.

Finally, Frickel and Gross’ last proposition is “[t]he success of a SIM is contingent upon the work done by movement participants to frame movement ideas in ways that resonate with the concerns of those who inhabit an intellectual field or fields” (2005:221). Here again ID is at a disadvantage. The movement frames (Snow et al., 1986) that ID uses are usually formed around two main themes: the limitations of natural selection and the infringement of academic freedom by the scientific establishment. Neither of these themes would resonate well with academic audiences. The first theme would be rejected because the limitations of current evolutionary science are precisely what most scientists in the field work on. These are areas where the next big discoveries in the field will come, rather than providing proof that some biological structures were designed. In addition, most scientists were socialized into the culture of science in grad school, where they were taught to limit causation to natural causes and that scientific ideas are evaluated for their veracity (i.e., peer-review). Thus, the charge that ID is unfairly excluded from science due to infringements of academic freedom would not likely persuade many scientists either.

Instead, these movement frames are geared toward the general public, as they would be more likely to see unexplained biological phenomena as evidence of limitations in evolutionary

theory and accept the charge of denying academic freedom. Indeed, the first theme is in many ways a rewording of an earlier anti-evolution approach wherein the status of evolution as a ‘theory’ was highlighted. As the common use of the word ‘theory’ is significantly different than its formal use in science, this was an effective strategy for nonscientists (Scott 1997). The second theme subliminally links to the first amendment freedom of speech in America, which is hard to deny but fundamentally misconstrues the actual process of scientific review. Thus, while ID has potent movement frames to recruit adherents, these are more useful for recruiting nonscientists, helping to improve the movement’s public image but doing little for its acceptance into science.

5.0 RESEARCH QUESTIONS

This study will utilize the network of inter-organizational ties (operationalized as commonly-recognized intellectuals) between ID and other organizations, using the ID movement as the focal point (see data collection section below). By examining the inter-organizational ties between ID and other fields, this study aims to measure the extent of institutional boundary-work between mainstream science, ID and creation science. Despite Frickel and Gross' proposition that SIMs are "more likely to emerge when high-status intellectual actors harbor complaints against what they understand to be the central intellectual tendencies of the day" (2005:209), I do not expect to find high status scientists involved with ID organizations. The ID movement had existed for roughly 17 years at the time of data collection, and had received much attention in the media, was the focus of school district curriculum battles, and had received strong resistance from scientists and scientific organizations. Thus, much boundary-work has already been completed by science; therefore, scientists already are aware of the arguments against ID and risks involved with promoting ID. As such, I do not expect to find high-status scientists recognized by scientific and ID organizations.

Hypothesis 1: There are few or no shared intellectuals between the ID and mainstream science organizations in the network analyzed here.

While most ID proponents do not have access to traditional scientific resources (e.g., academic employment, research grants, peer review publications), they do have access to certain organizational resources. These organizations serve as communication hubs for the movement, facilitating the spread of ideas both within the movement and to the public. The Biologic Institute, founded by the Discovery Institute, employs ID scientists and funds research efforts into ID, thereby circumventing established science altogether. As such, I expect to find high numbers of individuals commonly recognized by ID organizations, reflecting the usefulness of these organizations for movement communication and identity formation.

Hypothesis 2: ID organizations commonly recognize a large number of intellectuals within their movement.

Given the accusations of ID as a ‘repackaging’ of creation science (Scott 1997:277), I expect to find a large number of individuals commonly recognized by both ID and creation science (CS) organizations. This finding would indicate a shared intellectual community among both ID and CS organizations, reflecting a weak or nonexistent institutional boundary between these two movements. While not definitive, this finding would provide evidence that ID grew out of the CS movement, rather than having a distinct intellectual heritage.

Hypothesis 3: There are a large number of individuals commonly recognized by ID and CS organizations.

Several social network analytic measures will be used to examine the connections between these fields. Centrality analysis determines what organizations are the most prominent in the network. This prominence can be related to an organization's popularity compared with other organizations, their proximity to the other organizations in the network, the extent to which they serve as a flow-through point for communication, or other factors. Many authors have shown how network centrality is related to importance (Ansell (2003); Moody and White (2003); Fuchs (2001); Le Merrer and Tredan (2009); Diani (2003); Farris and Felmler (2011); Rossman et al. (2010); Klenk et al (2010)). Centrality analysis will provide a quantitative look at the role of organizations in the intellectual communities of mainstream science, ID and creation science. Cut vertex, *m*-slice, and ERGM analysis will also be used to examine the boundary-work between science, ID and creation science. Each of these analyses offer a different look at the data (see sections for descriptions).

In addition to this general examination of boundary-work, this study also addresses the following research questions.

1. Which organizations are the most prominent in the intelligent design network? I will determine the prominent organizations using several network analytic measures. This will include both descriptive measures and predictive modeling of the networks. I hypothesize that, due to their more or less similar criticism of mainstream science, organizations and individuals affiliated with the creation science and creationist (religious) movements will also be prominent in the ID network.

2. What other fringe science movements are linked to the ID movement? As noted above, I expect creation science organizations to be linked to ID. Linkage to other fringe science movements, such as ‘Ufology’ or paranormal studies would reflect a non-scientifically oriented boundary-work. I hypothesize that creation science will be the external movement most extensively connected to ID, though I expect other fringe science movements to be minimally connected to ID as well.

3. Are links among organizations explained by the common arguments used by the linked organizations? (See below for a discussion on categorizing organizations.) In other words, is the shared use of one or more arguments predictive of a link between organizations? I will first use descriptive measures to show the extent to which organizations share arguments and links, and then estimate a model using ‘shared arguments’ to predict ties between organizations. I hypothesize that the shared use of arguments will have a significant but low effect predicting the existence of a tie between organizations.

6.0 DATA COLLECTION

Data were collected in two stages. In the first stage I collected website citation lists of organizations identified by a seed intelligent design website. The purpose of this stage was to collect a sample of organizations and examine the ties between these organizations based on commonly-recognized intellectual or organizational leaders. The second stage involved collecting lists of such individuals recognized for their intellectual or organizational leadership by the organizations identified in the website citation list. Details of each stage of data collection are found below.

6.1 STAGE 1: WEBSITE CITATION LISTS

The website citations are found in the “links” pages of the websites. These are the organizations with which they actively identify, view as ‘friends to their cause,’ or see as relevant to the issue(s) with which their organization is concerned. Ackland and O’Neil consider the formation of hyperlinks part of ‘online collective identity formation’ (2011:2). They see online connections as providing both symbolic and practical resources, exchanging both textual collective action frames and what they term “index authority,” which raises the profile of organizations in search engines by increasing their hyperlink activity. The result of this collection will be an

“organizational exchange network,” a “directed network where ties between organizations represent the exchange of practical resources” (Ackland and O’Neil 2011:3).

There are several reasons for collecting this type of information. One reason was to solve the problem of defining what constitutes the ID movement. Critics of ID claim the movement is nothing more than an updated version of creationism, whereas ID proponents claim their theory and movement is scientific and fundamentally different from creationism. Should creationist organizations be included or excluded? Deciding one way or the other without reference to the actual inter-organizational linkages would have required taking a stand one way or the other on this issue.

Instead of defining the boundaries of the ID movement based on prior discussions of the movement, I let the movement define itself using website citations and inter-organizational memberships. In other words, I let the inter-organizational linkages themselves define where the boundaries of the ID movement are found, without relying on rhetorical claims of proponents or critics of ID. An alternative method would have been to use newspaper citations or parties to ID-related trials to determine the list of intelligent design organizations. Newspaper citations would have undoubtedly been biased toward larger, more media prevalent organizations. Indeed, many smaller ID organizations would probably have no mention at all. Doreian and Woodard (1992) showed how using a priori lists to define networks produce significantly different networks than using “expanding selection.” While a comparison with a fixed list collection is not feasible, the resulting network (see Figure 2) clearly includes organizations (e.g., American Association for the Advancement of Science) that would not be included in a fixed list collection. Courtroom trials, while providing excellent sources of rhetorical boundary-work, have only a limited number of participants and organizational involvement may result more in political or strategic

calculations than organizational goals.⁴ This strategic non-involvement of organizations, as well as the geographic nature of many court cases, would present artificial limitations on the involved organizations and intellectuals, thus biasing the resulting data analysis.

This does not mean that all organizations in this collection are part of the ID movement, but rather that they are part of the hyperlinked community of organizations originating with ID organizations. The organizations will be grouped according to their mission statements and other relevant data (see section 7.0). Their relationship to the ID movement will be determined by examining the inter-organizational linkages between the organizations in this sample (see below).

Self-definition of the ID movement also removed potential limitations to the movement's composition which defining the movement based on ideological beliefs/movement goals might have incorrectly applied. Kleinberg (1998) showed the limitations of searching websites based strictly on textual content. If, for instance, I only examined organizations that explicitly claimed they supported ID theory, this would likely have resulted in not including many organizations that shared similar beliefs/goals, but did not explicitly support ID. Creationist organizations share many of the same beliefs and goals as ID proponents (see discussion of creationism and ID). Therefore, it is possible that they also share website connections and board membership, and thus are in some sense allied. However, this could only be discovered if the ID movement was allowed to self-define itself by using website citations and board/fellow/advisory membership.

Indeed, self-definition of the movement is part of what the analysis was designed to do. ID proponents claim they are not affiliated with creationists, that they are scientists doing real scientific work, and that evolution proponents simply call them 'creationists' in order to de-

⁴ See http://en.wikipedia.org/wiki/Kitzmiller_v._Dover_Area_School_District.

legitimize their claims. Collecting the data (and thus the picture of the movement presented here) in this way avoided any bias that taking a stand one way or another on this issue would introduce.

Another reason I collected this type of data was to measure the prominence and structural positions of organizations in the movement. Prominence within an organizational network is associated with having more media coverage and governmental access (Diani 2003:110), while embeddedness within a network is associated with greater within-network collaboration (Ansell 2003:142). Organizational networks can bring resources to a movement. These resources can be financial or legitimizing. For instance, initial funding of ID scientists in the mid-1990's by the John Templeton Foundation provided critical financial resources as well as some legitimacy to the young ID movement. The quick cessation of funding and subsequent renouncing of support for ID by the foundation shows a striking instance of boundary work in action (<http://www.thenation.com/article/god-science-and-philanthropy?page=full>). Using the citations lists provided a method of determining the structural position of organizations in the overall network and which were the most important/active in the movement. This way I could use the data to determine which organizations were most prominent, rather than using secondary sources to determine prominence. Simply using the organizations most commonly cited in media might only tell us that some organizations prioritized media coverage, whereas others may have prioritized resource mobilization, or coalition building, etc. The data collection described below facilitated the measurement of prominence in the movement.

This data will also allow me to uncover unexpected or 'submerged' linkages between organizations in different movements or fields. Utilizing a sampling methodology similar to snowball sampling allows the data collection to self-direct itself, including organizations or

movements not initially expected to be included. For example, organizations promoting pseudo sciences like ‘parapsychology’ and ‘ufology’ were included in the data collection. A different data collection strategy would likely not have discovered links to these movements.

Finally, this data collection strategy is also an effort to measure the boundary work (Gieryn 1999) done by several fields, particularly of mainstream science. While Latour’s (1987) ‘Actor Network Theory’ considers a wide array of elements (e.g., individual scientists, specific technologies, scholarly articles, funding sources, etc.) to be part of science, for this study I consider science as a self-defined network of actors and organizations (Fuchs 2001). As Gieryn noted, those within the scientific field do ‘boundary-work’ in order to define what is ‘scientific’ and what is not. One way to exclude something as ‘outside of science’ is to declare it non-scientific, as both the National Academy of Sciences and the American Association for the Advancement of Science have done regarding intelligent design and creationism by issuing a statement on the subject⁵. Another way is to expel individual scientists and organizations that promote ID from the scientific community, or restrict their access to scientific resources. This could entail the removal of a scholar from employment at an academic institution (see, for example, Vedantam 2006), or rejecting submissions to academic journals solely due to support for ID theory. Ultimately, expulsion results in the loss of scientific authority and recognition by scientific organizations, which is the form of boundary-work examined in this study.

Likewise, ID proponents claim that they are not creationists; therefore, based on those statements, we would expect relatively coherent boundaries to exist between those two intellectual communities. The goal of this data collection is to collect enough data to measure the

⁵ See <http://www8.nationalacademies.org/onpinews/newsitem.aspx?recordid=11876> and <http://www.aaas.org/news/releases/2002/1106id2.shtml>.

extent to which this boundary work has been completed. Conceptualizing the scientific, ID and creationist communities as networks of actors and organizations, the data will show the strength of these boundary separations by measuring the inter-organizational connections (or lack thereof) between the different intellectual fields.

Following Diani (2003:110) I expect that the organizations prominent in the ID inter-organizational network (based on centrality measures) will be the organizations with greater representation in the media. In addition to a larger media presence, these organizations will have many of the more famous ID proponents as members. They may also be more active in publishing ID books and other materials.

I also expect it is less likely that the prominent organizations will share ties with movements external to the ID movement, especially with mainstream scientific organizations or with creation science organizations. As boundary work would be even more important for prominent organizations, given their greater likelihood of media coverage, linkages with organizations outside their movement would be clear boundary violations and could call into question the validity of claims regarding their separation. For example, inter-organizational links between the Discovery Institute and the Institute for Creation Research (both well-known organizations) could be cited by ID-critics as evidence that ID is not truly distinct from creation science. However, a link between the Access Research Network and Probe Ministries, two less well-known organizations in the ID and creation science movements, would not present as much of a challenge to the separation of ID and creation science.

The first citation list collected was from the Center for Science and Culture at the Discovery Institute. This organization is widely considered to be the center or leader of the movement (Branch 2011; Davey and Blumenthal 2006; Dowd 2007; Goodstein 2005, Forrest

2011; Pennock 2011; Rudoren 2006). Indeed, its ‘Fellows’ list includes many of the leading theorists/ ‘researchers’ in the ID movement, including the three most well known outside the movement, Michael Behe, William Dembski and Phillip Johnson. This organization was the only one identified by ‘external’ sources; all others were included through the website citation collection. Starting with this citation list, I then collected the citation list of these websites. In total, this website citation list collection was performed three times, yielding a total of 408 website citation lists.

When I finished collecting the website citation data, I sorted the names in order to correct misspellings or incorrect word order. This was necessary not only due to typing errors, but also due to abbreviations/colloquialisms on the websites. When creating website hyperlinks, website authors often include only part of the organization’s name they are linking to. For instance, when linking to the Discovery Institute’s Center for Science and Culture, the link text might read ‘Center for Science and Culture’ or ‘Center for Science and Culture – Discovery Institute.’ If the organization a hyperlink pointed to was not apparent by the text, the link was manually followed to determine the organization linked to. The varying names of one organization had to be made consistent to avoid missing actual linkages between organizations, as well as creating a link between two organizations that doesn’t really exist, although this is much less likely. The initial website sample yielded 11,026 website entries. After manual cleaning (e.g., removing duplicates, spelling errors) the citation data, the 408 website citation lists yielded a total of 7,980 unique websites. Figure 1 displays the website citation network collection steps.

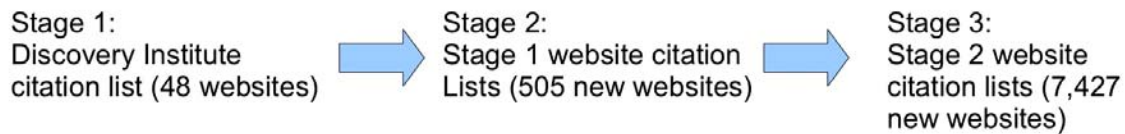


Figure 1. Website Citation Collection Steps

Figure 1 graphically represents the website citation collection. Stage 1 on the left hand side of Figure 1 represents the Discovery Institute (DI) website and its citation list, totaling 48 websites. Stage 2 represents the websites cited by the websites listed by DI in stage 1. 505 new websites were added in stage 2. Stage 3 represents the websites cited by the websites collected in stage 2, adding 7,427 new websites. Note that this website network served as the basis for the secondary sample of organizations for the analysis of the inter-organizational ties formed by commonly-referenced individuals, not references by their websites.

Once the website citation data was cleaned, I imported the data into Pajek and UCInet in order to analyze the data and create the sample of organizations with their web links as one mode data. The next stage of data collection involved collecting the list of board and advisory members for all organizations identified in the first stage of collection. This is two-mode data, since the networks were made up of organizations and individuals. It's important to note that, because the website citation data included all websites on the organizations' links pages, the website citation network includes both websites of real organizations and personal websites (Bjorneborn 2006). What I mean by websites of 'real organizations' is when the website is created by an organization, not an individual, to provide information to the public and to advance the organization's goals. In this case, the website is only one tool the organization uses and the organization itself exists independently of the website. In the case of 'personal websites,' the

website is an end in itself. There is no organization that exists independently of the website; indeed, these websites are most commonly used for personal expression. They do not represent a significant financial or professional investment in promoting a certain scientific perspective. While they were useful for determining the most commonly cited organizations (degree centrality) in the ID movement, they were not appropriate for inclusion in the second stage of data collection.

Once I had collected the website citation network, I removed all organizations with a degree centrality (undirected) of 4 or lower before their organizational board and advisory membership was collected. This selection method is similar to the selection of ‘authority’ pages (Kleinberg 1998). Kleinberg, in the context of web querying, defined ‘authority’ as the websites most relevant to a particular search term, which does not always equal the number of times that term is used in a webpage. Authorities, according to Kleinberg, should also have overlap in the sets of pages each authority is linked to. These commonly-linked sites are called ‘hub’ pages and the prevalence of links by hub pages can be used to determine which websites are true authorities on a given query.

My sampling methodology differed from Kleinberg’s as I considered all organizations with a minimum degree centrality of 5. As my research goal is to measure the extent of boundary work between ID and other scientific movements, using the same method to identify authority pages would not be appropriate. For one, Kleinberg’s method is based on an initial textual query and a subsequent refining of the results to authority pages. This would exclude results not containing the phrase “intelligent design” and would significantly inhibit the measurement of boundary work. Indeed, a large portion of the network resulting from my sample would have been excluded outright, severely limiting the examination of boundaries. In addition, since my

primary analysis is of the inter-organizational network, excluding certain organizations from analysis would not be appropriate, since even limited connections between two scientific movements is of interest in this research. Of the initial sample of 7,980 websites, the resulting website sub-network had 271 websites with a minimum degree centrality of 5 ties.

There are two reasons I used degree centrality of 5 as the minimum for inclusion in the board network sample. One was to establish a minimum level of connectedness in the website network higher than a single website citation. A degree centrality of 1 or 2 likely reflects at most a tangential relationship to the ID movement. Gondal (2011: 23), while analyzing citations in sociological literature, used a similar inclusion rule. In addition, websites of this low degree centrality are more likely to be personal websites, since they will not be as well known or considered authorities in the movement. Of the websites in the minimum centrality of 4 network and not already included in the sample, I found that 67% were indeed personal websites or information-only websites, and were thus not in the scope of this data. Of the 33% of new websites that represented actual organizations, 52% were bioethics or medical organizations, with no bearing on the intelligent design – Evolution debate. Therefore only about 17% of new websites were organizations of interest to this study. Furthermore, the organizations that were involved in the ID/creationism movement were all local, often single city-based organizations, which are often little more than discussion groups. Thus, these do not have a prominent role in the national controversy.

The other reason I limited inclusion in the board network to website degree of 5 was practical. It is very time consuming to collect board data, so using this limitation allowed me to complete data collection in a reasonable amount of time. Even with this limitation, it still required about 2 years to complete primary data collection (website citations and

board/membership names), which does not include follow-up research I performed while cleaning the website and board network data. Including organizations with a website degree centrality of 4 or lower would have made the data collection timeframe unmanageable.

6.2 STAGE 2: INDIVIDUALS RECOGNIZED BY ORGANIZATIONS

Using the website sub-network sample with a minimum degree centrality of 5, I collected the individuals recognized as intellectual or organizational leaders for all organizations included in this sample. This included board memberships, fellows list, advisory boards, etc. This data is two-mode network data, as it represents ties between organizations and individual members of those organizations. When actors are affiliated with multiple organizations, this creates ties between these organizations. This tie is evidence that the two organizations consider each other as allies or at least friendly. Further, it is likely that communication between the two organizations will be facilitated by this personal connection. This data was usually available on organizations' websites; however, I also consulted federal tax documents for this data.

Organizations' boards of directors make high-level decisions regarding organizational agendas and decisions. Moreover, individuals are often members of multiple boards, creating the possibility of information and agenda sharing between organizations. Earlier research on board networks, often called interlocking directorates, in the corporate and non-profit sector has found that this network not only exists, but that it affects certain outcomes for organizations. Studying the connections between the corporate community and non-profits, Sakman and Domhoff (1983) found that non-profits, including institutions such as universities, are part of the corporate community in terms of their inter-organizational ties. According to their data, non-profits are

actually highly connected and centrally located in the corporate network, except when analysis is limited to board officers. Analyzing the connections among what they call financial “interest groups”, which are several organizations that are communally controlled, Mintz and Schwartz (1983) found wide connections and interdependencies among financial firms, with cliques forming only along functional lines.

In his book, *Who Rules America*, G William Domhoff found that ultraconservative think tanks became more central in the national policy network between 1973 and 1990 (Domhoff, 2002: 83). Domhoff also found that the leaders of many think tanks occupy high-status positions in the corporate community and the social structure of the United States. “Over 90 percent of the policy-group directors who sit on the boards of two or more organizations are corporate executives, mostly from very large corporations. About half attended high-status universities as undergraduates, and half are in upper-class social clubs, though only a small percentage of them are from upper-class families originally” (Domhoff, 2002: 84).

During this stage of data collection, I recorded the board memberships of each organization included in the sample. Besides standard board memberships, I also recorded the membership of boards of advisors or fellows. While these boards do not set the agenda or goals of the organizations directly, they do play a role in the work of the organization by acting as a source of information/opinion and/or by pursuing research of interest to the organization. They also give concrete evidence of the goals and claims of an organization by showing what individuals an organization is willing to associate itself with. Making an individual a fellow of an organization indicates support for the individual’s research or scientific opinions, and often involves a stipend or research grant. For instance, the Discovery Institute’s Center for Science and Culture lists William Dembski as a fellow on its website. This shows that the Discovery

Institute endorses at least some of Dembski's claims and goals, since they are willing to publicly associate with him. In contrast, few if any scientific organizations outside the ID movement would be willing to associate themselves with or support Dembski, due to his opinions regarding the theory of evolution and intelligent design. Including advisors/fellows is necessary in order to examine the boundaries between different organizational/scientific fields. Thus, including the fellows/advisors of organizations adds to our total picture of the inter-organizational linkages between organizations and, therefore, boundary work.

Senior staff members were also included in this stage of data collection, as they also play a role in the agenda and goal setting of an organization. Often they are included in the board of directors. Only staff whose position would allow them to influence the policy of the organization, such as executive directors or vice presidents, were included. The inclusion of senior staff also adds to the inter-organizational network of organizations.

During this phase of data collection I excluded websites that did not have an independently existing organization (as described above). There were two reasons I excluded these websites from the inter-organizational network collection. One was practicality; these websites were often poorly constructed, including little more information than a single page of individually written content. Thus, it was often difficult if not impossible to identify who was the owner/author of the website. This would create a bias toward professionally-maintained personal websites as opposed to more amateurish websites. Another challenge posed if this source of data were to be included was the frequent lack of accompanying information about the website authors, such as degrees held, current/past professional positions or other individual-level data. Without this additional information, substantial error could be introduced into the inter-

organizational network by false-positive links. By excluding these websites from inter-organizational network collection, I avoided facing these data difficulties.

The other reason I excluded individual websites was to keep the inter-organizational network data uniform. The focus of this research is on the network of organizations associated with ID by commonly referenced individuals. Including individuals who made personal websites would take the focus of this research away from organizations and more toward a study of Internet behavior. While we can say that individuals promoting ID on the web are, in a sense, part of the ID movement, they are in a category distinct from organizations. Most of these websites are meant more for other ‘believers’ already in the movement. Their language, graphics and arguments are often harsh toward evolution and those who support it. They are not meant to bring in more adherents to the movement, at least any that do not already have a rather strong critical view of evolution. On the other hand, most ID (and creationist) organizations take a much more restrained and subdued approach to communicating their opinions of evolution. Their goal is to appeal to the general public, who may or may not have much knowledge of evolution. These organizations often use professional prestige (members with doctorates, having a ‘graduate school’, etc) to appeal to the general public. Organizational websites used more restrained language in order to appeal to potential ID adherents, similar to findings about extreme right-wing websites (Daniels 2009, Futrell et al. 2006, Gerstenfeld 2003: cited in Blee and Creasap 2010). Thus personal websites and organizations play different roles in the ID movement; excluding personal websites from the inter-organizational network maintains the focus on movement organizations and the role they play in recruiting more adherents to the movement.

There were two sources of data used during this stage of data collection, organizational websites and 990 tax forms. Many organizations provide their boards of directors on their websites, as well as senior staff members and boards of advisors. However, this information is often not comprehensive and sometimes not available at all on the organization's website. As a result, I also turned to the second data source, 990 tax forms, to complement any information found on an organization's website. 990 tax forms are annual financial/organizational summaries the IRS requires non-profit corporations to complete, as long as the non-profit has an annual revenue of \$25,000 or more. They are made available to the public by the IRS via the website 'Guidestar.org.' (While no evidence of a formal relationship between the IRS and Guidestar could be found, the IRS does point to Guidestar as a source of nonprofit tax information.) In addition to their revenue information, 990 forms also include the organization's board of directors and staff members. I also used 'Guidestar.uk' for organizations located in the UK. The information obtained from the UK version of Guidestar is similar to that found on the US version. This information was usually more comprehensive than the organization's website and therefore provided a valuable complement to the information found on the website. Of the total 145 organizations with board/membership data collected, 990 forms from Guidestar or equivalent information from Guidestar UK was used in lieu of or supplemental to website information for 75 organizations (52%). While the quality of data pulled from 990 forms varied in a similar fashion as the board data from websites (large, more formalized organizations with greater resources provided more complete data), the official nature of these documents, with the associated penalty for misrepresentation, makes these data trustworthy.

Once I had collected all the board data, I sorted the data by last name and cleaned the data using similar methods described above. The primary reason this was necessary was the

inconsistencies between how two or more organizations report an individual. One organization may include a middle initial, one may exclude it, while another may include the entire middle name. Organizations may list only first initial, while others may list a shortened version of someone's first name (e.g., Brad instead of Bradley). In order to correctly populate the board network, these inconsistencies needed to be eliminated. This was done in cases where the inconsistency was clearly a reporting difference. However, there were many cases where more than one inconsistency existed, which suggested two names were the same person but this was not immediately clear. For example, one name might be 'Bradley K. Smith' while the other is "Brad Smith.' The second name could be the same person as the first, or they could be 'Bradley N. Smith.' Because this data alone is not sufficient to decide a link exists here, I referenced other information in order to supplement this data. Degrees held, organizational/professional positions, geographic locations, honorifics (e.g., British knighthood), and other data were used to decide if two inconsistent names were the same person or not. Using the example above, if it's discovered that both Brad Smiths are a fellow at the same organization, the inconsistencies would be eliminated, thus creating a tie between the two organizations this person was a member of.

When creating a tie in this situation, I required strong positive information that the two names identified the same person. For instance, if both names were listed as having an MA degree, this was not sufficient to determine that they were the same person. Having an MA degree was not considered as uniquely identifying information. Information such as this was used to supplement more concrete identifying information, such as holding a position in a certain organization. So if two names that looked similar were both listed as fellows at the same organization and both had MA degrees, then the names were made identical and thus a tie was created between the two organizations in the board network. If no uniquely-identifying

information was able to be found, the names were not modified and thus no tie was created between the two organizations the names were connected with. Thus, for these situations, a null tie was considered the default status, and was changed only if uniquely-identifying information was found that confirmed the tie should not be null. As such, the board network data is somewhat conservatively populated; the true network is probably at least slightly denser than represented here, especially for the organizations with very high degree centrality.

The data I collected is available to the public and available on the Internet. This information came in the form of organization websites and IRS forms. All materials gathered were public domain information: I did not use interviews or any other method to obtain non-public information. The data in this paper represents a multi-year cross section of the website and inter-organizational network of the ID movement. Organizational and website data collection began in January 2007 and ended in January 2009. The time involvement required to collect this amount of data made a roughly two-year data collection stage necessary. I included three years of tax data; 2004, 2005 and 2006. These three years were chosen because they were the most commonly available. Tax forms from 2003 or earlier were commonly ‘archived’ by Guidestar, and were therefore no longer available. The 2007 tax forms were only available for a small minority of organizations, so these were not included to maintain data consistency across all organizations.

As a result of my data collection procedures, there is a time dynamic in the data, in the sense that changes in organizational board membership could have occurred between the start of data collection and the end. The data is not longitudinal; I did not explicitly follow the organizational memberships of a specific cohort. Nor is the data truly cross-sectional, since not all data collection occurred at more or less the same time. Rather, the data is mostly cross-

sectional, but has an unavoidable element of time included in it. This makes interpretation of the data slightly different than if it was fully cross-sectional. For instance, according to the data an individual might be a member of three organizations' board of directors. However, the individual may have only been a member of two organizations' board simultaneously; they may have quit one and then joined another, but not belonged to three all at the same time. If this occurred during the time of data collection, the individual would be recorded as belonging to all three organizations' boards. Therefore, when interpreting the data analyzed in this paper, it is important to note this time element. Thus, this data represents of picture of the ID movement over roughly two years.

I do not consider the two-year span of data collection to be a significant problem in the data. When looking at multiple years of tax data, it becomes clear that board memberships in the ID movement are quite stable. For the majority of ID organizations, board memberships did not change significantly, or sometimes at all, over the two years of data collected. This is probably a result of the small and insulated character of the ID/creationist movement, as opposed to mainstream science, where I found much higher turnover of board memberships.

I also do not expect the advisor/fellow board memberships to be affected by the time span for data collection. The ID movement has been in existence for over 15 years and has garnered significant media attention, resulting in numerous denunciations by mainstream science through proclamations, books, scholarly journal articles, etc. The rejection of ID from the overall scientific community by the members of that community is well known at this point, even prompting protests from ID supporters (<http://www.imdb.com/title/tt1091617/>). Thus, we would expect much of the boundary work between mainstream science and the ID movement to have already occurred and not to fluctuate during the time period for data collection.

Any actual fluctuations also should not affect the interpretation of the results significantly. As the main analyses deal with the inter-organizational network linkages, a two-year time span should not be sufficiently long enough to cut the lingering personal ties between two organizations. Both personal and professional linkages of the formerly shared member will not dissipate immediately. Thus, an informal linkage between these two organizations now exists.

To summarize, data for two networks was collected: website citations made up the initial network and inter-organizational linkages made up the second network. The website citation network was comprised of 7,980 websites with 10,949 links between the websites. This network provided the sample of organizations for the inter-organizational network and will not be included in any subsequent analysis, as this data does not help address the research questions (see above). The inter-organizational network was comprised of 146 organizations with 456 connections between these organizations. These connections represent commonly referenced individuals between these organizations, usually in the form of organizational fellows or ‘advisory’ board members. This will be the network analyzed in subsequent sections. In particular, see section 7.0 for a discussion of how I coded the organizations into different groups based on their organizational characteristics.

7.0 THE INTELLIGENT DESIGN INTER-ORGANIZATIONAL NETWORK

Figure 2 below shows the graph of the inter-organizational network. Note that isolates, organizations with no shared individuals, have been removed for ease of interpretation. There were 61 isolated organizations in the network (see Table 4). Each dot (vertex) represents an organization and the labels identify what organization each vertex represents. The size of the vertices reflect the number of intellectuals each organization shares with other organizations (i.e., a larger vertex indicates a greater number of shared intellectuals). A line (edge) indicates at least one shared board member between the two connected organizations.

This network consists of the shared membership between organizations of both regular organizational boards and boards of advisors and fellows; this set of data will be the primary data analyzed here. This data represents the overall inter-organizational connections between different scientific movements, represented by the set of organizations presented in Figure 2. As science and scientific movements rely on individuals (i.e., scientists⁶) to do the work of promoting and developing the movement (Frickel and Gross 2005), fellow/advisory boards, almost always made up of well-known scientists or intellectuals in their respective fields are essential to the examination of boundaries between the different movements. As described above, the sample of organizations initially started with the Discovery Institute and followed their web citations three steps. The inter-organizational connections of those organizations are represented in Figure 2, with the organizations without commonly referenced individuals excluded for ease of interpretation.

The organizations have been arranged roughly into groups based on the scientific/intellectual movement to which they belong, denoted by the colors of vertices for each group. For example, all of the ID and creation science organizations are on the right side of the figure, with yellow vertices. This configuration of organizations is useful for examining the extent of boundary work completed between different scientific/intellectual movements, particularly between ID and other movements. The existence of lines between different groups constitutes a commonly recognized individual between those movements and therefore an underdeveloped boundary between those movements. Note that the configuration of the

⁶ I use the term ‘scientist’ here since I consider the various movements here as scientific/intellectual movements (Frickel and Gross 2005) in general. This should not be interpreted as an attempt to consider all the various movements here as truly ‘scientific.’ Much has been written about how various individuals and organizations represented in the network considered here are not scientific and I do not take issue with those conclusions. Rather, I consider all movements equally here in order to examine the boundary work between them.

organizations here is for visual interpretation and does not reflect any mathematically-derived configuration based on network structure or attributes. However, see the ERGM analysis section for evidence that these categories do contribute to the network structure.

The organizational fields used here were manually coded using the organizations' mission statements (Appendix B) and/or other information on the organizations' websites. Organizations were coded as intelligent design (ID) or creation science (CS) (yellow vertices in Figure 2) if they promoted ID and/or creation science. ID was defined as the act of denying the origin of life (or parts of life) as a result of Darwinian evolution and the claim that some elements of life needed input (i.e., design) in order to exist. Creation science was defined as the claim that the Bible is inerrant in all matters. While this almost always included statements denouncing evolution, this was not necessary for categorization into CS. Note that many CS organizations listed ID claims as evidence of the impossibility of evolution, but not as replacements to the Bible. There were 56 total organizations in this field, with 43 isolates.

Organizations were coded as mainstream science (green vertices in Figure 2) if they worked within "normal science" (Kuhn [1962] 1996). There were 13 organizations in this field, with zero isolates. These organizations worked within established paradigms and often were professional organizations for scientists working in certain subfields. For example, the Geological Society of America was coded as mainstream science, since it represents geologists working within the established paradigms of geology (e.g., uniformitarianism, plate tectonics, etc). In contrast, the Institute for Creation Research, which rejects uniformitarianism and accepts catastrophism (i.e., "Biblical Geology") was coded as creation science, even though both organizations deal with the topic of geology.

In contrast, organizations were coded as pseudo-science (red vertices in Figure 2) if they promoted topics and methods that are not generally accepted within normal science. For example, the study of ‘psi’ or ‘the use of remote viewing’ (i.e., ‘psychics’) were common examples of pseudo-science topics. There were 16 organizations coded as pseudo-science, with 3 isolates. On the other hand, organizations were coded as pro-science (light purple vertices in Figure 2) if they promoted the use of accepted scientific methods to understand or explore topics not traditionally considered in science. For example, SETI Institute uses radio telescopes, which is an entire subdiscipline in astronomy, to search for extraterrestrial intelligence. There were 13 organizations coded as pro-science, with 5 isolates. In contrast, Ufology organizations (Fund for UFO Research and Mutual UFO Network) use unverified pictures, videos and verbal accounts of UFO sightings to make their claims. Some organizations do actual scientific research (like SETI) whereas other organizations simply promote the use of scientific methods/reasoning to understand certain subjects, like the Skeptics Society.

Organizations primarily devoted to studying ethical problems were coded as Ethics organizations (dark blue vertices in Figure 2). There were 20 such organizations, with 3 isolates. Almost all of these organizations were geared towards medical or bioethics. Organizations that promoted primarily biblical ethics were not included in this category. For example, many of the creation science organizations also dealt with ethical issues, but this was not their primary issue. Likewise, the two pro-life organizations, Priests for Life and Students for Life of America were both biblically-oriented and single-issue organizations (the ethics organizations were not single-issue), and therefore were not included in the Ethics subnetwork.

Finally, the Science-Religion subnetwork (purple vertices in Figure 2) is made up of organizations that explore and debate the ‘intersection’ of science and religion. This

‘intersection’ is made up of topics that both science and religion deal with, like the origin of life, the characteristics of humanity, nature of the universe, etc. The main characteristic that differentiates these organizations from the creation science and pro-science organizations is that the Science-Religion organizations consider a cooperative synthesis of science and religion. Rather than promoting biblical understanding before all science (creation science) or dismissing religious understandings in favor of scientific (pro-science), these organizations attempt to weave the two traditions together. For example, the American Scientific Affiliation is an organization made up of Christian scientists that, in stark contrast to the creation science movement, has accepted theistic evolution (Numbers 2006:181). Indeed, the CS movement has actually denounced the American Scientific Affiliation for that exact reason (Numbers 2006:259, 353). There were 23 organizations in this field, with 6 isolates. Table 1 lists the organizations in Figure 2 by organizational field categories. The following sections consider each subnetwork more closely.

Table 1. Inter-organizational network organizations by organizational field categories

<u><i>Intelligent Design/Creation Science</i></u>
Access Research Network
Answers in Genesis
Creation Ministries International
Creation Research Society
Discovery Institute: Center for Science and Culture
Institute for Creation Research
Intelligent Design and Evolution Awareness Center
Intelligent Design Undergraduate Research Center
International Society for Complexity, Information and Design
Kolbe Center for the Study of Creation
Origins/Leadership University
Probe Ministries
Triangle Association for the Science of Creation

Mainstream Science

American Association for the Advancement of Science
American Astronomical Society
American Institute of Biological Sciences
American Institute of Physics
Astronomical Society of the Pacific
Geological Society of America
National Academy of Sciences
National Association of Biology Teachers
National Science Teachers Association

Pseudo Science

Cognitive Sciences Laboratory
Farsight Institute
Global Consciousness Project
Institute of Noetic Sciences
International Consciousness Research Laboratories
International Society for the Study of Subtle Energies and Energy Medicine
International Society of Life Information Science
Parapsychological Association
Parapsychology Foundation
Rhine Research Center
Scientific and Medical Network
Society for Psychical Research
Society for Scientific Exploration

Bioethics

American Society for Bioethics and Humanities
American Society of Law, Medicine and Ethics
Australasian Bioethics Association
Center for Bioethics - University of Minnesota
Center for Bioethics - University of Pennsylvania
Center for Bioethics and Human Dignity
Hastings Center
HumGen International
International Association of Bioethics
International Network on Feminist Approaches to Bioethics
Joint Centre for Bioethics - University of Toronto
Kennedy Institute of Ethics - Georgetown University
Lindeboom Institute
Nuffield Council on Bioethics
Public Responsibility in Medicine and Research
Southern Cross Bioethics Institute

Wellcome Trust

Pro-Science

Boundary Institute
Committee for Skeptical Inquiry
Kansas Citizens for Science
National Center for Science Education
New Mexicans for Science and Reason
Planetary Society
Santa Fe Institute
Secular Web Library/Internet Infidels
SETI Institute
Sigma Xi
Skeptics Society

Science-Religion

A Rocha
Affiliation of Christian Geologists
American Scientific Affiliation
Au Sable Institute of Environmental Studies
Canadian Scientific and Christian Affiliation
Center for Theology and the Natural Sciences
Christians in Science
Counterbalance Foundation
European Society for the Study of Science and Theology
Faraday Institute
Ian Ramsey Centre
Institute on Religion in an Age of Science
International Society for Science and Religion
John Ray Initiative
John Templeton Foundation
Metanexus Institute
Science and Religion Forum
Zygon Center for Religion and Science

Note: Disconnected organizations, anti-abortion organizations, and Ufology organizations not included.

7.1 MAINSTREAM SCIENCE SUBNETWORK

The organizations in the central area of the network, with green vertices, can generally be described as mainstream scientific organizations. These organizations are (more or less) directly involved with production of scientific knowledge and/or the professional interests of scientists. Figure 3 below shows this subnetwork, with only inter-organizational connections common to the subnetwork included. The American Association for the Advancement of Science (AAAS) is prominent in this group, which is directly connected to all other organizations in this subnetwork and shares a large number of ties to other organizations outside this subnetwork, as shown in Figure 2. Other organizations include the American Institute of Biological Sciences, the National Academy of Sciences, the American Institute of Physics, the American Astronomical Society, and the Astronomical Society of the Pacific.

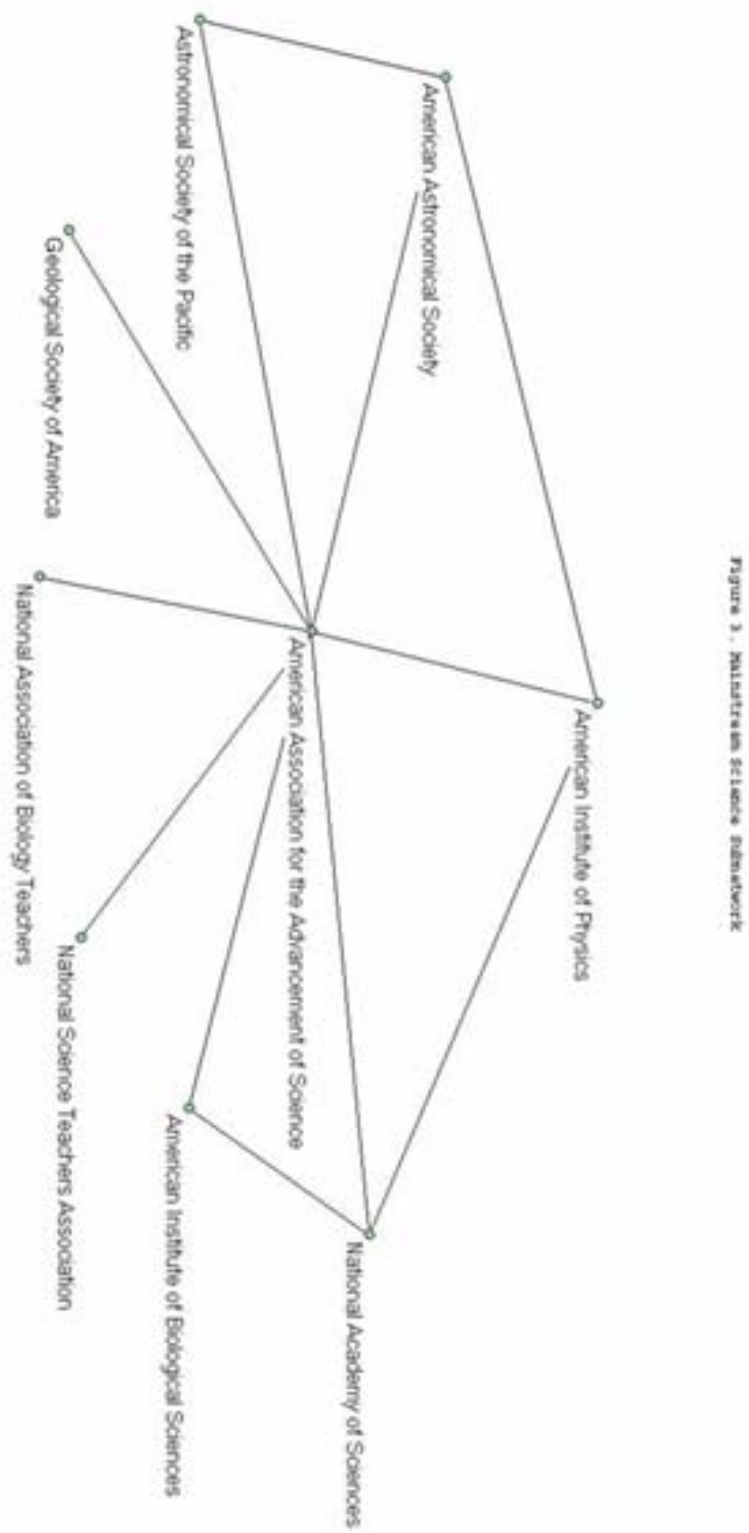


Figure 3. Mainstream science subnetwork

7.2 PRO-SCIENCE SUBNETWORK

Below the central area (denoted by light purple vertices) we find organizations that are predominantly oriented toward promoting scientific understanding or defending science against religious intrusion. In contrast to the mainstream scientific subnetwork discussed above, some of these organizations promote the use of accepted scientific methods to understand or explore topics not traditionally considered in science. Some organizations, like the Boundary Institute, the Santa Fe Institute, and SETI Institute, promote the use of scientific methods to explore new areas of inquiry. Some deal with challenges to science from external organizations, primarily regarding public school science curriculum. For example, the National Center for Science Education exists to protect science curricula (especially evolutionary studies) against restrictions introduced by religious activists. Kansas Citizens for Science plays a similar role but not at the national level. The Committee for Skeptical Inquiry, an organization that “promote[s] scientific inquiry, critical investigation, and the use of reason in examining controversial and extraordinary claims” (http://www.csicop.org/about/about_csi) and whose co-founders include Carl Sagan, is prominent in this subnetwork. Other organizations in this group include the Skeptics Society, New Mexicans for Science and Reason, and Internet Infidels. Figure 4 displays the subnetwork.

Note that Kansas Citizens for Science and Sigma Xi have connections to the ‘science-religion’ subnetwork (described below) but none internal to the pro-science subnetwork. Kansas Citizens for Science was formed to advocate for science standards in Kansas public schools, particularly to resist the inclusion of ID theory into the science curriculum (<http://www.kcfs.org/>). The lack of any connections between Kansas Citizens for Science and any other pro-science organizations probably reflects the state-level nature of this organization, while its connection to the Religion-Science subnetwork likely indicates an attempt to work with

the theological community to resist the inclusion of ID theory into the science curriculum. Sigma Xi, a scientific honor society, may also have links to the Science-Religion subnetwork for similar reasons, possibly on the issue of human rights and scientific research (<http://www.sigmaxi.org/programs/issues/index.shtml>).

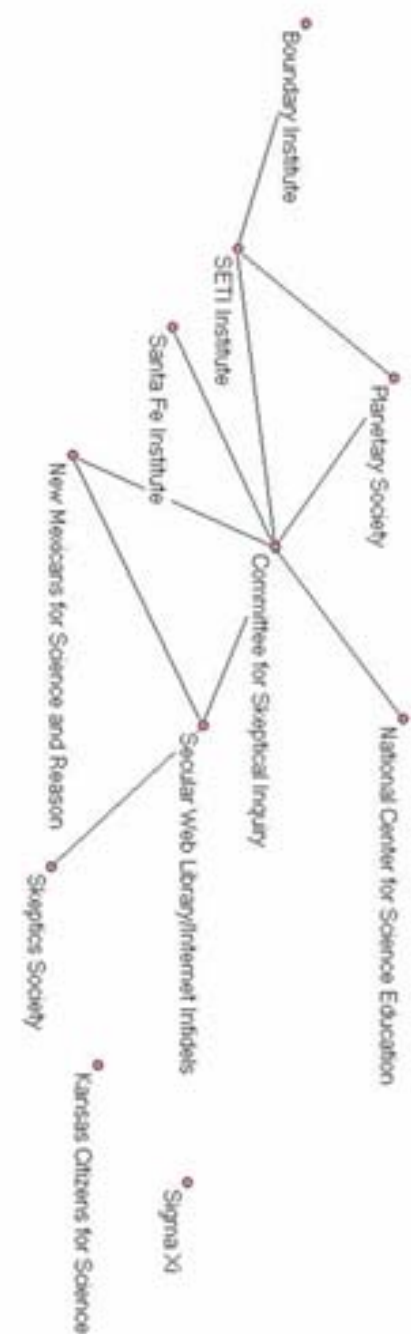


Figure 4. Pro-science subnetwork

Figure 4. Pro-science subnetwork

7.3 SCIENCE-RELIGION SUBNETWORK

The lower left side of the network, denoted by dark purple vertices, can be described as the ‘science-religion’ subnetwork. These organizations deal with the intersection of science and religion, attempting to resolve conflicts between the two knowledge systems, and/or promoting the combination of science and religion to answer philosophical questions. Well-known organizations here are the Metanexus Institute, the John Templeton Foundation, an early funding source of ID⁷, and the American Scientific Affiliation, an organization of Christian scientists who reject creation science (Numbers 2006). The presence of so many organizations devoted to considering the conflicts between scientific and religious understanding is not surprising, as many observers consider creation science and ID theory to be nothing more than religion masquerading as science (Forrest 2004; Scott 2001). Note that many of the organizations in this subnetwork are connected to the mainstream scientific organizations. Figure 5 displays this subnetwork. With the exception of the Affiliation of Christian Geologists, this subnetwork has a relatively dense set of internal inter-organizational connections, reflecting a cohesive intellectual community among these organizations.

⁷ See <http://www.thenation.com/article/god-science-and-philanthropy?page=full>.

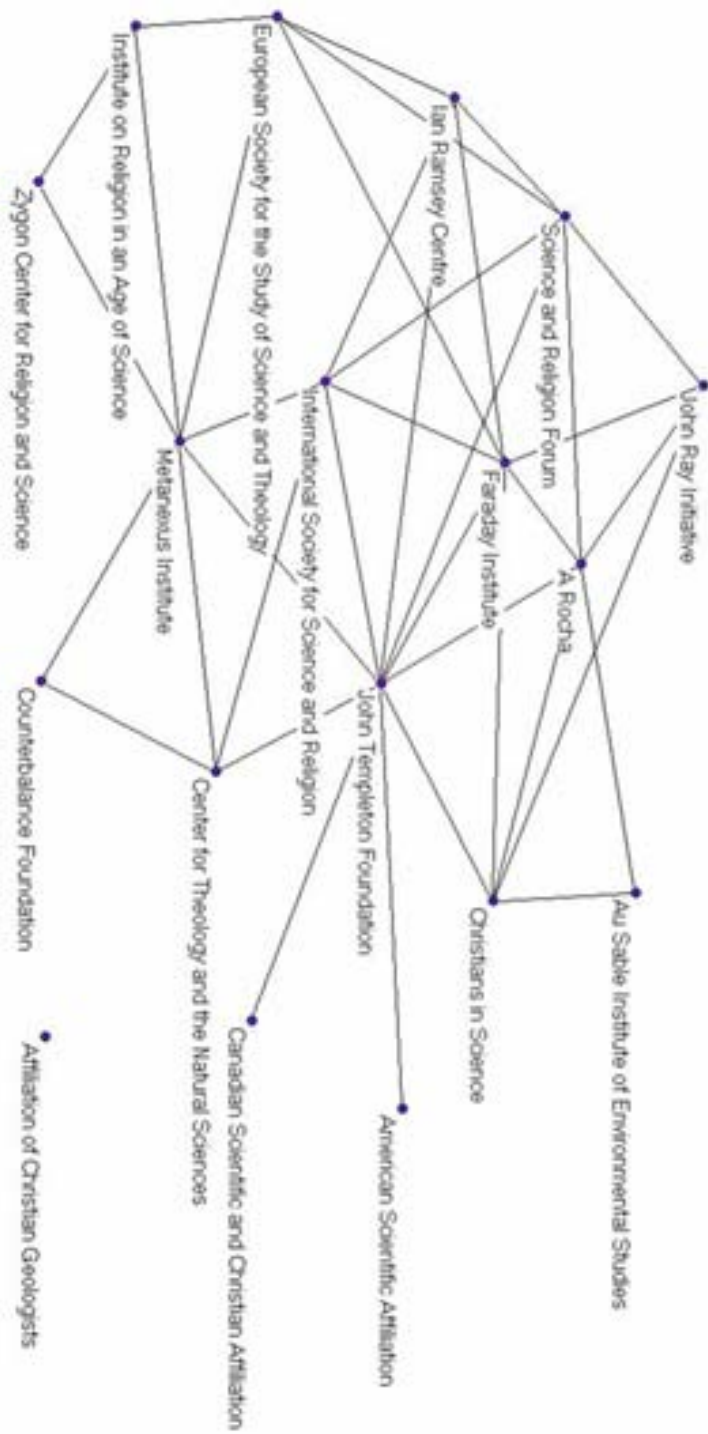


Figure 5. Science-Religion subnetwork

Figure 5. Science-Religion subnetwork

7.4 BIOETHICS SUBNETWORK

The upper left area of the network is comprised of bioethics organizations, which deal mostly with the ethics of science and medicine (blue vertices). The presence of these organizations is due to the science-religion subnetwork, and the extensive ties between these two subnetworks and the mainstream science subnetwork are clearly shown in Figure 2. Although bioethics is more tangentially related to the ID-evolution conflict, these organizations nevertheless were included in the citation network and therefore in the inter-organizational network above. Figure 6 provides a closer look at this subnetwork. The Hastings Center, a bioethics research institute founded in 1969, is clearly the most well connected organization in this subnetwork.

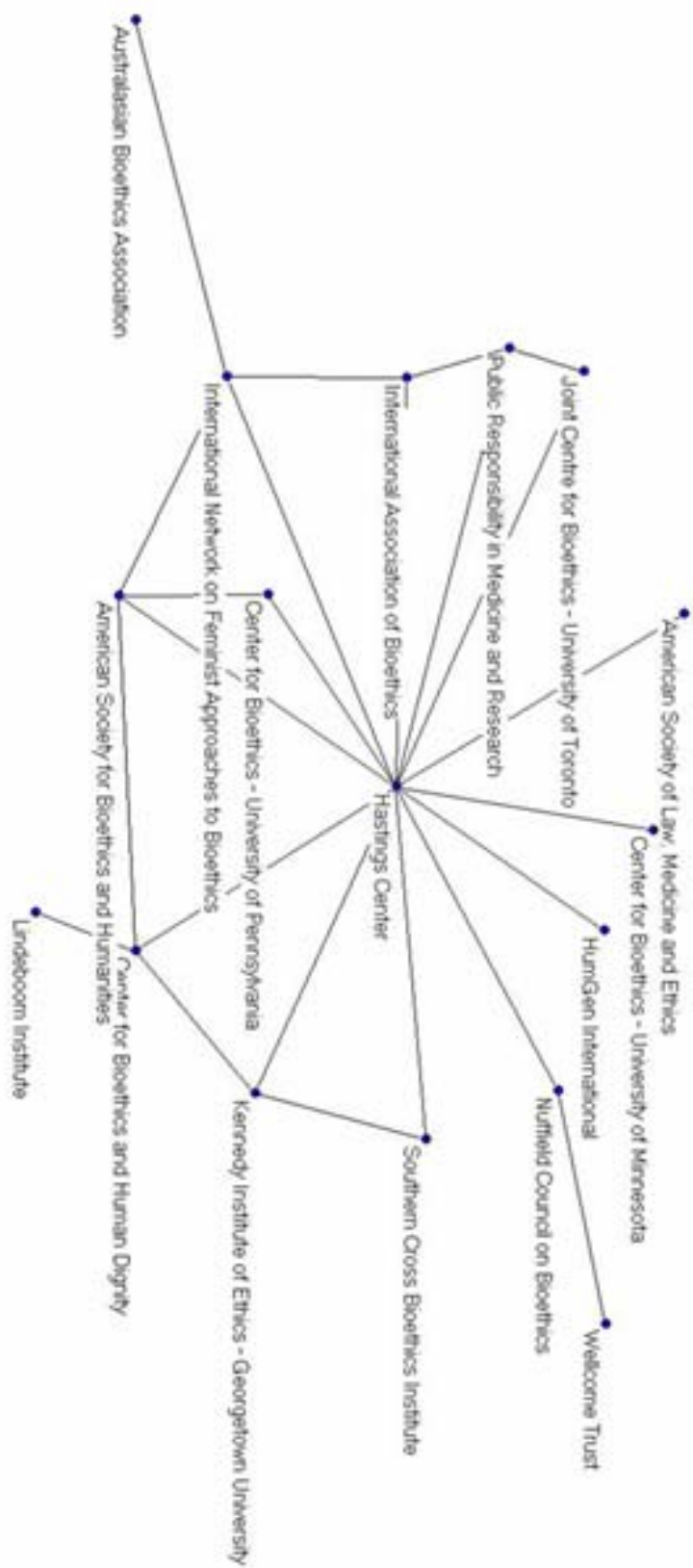


Figure 6. Bioethics subnetwork

Figure 6. Bioethics subnetwork

7.5 PSEUDO-SCIENCE SUBNETWORK

The organizations above the central section of the network, denoted by red vertices, can be described as fringe science or pseudo-science organizations. Almost all of these organizations deal with non-mainstream psychology, or ‘parapsychology.’ Note that the Society for Scientific Exploration has ties to the AAAS. This demonstrates that this organization has traditionally-trained scholars among its recognized intellectuals. For example, Dr. Charles R Tolbert, a professor of astronomy at the University of Virginia, was a fellow of the AAAS and a president emeritus of the Society for Scientific Exploration. This subnetwork is shown in Figure 7.

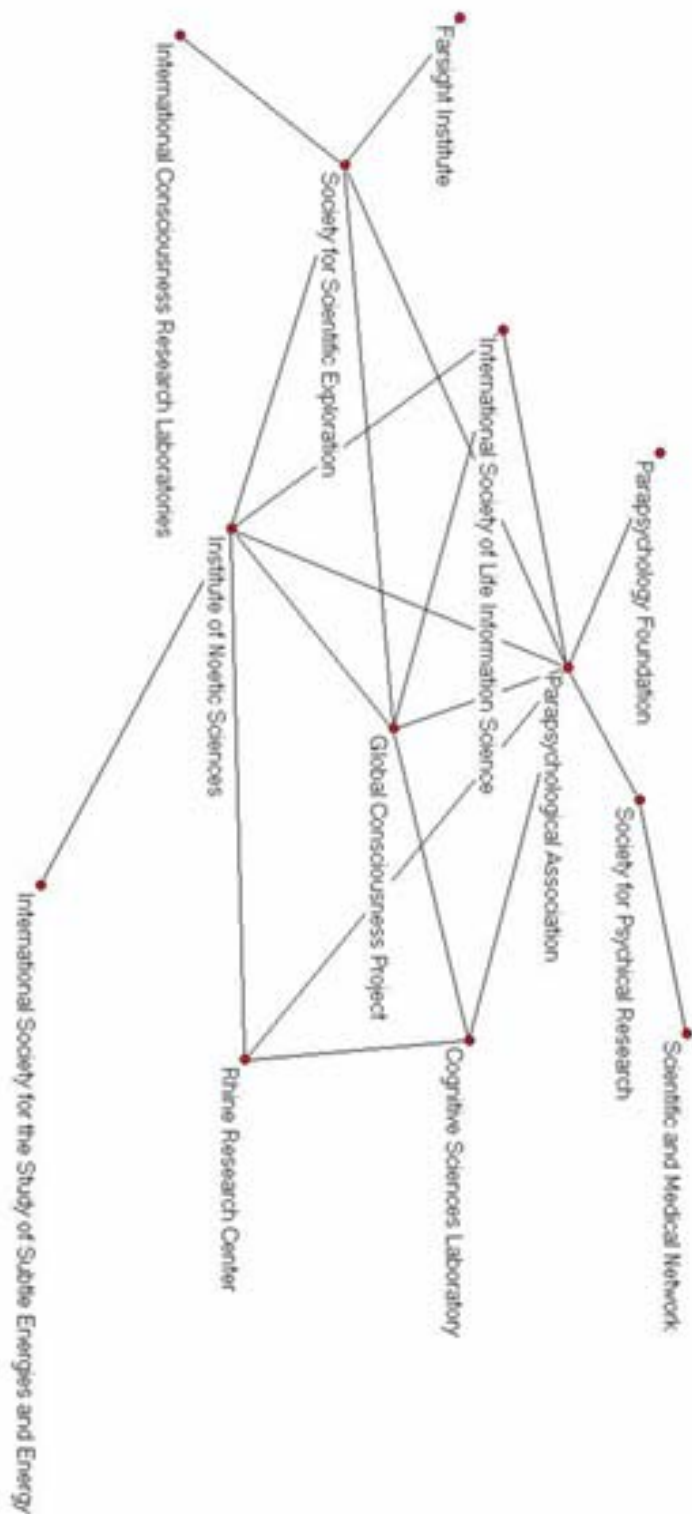


Figure 7. Pseudo Science subnetwork

7.6 INTELLIGENT DESIGN/CREATION SCIENCE SUBNETWORK

Finally, the right side of the network can be called the ‘intelligent design/creation science’ area of the network. However, we see that this area of the network is not highly interconnected. The organizations in the upper area are all creationist organizations. The Creation Research Society and the Institute for Creation Research are the most well known American creationist organizations and have played a role in many religiously-derived challenges to teaching evolution in public schools. Answers in Genesis is the organization that built and runs the controversial Creation Museum in Kentucky. Note that these organizations are linked to the rest of the network with only one connection and are therefore highly marginal to the overall inter-organizational network. Other creation organizations include the Triangle Association for the Science of Creation, which is not connected to any other organizations in the subnetwork, Probe Ministries and the Kolbe Center for the Study of Creation, both connected to the Discovery Institute but not the main creation science organizations, and Leadership University, an organization of Christian scholars which shares several ties with ID organizations. The other organizations in the subnetwork are intelligent design (ID) organizations. The Discovery Institute, the International Society for Complexity, Information and Design, Access Research Network, Intelligent Design and Evolution Awareness Center, and the Intelligent Design Undergraduate Research Center comprise the ID group.

Figure 8 below provides a close-up view of this subnetwork. ID organizations have grey vertices while creation science organizations have orange vertices. This differentiation allows within-subnetwork comparisons and does not indicate a boundary between ID and CS organizations.

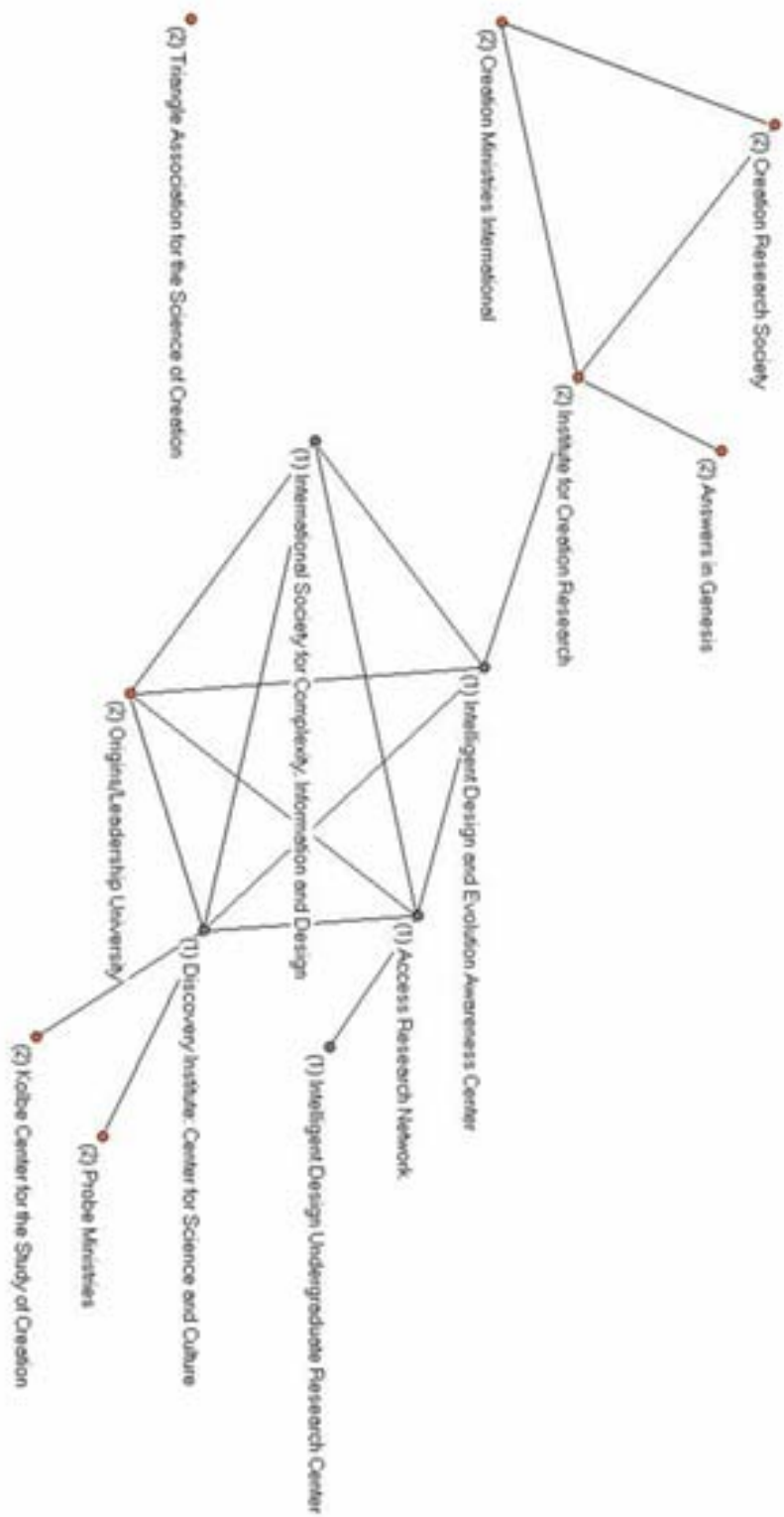


Figure 8. Intelligent Design/creation science subnetwork

Figure 8. Intelligent Design/Creation Science subnetwork

In Figure 8 notice the extent of direct connections between the ID and creation science organizations. With the exception of the Intelligent Design Undergraduate Research Center, there are creation science organizations directly connected to each ID organization. The Discovery Institute has direct connections with three organizations of this type: Probe Ministries, the Kolbe Center for the Study of Creation, and Leadership University. Probe Ministries promotes a fundamentalist biblical interpretation of many facets of knowledge and society, the origin of life included. The Kolbe Center for the Study of Creation is a lay Catholic organization that promotes creation science. Leadership University connects scholars with a Christian view of the world and is affiliated with Campus Crusade for Christ International. Note that Leadership University is directly connected to almost all of the ID organizations. Finally, as noted above, the Institute for Creation Research is directly connected to the Intelligent Design and Evolution Awareness Center.

One other creation science organization, the Triangle Association for the Science of Creation, is not directly connected to any of the ID or other creation science organizations. The isolation of this creation science organization from all other ID/creation science organizations, the lack of direct connections between Probe Ministries, the Kolbe Center, and the larger creation science organizations, as well as the large number of CS isolates (discussed below) suggest differing strategies among creation organizations, as well as a type of competitive marketplace of creationist organizations. Rather than working together and sharing ‘expertise’ (in the form of creation scientists) some organizations remain separate, likely to differentiate themselves to attract followers. Coalition building, measured here as sharing leadership (both organizational and scientific) members, would erode these distinctions. Indeed, many of the creation organizations refer to their organizations as ‘ministries’ with the express purpose of

enlightening individuals to the truth of the Bible. The primary goal of such organizations is to recruit new membership, rather than promote goals that do not directly affect their organizational viability (e.g., teaching creation science in public schools). In essence, they present a slightly different take on creation, as well as other facets of Christianity, in order to attract dues paying followers and sell various organization-produced media (books, videos, etc).

A primary method of differentiation among creation science organizations is promoting the organization's founder/leader, often through a conversion or enlightenment story. This helps to give the organization authenticity, while at the same time separating this organization from other creation science organizations. These inspirational leaders are presented as trustworthy authorities on biblical issues, especially creation science. For example, the homepage of Answers in Genesis (<http://www.answersingenesis.org/>) has a bio, blog links and upcoming speaking events for the organization's founder, Ken Ham. Other organizations with similar tactics include: the Center for Scientific Creation, the Christian Research Institute, and Reasons to Believe, among others. Books written by and videos created by these leaders almost always are available via their organization's website.

The existence of these creation 'ministries' is due to the quite large potential support base of creation science organizations. In a 2008 survey, 44% of the American public held strict, young earth creationist beliefs (Dawkins 2009: 429) and creation science, since it relies on the Genesis account of the origin of life, is easily recognizable and interpretable by anyone raised within Christianity, Judaism or Islam. Whereas intelligent design theory, with its heavy reliance on information theory, statistical probability and critique of evolutionary mechanisms, is not readily accessible by the general public. Thus ID organizations do not have a large potential base of direct supporters (although they receive referential support by creation science supporters) and

are therefore more likely to share resources (expertise, professional time, etc) and coordinate actions in order to maintain itself as a movement. Indeed, as ID organizations claim they are part of a genuine scientific/intellectual movement, appealing directly to the public for support would be incongruent with this movement strategy. However, further investigation into this possible phenomenon is beyond the scope of this project.

Three main conclusions can be derived from the network connections presented in Figure 2. One, using the inter-organizational network data presented here, we see that the structural connections more or less reflect the professional/ideational boundaries of the different sectors examined here. The overall network density (proportion of actual ties to all possible ties) is only 0.043. In other words, only 4.3% of all possible ties actually exist in the network. This suggests that the actors in the network choose organizations (and vice versa) selectively, mostly due to similar beliefs or scientific goals. Further, given the structural role the mainstream scientific organizations appear to play, especially the AAAS, it appears that all sectors establish links to the mainstream scientific core. This is likely to use the credibility and prestige of these large general scientific organizations to increase their own organizations/fields prestige.

Second, there are two dyads in the bottom right section of the sociogram that are disconnected from the main network. These organizations were included in the website citation network, but do not share any recognized intellectuals with the rest of the inter-organizational network. A look at the organizations making up the two dyads gives us a clear idea of what movement fields these dyads represent. One dyad can be called part of the ‘UFO conspiracy’ movement (Mutual UFO Network and the Fund for UFO Research), while the other dyad is clearly part of the anti-abortion movement (Students for Life of America and Priests for Life). The lack of connections between these two dyads and the rest of the network may indicate that

the movements represented by these two dyads are considered too extreme to be associated with by the movements/fields making up the main network: too non-scientific in the case of the UFO conspiracy movement, too politically and religiously polarizing in the case of the anti-abortion movement. Indeed, given that ID and parapsychology organizations have connections to the mainstream scientific network core, the complete lack of connections to the UFO organizations suggests a real lack of traditionally-trained scientists in the movement. The lack of connections also suggests that, even if organizations/persons in other movements agree or have common interests, forming connections to these two movements is too costly in terms of public opinion. For example, it would be easy to imagine connections between the ID/creationist movement and the anti-abortion movement, since both movements oppose mainstream scientific consensus (evolution and embryological development) and the success of ID/creationism would provide support for the anti-abortion movement. Indeed, proving that life was ‘intelligently created’ would undoubtedly provide support for all religious causes, despite the protestations of ID theorists who claim that is not their goal.

Finally, based on the data examined here, there are minimal connections between the main creationist organizations and the ID organizations. However, the ID movement provides the only link between the main creation science organizations and the set of mainstream science organizations found in this network (and, interestingly, other creation science organizations). Plus, there are extensive connections between less well-known creation science organizations (and a Christian academics organization) and ID organizations. Thus, there is a complicated structural relationship between the ID movement and the overall creation science movement. On the one hand, the ID and creation science organizational movements are not highly interconnected, which suggests that the ID movement is not a simple ‘re-branding’ of the

creation science movement. On the other hand, ID organizations provide the only inter-organizational linkage between creation science and mainstream science organizations. Thus, when considering inter-organizational communication brokerage, ID literally provides the only access to mainstream science available to creation science organizations. This structural role demonstrates the potential of ID to provide scientific prestige to at least the common ID/creation science agenda of reducing the acceptance of Darwinian evolution as the explanation of biological diversity, and possibly even the acceptance of God as the alternative source of this diversity.

The pattern of structural ties between ID and the various creation science organizations also suggests that those in the ID movement are very selective when working with creation science organizations. Working with members of the well-known creation science organizations would present major public relations problems for ID organizations, as ID critics could easily point to that pattern as proof that ID is creationism dressed up as science. Therefore, even though they share the same goal (overturning scientific consensus on evolution), the ID and well-known creation science organizations largely avoid each other. However, it appears that the ID movement is not concerned about being associated with less-known creationist organizations as it is less likely connections to these organizations present external problems for ID. Thus, the Discovery Institute, broadly accepted as the organizational home of ID, shares direct connections with two overtly creationist organizations, as well as a Christian scholars organization.

8.0 CENTRALITY ANALYSIS

Though there are many different ways to measure centrality in social networks, the basic notion of centrality is to use network ties to determine what nodes are the most prominent in the network. This prominence can be related to a node's popularity compared with other nodes, their proximity to the other nodes in a network, the extent to which they serve as a flow-through point for communication, or other factors. Ansell (2003) characterizes centrality as a measure of embeddedness. "A major measure of positional embeddedness is centrality. Presumably, the more central an organization is within a network of relationships, the more it is deeply embedded in that network" (Ansell 2003; 125). Moody and White defined group embeddedness as the "degree to which actors' partners (or their partners' partners) are connected to one another through multiple independent paths" (2003:112). The greater the number (" k ") of independent paths connecting a group of actors, the more 'embedded' they are in the network. While node-level centrality measures are related to this definition of embeddedness (Moody and White 2003:116), *m*-slice analysis (presented later) does measure this aspect of embeddedness directly.

Nevertheless, individual centrality measures offer key insight into the role of actors in a network. Being central to the network means having access to the core possessions of the network (Fuchs 2001: 248) or playing a crucial role in the structure and connectivity of the network (Le Merrer and Tredan 2009). Diani (2003:110) found that social movement organizations with high centrality experienced more media coverage and had greater access to

regional government councils. Farris and Felmler (2011) showed that network centrality in peer networks was related to aggressive behavior and status attainment among high school students. Rossman et al. (2010) cited network centrality in screen credits as predicting academy award recognition. Klenk et al (2010) measured social capital among researchers as a function of network centrality and found that researchers with higher centrality were more productive.

Three measures of centrality are presented here: degree, closeness and betweenness centrality. Degree centrality measures the number of links a node shares with all other nodes in the network. This can be seen as measuring the “activity” level of each node (Wasserman and Faust, 1994: 178). Closeness centrality measures the sum of the shortest distance needed for a given node to reach all other nodes in the network, by counting the number of intermediary links (also known as geodesics). As Wasserman and Faust put it “[t]he idea is that an actor is central if it can quickly interact with all others. In the context of a communication relation, such actors need not rely on other actors for the relaying of information...” (1994: 183). Thus, a node with high closeness centrality is more centrally located in the structural relations of the network, while a node with low closeness centrality is located on the periphery of the network. Finally, betweenness centrality measures the extent to which a given node lies on the shortest paths between all possible pairs of other nodes in the network. Quoting again from Wasserman and Faust, “[i]nteractions between two nonadjacent actors might depend on the other actors in the set of actors, especially the actors who lie on the paths between the two. These “other actors” potentially might have some control over the interactions between the two nonadjacent actors” (1994:188). “The important idea here is that an actor is central if it lies between other actors on the geodesics, implying that to have a large “betweenness” centrality, the actor must be *between* many of the actors ...” (1994:189). For the network examined here, the exchange of scientific

ideas or the conferral of prestige could be communicated or facilitated by organizations with high betweenness centrality. These organizations may also play a role in spanning the boundaries between different scientific fields. Bjorneborn (2006) found that websites with high betweenness centrality were likely to cross disciplinary boundaries among academic websites.

8.1 DEGREE CENTRALITY

Degree centrality measures the number of shared board and fellow's memberships each organization possesses in common with other organizations in the network. These links are non-directional (i.e., edges); therefore there is no difference between in-degree or out-degree centrality. However, these ties are valued (or weighted); two organizations can share multiple individuals. Thus, an organization with a degree centrality of 10 shares 10 individuals with other organizations. These 10 individuals might be shared with 1 organization or 10 organizations; the degree value does not specify the number of organizations connected to a given organization. These values are presented in Table 10 in Appendix C; the boxplot summary is presented below for ease of interpretation. Note that the number of individuals recognized by organizations in the different fields differs significantly. The average number of individuals recognized as content experts (i.e., number of fellows and board members) among ID/creation-Science organizations was 14, much smaller than Mainstream Science organizations (967), pro-science organizations (46), and Science-Religion organizations (25). Figure 9 below shows the inter-organizational network with tie values shown. These tie values indicate the number of board or fellows that the two organizations share.

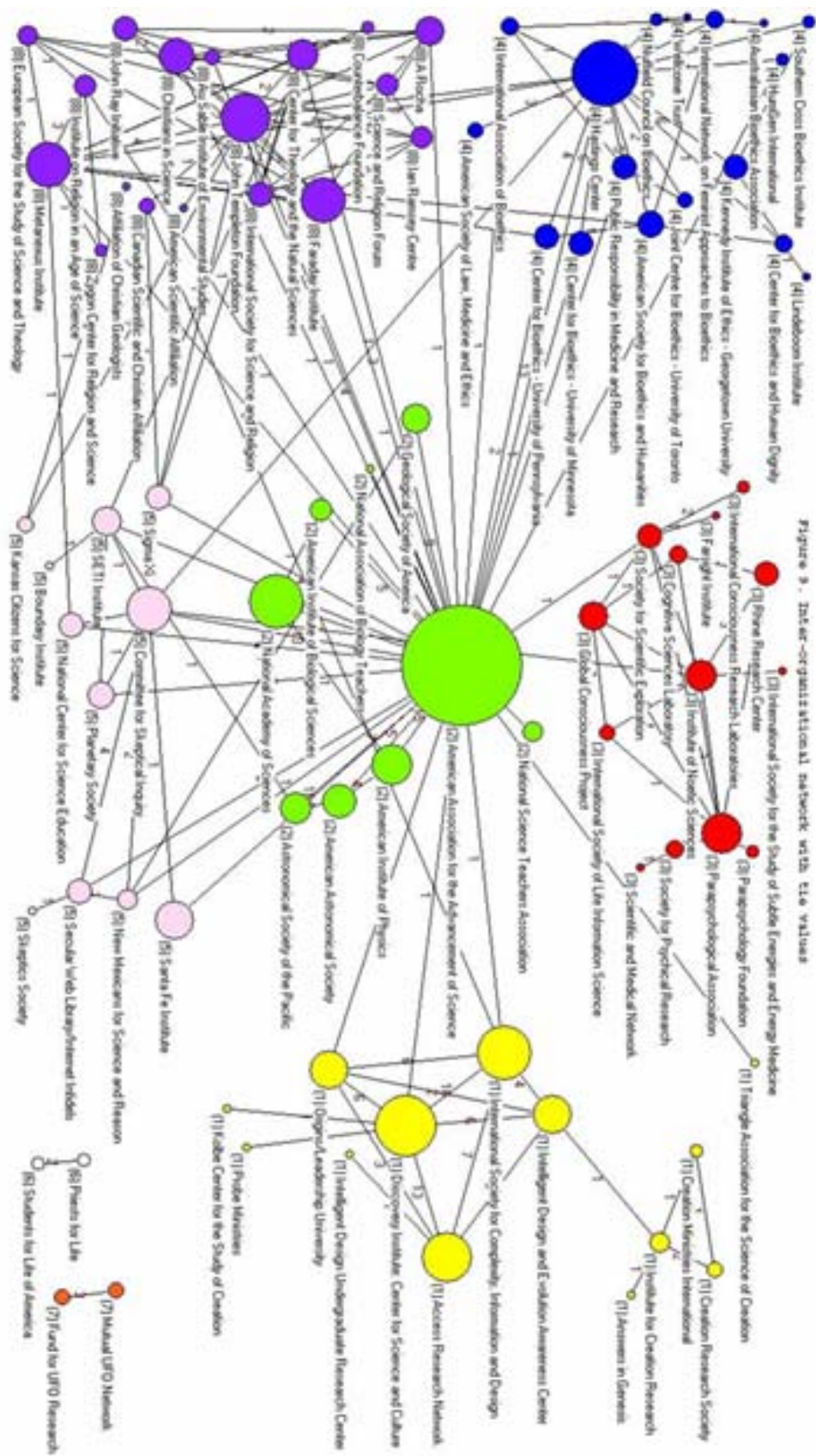


Figure 9. Inter-organizational network with tie values

Degree centrality measures the number of connections a given organization shares with other organizations in the network. However, degree centrality does not take into account the structural position of the organization within the overall network; rather it shows the popularity of the organization as measured by the count of ties to other organizations. Closeness and betweenness centrality, discussed in subsequent sections, do take into account their structural positions within the whole network, either by measuring their distance to other organizations or by measuring their importance for connecting different organizations. Thus, degree is a local measure of centrality, while closeness and betweenness are global measures. Figure 10 presents boxplots of the degree centrality values by organizational field.

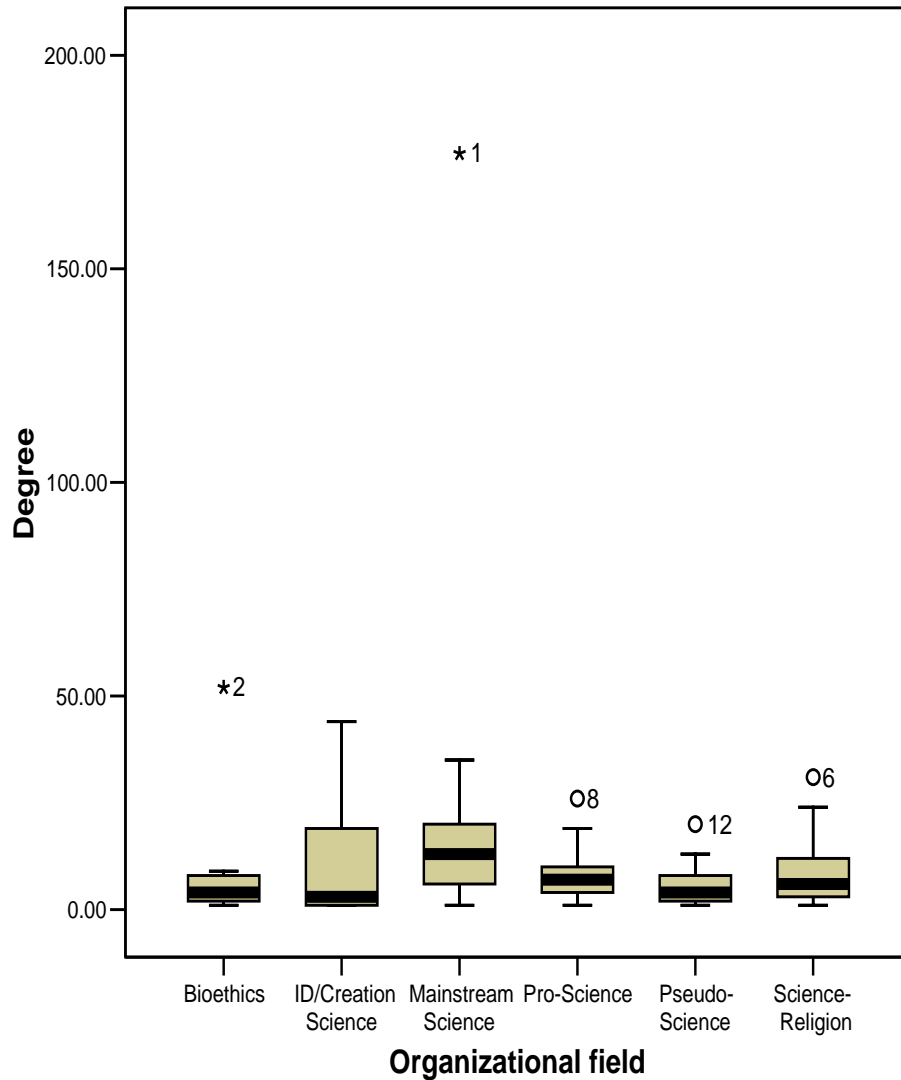


Figure 10. Degree centrality boxplots by organizational field

Most of the organizations in the network share less than 25 intellectuals. Note the greater variation in ID/creation science and Mainstream Science organizations in Figure 10. The American Association for the Advancement of Science (AAAS) is the outlier in the Mainstream Science field between 150 and 200 degree. The median in the ID/creation science boxplot is so low due to the large number of organizations in this field with zero degree centrality.

Of the organizations with degree centrality greater than zero, the average degree is 10.7 and the median degree is 5. This suggests a skewed distribution of degree centrality values (see Figure 11). The organization with by far the highest degree centrality is the American Association for the Advancement of Science (AAAS). The AAAS shared 177 connections between its board/fellow members and other organizations in the network. This is likely a function of both the sheer size of the AAAS and its role as an advocacy and funding organization for the general field of science.

The organizations with the 3rd, 5th, and 7th highest degree centrality are all ID movement organizations. The Discovery Institute (degree centrality 44) was the organization initially sampled and is a prime organization in the ID movement. The International Society for Complexity, Information and Design is another ID organization (degree = 35), which was founded, among others, by William Dembski. ISCID promotes the study of complex systems and features many prominent ID proponents in its fellows list. The 7rd highest organization, Access Research Network (degree = 30), originally started in 1979 as a young earth creationist organization called Students for Origins Research. The group changed its name in the 1990's and switched its ideological stance towards ID (Scott 1997:269).

Three of the ID organizations were in the top 10 of degree centrality distribution. The remaining ID organizations were: the Intelligent Design and Evolution Awareness Center, with a degree centrality of 19, has the 14th highest degree centrality in the network; and the Intelligent Design Undergraduate Research Center, with only a degree centrality of 1. Clearly, the Intelligent Design Undergraduate Research Center is a marginal organization, with only 1 tie to other organizations in the network, specifically the Access Research Network. Thus, with no ties outside of the ID movement, and with a marginal structural role, Intelligent Design

Undergraduate Research Center appears to be a relatively unimportant organization. On the other hand, the Intelligent Design and Evolution Awareness Center was a much more prominent organization in the overall network, connecting to almost all of the ID organizations directly and providing the sole link from the ID subnetwork to the main creationist subnetwork. Thus, Intelligent Design and Evolution Awareness Center, as a bridge organization, plays a crucial role in the structure of the network.

Leadership University, with a degree centrality of 18, is a project of Campus Crusade for Christ, International, and provides articles on faith and academia and lists scholars who are open about their Christianity. This organization is highly connected to the ID organizations. Leadership University has the 15th highest degree centrality, and therefore is prominent based on this centrality measure.

The main creation science organizations all had relatively low degree centrality scores, which is to be expected considering their single connection to the main component of the network. The Institute for Creation Research had 5 connections, the Creation Research Society had 3, Creation Ministries International had 2, and Answers in Genesis had just one connection to the network. Thus, the national creation science organizations are not highly connected within the inter-organizational network.

However, there were two less well-known creationist organizations directly connected to the ID subnetwork, Probe Ministries and the Kolbe Center for the Study of Creation. Their degree centralities were both 1, indicating they each had just 1 connection to the network (ID subnetwork specifically). However, their structural position suggests that their closeness centralities will indicate more prominent positions in the overall network. Likewise with the creation science organization not connected to the ID or main creation science organizations: the

Triangle Association for the Science of Creation. Their degree centrality score was 1 as well; however, their structural position relative to the mainstream scientific network core is different than with the main creation science organizations. This difference in structural positions will be detected by closeness centrality.

Note that 61 organizations (42%) of the total 145 organizations have zero degree centrality, which means they did not share board or advisory members with any organizations in the network. This shows that website links are much more likely to be shared within and between different movement sectors or other fields than board linkages. Figure 11 below shows the overall distribution of degree centrality scores in the network, excluding the isolates. The highly skewed distribution of inter-organizational linkages is similar to the findings of Davis et al. (2003) regarding corporate board interlocks.

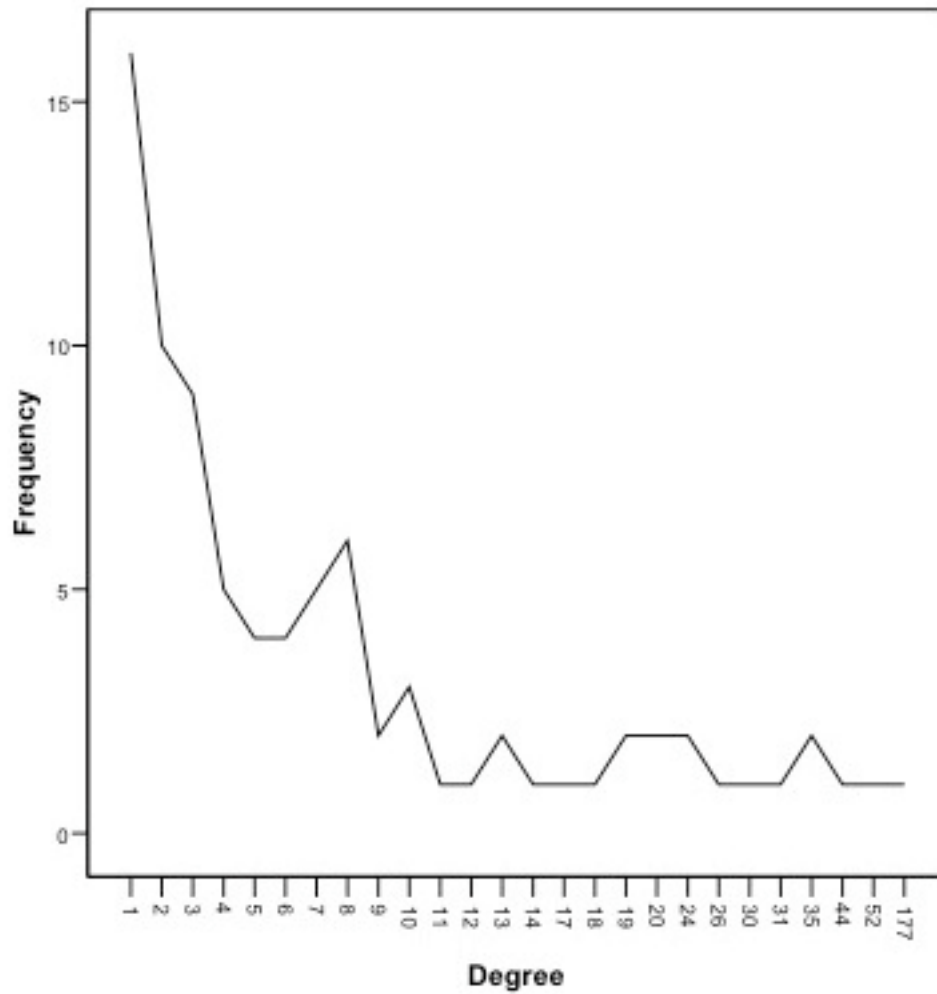


Figure 11. Inter-organizational Network Degree Centrality

8.2 CLOSENESS CENTRALITY

Closeness centrality is the number of geodesic steps required to reach all other (connected) members of the network from any given node. “The measure focuses on how *close* an actor is to all the other actors in the set of actors. The idea is that an actor is central if it can quickly reach

all others. Thus, it is a measure of how “close” any given node is to other nodes, and therefore shows if the node is centrally located in the network (low closeness score) or is more in the periphery of the network (high closeness score). Unlike degree centrality, this measure is global, since it takes into account the total structure of the network. Degree centrality is a local measure, as it does not take into account the overall network structure, instead just simply comparing the count of direct ties for each node. However, due to this greater complexity, the interpretation of closeness centrality is not as straightforward as degree centrality. Figure 12 displays boxplot distributions of closeness centrality by organizational field. Table 11 in Appendix C displays the farness values for the inter-organizational network. Farness is the reciprocal of closeness centrality and is presented here for ease of interpretation, as this measurement represents a simple count of geodesic steps from a given organization needed to reach all other organizations in the network. High farness indicates low closeness centrality. Note that closeness centrality cannot be computed for isolates or the Ufology and Pro-Life subnetworks, as these require infinite distances to reach all other organizations.

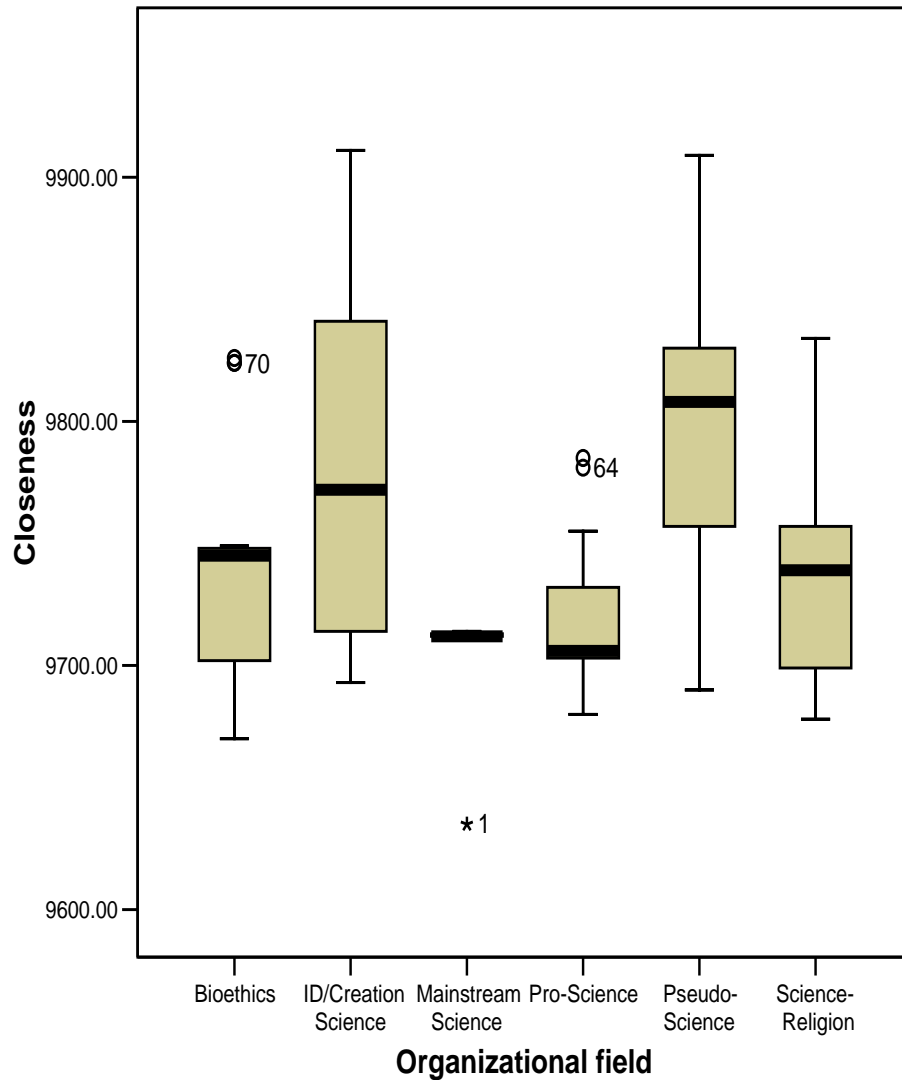


Figure 12. Closeness centrality boxplots by organizational field

Note the stark difference in the variation of closeness centrality values between the ID/creation science subnetwork and the mainstream science subnetworks. ID/creation science has a wide range of closeness values, the mainstream science has an extremely tight distribution of closeness centrality. This reflects their connection to the AAAS, which has the lowest closeness score in the network.

Two ID/creation science organizations with very high degree centrality also had very low farness scores (i.e., high closeness centrality): Discovery Institute (9,693), and the International Society for Complexity, Information and Design (9,694). One ID/creation science organizations, Leadership University, also has a very low farness score (9,695). Leadership University is a Christian scholars association highly connected to the ID subnetwork, as described above.

The differences in degree and closeness centrality of Leadership University illustrates the different structural characteristics that degree and closeness centrality measure. The organization had the 15th highest degree centrality (18), but the 9th highest closeness centrality. Though this organization does not have an especially high number of connections in the network, these connections are located in a central area of the network with a small distance from all other network regions.

Some of the ID/creation science organizations have low farness scores. The Discovery Institute (9,693), the International Society for Complexity, Information and Design (9,694) and Leadership University (9,695) all have very similar, near the lowest farness scores, as mentioned above. Access Research Network (9,762), Intelligent Design and Evolution Awareness Center (9,759) and Intelligent Design Undergraduate Research Center (9,841) all have somewhat higher farness scores, especially the Intelligent Design Undergraduate Research Center, confirming its more marginal position noted above based on degree centrality. The low farness scores of the ID organizations suggest that ID is not an entirely marginal movement in relation to mainstream science and other scientific-related fields. Although the overall low farness scores of the ID organizations, especially the Discovery Institute, could be explained by the data selection method, this finding is still significant since this is based on the inter-organizational network of organizations, not the web links the organizational sample was based on. As web links and inter-

organizational connections based on shared intellectuals are two distinct forms of data, network properties based on web links will have little or no effect on the properties of the inter-organizational network. It is entirely conceivable that the ID organizations would be completely disconnected from the mainstream scientific core of the network once network ties are limited to inter-organizational connections. The fact that this doesn't happen for ID which, as an organizational subnetwork, shares several connections to mainstream science, shows that ID is not entirely a fringe movement with no inter-organizational connections to 'real' science.

As expected, the large creationist organizations have much higher farness scores than the ID organizations. The farness scores are 9,832 (Institute for Creation Research), 9,910 (Creation Ministries International and Creation Research Society), and 9,911 (Answers in Genesis). These are among the highest farness scores in the network, thus confirming the peripheral position of the main creationist organizations. This is in contrast to the creation science organizations connected to the ID organizations. Probe ministries and the Kolbe Center for the Study of Creation have a farness score of 9,772, much lower than the farness scores of the main creation science organizations. Thus, the ID-connected creation science organizations, as expected from the visual representation of the network, are closer to the rest of the network organizations than the main creation science organizations.

The creation science organization unaffiliated with ID or the main creation science organizations had a very low farness score. The Triangle Association for the Science of Creation had a farness score 9,714, much lower than the main creation science organizations and only about $\frac{1}{2}$ standard deviation higher than the ID organizations with the lowest farness scores (including the Discovery Institute). This low farness score reflects their direct connection to the AAAS, which has the highest degree and closeness centralities; the high centrality of AAAS

allows the Triangle Association for the Science of Creation to reach all other organizations in the network in relatively few steps, even though they share no links with any other organizations.

Overall, there is relatively little variation in the closeness centrality scores. The average and median closeness scores (9,748.4 vs. 9,745) differ by less than four steps. The lowest farness score is 9,635 (AAAS) and the highest score is 9,911 (Answers in Genesis). The total range in farness scores is therefore only 276 geodesic steps, with the highest farness value only about 3 percent greater than the lowest farness score. Thus, though some organizations are more closely connected to the rest of the network than other organizations, closeness centrality is relatively homogeneously distributed across the organizations in the network. Below we shall examine betweenness centrality, which measures the extent to which an organization lies on the shortest paths between other organizations.

8.3 BETWEENNESS CENTRALITY

Betweenness centrality is the “proportion of shortest paths between all pairs of nodes that pass through a given node” (Otte & Rousseau 2002). “Betweenness centrality refers to the degree to which an actor is on the shortest paths ‘between’ other actors in the network and can thus presumably mediate relationships between those actors. Thus, this centrality measure comes closest to measuring the degree to which an actor operates as a powerful broker within a network. (Ansell 2003:126). Betweenness centrality is calculated as the number of shortest-path geodesics linking all possible pairs of nodes that a given node lies on, divided by the total number of shortest-path geodesics linking all other nodes (Wasserman and Faust 1994: 190). Thus, the measure takes into account possible alternative shortest paths between any two given

nodes. If the network is densely connected we can expect there are multiple alternative shortest-paths between most of the nodes in the network, and therefore betweenness centrality will not be a critical measure. However, as discussed above, the inter-organizational network is not densely connected. Therefore, differential control over within-network ‘flow,’ as measured by betweenness centrality, is an important analytic measure here. As this network measures the connections between different scientific fields, flow is conceptualized as the dispersion of scientific opinions and prestige. High betweenness may also indicate the role of an organization in spanning boundaries between different organizational fields. These organizations are likely considered well-regarded within their fields and outside of their fields, evidenced by their role in connecting organizations over long network distances. Thus, organizations with a high betweenness centrality have greater opportunity to share their organization’s goals and viewpoints and many play a role in spanning scientific boundaries. Table 12 in Appendix C displays the full list of betweenness centrality scores, while Figure 13 below displays the boxplot summary of these values.

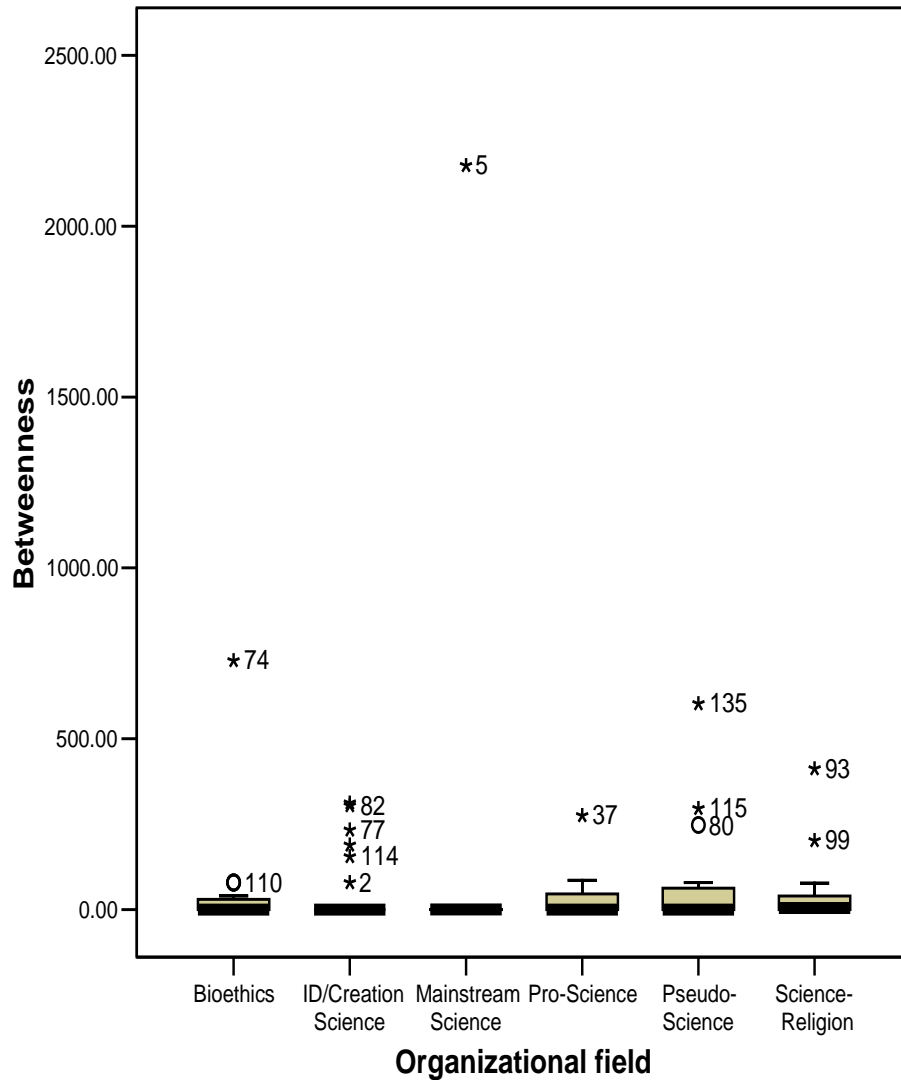


Figure 13. Betweenness centrality boxplots by organizational field

Once again the AAAS has an extremely high centrality value, as shown in Figure 13. Note that, with a few exceptions, ID and creation science organizations have very low betweenness centrality. Excluding organizations with zero betweenness centrality, the average betweenness score is 154 and the median score is 49 (standard deviation = 340.5), indicating a highly skewed distribution. Indeed, only 13 organizations have higher than average betweenness scores. The AAAS again tops the list with a betweenness value of 2,177, which is almost 300

percent higher than the second highest betweenness value. Thus, based on network structure, the AAAS lies on more shortest-paths than any other organization in the network. This reflects its central location in the network, and shows its importance in creating the ties between most of the organizations in the network.

Three ID/creation science organizations with high degree or closeness centrality also had high betweenness centrality. These included the Discovery Institute, the Intelligent Design and Evolution Awareness Center and the Institute for Creation Research. The Discovery Institute, besides being the organization used to create the initial sample of organizations for link collection, also has a direct connection to the AAAS and provides the only connection to two creation science organizations in the network. The Intelligent Design and Evolution Awareness Center provides the only link between the main creation science organizations and the rest of the network. Thus, all shortest-paths between these two groups of organizations run through this organization, again showing the importance of this organization for linking the main creation science organizations to all other organizations. The International Society for Complexity, Information and Design, is the structural center of the ID movement, and thus likely provides the majority of shortest-paths between other organizations and the ID organizations.

Access Research Network had the 17th highest betweenness centrality, showing that it was more peripheral than the ID organizations discussed above. The Intelligent Design Undergraduate Research Center, the last ID organization, had a betweenness centrality value of zero. This is because this organization has only one link, to the Access Research Network, and therefore could not be found on any shortest-paths between any other organizations. Thus, based on all three measures of centrality, the Intelligent Design Undergraduate Research Center is the least prominent member of the ID organizations. Finally, Leadership University, the Christian

academics organization highly connected to ID, had the 13th highest betweenness value. This was nearly as high as the International Society for Complexity, Information and Design (12th highest betweenness value). Looking at Figure 2, Leadership University appears to have a similar structural position as the Discovery Institute; connecting organizations on the right side of the network (ID and creation science) to the mainstream scientific network core. However, there are not as many organizations connected to Leadership University as to the Discovery Institute, thus its lower betweenness centrality value.

Not surprisingly, the main creation science organizations have very low betweenness centrality values. Answers in Genesis, Creation Ministries International, and the Creation Research Society all have zero betweenness centrality, again showing their marginal position in the overall network. The Institute for Creation Research was the only main creation science organization with a non-zero betweenness centrality score. The Institute has the 10th highest betweenness value in the network; this is due to the Institute providing the lone tie to an organization outside of the main creation science subnetwork. Thus, its betweenness centrality value reflects the Institute's key role in connecting the main creation science organization subnetwork to the rest of the inter-organizational network.

The two creation science organizations directly connected to the ID organizations, Probe Ministries and the Kolbe Center for the Study of Creation, both have betweenness centralities of zero, due to each organization only having a connection to one organization, the Discovery Institute. Likewise with the creation science organization not connected to ID or the main creation science subnetwork, the Triangle Association for the Science of Creation. This organization has a betweenness centrality of zero, reflecting its marginal structural position.

Overall, the distribution is highly skewed; only 46 organizations had a non-zero betweenness score. The low density of ties, combined with the relatively coherent central region and outlying areas of the network produce a structure where, controlling for all shortest-paths, a small number of organizations lie on any shortest-paths, and an even smaller number of organizations lie on the majority of shortest-paths. Of the three centrality measures analyzed here, this is the most sparsely distributed. Table 2 below shows the organizations in the inter-organizational network with zero betweenness centrality.

Table 2. Connected organizations with zero betweenness centrality

Bioethics

American Society of Law, Medicine and Ethics
 Australasian Bioethics Association
 Center for Bioethics - University of Minnesota
 HumGen International
 Joint Centre for Bioethics - University of Toronto
 Lindeboom Institute
 Southern Cross Bioethics Institute
 Wellcome Trust

Intelligent Design/Creationist

Answers in Genesis
 Creation Ministries International
 Creation Research Society
 Intelligent Design Undergraduate Research Center
 Kolbe Center for the Study of Creation
 Probe Ministries
 Triangle Association for the Science of Creation

Mainstream Science

American Institute of Biological Sciences
 Geological Society of America
 National Association of Biology Teachers
 National Science Teachers Association

Pro-Science

Boundary Institute
 Planetary Society
 Santa Fe Institute
 Skeptics Society

Pseudo-Science

Farsight Institute
International Consciousness Research Laboratories
International Society for the Study of Subtle Energies and Energy
Medicine
International Society of Life Information Science
Parapsychology Foundation
Scientific and Medical Network

Science-Religion

Affiliation of Christian Geologists
American Scientific Affiliation
Au Sable Institute of Environmental Studies
Counterbalance Foundation
Zygon Center for Religion and Science

The organizations in Table 2 are connected in the inter-organizational network (i.e., had greater than zero degree), but had zero betweenness centrality, due to their structural positions within the network. Some of these organizations are connected to only one other organization (sometimes called “pendants”) and therefore cannot lie on any paths between two organizations, let alone any shortest paths. All of these organizations occupy marginal positions within their respective subnetworks. They have low network activity and have not developed extensive ties to other organizations within the network. This low level of inter-organizational linkage may signify marginal roles within their respective fields, small organizational size, a lack of interest in sharing expertise, or other possibilities.

A quick look at Figure 2 shows why these organizations had zero betweenness. For example, in the ID/creation subnetwork, Answers in Genesis had zero betweenness. When we examine this subnetwork, we see that Answers in Genesis is connected only to the Institute for Creation Research. The sparse connections to other creation science organizations may be a result of the relative youth of Answers in Genesis, or differing organizational strategies, as

Answers in Genesis does not focus on semi-formal education or formal creation science arguments, using mainly biblical arguments instead.

Most of the other organizations in the ID/creation science subnetwork with zero betweenness are pendants (connected to only one other organization). The two exceptions, Creation Ministries International and Creation Research Society, are part of a triangle where all shortest paths go ‘through’ the third triangle organization, the Institute for Creation Research. Considering the small size of this subnetwork relative to the other subnetworks, ID/creation has a large number of organizations with zero betweenness. This reflects the low density of connections between organizations in this subnetwork. Thus, relative to most of the other subnetworks, ID/creation science has a lower level of direct expertise sharing among its organizations.

Organizations in the ID/creation subnetwork are selective when forming ties to other organizations. Indeed, removing just the link between Intelligent Design and Evolution Awareness Center and Institute for Creation Research would split the subnetwork into two smaller components, one made up of ID and creation science organizations, the other made up only of creation science organizations (see Figure 8). This is more evidence for the lack of an overarching movement identity among these organizations.

8.4 CENTRALITY CONCLUSION AND DISCUSSION

The purpose of this analysis was to examine the structural roles of the organizations in the network, based on three different types of centrality measurement: degree centrality, closeness centrality, and betweenness centrality. These measurements characterize organizations,

respectively, by counting the number of ties, counting the number of steps to all other organizations, and counting the number of shortest-paths between pairs of organizations an organization lies on. In the context of the inter-organizational network, ties represent shared individuals between organizations. These individuals include board members (rarely) and fellows/advisors (much more common). Thus, a tie between two organizations indicates that both organizations recognize one individual as contributing to/being an expert in a particular scientific field. For example, the Discovery Institute and Access Research Network both recognize William Dembski (among others) as a leading intellectual of the ID movement. Discovery lists him as a ‘senior fellow’ while Access Research Network calls him a ‘friend of ARN’; therefore these two organizations commonly cite Dembski as an ID authority.

Thus, the inter-organizational network is a network of ties between organizations based on commonly-recognized intellectuals in various fields. Degree centrality measures the number of individuals a given organization shares with other organizations. This measure indicates how ‘active’ an organization is in identifying intellectuals relevant to their organizational goals and may indicate the level of influence an organization holds over a particular field. Closeness centrality can be conceptualized here as an ‘intellectual distance’ measure, where organizations with high closeness (low farness) are intellectually closer (i.e., less objectionable) to all other organizations whereas organizations with low closeness (high farness) are intellectually farther. For example, the American Institute of Physics has a farness value of 9,712, while Answers in Genesis has a farness value of 9,911, indicating that the American Institute of Physics is intellectually ‘closer’ to all other organizations than Answers in Genesis. In other words, the American Institute of Physics would be less controversial to all other organizations than Answers in Genesis. Finally, betweenness centrality can be seen as a form of ‘intellectual brokerage’

wherein organizations with high betweenness centrality play a greater role in bridging ‘intellectual distances’ between organizations. High betweenness centrality indicates an organization plays a role in connecting organizations with differing intellectual traditions and often this involves scientific boundary spanning. For example, most of the ID organizations have high betweenness centrality, as they provide the only connections between most creation science organizations and the mainstream science subnetwork. Thus, as ID is more ‘scientific’ than creation science and considers design much more than mainstream science, it acts as a ‘intellectual broker’ between these two fields. Figure 2 is repeated below for ease of reference.

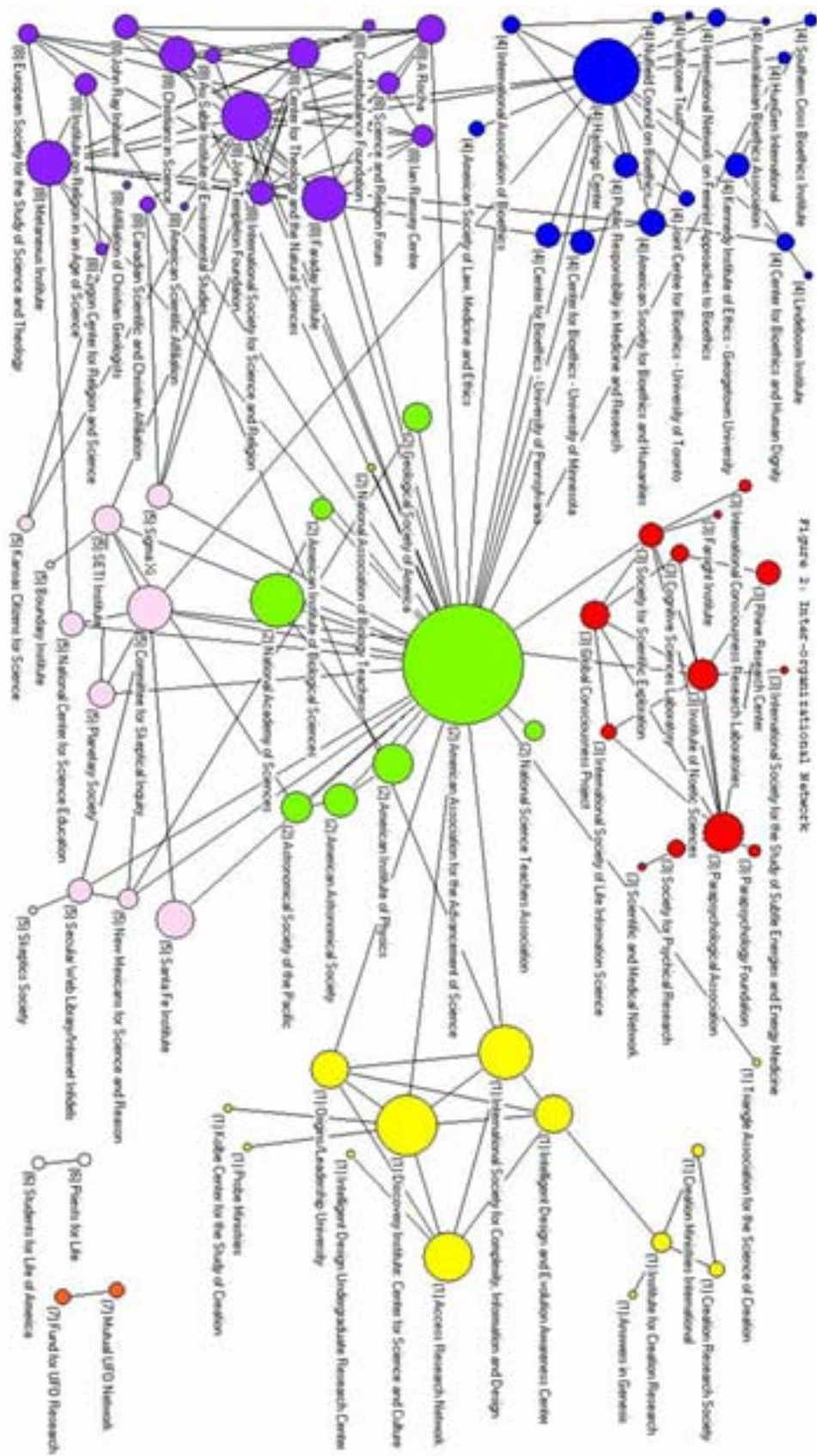


Figure 2: Inter-organizational Network

Overall, the importance of the American Association for the Advancement of Science (AAAS) in the network was confirmed by all three centrality measures. It had the highest degree centrality (177), the highest closeness centrality (farness=9,635), and the highest betweenness centrality (2,177.29). These findings reiterate the importance of the AAAS based on a visual inspection of the network. The extensive ties the AAAS shares with other organizations (a local property) and its central location in the network (a global property) result in high centrality measures for this organization. The high betweenness score reinforces the key role this organization plays in connecting various organizational fields, a result of its central location in the overall network. Ironically, though it officially opposes ID theory, it provides the only inter-organizational connections between the mainstream scientific subnetwork and the ID/creation science subnetwork. These connections represent a traditionally trained scholar (i.e., a student at a non faith-based institution) who then identified himself as a supporter of creation science or ID theory (see section 8.4.1 for discussion of this individual).

Several ID organizations also had high centrality measures. The Discovery Institute and the International Society for Complexity, Information and Design (ISCID) both had consistently high centrality values across all three measurements, demonstrating the importance of these two organizations, particularly their role in connecting the ID/creation subnetwork to the mainstream scientific subnetwork. Access Research Network had high degree centrality and mid-range closeness and betweenness centrality; thus, it shared a large number of individuals with other organizations, but did not play a role in connecting the ID/creation science subnetwork with other subnetworks. The Intelligent Design and Evolution Awareness Center had mid-range degree and closeness centrality but high betweenness centrality. This high betweenness centrality was due to the organization's role in connecting the larger creation science organizations to the

rest of ID/creation science subnetwork. The Intelligent Design Undergraduate Research Center had very low degree and closeness centrality values and zero betweenness centrality, thus confirming the marginal structural role the Center has in both the ID network and the overall inter-organizational network. Finally, Leadership University, the Christian organization highly connected to the ID subnetwork, had high closeness centrality and relatively high degree and betweenness centrality. This organization also helped connect the ID/creation science subnetwork to the mainstream scientific subnetwork.

The older, nationally known creation science organizations, Answers in Genesis, Creation Ministries International, Creation Research Society, and the Institute for Creation Research all had very low degree and closeness centrality, reflecting their marginal position in the overall network. The Institute for Creation Research was the only organization in this subnetwork to have a non-zero betweenness centrality, due to its role of providing the only link between the main CS subnetwork and the rest of the overall network. Indeed, the Institute had the 7th highest betweenness centrality, though that was solely because it, by structural necessity, was on all shortest-paths between the other main creation science organizations and all other organizations in the network. All the other organizations had no betweenness centrality due to their extremely marginal position in the network. Overall, the main creation science organizations had marginal position in the network, which was reflected in their centrality scores. The connective role of the Institute for Creation Research was the only exception to this marginality.

The two creation science organizations connected to the ID subnetwork, Probe Ministries and the Kolbe Center for the Study of Creation, had very low degree and zero betweenness centrality, though they did have higher closeness centrality than the main creation science

organizations. Thus, though they were quite marginal in the network, their connection to the Discovery Institute did place them closer to the other organizations in the network than the main creation science organizations.

Finally, the creation science organization unconnected to both ID and the national creation science organizations also had very low degree and zero betweenness centrality. However, the Triangle Association for the Science of Creation had closeness centrality almost as high as the ID organizations. Thus, though this organization was isolated from both ID and the main creation science organizations and it had very low degree centrality, it was more centrally located than the main creation science organizations. Table 3 presents a summary of centrality scores for the connected ID and creation science organizations.

Table 3. Intelligent design and creation science organizations' centrality scores

Organization	Centrality			Summary
	Degree	Closeness	Betweenness	
<u>Intelligent Design</u>				
Access Research Network	High	Medium	Medium	High frequency of connections, but not too structurally important for connectivity
Discovery Institute	High	High	High	Structurally important position, helps connect ID/CS subnetwork to mainstream science subnetwork
Intelligent Design and Evolution Awareness Center	Medium	Medium	High	Structurally important position; connects main CS subnetwork to ID subnetwork
Intelligent Design Undergraduate Research Center	Low	Low	Zero	Marginal structural role
International Society for Complexity, Information and Design	High	High	High	Structurally important position, helps connect ID/CS subnetwork to mainstream science subnetwork
<u>Creation Science</u>				
Answers in Genesis	Low	Low	Zero	Marginal structural role
Creation Ministries International	Low	Low	Zero	Marginal structural role
Creation Research Society	Low	Low	Zero	Marginal structural role
Institute for Creation Research	Low	Low	High	Structurally important position; connects CS organizations to ID subnetwork
Kolbe Center for the Study of Creation	Low	Medium	Zero	Marginal structural role, except for connection to the Discovery Institute
Leadership University	Low	High	Low	Structurally important position, helps connect ID/CS subnetwork to mainstream science subnetwork
Probe Ministries	Low	Medium	Zero	Marginal structural role, except for connection to the Discovery Institute
Triangle Association for the Science of Creation	Low	Medium	Zero	Marginal structural role, except for connection to the AAAS

NOTE: ID and CS organizations with zero degree centrality not included.

8.4.1 Boundary-work and centrality

The centrality measures discussed above begin to show us a quantitative look at the extent of boundary formation between mainstream science, ID and creation science. Even though this network was constructed from the vantage point of the ID movement, with a few exceptions ID organizations were not the most central organizations in the network. Mainstream science organizations, in particular the AAAS, were intellectually closer to the organizations in the network than the ID organizations (as evidenced by closeness centrality). This intellectual isolation, in combination with the sparse set of direct ties between mainstream science and ID organizations, finding suggests a boundary between the two fields. The peripheral nature of the creation science organizations, and the lack of direct ties to mainstream science (with one exception) indicate an even stronger boundary between mainstream science and CS organizations.

The structural analysis presented above (and further analyses below) is indicative of actual boundary creation and maintenance episodes performed by scientists and scientific advocates. Much of this boundary-work has been accomplished by rhetorical/narrative means. A great number of scholarly articles and texts have been published arguing against the scientific merits of ID theory (see Fitelson, Stephens & Sober 1999; Forrest 2011; Forrest & Gross 2004; Ruse 1982; Ruse 2005; Scott 1997; Scott 2001; Scott 2004). Much of this rhetorical boundary-work was discussed in earlier sections.

Besides academic publishing, another avenue for rhetorical boundary-work is in the courtroom (Gieryn, Bevins & Zehr 1985). While the 1925 Scopes trial is the most famous example, the 2005 trial in Dover, Pennsylvania offers a contemporary example of courtroom boundary-work only a few years before the data analyzed here was collected. After the school

board for Dover decided to use the ID-supportive textbook *Of Pandas and People*, parents sued to have this decision overturned. The case centered on the scientific merits of ID theory. Among those who testified for the parents were Kenneth Miller, a biology professor from Brown University, Robert Pennock, a philosopher critical of ID theory, Barbara Forrest, a philosopher highly critical of ID, as well as several other scientists. Among those who testified for the defense were Michael Behe, author of *Darwin's Black Box* and professor of biochemistry at Lehigh University and Steve Fuller, a professor of Sociology at Warwick University⁸.

The organizational affiliations of the witnesses on both sides show a stark example of boundary-work in action. Of the full list of organizations in the network analyzed here, one of the parents' witnesses was associated with the Metanexus Institute (in the Science-Religion subnetwork), one was associated with the National Center for Science Education (NCSE, in the pro-science subnetwork), two were associated with the AAAS, and one was associated with both the AAAS and NCSE. None were associated with ID or CS organizations. On the defense's side, Michael Behe was associated with the Discovery Institute, the International Society for Complexity, Information and Design (ISCID), the Intelligent Design and Evolution Awareness Center and the Access Research Network. Scott Minnich was associated with the Discovery Institute and ISCID. No defense witnesses had any organizational affiliations with non-ID organizations. On the parents' side, the AAAS was the most common organizational affiliation, demonstrating its importance for mainstream science, confirming its high centrality values. Likewise on the defense side, Discovery Institute and ISCID were the most common organizational affiliations, confirming their high centrality values among ID organizations.

⁸ See http://en.wikipedia.org/wiki/Kitzmiller_v._Dover_Area_School_District

Thus, boundary-work was in strong evidence at the Dover trial. No one associated with mainstream science organizations testified on behalf of teaching ID theory, while no one associated with ID organizations testified on behalf of the parents. This shows that the organizational affiliations analyzed here are indicative of boundary-work by organizations within the fields represented in Figure 2. Note that no creation science organizations were ‘represented’ at the Dover case, demonstrating their lack of importance in current scientific boundary disputes, reflected in their low centrality values above. In addition, the strategic withdrawal of involvement by the Discovery Institute and its fellows⁹ shows that while court cases are good examples of boundary-work, both rhetorically and organizationally, they do not represent good sources of data for the analysis presented here.

⁹ See http://en.wikipedia.org/wiki/Kitzmiller_v._Dover_Area_School_District.

9.0 ORGANIZATIONS WITH NO INTER-ORGANIZATIONAL CONNECTIONS

Table 4 lists the organizations in the inter-organizational network with zero degree. These organizations were included in the website citation network, but did not share any individuals with other organizations in the network. The organizations are listed by their scientific/theological focus.

Table 4. Organizations with no inter-organizational linkages

Bioethics

Eubios Ethics Institute
European Association of Centres of Medical Ethics
Minnesota Center for Healthcare Ethics

Charitable Foundations (not aligned with evolution/ID position)

Pew Charitable Trusts

Christian Organization (non-Creation Science)

Association of Christians in the Mathematical Sciences
Christian Association of Stellar Explorers (Christians in Astronomy)

Intelligent Design/Creation Science

Alpha Omega Institute
Apologetics Press
Associates for Biblical Research
Biblical Creation Society
Black Hills Creation Science Association
Center for Scientific Creation
Christian Answers Network
Christian Apologetics and Research Ministry
Christian Medical Fellowship/FaithCare
Christian Neuroscience Society
Christian Research Institute
Creation Association of Puget Sound
Creation Discovery Project

Creation Evidences Museum
Creation Moments
Creation Research
Creation Resource Foundation
Creation Resources Trust
Creation Science Association for Mid-America
Creation Science Association of British Columbia
Creation Science Association of Orange County
Creation Science Evangelism
Creation Science Fellowship
Creation Science Homepage
Creation Science Movement
Creation Studies Institute
Creation Truth Foundation
Creation Vs Evolution/All About God Ministries
Creation Worldview Ministries
Earth History Research Center
Focus on the Family
Geoscience Research Institute (7th Day Adventist General Conference)
God and Science
Intelligent Design Network
Missouri Association for Creation
Mt Blanco Fossil Museum
Origins Resource Association
Reasons to Believe
Rocky Mountain Creation Fellowship
Science Against Evolution
South Bay Creation Science Association
Stand to Reason
Twin Cities Creation Science Association

Pro-science

National Geographic Society
Ohio Citizens for Science
Students for the Exploration and Development of Space
Talk.Origins Foundation
Tree of Life

Pseudo/Fringe-science

European Journal of Parapsychology
Institute for New Energy
Orgone Biophysical Research Laboratory

Science-Religion

Berea College Science and Faith
Faith and Reason Ministries
Institute for the Study of Christianity in an Age of Science and Technology
Pascal Centre for Advanced Studies in Faith and Science

The majority of the organizations in Table 4 are ID/creation science organizations. Of the 61 organizations with no inter-organizational linkage, 43 (about 70%) are ID/creation science. Comparing Table 4 with Figure 2, we also see that the vast majority of ID/creation science organizations have no inter-organizational connections. There are 56 total ID/creation science organizations in the network, but only 13 of them (23%) have any inter-organizational linkages. By contrast, the science-religion subnetwork has only 4 total isolates, with over 85% of the organizations in the subnetwork having a least one connection to another organization. Thus, inter-organizational network participation is quite low for ID/creation science organizations, compared to the other subnetworks examined here.

There are a few possible explanations for the highly selective linkage pattern among ID/creation science organizations. One is the differing sizes and scopes of the organizations. Many of the ID/creation science organizations in Table 4 are small organizations with activities mostly confined to certain geographic areas. The average number of individuals recognized as content experts (i.e., number of fellows and board members) among ID/creation science organizations was 14, much smaller than Mainstream Science organizations (967), pro-science organizations (46), and Science-Religion organizations (25). The smaller number of shared expertise may be a function of the smaller number of individuals cited by each organization. Many of these organizations include specific geographic areas in their names (e.g., Black Hill Creation Science Association, Creation Association of Puget Sound, etc). These organizations may have little to no relationships with larger organizations that do not target a geographically-limited audience and use electronic media as the primary form of communication, rather than in-person meetings. In essence there are two strata of organizations, with little board or fellow membership overlap between the organizations of the two strata.

Another possible explanation is that expertise sharing, or inter-organizational linkage of other kinds, are not a high priority for ID/creation science organizations. As noted above, there is evidence for a competitive marketplace of creation science organizations (ID organizations to a lesser extent), where organizations compete for dues-paying members and media sales by differentiating themselves from each other. Many organizations promote their own inspirational leader, with their own biblical interpretations, rather than referencing prominent leaders outside of the organization. The high rate of non-linkage between ID/creation science organizations (almost 80%) provides further evidence for this non-cooperative differentiation.

This low rate of inter-organizational linkage also provides structural evidence that ID/creation science is not a true scientific field or scientific/intellectual movement. The sharing of expertise is an important aspect of science, as it facilitates the expansion and improvement of the empirical and theoretical foundations of any discipline. The recognition of the work of individual scientists, often through election to organizations such as the National Academy of Sciences, is also key to promoting the work of science. As evidence of this priority, the mainstream scientific core of the inter-organizational network, which qualifies as the most ‘scientific’ of the organizational fields examined here, had no organizations with zero linkages. Every mainstream scientific organization found in the website citation network shared individuals with other organizations in the network. This is in contrast with the near 80% of ID/creation science organizations with no ties to other organizations.

According to Frickel and Gross, a successful scientific/intellectual movement needs to frame movement ideas in order to convince/recruit new members (2005: 221). At an organizational level, shared membership of advisory/fellow boards, would both provide the ability to coordinate the framing of movement messages and goals and be an effect of such

action. The leading thinkers of the ID/creation science field would be utilized by multiple organizations to provide intellectual and moral guidance, and help unify the various organizations under a common identity and set of goals. At the same time, higher levels of shared board or fellow membership would be empirical evidence of a shared identity among organizations. Given their extremely low rate of shared-membership of boards and fellows, this does not appear to be a priority of the ID/creation science movement. Indeed, many organizations have their own “in-house” expert(s) that provides all of the intellectual and framing resources utilized by the organization. Thus, in many of these organizations no attempt is made to view the work of the organization within the context of a larger movement with similar goals. Only a minority of the organizations recognize trans-organizational experts and leaders, and therefore view themselves as part of a larger movement. Thus, the overall ID/creation science movement is quite fragmented, with only a small number of organizations viewing themselves as part of a movement at all. Most of the network measures utilized here will only consider the organizations with shared board or fellow members (ERGM analysis is the exception), yet it is important to consider these measures in the context of a largely fragmented ID/creation science movement.

10.0 CUT VERTEX AND M-SLICE ANALYSIS

This section examines the cut-vertices and *m*-slices (described in section 10.2), two measures of network cohesion. The purpose of these two measures is to look more closely at the structural characteristics of organizations and the ties within the ID/creation science subnetwork. Cut-vertices point to important structural connections and the lack of dense, overlapping ties. In contrast, *m*-slices point to overlapping, cohesive communities within the overall network. Therefore, both measures provide a more contextual analysis of ties than centrality analysis. Cut-vertices will be examined first.

10.1 CUT-VERTICES

A cut-vertex, or cutpoint, is an actor whose removal disconnects part of the network. More formally, “[a] node, n_i , is a *cutpoint* if the number of components in the graph that contains n_i is fewer than the number of components in the subgraph that results from deleting n_i from the graph” (Wasserman and Faust 1994:112-113). Cutpoints are quite important in that they connect two otherwise disconnected subsets within a network. Wasserman and Faust note that “[i]n a communications network, an actor who is a cutpoint is critical, in the sense that if that actor is removed from the network, the remaining network has two subsets of actors, between whom no communication can travel” (1994:113).

In the context of the inter-organizational network analyzed here, cutpoints may play an especially important function of highlighting weak or sparse board or fellow membership overlap between two professional or ideational groupings. These sparsely connected areas can be interpreted as the result of ‘boundary work’ where scientific communities claim epistemic authority and expel what they consider to not be scientific (Gieryn 1999). Thus, we would expect no inter-organizational overlap between the scientific organizations within the boundary and the non-scientific organizations outside the boundary. The complete lack of direct inter-organizational connections between the national creation science organizations and the mainstream scientific core of the network can be interpreted as the result of a well-defined boundary. This is to be expected since creation science, despite decades of promotion and numerous court challenges, has never recruited more than a few traditionally-trained scientists (most of its leaders are religiously trained), and its theoretical paradigm has never been considered scientific even by laymen. Thus, due to the long, well-argued exclusion of creation science from science proper, there are no inter-organizational ties between mainstream science and the national creation science organizations, though the lesser-known Creation science organizations do have some extended ties to the scientific core.

However, despite a boundary being drawn between science and non-science, or between different scientific disciplines, inter-organizational connections may still exist, calling into question the legitimacy or enforcement of this boundary. The connections between the mainstream scientific core and the ID subnetwork show that, despite vigorous attempts by mainstream science to expel (or maintain the exclusion of) ID theory and proponents from the scientific community, there are some connections between the two organizational fields. These connections come from the traditionally trained academics who make up most of the intellectual

leaders of the ID movement and the uncommon yet real support of ID theory from traditionally trained academics employed at colleges and universities. Thus, it appears the boundary between traditional science and ID is permeable and shows the incomplete nature of the ‘boundary work’ by mainstream science.

Table 5. Inter-organizational Network Cut Vertices

Organization name	Number of organizations connected by cut vertex
<u><i>Bioethics</i></u>	
Center for Bioethics and Human Dignity	1
Hastings Center	3
International Network on Feminist Approaches to Bioethics	1
Nuffield Council on Bioethics	1
<u><i>Intelligent Design/Creation Science</i></u>	
Access Research Network	1
Discovery Institute: Center for Science and Culture	2
Institute for Creation Research	3
Intelligent Design and Evolution Awareness Center	4
<u><i>Mainstream Science</i></u>	
American Association for the Advancement of Science	3
<u><i>Pro-science</i></u>	
Kansas Citizens for Science	1
Secular Web Library/Internet Infidels	1
SETI Institute	1
<u><i>Pseudo/Fringe-science</i></u>	
Institute of Noetic Sciences	1
Parapsychological Association	3
Society for Psychical Research	1
Society for Scientific Exploration	2
<u><i>Science-Religion</i></u>	
John Templeton Foundation	1

Table 5 lists the cutpoints in the inter-organizational network by their field, as well as the number of organizations that would be disconnected from the main network component (i.e., the network shown in Figure 2, minus the two separate dyads) if the cutpoints were removed. This is the number of organizations connected to the network by the cutpoint, which shows the magnitude of importance for each cutpoint in terms of connectivity. Removing any of these cutpoint organizations would disconnect the associated number of other organizations from the network, creating two new, smaller components in place of the main component, or (more commonly) a smaller component and a greater number of isolates. Thus they play a key structural role in connecting otherwise disconnected groups of organizations. In the network analyzed here, these organizations may represent incomplete scientific boundaries, initial communication between two organizational fields, or other phenomena. An analysis of each cutpoint will help clarify its role. A cutpoint also could be called a connector. Just as its removal would disconnect two parts of a graph, its presence connects them. With this in mind, the following discussion often will draw attention to this connector role of cutpoints.

Three organizations in Table 5 are ID organizations: Access Research Network, Discovery Institute, and the Intelligent Design and Evolution Awareness Center. One creation science cutpoint, the Institute for Creation Research, will be discussed below. Access Research Network provides the only connection to the network for the Intelligent Design Undergraduate Research Center, probably the result of the latter organization being a spin-off of the former organization and the Intelligent Design Undergraduate Research Center only listing one individual (it appears to have become defunct at some point after data collection). The lack of direct connections with other ID organizations may also be a result of their already existing ties with the Access Research Network; forming a connection with the spin off organization may be

considered redundant. Thus, without Access Research Network, the Intelligent Design Undergraduate Research Center would have no inter-organizational ties to the ID subnetwork (or any other organizational subnetworks shown here).

The Discovery Institute is a cutpoint due to the two creation science organizations linked to it. These two organizations, Probe Ministries and the Kolbe Center for the Study of Creation, have no other links to the inter-organizational network and therefore rely on their connection to the Discovery Institute for connection to the larger network (and the ID subnetwork). This role of the Discovery Institute as a cutpoint for these two organizations is interesting for two reasons. One, despite their shared viewpoints on evolution and creation, these two organizations share no connections with the larger creation science organizations. The absence of these connections points to a lack of inter-organizational coherence among the creation science organizations. Unlike ID, where all the organizations are connected, creation science organizations do not all cite common intellectuals. This is likely the result of the uncoordinated founding of many creation science organizations. Many of these organizations, especially the organizations modeled at least rhetorically as ‘ministries’, are led by charismatic religious leaders (often lay preachers) and therefore are oriented towards those leaders’ particular interpretations or points of interest concerning creation. For example, the Institute for Creation Research predominantly deals with the Noachian Flood, while Probe Ministries deals more with criticizing Darwinian evolution. Thus, an overarching creation science ‘paradigm’ does not play a role in many of these organizations, and therefore does not promote cooperation among all creation science organizations. Add to this the potential competitive marketplace of supporters, as noted above, which would also discourage the formation of ties between creation science organizations. Thus,

there does not appear to be a large number of commonly-cited intellectuals. The result is a less-than-unified movement.

Finally, the Intelligent Design and Evolution Awareness Center is also a cutpoint in the ID subnetwork. The Center is the only organization with any overlap of commonly recognized individuals between the ID subnetwork and the four well-known creation science organizations. On one hand, this shows a sparse set of connections between the ID and CS subnetworks. Only one organization in each subnetwork had any inter-organizational overlap with the other subnetwork. This sparse overlap suggests that ID and CS are not a unified scientific/intellectual movement. If ID was in fact creation science expressed through scientific arguments and hence the same movement, we would expect a denser set of ties between the two organizational subnetworks. The sparsity of inter-organizational ties suggests that they are indeed separate movements. Further analysis below will help clarify this issue.

On the other hand, the presence of this single connection provides CS with the only inter-organizational connection to mainstream science, through the intermediary of ID. Thus, without the ID organizational subnetwork, there would be no connection between CS organizations and mainstream science organizations. In other words, the ID movement is providing the only connection between CS and mainstream science (AAAS), at least at an organizational level. Although it is clear that this connection has not provided any scientific prestige to CS, ID is nonetheless providing an inter-organizational connection to mainstream science. In essence, this linkage could allow organizations in CS to borrow the scientific prestige of ID by citing the connection between the two organizational networks. Thus there is the potential for the prestige of science to be transferred to the CS movement through ID. For example, if a fellow of the Discovery Institute gave a talk sponsored by the Institute for Creation Research (ICR), Dr. Henry

F Schaefer III (see conclusion), a fellow of both the Discovery Institute and AAAS, could be mentioned, thereby imputing a (albeit small) amount of scientific legitimacy to the ICR talk.

Only one CS organization in the network is a cutpoint: the Institute for Creation Research. The Institute serves as a cutpoint for two reasons. One, as discussed above, the only connection between the CS subnetwork and the rest of the network is through the Intelligent Design and Evolution Awareness Center and the Institute for Creation Research. The other is by connecting the CS organization Answers in Genesis to the rest of CS subnetwork. It is unclear why Answers in Genesis is sparsely connected within the CS subnetwork. The three other organizations exhibit a closed triangle structure, meaning that all possible connections exist: yet Answers in Genesis is connected only to the Institute for Creation Research. It is possible that Answers in Genesis, founded in 1994 by Ken Ham, has differentiated itself from the other CS organizations by using tactics designed to be accessible by mass audiences. Answers in Genesis built and runs the Creation Museum in Petersburg Kentucky. They are also behind the proposed “Ark Encounter” planned in Kentucky and scheduled to open in 2014. The use of tourist attractions and recreation to promote creation science is much different than the traditional tactics of book publishing, public speaking and court challenges to the exclusion of creation science from public schools. These innovative strategies may allow Answers in Genesis to operate mostly independent of the other CS organizations. The remaining cutpoint organizations in the network are not ID or CS organizations and therefore will not be discussed.

10.2 *M*-SLICE ANALYSIS

As with degree centrality, *m*-slice analysis considers the weight or strength of ties between organizations (i.e., the number of individuals two organizations recognize). For example, if two organizations commonly recognize 3 individuals, the tie between these two organizations will have a weight (or strength) of 3. *M*-slices combine this notion of weight with what are called *k*-cores. Wasserman and Faust (1994: 266) define a *k*-core as “a subgraph in which each node is adjacent to at least a minimum number, *k*, of the other nodes in the subgraph.” *M*-slices are similar to *k*-cores, except that they also include connected nodes outside the core. The idea behind network cores is that they are “more cohesive and richly connected, relative to the overall network” (Doreian & Woodard 1994). Expanding this concept, “an *m*-slice is a maximal subnetwork containing the lines with a multiplicity equal to or greater than *m* and the vertices incident with these lines” (de Nooy et al., 2005: 109). *M* is the weight or strength level of connectedness between nodes, and high-level slices are nested within lower level slices. For instance, within a 5-slice, we find a set of nodes connected to each other with at least a total line multiplicity of 5, meaning all the nodes have at least a weighted total of 5 connections to each other. The nodes in this 5-slice would also be present in the 4-slice, the 3-slice, etc. *M*-slices, then, “...define cohesive subgroups on line multiplicity rather than on the number of neighbors” (de Nooy et al., 2005: 109). This is especially useful when examining one-mode affiliation networks derived from a two-mode interlock network. As *m*-slice analysis focuses on multiple lines, which are considered “more institutional,” this analysis should highlight characteristics of the network not discovered by centrality measures (de Nooy et al., 2005:109). However, *m*-slices can represent separate cohesive subgroups, as all of the members of a given slice do not have to be directly connected. Thus, it’s important to keep in mind that while multiple organizations may

be in the same slice, they can be in different subnetworks as well. Figure 14 below shows an example network with m -slice values represented by colors and node size.

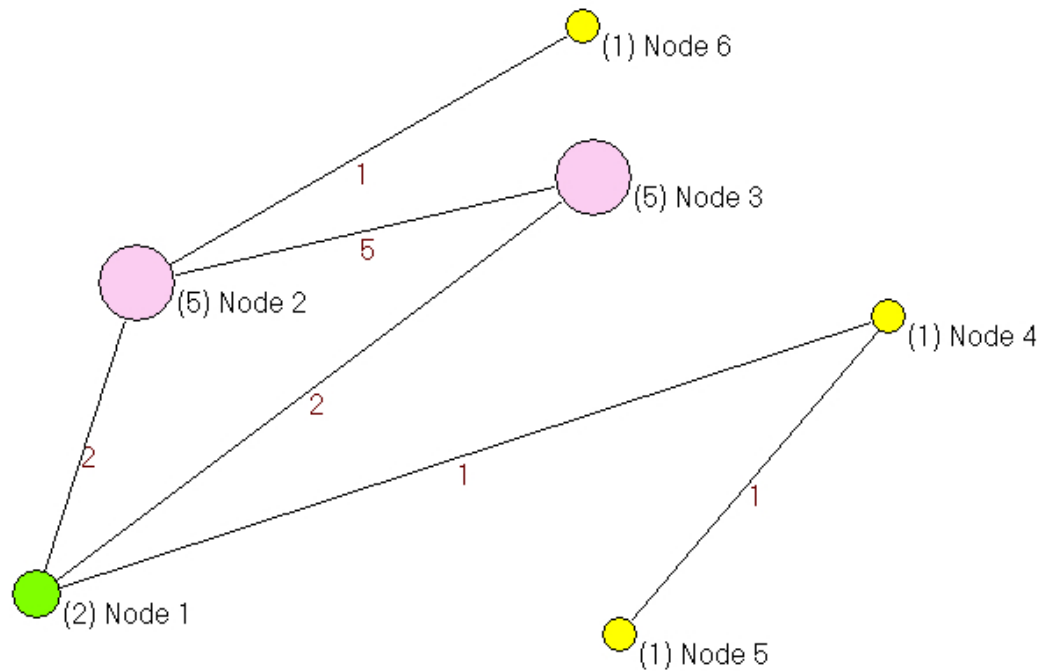


Figure 14. Example network with m -slice values

The numbers in parentheses before the node labels are the highest m -slice the node belongs to (also indicated by node size). Nodes 2 and 3 belong to the 5-slice, since they share a connection of strength 5. Nodes 1, 2 and 3 belong to the 2 slice, as they all have connections of at least strength 2. This demonstrates the nested character of m -slices. All nodes in the figure are in the 1-slice, as each has a connection with at least strength 1. So, by examining the highest m -slice values, we find that nodes 2 and 3 are the most strongly connected in the graph, with node 1 having a lower connectivity and nodes 4, 5 and 6 having even lower connectivity. Note that node 2 has a degree centrality of 8, while node 3 has a degree centrality of 7, but they are both in the

5-slice. This demonstrates one of the differences between degree centrality and m -slice analysis: degree centrality considers all ties of any strength while m -slices depend on the tie of greatest strength.

M -slices have a wide range of uses in data analysis. Sicilia et al. (2007) used m -slices to analyze common interest in discussion threads with e-learning technologies, providing evidence to restructure the online courses. Brughmans (2010) used the analysis to map the presence of common pottery forms at multiple archaeological sites of ancient Rome, suggesting closer trade and social connections between sites in higher m -slices. Hunscher (2006) used m -slices to look at the new web technology of tagging URLs by Internet users and mapped the connections between users by similar URL tags, showing that different user groups exhibited varied online behavior.

Table 6 below displays the m -slice value for each connected organization in the inter-organizational network, sorted by highest m value. Organizations in the 0-slice (i.e., organizations with zero shared individuals) are excluded from the table.

Table 6. Inter-organizational network m -slices

Organization Name	High m -slice value
American Association for the Advancement of Science	33
National Academy of Sciences	33
Access Research Network	20
Discovery Institute: Center for Science and Culture	20
International Society for Complexity, Information and Design	20
Intelligent Design and Evolution Awareness Center	18
Origins/Leadership University	18
Santa Fe Institute	18
American Institute of Physics	16
Committee for Skeptical Inquiry	14
Hastings Center	14
American Astronomical Society	12
Astronomical Society of the Pacific	12
Christians in Science	12
Faraday Institute	12

John Templeton Foundation	12
Metanexus Institute	12
Geological Society of America	9
Planetary Society	9
SETI Institute	9
Center for Theology and the Natural Sciences	8
American Society for Bioethics and Humanities	7
Center for Bioethics - University of Minnesota	7
Center for Bioethics - University of Pennsylvania	7
Global Consciousness Project	7
Institute of Noetic Sciences	7
National Center for Science Education	7
Parapsychological Association	7
Rhine Research Center	7
A Rocha	6
American Institute of Biological Sciences	6
International Society for Science and Religion	6
John Ray Initiative	6
Kennedy Institute of Ethics - Georgetown University	6
Public Responsibility in Medicine and Research	6
Secular Web Library/Internet Infidels	6
Sigma Xi	6
European Society for the Study of Science and Theology	5
Ian Ramsey Centre	5
Institute on Religion in an Age of Science	5
National Science Teachers Association	5
New Mexicans for Science and Reason	5
Science and Religion Forum	5
Cognitive Sciences Laboratory	4
Society for Scientific Exploration	4
American Society of Law, Medicine and Ethics	3
Au Sable Institute of Environmental Studies	3
Canadian Scientific and Christian Affiliation	3
Center for Bioethics and Human Dignity	3
Fund for UFO Research	3
International Association of Bioethics	3
International Network on Feminist Approaches to Bioethics	3
International Society of Life Information Science	3
Joint Centre for Bioethics - University of Toronto	3
Mutual UFO Network	3
Society for Psychical Research	3
Counterbalance Foundation	2
Creation Ministries International	2
Creation Research Society	2
HumGen International	2
Institute for Creation Research	2

International Consciousness Research Laboratories	2
Kansas Citizens for Science	2
Parapsychology Foundation	2
Priests for Life	2
Southern Cross Bioethics Institute	2
Students for Life of America	2
Zygon Center for Religion and Science	2
Affiliation of Christian Geologists	1
American Scientific Affiliation	1
Answers in Genesis	1
Australasian Bioethics Association	1
Boundary Institute	1
Farsight Institute	1
Intelligent Design Undergraduate Research Center	1
International Society for the Study of Subtle Energies and Energy Medicine	1
Kolbe Center for the Study of Creation	1
Lindeboom Institute	1
National Association of Biology Teachers	1
Nuffield Council on Bioethics	1
Probe Ministries	1
Scientific and Medical Network	1
Skeptics Society	1
Triangle Association for the Science of Creation	1
Wellcome Trust	1

The highest m -slice, the 33-slice, is made up of only two organizations: the American Association for the Advancement of Science (AAAS) and the National Academy of Sciences (NAS). These two organizations shared 33 individuals, the highest connectivity in the network. This suggests a similarity in the organizations' goals and identities, due to their high level of inter-organizational connection. Indeed, both organizations are long-existing mainstream scientific organizations with an extremely high prestige both within and outside of scientific fields. Thus, it is little surprise these two organizations would share so many individuals.

Since m -slices are nested, the AAAS and NAS are also part of all lower slices in the network. However, note that to be in a given m -slice, an organization only needs to have a connection to one other organization with a multiplicity of m , as the AAAS and NAS are

connected by 33 common individuals. As noted above, the organization members of a given slice do not need to be connected to each other, either directly or at longer distances. For example, the Fund for UFO Research and the Mutual UFO Network are part of the 3-slice, as they share 3 individuals between the two organizations. However, as noted above, these two organizations form an isolated dyad; they are connected to each other but to no other organizations in the network, including the other organizations in the 3-slice, 2-slice and 1-slice. Thus, while we can consider these two organizations as a cohesive subgroup at the 3-slice level, we need to consider the other 3-slice members as a different cohesive subgroup (or multiple cohesive subgroups). To help with the interpretation of the m -slices, Figure 15 below displays the inter-organizational sociogram with m -slice values for each organization.

The number in parentheses before the organization names represents the highest m -slice the organization belongs to (the same number listed in Table 6). The vertex colors also represent the highest m -slice the organization belongs to. For example, all 1-slice organizations have yellow vertices; all 2-slice organizations have green vertices, etc.

There is a stark contrast in m -slice values among the organizations in the ID/creation science subnetwork (right side of the sociogram). With one exception, the ID organizations have very high m -slice values (18 and 20), while the creation science organizations have very low values (1 and 2). The second highest m -slice, the 20-slice, is made up entirely of ID organizations: Access Research Network, the Discovery Institute, and the International Society for Complexity, Information and Design (ISCID). This means that, among these three organizations, each organization shares at least 20 individuals with the other two organizations. Access Research Network shares 20 individuals, the Discovery Institute shares 29 individuals, and ISCID shares 23 individuals. Thus, these three organizations display a high level of interconnection within the subnetwork.

Two other organizations in the ID/creation science subnetwork also display a high level of cohesion: the Intelligent Design and Evolution Awareness Center and Leadership University. These two organizations are in the 18-slice. Since m -slices are nested, the three organizations in the 20-slice discussed above are also part of this 18-slice. Thus, with the exception of the Intelligent Design Undergraduate Research Center (IDURC), all of the ID organizations are in a highly cohesive subgroup. This shows again the marginality of IDURC compared to the other ID organizations.

The creation science organizations do not show such highly cohesive ties as the ID organizations. All of the CS organizations are in either the 1-slice or 2-slice. The older, larger CS

organizations are in the 2-slice: Creation Ministries International, Creation Research Society, and the Institute for Creation Research. The two CS organizations connected to the Discovery Institute, the Kolbe Center for the Study of Creation and Probe Ministries are in the 1-slice, as is the CS organization connected only to the AAAS, the Triangle Association for the Science of Creation. This shows once again that the creation science movement is not a cohesive organizational field. The *m*-slice levels of all the CS organizations show a low level of board or fellow membership overlap between the organizations; this suggests a lack of organizational coordination, with little importance given to promoting similar theories. There do not appear to be strong bonds between the creation science organizations.

Overall, the *m*-slices demonstrate a strong dissimilarity in network cohesion between the ID organizations and the creation science organizations. ID organizations exhibit very high multiplicity of board and fellow membership overlap. With one exception, all of the ID organizations were in the 2nd and 3rd highest *m*-slices (20 and 18, respectively), demonstrating strong inter-organizational cohesion. These strong bonds suggest a high importance of organizational and ideational coordination in the ID movement. The high board and fellow membership overlap between the ID organizations shows that many of the same actors are acknowledged by multiple organizations. The leading ID theorists (e.g., William Dembski and Michael Behe) are recognized as such across the movement, thus instilling a common set of arguments and vocabularies.

This suggests that the ID movement is, at least at an organizational level, a true scientific/intellectual movement (SIM). As noted earlier, one of the primary characteristics of SIMs is their “organized collective action” (Frickel and Gross 2005:207). The high level of interconnectedness and cohesion of the ID subnetwork demonstrates the collective nature of the

ID movement. ID has a core set of leaders, as evidenced by the large number of commonly recognized movement intellectuals. This core set of movement leaders is strong evidence for a common movement identity, especially given the various fields many of these leaders work in (e.g., mathematics, biochemistry, engineering, etc.). Thus, it is likely that ID proponents, although they have different academic backgrounds and approach the question of origins from different angles, would all consider themselves as part of the ID movement, another characteristic of SIMs (Frickel and Gross 2005:206).

In contrast, the creation science organizations do not demonstrate strong, cohesive inter-organizational ties. None of the organizations are connected by more than 2 individuals, and many by only one. This lack of cohesion suggests a loosely organized movement, with little importance given to organizational or ideational coordination. This may be a result of creation science relying mostly on biblical interpretations for ‘evidence,’ rather than the work of individual scholars like ID. Regardless of the current rejection of ID as a true science, it undoubtedly works more like a science than creation science. The leading works in the field are original theories contributed by academically trained scholars, and these scholars (and their theories) are recognized by most of the ID organizations as contributing to ID theory. In this sense ID is more like a scientific field than CS. Indeed, the mainstream scientific subnetwork also displays a high level of cohesion among most of the organizations.

The CS movement, however, relies primarily on the Bible, with only a few organizations making use of other written works based on biblical interpretation (e.g., the Institute for Creation Research uses *The Genesis Flood*, written by one of their founders). As such, there are few original ideas in the CS movement; the particular emphases or interpretations of the Bible by a given organization and their organizational strategies (e.g., media releases, legal challenges,

physical attractions, etc.) are really what distinguish one CS organization from another. Some organizations rely strictly on a literal interpretation of the Genesis chapter of the Bible, while others cite evidence of the Noachian Flood as evidence for biblical accuracy. Whatever the emphasis, there is likely no strong need to recognize biblical experts that work for another organization when each organization has their own biblical experts. Thus, the ID movement's more 'scientific' methods promote strong inter-organizational ties, while the CS movement's 'non-scientific' methods do not promote inter-organizational linkage, and may even discourage organizational overlap.

For example, the Creation Research Society and the Institute for Creation Research share two commonly-cited individuals, the most of any two CS organizations. Donald DeYoung, chairman of the Science and Mathematics department at Grace College, was the President of the Creation Research Society and an adjunct faculty member of the Institute for Creation Research. D. Russell Humphreys, a physicist formerly of Sandia National Laboratory in New Mexico, was a board member of the Creation Research Society and a research scientist for the Institute for Creation Research. Dr. Humphreys is also cited by Creation Ministries International, making him the most highly cited individual within the CS subnetwork. His popularity is probably due to his book *Starlight and Time* (Humphreys 1996), in which he proposes a model consistent with the 6-day creation in the Bible and the apparent distance of stars. Note, however, that the majority of creation science organizations have zero inter-organizational links, meaning they do not cite Dr. Humphreys, Dr. Deyoung, or any other individuals in common with other organizations.

In contrast, 3 individuals, Michael Behe, William Dembski, and Jonathan Wells were cited by all connected ID organizations except for the Intelligent Design Undergraduate Research Center. Considering there are only 2 ID organizations with no inter-organizational links

(Intelligent Design Network and Science Against Evolution), the majority of ID organizations recognize these individuals as intellectual leaders of the movement, demonstrating the presence of a collective identity among ID proponents.

10.3 CUT-VERTEX AND *M*-SLICE CONCLUSION

Both cut-vertex and *m*-slice analysis showed a stark contrast between the intelligent design and creation science organizational subnetworks. Four organizations in the intelligent design subnetwork are cutpoints. However, only one organization (the Intelligent Design Undergraduate Research Center) relies on one of the cutpoints for connection to the subnetwork. Thus, with one exception, the intelligent design subnetwork sustains multiple ties between the organizations. This suggests a tendency to coordinate organizational actions and a shared sense of mission. *M*-slice analysis also showed a cohesive set of ties, demonstrating a unified intellectual community among intelligent design organizations. This is in strong contrast to the set of creation science organizations. The creation science movement is largely fractured, with a subnetwork of the larger, mostly older organizations sharing links with each other, except for Answers in Genesis, which is only connected to one other organization. In particular, *m*-slice analysis showed an extremely weak, non-cohesive set of ties among the creation science organizations. Overall, intelligent design appears to be a smaller but much more cohesive organizational network, and has a more unified intellectual community, than the creation science movement.

11.0 ERGM ANALYSIS

Table 8 displays the results of an exponential random graph model (ERGM) run on the inter-organizational network. This model shows the extent to which various structural and categorical attributes contributed to the overall network structure. ERGM is a logistic model that takes into account the discrete (and usually dichotomous) nature of the dependent variable, the presence or absence of a tie, and the inter-dependence between the response and predictor variables (Anderson et al. 1999: 38). A set of coefficients are estimated and then tested against a series of random networks with the same number of nodes and ties as the actual network. As in other statistical models, the effects of each coefficient are estimated while taking into account all other coefficient effects; thus, this analysis allows us to examine the individual effect of each attribute. This method also allows us to examine how the formation of ties in local areas of the network contributes to the overall network structure (Gondal 2011:22). This analysis in particular is similar to Ackland and O’Neil’s (2011) study of the environmental movement online and frame networks.

Recently it has been shown that Monte Carlo simulation methods provide more accurate parameter estimates depending on the size of the networks being analyzed (Robins et al. 2007); all but one of the models were estimated using this method. This model estimates the log-odds of each tie conditional on all other ties in the network and their pattern of connections, which can then be used to infer the probability of the ties in the entire network (Anderson et al. 1999: 47).

There were 4 endogenous network attributes included as coefficients: edges, isolates, triangle, and *k*-star. The edges coefficient takes into account the number of ties in the network and acts in a similar fashion as the intercept in a standard linear model (Gondal 2011:26). The isolates coefficient takes into account the number of isolates in the inter-organizational network. This coefficient was necessary to include given the large number of isolates in the network. The triangle coefficient estimates the effect that triangles in the network contribute to the overall structure. This coefficient measures the effect of transitive relations (e.g., a friend of my friend is my friend). Transitive relations are represented in graphical layout as a triangle. This coefficient was included to account for transitive relations while estimating the probability of within-subnetwork connections. The *k*-star coefficient estimates the effect of differing sizes of star configurations in the network. A star is a network with a single node with a set of nodes connected to it, so the central node plays a very powerful role. The *k*-star distribution is equivalent to the unweighted degree distribution (Snijders et al., 2006). This coefficient was included to take into account the unweighted degree distribution, which is the number of other organizations each organization is connected to.

In addition, two exogenous variables were also included as coefficients in the models. Organizational focus is a coefficient that examines the effect of organizational identity on overall network structure; in other words, do some organizational fields have greater probabilities of tie formation. A significant positive coefficient indicates that organizations within that specific field are more likely to form ties. Although each organization was assigned only one value, the model estimates the effect for each organizational focus separately. This coefficient was included in order to account for unequal tie formation by the subnetworks and to estimate the effect of cross-field tie formation (as within-subnetwork ties will be accounted for).

A homophily coefficient, using the same categories, was also included. This coefficient measures the extent to which organizations prefer to link to other organizations in the same field. This coefficient will serve to test the boundary-work by the different fields identified in the network. A positive and significant coefficient demonstrates a higher probability of within-subnetwork tie formation, indicating possible boundary-work, since cross-field ties are less likely. This boundary-work test is of particular importance when looking at ID and creation science organizations, as the homophily effects for these two groups were estimated separately. Thus, if these effects are positive and significant, this will provide evidence that these are two separate fields, rather than a single movement.

All models were estimated using ‘statnet’ (Handcock et al. 2003), a network analysis package that runs in the R environment (R Development Core Team 2011). This software package was chosen for its parameter estimation options and its hardware flexibility (it can run on any machine with R installed). Table 7 lists the organizations included in the analysis by their organizational field categories. These were used for the ‘organizational focus’ and ‘homophily’ coefficients.

Table 7. Inter-organizational network organizations by organizational categories used in ERGM analysis

<u><i>Creation Science</i></u>
Alpha Omega Institute
Answers in Genesis
Apologetics Press
Associates for Biblical Research
Biblical Creation Society
Black Hills Creation Science Association
Center for Scientific Creation
Christian Answers Network
Christian Apologetics and Research Ministry

Christian Medical Fellowship/FaithCare
Christian Neuroscience Society
Christian Research Institute
Creation Association of Puget Sound
Creation Discovery Project
Creation Evidences Museum
Creation Ministries International
Creation Moments
Creation Research
Creation Research Society
Creation Resource Foundation
Creation Resources Trust
Creation Science Association for Mid-America
Creation Science Association of British Columbia
Creation Science Association of Orange County
Creation Science Evangelism
Creation Science Fellowship
Creation Science Homepage
Creation Science Movement
Creation Studies Institute
Creation Truth Foundation
Creation Vs Evolution/All About God Ministries
Creation Worldview Ministries
Earth History Research Center
Focus on the Family
Geoscience Research Institute (7th Day Adventist General Conference)
God and Science
Institute for Creation Research
Kolbe Center for the Study of Creation
Missouri Association for Creation
Mt Blanco Fossil Museum
Origins Resource Association
Origins/Leadership University
Probe Ministries
Reasons to Believe
Rocky Mountain Creation Fellowship
South Bay Creation Science Association
Stand to Reason
Triangle Association for the Science of Creation
Twin Cities Creation Science Association

Intelligent Design

Access Research Network

Discovery Institute: Center for Science and Culture
Intelligent Design and Evolution Awareness Center
Intelligent Design Network
Intelligent Design Undergraduate Research Center
International Society for Complexity, Information and Design
Science Against Evolution

Mainstream Science

American Association for the Advancement of Science
American Astronomical Society
American Institute of Biological Sciences
American Institute of Physics
Astronomical Society of the Pacific
Geological Society of America
International Society of Life Information Science
National Academy of Sciences
National Association of Biology Teachers
National Geographic Society
National Science Teachers Association
Santa Fe Institute
Sigma Xi

Pseudo-science (D)

Cognitive Sciences Laboratory
European Journal of Parapsychology
Faraday Institute
Farsight Institute
Global Consciousness Project
Institute for New Energy
Institute of Noetic Sciences
International Consciousness Research Laboratories
International Society for the Study of Subtle Energies and Energy Medicine
Orgone Biophysical Research Laboratory
Parapsychological Association
Parapsychology Foundation
Rhine Research Center
Scientific and Medical Network
Society for Psychical Research
Society for Scientific Exploration

Ethics

American Society for Bioethics and Humanities
American Society of Law, Medicine and Ethics

Australasian Bioethics Association
Center for Bioethics - University of Minnesota
Center for Bioethics - University of Pennsylvania
Center for Bioethics and Human Dignity
Eubios Ethics Institute
European Association of Centres of Medical Ethics
Hastings Center
HumGen International
International Association of Bioethics
International Network on Feminist Approaches to Bioethics
Joint Centre for Bioethics - University of Toronto
Kennedy Institute of Ethics - Georgetown University
Lindeboom Institute
Minnesota Center for Healthcare Ethics
Nuffield Council on Bioethics
Public Responsibility in Medicine and Research
Southern Cross Bioethics Institute
Wellcome Trust

Pro-science

Committee for Skeptical Inquiry
Kansas Citizens for Science
National Center for Science Education
New Mexicans for Science and Reason
Ohio Citizens for Science
Secular Web Library/Internet Infidels
Skeptics Society
Students for the Exploration and Development of Space
Talk.Origins Foundation
Tree of Life

Anti-abortion

Priests for Life
Students for Life of America

Ufology

Fund for UFO Research
Mutual UFO Network

Christian organization (non-Creation science)

A Rocha
Affiliation of Christian Geologists
Association of Christians in the Mathematical Sciences

Au Sable Institute of Environmental Studies
Christian Association of Stellar Explorers (Christians in Astronomy)
Christians in Science
Faith and Reason Ministries

Science-theology

American Scientific Affiliation
Berea College Science and Faith
Canadian Scientific and Christian Affiliation
Center for Theology and the Natural Sciences
Counterbalance Foundation
European Society for the Study of Science and Theology
Ian Ramsey Centre
Institute for the Study of Christianity in an Age of Science and Technology
Institute on Religion in an Age of Science
International Society for Science and Religion
John Ray Initiative
John Templeton Foundation
Metanexus Institute
Pascal Centre for Advanced Studies in Faith and Science
Zygon Center for Religion and Science
Science and Religion Forum

Science outliers

Boundary Institute
Planetary Society
SETI Institute

Table 8 presents the parameter estimates of the model. Note that all estimates were produced using Markov Chain Monte Carlo estimation; this method produces better estimates, but does not uniquely identify parameter effects. A different parameter estimate will be produced each time the model is run. To account for this, I ran all relevant models ten times each, and selected the model with the lowest Akaike information criterion (AIC) value (Akaike 1974). The AIC value provides an estimate of fit of a model, compared with other models. Each individual model run itself included 10 iterations (wherein the model with the best log-odds was selected) of 10,000 random networks. Ten model runs were sufficient to produce similar or exact low AIC

values multiple times for each model; therefore further runs would not produce better model estimates. I also experimented with larger random network sample sizes and found similar results. A positive parameter value indicates that the probability of tie being present is greater than the tie being absent, all other effects being taken into account. And vice versa for negative parameters (Anderson et al. 1999: 54).

There were 18 total models run and they were constructed in an additive manner, presenting individual coefficients first, then presenting each possible combination of coefficients until including all coefficients. These were run in order to show the effects with different combinations of coefficients, and are all presented in Appendix D. Model 18 only is presented here as it includes all parameter estimates and demonstrates the effect of each parameter, taking into account all others. Model 18 includes structural estimates; these are intended to show the effect of structural characteristics in producing the overall network structure. These effects include the number of edges in the network, the number of isolates, transitive relations ('triangle' coefficient), and star networks of size 1 – 5 ('*k*-star' coefficient). A 5-star is a network with a single node with 5 nodes connected to it and no connections between the other 5 nodes, so the central node plays a very powerful role. Model 18 also includes 'organizational focus' and 'homophily' coefficients. The first coefficient shows the effect of field membership on the probability of tie formation, while the second coefficient measures the effect of within-field ties on network structure.

Table 8. Inter-organizational network ERGM model 18

Independent variables	Model 18 ¹		
	Coefficients	Standard errors	
Edges	-8.416	(0.005)	***
Isolates	-0.403	(0.009)	***
Triangle	1.222	(0.001)	***
K-star(K)			
K=1	-0.031	(0.013)	*
K=2	0.846	(0.001)	***
K=3	-0.345	(0.062)	***
K=4	0.077	(0.012)	***
K=5	-0.006	(0.001)	***
Organizational Focus ²			
Creation Science	-0.267	(0.009)	***
Intelligent Design	0.644	(0.040)	***
Pseudo/Fringe-science	0.296	(0.006)	***
Ethics	-2.350	(0.030)	***
Pro-science	0.383	(0.028)	***
Christian organization (non-Creation science)	0.227	(0.023)	***
Science-religion	0.317	(0.017)	***
Science outliers	0.302	(0.015)	***
Homophily			
Creation Science	1.985	(0.025)	***
Intelligent Design	2.362	(0.001)	***
Mainstream Science	2.158	(0.006)	***
Pseudo/Fringe-science	2.551	(0.014)	***
Ethics	6.734	(0.002)	***
Pro-science	2.421	(0.005)	***
Christian organization (non-Creation science)	2.864	(0.004)	***
Science-religion	1.680	(0.019)	***
Science outliers	5.085	(0.000)	***

* $p < .05$

** $p < .01$

*** $p < .001$

¹ Model was fit using Markov Chain Monte Carlo estimation. Coefficients and standard errors were not uniquely determined. The coefficients shown in table represent the model with the best fit out of 10 repetitions.

² Organizations with a mainstream science focus provide the reference category for the organizational focus parameters.

Model 18 includes all parameters estimates used in this analysis. The coefficients presented here are log-odds. The edge coefficient can be interpreted like the intercept in a

standard linear model. Thus, taking into account all other effects, the number of edges in the inter-organizational network would be unlikely to produce the actual network configuration (since the coefficient is negative). The negative value likely reflects the skewed distribution of edges. A small number of nodes share a majority of the edges, while there are a large number of isolates in the model. The isolates coefficient is also negative, indicating that the number of isolates does not predict the overall network structure, also likely due to the skewed degree distribution.

The triangle coefficient was positive and significant, indicating that transitive ties played a role in network formation. This is especially significant as this model also took into account homophilous linkages, which indicates that, even by controlling for within-subnetwork ties, organizations tended to form ties with organizations that shared ties with organizations already linked to them. The odds of forming this third connection, given the existence of the other two connections (i.e., closing the triangle) were about 3.4 (exponent transformation of 1.222) against this link not being present (Hunter et al., 2008). In other words, transitive ties were formed about than 3 out of every 4 times. As homophily was controlled for, this suggests that transitive relations existed both internal to and external to individual fields. A quick look at Figure 2 demonstrates this pattern. Some transitive relations occur between different subnetworks. For example, there is a set of transitive relations between the American Association for the Advancement of Science (AAAS), SETI Institute, and the Center for Theology and the Natural Sciences. The majority of the multiple-field transitive relations include the AAAS, showing once again the importance of this organization for the overall network structure.

However, it would appear that the majority of transitive relations are within the organizational subnetworks. One triangle of key importance here is within the ID/creation

science subnetwork. The triangle formed by Creation Ministries International, the Creation Research Society, and the Institute for Creation Research makes up the bulk of the inter-organizational ties among creation science Organizations and constitutes the only set of transitive inter-organizational ties within the creation science movement. With the exception of the tie between Answers in Genesis and the Institute for Creation Research, this triangle is the only inter-organizational evidence of cooperation and common identity among the creation science organizations.

Indeed, the lack of transitive ties is even more important among the creation science organizations. Answers in Genesis has no connections to either Creation Ministries International or the Creation Research Society, even though all three organizations are connected to the Institute for Creation Research. In addition, the two CS organizations that share board or fellow members with the Discovery Institute, the Kolbe Center for the Study of Creation and Probe Ministries, do not have any connections to each other. In contrast, the ID organizations show not just transitive relations, but high degree transitive relations. The only exception is the Intelligent Design Undergraduate Research Center. This suggests a much more cohesive identity and commonly recognized experts among the ID organizations than among CS organizations.

The k -star coefficients for size 2 and 4 were positive, while the 3 and 5-star parameters were negative. This is to be expected in graphs with high centrality values and reflects the balancing of the contributions of k -stars with $(k+1)$ -stars (Snijders et al., 2006:113). K -stars do have an effect on the network structure, with 2-stars having the largest effect, and the remaining coefficients decreasing in strength as the size of stars increase. As this is equivalent to the unweighted degree distribution, this indicates that the number of organizations connected to two other organizations has a strong influence on the overall network structure, while organizations

with higher levels of connectivity have lesser effects on network structure. This indicates that most organizations shared individuals with a small number of organizations, usually only two other organizations, and that this pattern was significant for producing the network structure.

Six of the organizational focus parameters were positive and significant: Intelligent Design, Pseudo/Fringe-Science, pro-science, Christian Organization, Science-Religion, and Science Outliers. In other words, net of the structural effects in the model, membership in these organizational fields did contribute to the network structure; these organizations were likely to have more ties with other organizations. In contrast, the creation science and Ethics coefficients were negative and significant, indicating that there were fewer ties than expected among the organizations in these subnetworks. The Ufology and Anti-abortion coefficients were suspect and have been suppressed due to extremely low sample sizes.¹⁰ As homophily is controlled for in this model, these effects really apply to cross-subnetwork relations. Thus, ID organizations had more ties to other subnetworks than expected; these were shared with the CS and Mainstream Science subnetworks. The CS organizations had fewer ties with other fields than expected. Thus, ID was more active in sharing individuals with other subnetworks than CS, indicating shared interest with both Mainstream Science and creation science.

Finally, the homophily coefficients are all positive and significant. This means that, given all other effects in the model, the organizations within each subnetwork tend to form ties more often with other organizations in the same subnetwork than with organizations outside their subnetwork. Thus, there is consistent evidence for homophily effects in the inter-organizational network. The significant effects of the within-organizational field homophily parameters point to the unequal distribution of ties within and between organizational fields, and confirm the

¹⁰ Both fields included only two organizations with 100% possible ties observed. See Appendix D for the these coefficient values.

presence of boundaries between the different subnetworks. If the distribution of shared individuals was even both within the organizational fields and between them, the organizational fields would not contribute to network structure and therefore would not be analytically important categories. The fact that they are all significant and positive shows that the network would be fundamentally different if these categories did not exist. Even the creation science subnetwork, after taking into account isolates and transitive relations, displays a tendency to form within-subnetwork linkages.

The homophily effect also provides evidence for the existence of boundaries between these fields. The difference in link structure within and between organizational fields is likely the result of boundary work by organizations. Again, the significant coefficients of these parameters indicate different link formation within the fields than between the fields. In addition, the coefficients are larger here than for all other effects except the edges coefficient (see footnote 7). For example, the odds of an ID organization forming a within-subnetwork tie are 10.6 (exponent transformation of 2.362), which means that this tie would be formed more than 10.5 out of 11.5 times (i.e., over 90% of the time). This strong tendency to form within-subnetwork ties provides evidence for boundary formation among the subnetworks analyzed here.

These results also confirm earlier analyses suggesting a significant difference in the network properties of the ID and creation science organizations. Centrality and *m*-slice analysis both pointed to large differences in the connectivity and cohesion of these two sets of organizations, with the ID organizations exhibiting higher centrality and greater cohesion than the CS organizations. Separate homophily parameters for both ID and CS were included in the ERGM model in order to test whether these differences held while taking into account other network effects. As both of these coefficients were significant, there was evidence of different

membership effects for the ID and CS subgroups. Thus, the tendency to form within-subnetwork ties suggests that ID and CS are two distinct subnetworks, with several organizations linking them together. In addition, this tendency was also different between the two subnetworks, with the odds of within-subnetwork ties among ID organizations of 10.6 and 7.3 among CS organizations. Thus, while both subnetworks tended to form within-subnetwork ties, this tendency was greater among ID organizations, again indicating a greater level of movement identity and cooperation among ID organizations than CS organizations.

Summary of findings:

- Transitive ties were likely to be present, taking into account within-field ties.
- Lower unweighted degree was associated with the network structure.
- Intelligent design organizations were more likely to form connections than creation science organizations.
- Intelligent design and creation science organizations were both likely to form within-field ties, though this effect was stronger for intelligent design.

11.1 ERGM CONCLUSION AND DISCUSSION

The purpose of this analysis was to determine which network effects and exogenous characteristics contributed to the network structure. The model found evidence for transitive relations, taking into account all other effects. Thus, organizations that share individuals also tend to share individuals with the same organizations. This indicates that most of the

subnetworks exhibit more than just dyadic relations. Instead, they are communities of organizations with overlapping ties. This effect was in addition to homophily (within-subnetwork connections) effects, indicating that transitive relations between subnetworks played an important role. However, as noted above, transitive relations were not heavily observed among the creation science organizations. This suggests again that the CS movement does not have a strongly shared intellectual community and many of the organizations operate more or less independently of each other. This is in contrast to the ID movement, which exhibited strong transitive relations among its organizations.

The 2- and 4-star coefficients were positive, while the 3- and 5-star parameters were negative. This ‘alternating’ effect reflects the high degree distribution. The large coefficient for the 2-star (and decreasing coefficients for higher k -stars) indicates that most organizations share individuals with only two organizations, with smaller numbers of organizations recognizing individuals from a greater number of other organizations. This suggests a small, directly-connected intellectual community among many of the organizations in the network. Note that most of the ID (though not CS) organizations have a higher unweighted degree than 2. The higher-star coefficients seem of more relevance for the ID organizations, indicating a larger number of directly connected organizations in the ID subnetwork than most of the other subnetworks. This may be a result of the relatively small size of the ID intellectual community. As mentioned above, this is in stark contrast to the CS organizations, which have few connected organizations, and therefore a weaker community of intellectuals.

Finally, all of the organizational subnetwork homophily coefficients were significantly related to the network structure, taking into account the other structural effects. The significant effects of the homophily parameters point to the unequal distribution of ties within and between

organizational fields, and confirm the presence of boundaries between the different subnetworks. The high magnitude of these coefficients also points to the strength of these boundaries. The average log-odds of the homophily effect was 3.1, which translates to the average odds of a within-subnetwork tie existing of about 22 to 1 (i.e., about 95%). Further, the separate effects of the creation science and intelligent design parameters point to a distinction between these two subnetworks, after taking into account the number of isolates and transitive relations in the network. While this is not definitive proof that they are two distinct organizational networks, this does show that the two subnetworks tend to share individuals with other organizations in their subnetwork, and are less likely to form ties between the two subnetworks.

Further analysis looking only at the ID and CS subnetworks found similar results concerning the tendency to form within-subnetwork ties (Table 9 below). ID organizations again tended to form within-subnetwork ties more often than cross-subnetwork ties. However, CS organizations had a negative homophily coefficient, indicating a tendency to not form within-subnetwork ties. As the number of isolates was controlled for, this indicates that CS organizations did not form within-subnetwork ties more often than cross-subnetwork ties. Thus, while it appears that the ID movement has done some boundary-work in relation to the CS movement (albeit weak boundary-work), the reverse does not appear to be true of the CS movement. Indeed, though the effect is weak, the odds were against the formation of within-subnetwork ties among CS organizations. This reflects the low number of within-subnetwork ties and the 3 CS organizations (Leadership University, Probe Ministries and the Kolbe Center for the Study of Creation) that only formed ties to ID organizations.

Table 9. Intelligent design and creation science subnetworks ERGM analysis

Independent variables	Coefficients	Standard errors	
Edges	2.773	(14.040)	
Isolates	4.877	(0.000)	***
Triangle	1.775	(0.746)	*
<i>K</i> -star(<i>K</i>)			
<i>K</i> =1	-0.001	(0.000)	***
<i>K</i> =2	-3.654	(6.798)	
<i>K</i> =3	4.855	(6.121)	
<i>K</i> =4	-4.944	(4.830)	
<i>K</i> =5	2.895	(2.631)	
Homophily			
Creation Science	-0.404	(0.000)	***
Intelligent Design	1.826	(0.000)	***

* $p < .05$

** $p < .01$

*** $p < .001$

Note: Model was fit using Markov Chain Monte Carlo estimation. Coefficients and standard errors were not uniquely determined. The coefficients shown in table represent the model with the best fit out of 10 repetitions.

Thus, ERGM analysis provided some evidence of a boundary between ID and CS; however, this boundary does not appear to be two-sided. While ID organizations tended to form ties with other ID organizations, this was not true of CS organizations. This provides further evidence of a more or less unified intellectual community in the ID movement, a low (but not absent) tendency of ID organizations to recognize similar intellectuals as the CS organizations, and a fractured intellectual community in the CS movement. The tendency of ID organizations to recognize the same intellectuals points to a unified movement identity and intellectual community in the ID movement. The ERGM results confirmed earlier analyses pointing to a cohesive intellectual community among the ID organizations. This indicates a common intellectual thread in the ID movement, wherein they work more or less under similar theoretical foundations. The recent founding of the Biologic Institute may increase this unified intellectual

community even further. However, it remains to be seen if this community will be able to formulate a scientifically suitable research program.

The results in Table 9 also showed that ID organizations did not tend to form ties with CS organizations, providing some evidence of boundary-work among ID organizations. However, there were several connections between ID and CS organizations, including the Discovery Institute and 3 CS organizations. Thus, there is some intellectual overlap between ID and CS organizations. This suggests that, while there are not many, there are some common intellectuals among the ID and CS movements, and therefore possibly some common beliefs among these two movements. However, the results show that, while ID organizations may sometimes identify with CS intellectuals, these are usually not recognized by more than one ID organization, suggesting that these connections between ID and CS result more from inter-personal linkages between these organizations than broader, movement-wide recognition.

Finally, the ERGM results in Table 9 provided more evidence of the lack of a unified intellectual community among CS organizations. In addition to the large number of CS organizations that did not commonly recognize any intellectuals, there was no evidence for preferring intellectuals within the CS movement when ties were formed. Indeed, the odds were against within-subnetwork ties. This suggests a lack of any boundary-work by the CS movement (in relation to the ID movement). Indeed, the lack of an intellectual community likely precludes boundary-work, as there would be little opportunities for communicating or enforcing such a boundary. Likewise, as creation science has been definitively rejected as ‘science,’ there is likely little motivation to police any boundary with another anti-evolution movement, as there would be little or no negative consequences of CS organizations being connected with ID organizations.

12.0 CONCLUSION AND DISCUSSION

This study examined the inter-organizational connections of the ID movement in order to assess the institutional boundary-work of science and ID. As a cultural network, science has used ‘expulsion’ boundary-work (Gieryn 1999) to differentiate ‘science’ and ID, thereby making a distinction between the two knowledge-systems. As a result, ID does not have access to the resources (employment, funding, journal publication, etc.) or the epistemic authority of science (e.g., inclusion in public school curriculum). ID proponents have responded by highlighting what they consider scientific qualities of ID theory and research, while also pointing to ‘unscientific’ characteristics of evolution and the broader scientific establishment. (See sections 3.1 and 3.2 for the rhetorical boundary-work from science and ID, respectively.) Mixed results were found regarding the three hypotheses given earlier.

Hypothesis 1: There are few or no shared intellectuals between the ID and mainstream science organizations in the network analyzed here.

The evidence presented here supports the existence of an institutional boundary between science and ID, and, with one exception, confirms the hypothesis of no shared intellectuals between mainstream science and ID organizations. While there were inter-organizational ties between ID and mainstream science, these ties were formed by one individual: Henry F.

Schaefer III, an accomplished professor of computational chemistry at the University of Georgia. Dr. Schaefer came out as an ID proponent in 2008 when reading his paper “The Big Bang, Stephen Hawking, and God” at a conference in Bombay, India. He represents an example of a high-status scholar using their prestige to promote the ID SIM, one condition that Frickel and Gross suggested would make the success of a SIM more likely (2005:209). His extreme scientific prestige (he is credited with over 1,300 publications¹¹) has likely shielded him from sanctions due to his advocacy of ID, while at the same time he lends scientific credibility to the ID movement. Thus, Dr. Schaefer is able to span the boundary between science and ID, since his traditional scientific accomplishments allow him to maintain a strong position within the scientific cultural network while also openly advocating ID theory, thereby being accepted into the ID SIM.

While evidence of boundary-spanning connections between ID and mainstream scientific organizations was found, these connections were weak. With the exception of Dr. Schaefer no other intellectuals were commonly recognized by ID and mainstream scientific organizations. Thus, overall, the scientific boundary-work has been mostly successful in ‘expelling’ ID proponents from scientific recognition. However, this conclusion is limited both by the data analyzed here, and by the possibility of individual scientists agreeing with ID claims while not making this opinion public. While ID proponents claim that many scientists hide their sympathies for ID in order to protect their employment, this is impossible to verify. A 1991 Gallup poll found that only 0.15% of earth and life scientists accepted creationism¹². However, this was before ID became well known and since ID purports to be more scientific than creation science,

¹¹ For biographic sketch, see http://en.wikipedia.org/wiki/Henry_F._Schaefer,_III.

¹² See <http://www.talkorigins.org/indexcc/CA/CA111.html>.

it's possible that ID would receive a greater amount of anonymous support from scientists working in the relevant fields (newer survey results are not available).

The data also showed an even stronger boundary between science and creation science. There was only one shared connection between a creation science organization and a mainstream science organization (Triangle Association for the Science of Creation and the American Association for the Advancement of Science), which was formed by a single computer scientist. No other creation science organizations shared any direct connections with mainstream science. This demonstrates the strong disassociation between science and creation science, a result of the decades-long boundary-work accomplished by scientific advocates.

With a few exceptions, the second hypothesis was strongly confirmed.

Hypothesis 2: ID organizations commonly recognize a large number of intellectuals within their movement.

The analysis showed high numbers of commonly recognized intellectuals among most of the ID organizations. *M*-slice and ERGM analysis in particular demonstrated the high level of connectivity among most of the ID organizations. In addition, there were only two ID organizations (about 28%) that did not recognize any intellectuals in the movement, a rate far lower than for creation science organizations (see below). This finding demonstrates a cohesive intellectual community in the ID movement and suggests that these organizations serve as a substitute to the institutional resources of science. It appears that the ID movement has agreed upon a set of intellectuals, thereby acknowledging their contributions to ID theory and, more broadly, cultivating a common identity for the movement participants. This provides a common

set of arguments for the ID movement, possibly even a form of scientific paradigm (Kuhn [1962] 1996). This paradigm, built primarily around William Dembski's notion of specified complexity, provides the theoretical and empirical research direction for the movement's intellectuals. The Biologic Institute, a recently-founded ID research organization, uses specified complexity in 2 of its 3 research areas.¹³ This more or less unified paradigm and cohesive intellectual community likely indicates a stable movement with clear goals. Indeed, there appears to be a reduction in activity among the advocacy part of the movement, with an increase in the 'research' area. Recent unsystematic searches indicate that movement activity among most of the organizations discussed here has decreased, except for the Discovery Institute. While this could reflect a decrease in support for the movement, it may also indicate a consolidation of activity, with the Discovery Institute nearly monopolizing advocacy and the Biologic Institute providing research evidence for the movement.

Mixed results were found when considering the boundary between ID and creation science, the third hypothesis.

Hypothesis 3: There are a large number of individuals commonly recognized by ID and CS organizations.

On the one hand, there were direct ties between creation science and ID organizations: the Intelligent Design and Evolution Awareness Center shared connections with the Institute for Creation Research and the Discovery Institute shared connections with the Kolbe Center for the Study of Creation and Probe Ministries. Leadership University shared connections with all but

¹³ See <http://biologicinstitute.org/research/>.

one connected ID organization; while this organization was categorized as creation science for analysis purposes, in reality it promotes both creation science and ID more or less equally, and therefore is difficult to truly associate with one movement. For example, while Leadership University promotes biblical understanding (creation science) and ID theory it has no direct connections to creation science organizations and extensive direct connections to ID organizations.

On the other hand, ERGM analysis found significant homophily effects for ID, indicating differential tie formation within ID and between these two subnetworks. This suggests a boundary between ID and creation science, as ID organizations were more likely to form ties within their subnetwork than with CS organizations. However, this effect was not found among CS organizations. Thus, there is evidence of a weak boundary between ID and CS organizations, with a related but distinct intellectual community among ID organizations. While they share some common intellectual leaders, for the most part ID organizations rely on movement-specific intellectuals.

The data also showed a low density of connections among the creation science organizations. Of the 49 creation science organizations included in this network, only 8 cited any common intellectual leaders, with about 84% having no commonly-cited intellectuals. Compared to the other organizational fields analyzed here, this represents an extremely low level of shared intellectual leadership, suggesting a weak sense of common identity among creation science organizations. While this may partially be a result of the local/regional aspect of some of these organizations, it is more likely due to the ideational tradition of the creation science movement, which relies heavily (sometimes exclusively) on the Bible. As such, the movement mostly subsists on interpretations of Biblical passages and how they relate to the natural history of the

planet. With few exceptions, the organizational leaders are religiously oriented (some trained, some lay) and have no advanced scientific training. Thus, there is little need for new breakthroughs or research initiatives, as in the ID movement. ID proponents pursue new evidence or theoretical reasoning to show the inability of evolution to produce biological structures; with few exceptions (e.g., *The Creation Flood* and *Starlight and Time*) there is no comparable research or theoretical need in creation science. Instead, most organizations rely on their own in-house leaders and their particular interpretations or foci regarding the Bible.

The low density of connections among creation science organizations may also indicate a sort of ‘competitive marketplace’ of religious leaders and their organizations. The *m*-slice analysis demonstrated the stark difference in connectivity between ID and the small portion of connected creation science organizations. As Ruse (2005) noted, evolution is perceived by anti-evolutionists as the main driving force of the greater secularization of society. As such, it is a potent topic for organizations to recruit dues paying (and media-purchasing) adherents. Many of the creation science organizations highly promote their own leader(s) and produce various forms of media (e.g., documentary DVDs) for sale. In contrast, the various fellows of the Discovery Institute are easily found on their website, only a few of which are actual organizational leaders at Discovery Institute, and various ID organizations promote the same documentaries on their website. Thus, it is in the financial interest of creation science organizations to promote their own organization over others, rather than form an intellectual community. Only a small fraction of creation science organizations appear to recognize intellectual leaders outside their organization; the remaining organizations are more a collection of organizations with similar goals but with little or no inter-organizational recognition or collective identity, and therefore not really part of an overarching movement.

12.1 RESEARCH QUESTIONS AND DISCUSSION

In section 5.0 I presented 3 specific research questions that addressed topics beyond the boundary issue between mainstream science and ID organizations. In this section I reiterate these questions and then provide summary results based on the analyses presented above.

1. Which organizations are the most prominent in the intelligent design network? I determined the prominent organizations using several network analytic measures, described above. This included both descriptive measures and predictive modeling of the networks. I hypothesized that, due to their more or less similar criticism of mainstream science, organizations and individuals affiliated with the creation science and creationist (religious) movements were also prominent in the ID network.

As expected by a search of the literature (Branch 2011; Davey and Blumenthal 2006; Dowd 2007; Goodstein 2005, Forrest 2011; Pennock 2011; Rudoren 2006), the Discovery Institute was overall the most prominent or important organization in the ID network. When considering the entire network, the Discovery Institute had the 3rd highest degree centrality, the 7th highest closeness centrality, and the 5th highest betweenness centrality. It was also in the 2nd highest *m*-slice (20), which also included two other ID organizations, Access Research Network and the International Society for Complexity, Information and Design (ISCID). Those two organizations had similarly high degree centrality, but did not have consistently high closeness or betweenness centrality. Thus, while Access Research Network and ISCID were in the same *m*-slice, the Discovery Institute was more prominent across all measures used here. Its more recent

funding of the Biologic Institute also shows its continuing importance in the ID movement (whereas the other two organizations have not shown as much activity in recent years).

Also as expected, there were direct connections between ID and creation science (CS) organizations, although not in an evenly-distributed manner. The Intelligent Design and Evolution Awareness Center shared the only connection with the subnetwork of larger CS organizations, demonstrating a low level of intellectual commonality with ID. The Discovery Institute shared connections with two CS organizations unconnected to the larger CS organizations and to each other, suggesting a few shared individuals between these two organizations and Discovery, but again little intellectual commonality between ID and CS. Thus, while several connections between ID and CS exist, there is no evidence of a pervasive intellectual community between ID and CS.

While initially this analysis treated both ID and CS as the same overall ‘neocreationist’ movement, the evidence presented here shows that, though there are connections between ID and CS organizations, they do not appear to share the same intellectual community. The low frequency of ties between the ID and CS movements shows that they commonly recognize only a few individuals, while the uneven distribution of ties shows that these are organization-specific citations, rather than pan-movement recognition. In other words, only a few individuals are commonly recognized by both ID and CS organizations, and these recognitions come from only a few organizations, rather than most or all of either movement. Overall, the evidence suggests that ID and CS are related but distinct organizational movements. While their goals may overlap (e.g., decreasing the legitimacy of evolution, alternative origins teaching in public schools, reversing the ‘secularization’ of society) they do not share many intellectual leaders, suggesting that they have distinct intellectual traditions.

This conclusion is limited to the data presented here and does not rule out ‘deeper’ connections between ID and CS. Many authors have pointed to the similarities between ID and CS, including the notion that ID is simply a newer form of creation science (Scott 1997) or that ID is more or less a front for overturning the naturalist tendency in modern science and society (Forrest and Gross 2004). The trend of anti-evolutionism differentiating itself from religion and moving toward ‘scientific’ reasoning through the 20th century is presented clearly and succinctly by several authors (Scott 1997; Numbers 2006). The ‘de-secularization’ goals of ID are detailed well by Forrest and Gross (2004) and examining ID writings and media these ‘extra-scientific’ goals are clear (Johnson 1993; Dembski 2004). I do not take issue with these other findings and agree with most of them. Nor do the conclusions reached here provide evidence that ID is indeed a ‘science.’ The boundary-work of science has gone far beyond simply accusing ID as being a form of religion and the finding of some dissimilarity between ID and CS does little to address these other ‘non-scientific’ characteristics.

2. What other fringe science movements are linked to the ID movement? As noted above, I expected creation science organizations to be linked to ID. Linkage to other fringe science movements, such as ‘Ufology’ or paranormal studies would reflect a non-scientifically oriented boundary-work. I hypothesized that creation science would be the external movement most extensively connected to ID, though I expected other fringe science movements to be minimally connected to ID as well.

As noted above, there were several connections between ID and the creation science movement. However, no other ‘fringe’ science movements shared direct connections with ID.

While several movements were included in the overall network (due to website citations), none of these shared direct connections with ID. For example, the top-center section of Figure 2 was a subnetwork of fringe-science organizations, primarily concerned with ‘pseudo’ psychology (e.g., ‘parapsychology’, ‘psi’). ‘Ufology’ organizations were also included in the network, but also did not have any direct connections with ID. None of these other movements were directly associated with ID.

One ‘science-religion’ organization, the Canadian Scientific and Christian Affiliation was directly connected to the International Society for Complexity, Information and Design (ISCID). This connection was formed by their common recognition of David A. Humphreys, a professor emeritus of Chemistry at McMaster University in Ontario, Canada. Dr. Humphreys produced a video called “The Astonishing Elements of Life: Chemical and Molecular Evidence for a Creator” in which he argues that chemical properties show evidence of intelligent design¹⁴. He was also elected the Director of the Canadian Scientific and Christian Affiliation in 1999. Note that Dr. Humphreys is the only direct connection between the science-religion subnetwork and the ID subnetwork, and there are no direct connections between the science-religion subnetwork and the creation science organizations. This demonstrates the disassociation of the more mainstream scientific-religious organizations (e.g., the American Scientific Affiliation) from the creation science and ID movements (Numbers 2006). The lack of extensive direct connections indicates an intellectual ‘distance’ between the science-religion and ID/CS movements.

The only other organization directly associated with ID was the American Association for the Advancement of Science (AAAS). There were direct connections between AAAS and ISCID and between AAAS and the Discovery Institute. As mentioned above, these links were formed

¹⁴ See <http://www.cs.uwaterloo.ca/~shallit/humphreys.html>.

by Dr. Henry F. Schaefer III, a professor of computational chemistry at the University of Georgia. While one commonly-recognized individual hardly counts as extensive connections between ID and ‘science,’ this shows the possibility of high-status intellectuals aiding the ID movement to gain scientific legitimacy. Although there are few high-status individuals that have openly embraced ID, if more do so than the scientific establishment will have more difficulty with the boundary-work of keeping ID defined as ‘un-scientific.’

Overall, ID shared some direct intellectual connections to creation science, but none to other ‘non-scientific’ movements. Thus, ID’s institutional boundary-work reflects some, but not extensive, ‘un-scientific’ qualities. As noted above, ERGM results pointed to within-movement linkage effects among ID organizations, demonstrating a greater tendency to form within-movement connections. This suggests that ID has its own distinct intellectual community, with only some overlap with CS. In addition, the overlap of these two communities was not evenly distributed, with two ID organizations sharing connections with different CS organizations, and each connection represented only 1 commonly-recognized individual. While ID did share some intellectuals with CS, it is clear that the two movements do not share many intellectual leaders.

3. Are links among organizations explained by the common arguments used by the linked organizations? In other words, is the shared use of one or more arguments predictive of a link between organizations? I first used descriptive measures to show the extent to which organizations that shared arguments also shared links, and then estimate a model using ‘shared arguments’ to predict ties between organizations. I hypothesized that the shared use of arguments would have a significant but low effect predicting the existence of a tie between organizations.

The data presented here confirmed the hypothesis of the effect of ties being formed by similar organizational orientation. The odds of within-subnetwork ties ranged from 5.4 for science-religion organizations to about 841 for ethics organizations. ID had odds of 10.6 (i.e., about 10 to 1) while CS had lower odds of 7.3. Thus, for about every 11 ties formed by ID organizations, 10 will be within-movement ties and 1 will be a cross-movement tie. CS organizations were more likely to form cross-movement ties, with about 1 of every 8 ties being formed with another movement. As noted above, this provides evidence for the distinct intellectual community of ID (and the other subnetworks analyzed here), and less so for CS. Further analysis limited to ID and CS organizations confirmed the tendency of within-subnetwork ties among ID organizations, but rejected the finding of within-subnetwork preferences among CS organizations. While ID organizations consistently supported this hypothesis, the CS organizations did not support this hypothesis when focused only on ID and CS, again demonstrating the lack of a unified intellectual community among CS organizations.

Thus, for all subnetworks analyzed here, except CS, within-subnetwork ties were more likely than between-subnetwork ties, demonstrating homophilous relations between organizations. However, this data represents only commonly cited intellectuals. Further research could look at the website citation network, as this may highlight more complex relationships between the organizational fields analyzed here. Indeed the inclusion of the ‘pro-life’ and ‘Ufology’ movements in the website network points to more varied connections between ID and other movements. An analysis of the website data would shed light on whether the homophilous effects hold when only considering website citations (and thus, ‘friend of organization’ ties, rather than specific intellectual citations).

13.0 EPILOGUE

As of now, the boundary-work on behalf of evolution has been unquestionably successful: there are no ID programs at public universities, and few well-known ID proponents holding influential positions within the scientific hierarchy. Instead, most ID proponents are independently employed by ID movement organizations (e.g., the Biologic Institute) or they are employed at private Christian colleges (Michael Behe and Henry Schaefer being the prominent exceptions). ID theory is not part of the public school science curriculum in any state and attempts to integrate ID and other anti-evolution curricula have been rejected by new school board elections or court decisions. Even the well-fought efforts in Kansas failed to incorporate ID into the public school curriculum.

However, the Biologic Institute, which performs original research to find evidence for intelligent design, represents a new tactic in the movement and possibly a new stage in the ID movement. Having failed to initiate any ID research programs at traditional academic institutions, the Discovery Institute has started its own research institute. In turn, the Biologic Institute has helped found *Bio-Complexity*, a purportedly genuine scientific peer-reviewed journal dedicated to exploring the evidence for intelligent design.¹⁵ Douglas Axe, the director of the Biologic Institute, is also the managing editor and frequent author for the journal. It remains to be seen if this new ‘parallel science’ tactic will be successful.

¹⁵ See <http://bio-complexity.org/ojs/index.php/main/index>.

At an organizational level, anecdotal evidence suggests a narrowing of the organizational activity and resources in the ID movement. Specifically, the Discovery Institute appears to be increasingly taking on an almost monopolistic role in the ID movement. It helped found and funds the Biologic Institute and holds summer fellowships introducing ID to college students. Discovery Institute also works with Illustra Media to produce pro-ID documentaries. In contrast, other ID organizations do not show as much activity. The International Society for Complexity, Information and Design and the Intelligent Design Undergraduate Research Center both appear to be defunct, and the Intelligent Design and Evolution Awareness Center and the Intelligent Design Network have shown little activity since at least 2010. Access Research Network appears to be posting some online content, but little more.

Thus, the impetus of the ID movement appears to rest almost exclusively with the Discovery Institute. The implications of this resource concentration in the ID movement on scientific boundary-work is pretty straightforward, as it provides more evidence of the ‘interest-group’ (and therefore, non-scientific) nature of the movement. Indeed, Forrest and Gross (2004) have already stated as much regarding the Discovery Institute. While this will likely ensure the continued success of scientific boundary-work, it is unclear if this will significantly affect the viability of the Discovery Institute’s promotion of ID. As a non-profit foundation, the Discovery Institute relies mostly on private donations to subsist; regardless of the success or failure of the organizations boundary-work in relation to science, if donations continue to be made then the organization will continue its ID promotion. In addition, if more high-status intellectuals like Dr. Henry Schaefer publicly accept ID theory, lending more scientific credibility, then the movement will almost certainly persist.

APPENDIX A

GLOSSARY

Geodesic (Wasserman and Faust 1994:110)

A shortest path between two nodes is referred to as a *geodesic*.

Geodesic distance (Wasserman and Faust 1994:110)

The *geodesic distance* or simply the *distance* between two nodes is defined as the length of a geodesic between them.

Metaphysical Naturalism/Philosophical Naturalism

(http://en.wikipedia.org/wiki/Naturalism_%28philosophy%29)

[Metaphysical naturalism](#), (or [ontological](#) naturalism or philosophical naturalism) which focuses on [ontology](#): This stance is concerned with existence: what does exist and what does not exist? Naturalism is the [metaphysical](#) position that "[nature](#) is all there is, and all basic truths are truths of nature."

Methodological Naturalism (http://en.wikipedia.org/wiki/Naturalism_%28philosophy%29)

Methodological naturalism (or scientific naturalism) which focuses on [epistemology](#): This stance is concerned with knowledge: what are methods for gaining trustworthy knowledge of the natural world? It is an [epistemological](#) view that is specifically concerned with practical methods for acquiring knowledge, irrespective of one's metaphysical or religious views. It requires that hypotheses be explained and tested only by reference to natural causes and events.^[1] Explanations of observable effects are considered to be practical and useful only when they hypothesize natural causes (i.e., specific mechanisms, not indeterminate miracles). Methodological naturalism is the principle underlying all of modern [science](#).

Parapsychology (<http://en.wikipedia.org/wiki/Parapsychology>)

The term parapsychology was coined in or around 1889 by philosopher Max Dessoir, and originates from *para* meaning "alongside", and *psychology*. The term was adopted by J.B. Rhine in the 1930s as a replacement for the term psychical research. Parapsychologists study a number of ostensible paranormal phenomena, including telepathy, precognition, clairvoyance, psychokinesis, near-death experiences, reincarnation and apparitional experiences.

Psi ([http://en.wikipedia.org/wiki/Psi_\(parapsychology\)](http://en.wikipedia.org/wiki/Psi_(parapsychology)))

The term was coined by biologist Bertold P. Wiesner, and first used by psychologist Robert Thouless in a 1942 article published in the *British Journal of Psychology*. *Psi* was argued by Thouless and Wiesner to offer a non-theoretical manner of referring to extrasensory perception and psychokinesis, these terms being unjustifiably loaded with suggestions as to how the phenomena were caused or experienced.

Ufology (<http://en.wikipedia.org/wiki/Ufology>)

Ufology is a neologism coined to describe the collective efforts of those who study reports and associated evidence of unidentified flying objects (UFOs).

Uniformitarian Geology: (<http://en.wikipedia.org/wiki/Uniformitarianism>)

In the [philosophy of naturalism](#), uniformitarianism assumes that the same natural laws and processes that operate in the [universe](#) now, have always operated in the universe in the past and apply everywhere in the universe.

APPENDIX B

ORGANIZATION MISSION STATEMENTS

A Rocha (<http://www.arocha.org/int-en/index.html>)

A Rocha is an international Christian organization which, inspired by God's love, engages in scientific research, environmental education and community-based conservation projects.

Access Research Network (<http://www.arn.org/>)

Access Research Network is a non-profit 501(c)(3) organization dedicated to providing accessible information on science, technology and society.

We focus on such controversial topics as genetic engineering, euthanasia, computer technology, environmental issues, creation/evolution, fetal tissue research, AIDS, and so on. Through our publications and product offers, we give you the information you need to orient yourself in today's scientific and technological world and make informed decisions.

But science and technology are only half the picture. We put science topics in perspective by looking at related political, ethical and philosophical issues--so you can get a well-rounded understanding of the hot issues.

In our articles and publications we cover a host of issues--most of them controversial. Although we never shy away from controversy, we don't let it consume us either. We've mixed a little ancient proverbial wisdom with some common sense to develop the ARN approach to controversial topics.

Affiliation of Christian Geologists (<http://www2.wheaton.edu/ACG/index.stm>)

The Affiliation of Christian Geologists was formed in 1989 to:
promote fellowship among Christian geologists,
promote the integrity of geology as a scientific discipline,
investigate the ways in which Christian faith and geology bear upon one another,
educate the Christian public about geology,
develop avenues of witness to non-Christian geologists,
promote Christian stewardship and service in the geological sphere, and
provide intellectual leadership at the interface between Christian and geologic thought.

Alpha Omega Institute (<http://www.discovercreation.org/index.htm>)

Alpha Omega Institute was raised up by God in 1984 under the direction of Dave & Mary Jo Nutting, former evolutionary college instructors.

Today, AOI is a worldwide outreach dedicated to strengthening Christians and reaching unbelievers by exposing the fallacies of evolutionary worldviews and defending the accuracy of the Bible. As a 501(c)3 nonprofit organization, we are supported by tax-deductible donations from like-minded individuals.

American Association for the Advancement of Science (<http://www.aaas.org/>)

The American Association for the Advancement of Science, "Triple A-S" (AAAS), is an international non-profit organization dedicated to advancing science around the world by serving as an educator, leader, spokesperson and professional association. In addition to organizing membership activities, AAAS publishes the journal Science, as well as many scientific newsletters, books and reports, and spearheads programs that raise the bar of understanding for science worldwide.

American Astronomical Society (<http://aas.org/>)

The mission of the American Astronomical Society is to enhance and share humanity's scientific understanding of the Universe.

The Society, through its publications, disseminates and archives the results of astronomical research. The Society also communicates and explains our understanding of the universe to the public.

The Society facilitates and strengthens the interactions among members through professional meetings and other means. The Society supports member divisions representing specialized research and astronomical interests.

The Society represents the goals of its community of members to the nation and the world. The Society also works with other scientific and educational societies to promote the advancement of science.

The Society, through its members, trains, mentors and supports the next generation of astronomers. The Society supports and promotes increased participation of historically underrepresented groups in astronomy.

The Society assists its members to develop their skills in the fields of education and public outreach at all levels. The Society promotes broad interest in astronomy, which enhances science literacy and leads many to careers in science and engineering.

American Institute of Biological Sciences (<http://www.aibs.org/home/index.html>)

The American Institute of Biological Sciences is a nonprofit 501(c)(3) scientific association dedicated to advancing biological research and education for the welfare of society. Founded in 1947 as a part of the National Academy of Sciences, AIBS became an independent, member-governed organization in the 1950s. Today, with headquarters in Washington, DC, and a staff of approximately 50, AIBS is sustained by a robust membership of some 5,000 biologists and 200 professional societies and scientific organizations; the combined individual membership of the latter exceeds 250,000. AIBS advances its mission through coalition activities in research, education, and public policy; publishing the peer-reviewed journal *BioScience* and the education website ActionBioscience.org; providing scientific peer review and advisory services to government agencies and other clients; convening meetings; and managing scientific programs.

American Institute of Physics (<http://www.aip.org/>)

The American Institute of Physics (AIP) is a 501(c)(3) not-for-profit membership corporation created for the purpose of promoting the advancement and diffusion of the knowledge of physics and its application to human welfare. It is the mission of the Institute to serve the sciences of physics and astronomy by serving its Member Societies, individual scientists, students and the general public.

As a "society of societies," AIP supports ten Member Societies, who collectively represent a broad cross-section of more than 135,000 scientists, engineers, and educators in the global physical science community. With an extensive catalog of top-cited journals, AIP is one of the world's leading publishers in the physical sciences. AIP pursues innovation in electronic publishing of scholarly journals and offers full-solution publishing services for its Member Societies. AIP publishes 13 journals; two magazines, including its flagship publication *Physics Today*; and the AIP Conference Proceedings series.

Through its Physics Resources Center, AIP provides a spectrum of services and programs that encompass education and outreach, science communication, government relations, career services, statistical research, industrial outreach, and the history of physics and other sciences.

American Scientific Affiliation (<http://www.asa3.org/>)

The American Scientific Affiliation (ASA) is a fellowship of men and women of science and disciplines that can relate to science who share a common fidelity to the Word of God and a commitment to integrity in the practice of science. ASA was founded in 1941 and has grown significantly since that time. The stated purpose of the ASA is "to investigate any area relating Christian faith and science" and "to make known the results of such investigations for comment and criticism by the Christian community and by the scientific community."

American Society for Bioethics and Humanities (<http://www.asbh.org/>)

The purpose of ASBH is to promote the exchange of ideas and foster multidisciplinary, interdisciplinary, and interprofessional scholarship, research, teaching, policy development, professional development, and collegiality among people engaged in all of the endeavors related to clinical and academic bioethics and the health-related humanities. These purposes shall be advanced by the following kinds of activities:

Encouraging consideration of issues in human values as they relate to health services, the education of healthcare professionals and research.

Conducting educational meetings dealing with such issues.

Stimulating research in areas of such concern.

Contributing to the public discussion of these endeavors and interests including how they relate to public policy.

American Society of Law, Medicine and Ethics (<http://www.aslme.org/>)

With roots extending back to 1911, ASLME is a nonprofit educational organization. Our mission is to provide high-quality scholarship, debate, and critical thought for professionals at the intersection of law, medicine, and ethics. Our members come together to examine big health questions with far-reaching social ramifications . like genetic testing and research, medical record privacy, end-of-life decisions, and the dynamics of informed consent. We believe our greatest strength is our multidisciplinary focus. This creates a dynamic forum to exchange ideas from a wide range of perspectives, to:

Protect public health

Reduce racial, ethnic, and economic health disparities

Promote patient safety and quality of care

Facilitate dialogue on emerging biomedical science and research

We publish two nationally acclaimed peer reviewed journals: the Journal of Law, Medicine & Ethics and the American Journal of Law & Medicine. We sponsor conferences and webinars, many of which offer continuing education credits, on the key issues of the day. And we connect teaching professionals across North America for the exchange of ideas, classroom materials, and curricula. Our efforts have earned awards from industry groups such as Growth House and the Oncology Nursing Society. It all adds up to vital and diverse community, asking important questions and finding insightful answers for the benefit of our

members, our professions - and the culture at large.

Answers in Genesis (<http://www.answersingenesis.org/>)

Goal

To support the church in fulfilling its commission

Vision

Answers in Genesis is a catalyst to bring reformation by reclaiming the foundations of our faith which are found in the Bible, from the very first verse.

Mission

We proclaim the absolute truth and authority of the Bible with boldness.

We relate the relevance of a literal Genesis to the church and the world today with creativity.

We obey God's call to deliver the message of the gospel, individually and collectively.

Core Values

We resourcefully equip believers to defend their faith with excellence.

We willingly engage society's challenges with uncompromising integrity.

We sacrificially serve the AiG family and others.

We generously give Christian love.

Apologetics Press (<http://www.apologeticspress.org/default.aspx>)

What We Believe

The following principles of truth are accepted by those who actively participate in this work:

God exists, and man can know that God exists, by means of His manifold revelations, both in nature and through the inspired Word of God, the Holy Bible.

The entire material Universe was specially created by this almighty God in 6 days of approximately 24-hours each, as revealed in Genesis 1 and Exodus 20:11.

Both biblical and scientific evidence indicate a relatively young Earth, in contrast to evolutionary views of a multi-billion-year age for the Earth.

Both biblical and scientific evidence indicate that many of the Earth's features must be viewed in light of a universal, catastrophic flood (i.e., the Noahic Flood as described in Genesis 6-8).

All compromising theories such as theistic evolution, progressive creationism, threshold evolution, the gap theory, the modified gap theory, the day-age theory, the non-world view, etc., are denied and opposed as patently false.

Christianity is the one true religion; Jesus Christ is the only divine Son of God, resurrected Lord, and Savior of all who lovingly obey Him.

The 66 books of the Bible are fully and verbally inspired of God; hence, they are inerrant and authoritative, and a complete guide for moral and religious conduct.

Salvation is by means of obedience to the Gospel system, involving faith in God and Christ, repentance from sin, confession of faith, and immersion in water for remission of past sins, coupled with a life of growing consecration and dedication.

Those enjoying salvation are members of the one true church, which is the body of Christ.

Associates for Biblical Research (<http://www.biblearchaeology.org/>)

To provide information to the Christian community and the general public by the most effective means available on the subject of Biblical archaeology and the creation/evolution issues. This information is to be obtained from original research and fieldwork, and the research and fieldwork done by others outside the organization. This information disseminated and the activities of the organization shall be for the purpose of:

Demonstrating the historical reliability of the Bible

Resolving apparent conflicts between the findings of archaeology and science, and the Bible

Illuminating and enhancing understanding of the Biblical text

Edifying the Christian Church by encouraging a deeper knowledge of, greater appreciation for, and stronger faith in the Bible through knowledge and correct interpretation of the findings from archaeology and science

Making Biblical truth applicable and useful to daily Christian life and witness

Propagating the Christian faith by encouraging faith in Jesus Christ as Savior and yielding to Him as Lord, whenever and wherever such opportunity occurs

Exemplifying the Christian faith by word and deed

Association of Christians in the Mathematical Sciences (<http://www.acmsonline.org/>)

In addition to our statement of belief, you may be interested in knowing the purposes of the ACMS. Those purposes are as follows:

To encourage Christians in the mathematical sciences to explore the relationship of their faith to their discipline.

To promote interaction among Christians in the mathematical sciences.

To encourage research and writing by Christians, especially on topics interrelating their faith and their discipline.

To promote innovative and effective teaching.

Astronomical Society of the Pacific (<http://www.astrosociety.org/index.html>)

The Astronomical Society of the Pacific (ASP) was founded in 1889 by a group of Northern California professional and amateur astronomers after joining together to view a rare total solar eclipse. The ASP's earliest purpose was to disseminate astronomical information -- a mission which has flourished with astronomers' inexhaustible exploration of the universe. The ASP has become the largest general astronomy society in the world, with members from over 70 nations. The ASP Board of Directors and the Advisory Council are composed of members of the astronomical, educational, and amateur communities.

The Astronomical Society of the Pacific increases the understanding and appreciation of astronomy by engaging scientists, educators, enthusiasts and the public to advance science and science literacy.

The ASP's mission-based astronomy and space science education and public outreach activities work to promote science literacy through the enjoyment of astronomy. We are a recognized leader in the field of astronomy education. Our free teachers' newsletter, The Universe in the Classroom, is posted on the web. With the support of nationally recognized corporations and individual benefactors, the ASP sponsors Project ASTRO, an innovative program to pair amateur and professional astronomers with teachers and classes in the San Francisco Bay Area and also works with the ASTRO National Network with sites in 13 locations across the country.

Au Sable Institute of Environmental Studies (<http://ausable.org/>)

The historic mission of Au Sable Institute is the integration of knowledge of the Creation with biblical principles to bring the Christian community and the general public into a better understanding of the Creator and the stewardship of His creation.

Creation itself is a complex functioning of people, plants, animals, natural systems, physical processes and social structures, all of which are sustained by God's love and ordered by His wisdom. Thus, Au Sable brings together the full range of disciplines - from chemistry and economics to marine biology and theology - that we need if we are to be good stewards of God's household.

As earth-keepers, we have Creation itself as a collaborator. God has provided His people with the capacity to learn from Creation so we may live in harmony with God's purposes for Creation. And God has provided Creation as the great evangelist, awakening humility, awe and wonder at His divine power and majesty. In its beauty and integrity, Creation itself praises and points to the One in whom all things are held together, the One who calls us to serve and care for the garden. Au Sable accordingly leads its students out of the laboratory and classroom into the vast "University of Creation" where they can behold for themselves the glory of God.

Australasian Bioethics Association (<http://aabhl.org/>)

The Australasian Association of Bioethics and Health Law (AABHL) was formed in 2010.

It encourages open discussion and debate on a range of bioethical issues, providing a place where people can ask difficult questions about ideas and practices associated with health and illness, biomedical research and human values.

The AABHL seeks to foster a distinctive Australasian voice in bioethics, and provide opportunities for international engagement through its membership, journal and conferences.

Members come from all the contributing humanities, social science and science disciplines that make up contemporary bioethics.

Many members have cross-disciplinary interests and all seek to broaden the dialogues in which all members of the wider community ultimately have an interest.

The AABHL is a supportive, creative and challenging community that provides a rich source of continuing academic refreshment and renewal.

The aims of the AABHL are:

- to promote the study of bioethics in Australasia;
- to provide a public forum for debate and discussion of bioethics;
- to promote awareness of bioethics and bioethical issues in the community among all those involved in health care and related disciplines.

Biblical Creation Society (<http://www.biblicalcreation.org.uk/>)

The Biblical Creation Society is a Christian society that advances and defends the Biblical teaching on creation. We seek to think through issues related to origins from a coherent Biblical and scientific standpoint:

Standing for Creation since 1976

Addressing today's issues in the scientific and theological debate

Our publication, "Origins" provides comment and articles at the technical and more popular level.

For some recent comments on media stories, "John Ray's Diary" is an attempt to bring Ray's Christian principles to the fore when commenting on contemporary issues in science.

Opportunities to be involved in field trips and workshops

Dynamic speakers for your meetings - youth groups, church events, evangelistic opportunities and university groups.

Black Hills Creation Science Association

Website shut down, unable to locate.

Boundary Institute (<http://www.boundary.org/bi/index.html>)

Boundary Institute is a nonprofit scientific research organization dedicated to the advancement of 21st-Century science. We are currently pursuing two major research themes, one concerning the foundations of physics, the other the foundations of mathematics and computer science.

Canadian Scientific and Christian Affiliation (<http://www.csc.ca/>)

The Canadian Scientific and Christian Affiliation (CSCA) is a fellowship of men and women of science and of disciplines that can relate to science, who share a common fidelity to the Word of God and a commitment to integrity in the practice of science. CSCA was founded in 1973 and has grown significantly since that time.

The stated purposes of the CSCA are "to investigate any area relating Christian faith and science" and "to make known the results of such investigations for comment and criticism by the Christian community and by the scientific community".

The CSCA, incorporated in 1973, is affiliated with the American Scientific Affiliation (ASA), which was incorporated in 1941. As a Canadian Registered Charity, CSCA issues official receipts for income tax purposes for all donations in support of its ministry.

Center for Bioethics - University of Minnesota (<http://www.ahc.umn.edu/bioethics/>)

The mission of the Center is to advance and disseminate knowledge concerning ethical issues in health care and the life sciences. The Center carries out this mission by conducting original interdisciplinary research, offering educational programs and courses, fostering public discussion and debate through community outreach activities, and assisting in the formulation of public policy.

The Center is open to all points of view regarding moral values and principles. Its research reflects a strong belief in combining the strengths of various disciplines and professions. When possible, research findings are integrated with policy analysis.

The Center provides education in bioethics for University students, faculty, and staff; professionals in health care and related fields; and interested members of the general public.

Center for Bioethics - University of Pennsylvania (<http://www.bioethics.upenn.edu/>)

The field of bioethics emerged over thirty-five years ago. It provides a practical language for mediating between developments in science and popular culture and a means for our society to talk about its deepest moral concerns, fears and hopes. The Center employs this language to promote scholarly and public understanding of the ethical, legal, social and public policy implications of advances in the life sciences and medicine. It fosters informed dialogue about these issues across a broad spectrum of opinions that not only are the right questions addressed, but that the answers given rest upon solid facts and cogent arguments. From birth to death, from the lab to the stock market, Penn faculty engage in careful analysis, thoughtful reflection, and foster public discussion about the critical biomedical questions that put our traditions and values to the test.

Center for Bioethics and Human Dignity (<http://cbhd.org/>)

The Center for Bioethics & Human Dignity (CBHD) is a Christian bioethics research center of Trinity International University that explores the nexus of biomedicine, biotechnology, and our common humanity. CBHD fosters a distinctly Christian conception of bioethics that is both academically rigorous and broadly accessible.

Center for Scientific Creation (<http://www.creationscience.com/onlinebook/index.html>)
N/A

Center for Theology and the Natural Sciences (<http://www.ctns.org/index.html>)

CTNS is an international non-profit organization dedicated to research, teaching and public service. The central scientific focus of CTNS is on developments in physics, cosmology, evolutionary biology, and genetics, with additional topics in the neurosciences, the environmental sciences, and mathematics. With regard to the theological task, CTNS engages in both Christian and multi-religious reflection. The Christian theological agenda focuses on the various doctrinal loci of systematic theology. The multi-religious agenda attends primarily to theological issues arising from the engagement between the sciences and religious traditions such as Islam, Hinduism, Judaism, Buddhism, Confucianism, Taoism, and indigenous spiritualities.

In partnership with Taylor & Francis, a division of Routledge publishing, CTNS publishes the journal *Theology and Science*.

Christian Answers Network (<http://www.christiananswers.net/>)

CHRISTIAN ANSWERS is a worldwide evangelism, education and discipleship ministry of Films for Christ (also known as Eden Communications). Our primary goal is to provide accurate, biblical answers on a wide variety of questions asked by Christians and non-Christians. Questions can be submitted on-line. We also provide a great deal of other valuable information and resources related to Christianity, Christian education, discipleship, media, and more (see our resource directory).

Christian Answers is a not-for-profit ministry. No advertising space is sold or given on our Web sites. All our information and services are provided freely in service to our Lord and Savior Jesus Christ to help souls grow in knowledge and wisdom, and find eternal salvation.

Christian Apologetics and Research Ministry (<http://carm.org/>)

CARM is a conservative Christian Ministry based on the teachings of the Bible (66 books, excluding the apocrypha).

Christian Association of Stellar Explorers (<http://www.christian-astronomy.org/>)

The objective of CASE is to introduce others to the world and hobby of amateur astronomy through educational sessions, meetings, and group star parties.

Christian Medical Fellowship/FaithCare (<http://www.christianmedics.org.nz/>)

Christian Medical Fellowship is a group of Christian doctors and medical students throughout New Zealand with a passion for serving Christ through their work in medicine. We are encouraging people to think about what it means to be a Christian doctor

Christian Medical Fellowship as a body has certain key aims:

To unite Christian doctors in their common loyalty to our Lord Jesus Christ by both deepening their Christian faith and by seeking the highest attainable standards of Christian and professional conduct.

To promote in the medical profession personal faith in Jesus Christ and the acceptance of his ethical teaching.

To provide a forum for the expression of the relevance of the Christian faith to the particular problems of our national and local life as they relate to medicine.

To strengthen the work of the University Christian groups, particularly in the Faculties of Medicine, from which future members will chiefly be recruited.

To support the work of medical missionaries throughout the world.

Christian Neuroscience Society (<http://cneuroscience.org/>)

We are a group of Christians who are interested in furthering the dialogue between neuroscience and the truth of the Christian faith.

Christian Research Institute (<http://www.equip.org/>)

To provide Christians worldwide with carefully researched information and well-reasoned answers that encourage them in their faith and equip them to intelligently represent it to people influenced by ideas and teachings that assault or undermine orthodox, biblical Christianity.

Christians in Science (<http://www.cis.org.uk/>)

CiS is an international network of those concerned with the relationship between science and Christian faith, open to scientists, teachers, students and all those with an interest in this dialogue.

Although CiS is primarily a professional group, aimed at those working in science, a significant proportion of our members are not scientists, and we are happy to welcome into membership anyone with an interest in science and faith.

Cognitive Sciences Laboratory (<http://www.lfr.org/lfr/csl/>)

The mission of the Cognitive Sciences Laboratory is three-fold. To use the tools of modern behavioral, physiological, and physical sciences to:

Determine which parapsychological phenomena can be validated under strict laboratory conditions.

Understand their mechanisms.

Examine the degree to which they might contribute to practical applications.

The laboratory is a center for interdisciplinary research devoted to understanding a wide range of human experience. In addition to exploring parapsychological phenomena, the Cognitive Sciences Laboratory's charter extends to allied fields such as consciousness research, cognitive neuroscience, perception, physiology, psychology and physics.

Committee for Skeptical Inquiry (<http://www.csicop.org/>)

The mission of the Committee for Skeptical Inquiry is to promote scientific inquiry, critical investigation, and the use of reason in examining controversial and extraordinary claims. To carry out these objectives the Committee:

Maintains a network of people interested in critically examining paranormal, fringe science, and other claims, and in contributing to consumer education

Prepares bibliographies of published materials that carefully examine such claims

Encourages research by objective and impartial inquiry in areas where it is needed

Convenes conferences and meetings

Publishes articles that examine claims of the paranormal

Does not reject claims on a priori grounds, antecedent to inquiry, but examines them objectively and carefully

The Committee is a nonprofit scientific and educational organization, started in 1976. The Skeptical Inquirer is its official journal.

Counterbalance Foundation (<http://www.counterbalance.org/>)

Counterbalance is a non-profit educational organization working to promote the public understanding of science, and how the sciences relate to ethical and religious concerns. It is our hope that individuals, the academic community, and society as a whole will benefit from a struggle toward integrated and counterbalanced views on these complex issues.

Creation Association of Puget Sound (<http://caps.nwcreation.net/>)

The mission of CAPS is to communicate to schools, especially Christian Schools, churches and the general public, scientific as well as biblical evidence, which supports creation in Six days and contradicts evolution. We hope you will find this site to be informative and a great launching point for finding all your favorite creation resources.

Creation Discovery Project (<http://www.creationdiscovery.org/index.html>)

The Mission Statement is based on Matthew 28:19-20:

"Matthew 28:19 Go ye therefore, and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost:

"Matthew 28:20 Teaching them to observe all things whatsoever I have commanded you: and, lo, I am with you alway, even unto the end of the world. Amen."

In order to facilitate this the Creation Discovery Project will teach people the tenets of the Christian faith based on Scripture, specifically the Creation of a perfect world, man and woman, the fall of those perfect people, and the subsequent redemption plan. Many people are not open to hearing directly from Scripture since they feel that 'science' and particularly 'evolution' has proved the Bible to be fallible. We at the Creation Discovery Project will show that true science is in line with Christian Scripture, and not in line with evolution. We will show that to become a Christian does not require the abandonment of your intelligence, but the strengthening of it. Further we will strengthen the faith of those who are already Christians, and need to reply to the charge that Science does not support the Creation account described in Scripture.

Creation Evidences Museum (<http://www.creationevidence.org/>)

The Creation Evidence Museum is a non-profit educational museum chartered in Texas in 1984 for the purpose of researching and displaying scientific evidence for creation. As such the museum sponsors paleontological and archaeological excavations in addition to other extensive research projects. Dr. Carl Baugh, the museum's Founder and Director, originally came to Glen Rose, Texas to critically examine claims of human and dinosaur co-habitation. He conducted extensive excavations along the Paluxy River, with appropriate permission of the landowners. These original excavations yielded human footprints among dinosaur footprints (see the Director's doctoral dissertation). He then realized that a museum needed to be established in order to appropriately display this evidence, along with sustained excavations and other areas of scientific research for creation.

Creation Ministries International (<http://creation.com/>)

Creation Ministries International is a group of non-profit ministries in several countries. Though each is a legally and financially autonomous body, we have formally unified our efforts as a federation of ministries under the banner 'CMI-Worldwide' that helps to ensure unity, harmony, and efficiency of outreach.

Our role is to support the church in proclaiming the truth of the Bible and thus its gospel message. We provide real-world answers to the most-asked questions in the vital area of creation/evolution, where the Bible is most under attack today—Genesis.

We are apolitical and non-denominational (as an organisation, not as individuals within it). We try to confine ourselves to matters as defined broadly by our Statement of Faith, and try to not get involved as a ministry in other controversies or issues within Christendom, no matter how important we, as individuals, might regard these.

Creation Moments (<http://www.creationmoments.com/>)

Creation Moments, Inc. is a non-denominational ministry, which believes that:

God has spoken in Scripture and has acted in creation and human history. We believe that the autographs of the 66 canonical books of the Bible are objectively inspired, infallible and the inerrant Word of God in all of their parts and in all matters of which they speak (history, theology, science, etc.).

The message of the Bible is communicated in the most basic meaning of the text as understood in its historical and grammatical context.

God has acted to create the cosmos ex nihilo in six 24-hour periods in the recent past.

A divine design and purpose exists in nature, and this purpose is to point to and glorify the Creator.

A universal Noachian flood occurred, which destroyed all life on earth except those saved in the Ark (Noah, his family, and the animals).

While man was created sinless, he volitionally sinned. In that Adam, the first man, was acting as the federal head of the human race, everyone since Adam has been born sinful and in need of a Savior.

Jesus Christ was fully man and fully God. His substitutionary atonement in His death provides the only means of salvation to a sinful race.

Scientific research, like every other human activity, should not only seek to 'think God's thoughts after Him,' but serve to glorify the creating Word of God by being applied to life and society in such a manner that these are conformed to God's design for them.

Creation Research (<http://www.creationresearch.net/>)

"That we may publish with the voice of thanksgiving, and tell of all God's wondrous works."

Therefore:-

We proclaim the gospel of the Lord Jesus Christ;

Believing the Bible is the written word of God. It is divinely inspired and inerrant throughout. Its assertions are factually true and it is the supreme authority in all matters of faith and conduct.

We accept the final guide to the interpretation of Scripture is Scripture.

And the account of origins presented in Genesis is a simple but factual presentation of actual events and therefore provides a reliable framework for research into the origin and history of life;

Therefore we research, document and promote the scientific aspects of creation are important, they are secondary to the proclamation of the gospel of Jesus Christ as Sovereign, Creator, Sustainer, Saviour, Lord and Judge, Who is an equal member of the triune Godhead - Father, Son and Holy Spirit.

Creation Research Society (<http://www.creationresearch.org/>)

The Creation Research Society (CRS), a scientific society with worldwide membership, is recognized internationally for its firm commitment to scientific special creation. The CRS was founded in 1963 by a group of ten like-minded scientists who had corresponded with each other for a number of years. A major impetus for this effort was a problem that each one had experienced. They had been unable to publish in established journals scientific information favorable to the creation viewpoint. Believing that there were probably other scientists with similar experiences, these men saw the need for a journal in which such information could be published. Thus, the CRS was incorporated in the state of Michigan as a non-profit corporation for educational and scientific purposes. Shortly thereafter it was granted 501(c)(3) not-for-profit tax-exempt status by the IRS. The first issue of the Creation Research Society Quarterly was published in July, 1964.

Creation Resource Foundation (<http://creationresource.org/>)

The Creation Resource Foundation is devoted to giving families helpful “tools” to build a confidently Bible-based “world view.” This is done through multi-media seminars, newsletters, media interviews, and field trips. Our desire is to exalt the Lord Jesus Christ as the Creator to Whom every human being must be ultimately accountable.

Creation Resources Trust (<http://www.c-r-t.co.uk/>)

CRT was founded in 1981 as the Somerset Creationist Group when Methodist Local Preacher Geoff Chapman (right) and a small group of concerned Christians in South Somerset got together to see how they could share the evidence for creation and highlight the flaws in evolution theory.

This was done through talks and conferences, books, literature and audio-visual aids. In 1985 we decided to publish a quarterly creation paper for children called Our World which is still going strong today and distributed throughout the UK and overseas.

Initially our mission was intended to be local, but as requests for information and resources began coming in from a much wider area, in 1989 it was decided to change our name to the Creation Resources Trust. This not only reflected our wider influence but it accurately described what we were doing - providing resources on the subject of creation. In 1990 we launched Original View, a creation paper for teenagers, now known as "The REAL science paper." This is published three times a year and although originally aimed at students, it is now written at a more popular level, with plenty of colour and illustrations.

Creation Science Association for Mid-America (<http://www.csama.org/>)

To educate people regarding the vast amount of scientific evidence that supports Biblical Creation as the true account of origins, and that the General Theory of Evolution is not only a false notion of history, it is an extremely dangerous one, the fruits of which have destroyed entire nations including the wanton slaughter of at least 100 million people in this century.

To inspire faith in unbelievers and encourage the faith of believers, in the Bible as the Word of God, and therefore the only trustworthy source of information regarding the meaning, purpose, destiny and conduct of human lives. To show that Biblical Creation, because it is true, is the only "scientific" explanation of origins, and therefore is the only account of origins that can possibly be useful to science.

Creation Science Association of British Columbia (<http://www3.telus.net/csabc/>)

Our mission is to compile scientific as well as Biblical evidence which supports creation and contradicts evolution and to communicate this information to schools, churches and the general public.

Creation Science Association of Orange County (<http://www.creationscienceoc.org/>)

No mission statement.

Creation Science Evangelism (<http://www.drdino.com/>)

Creation Science Evangelism (CSE) is a leading Christian-apologetics ministry, defending the literal interpretation of the Genesis creation account from the theory of evolution (see our Statement of Faith). CSE was founded in 1989 by Dr. Kent Hovind, from a desire to spread the Gospel of Jesus Christ through the science of God's creation. Today, CSE is an international ministry with some of the most requested resources on the topics of creation, evolution, dinosaurs, and the Bible.

Creation Science Fellowship (<http://www.csfpittsburgh.org/>)

The Creation Science Fellowship, Inc. (CSF) of Pittsburgh is a non-profit organization engaged in the scientific and religious aspects of the creation/evolution controversy. CSF members

come from all all walks of life: scientists, educators, clergy, and others interested in studying this issue and in educating the general public.

The CSF sponsors a series of events each year in which we bring speakers to the Pittsburgh area to inform and educate the community in the Biblical model of creation. Many of these speakers are published authors and are actively engaged in current creation science research.

A major activity of CSF is to sponsor and organize the International Conference on Creationism. This conference is typically held every four years and attracts over 300 participants. The ICC is a forum where researchers come together to present and discuss their latest research and where the public can listen and interact with the researchers.

Creation Science Homepage (<http://mall.turnpike.net/C/cs/>)

We are a group of engineers and professionals with graduate degrees, largely in Computer Science. We are Christians who believe strongly that people need to become better informed on this most important question of our origins.

Creation Science Movement (<http://www.csm.org.uk/>)

The Creation Science Movement is the oldest creationist movement in the world. Founded in 1932 as "The Evolution Protest Movement" by a small group of Christians concerned by the propaganda that was promoting the theory of evolution as if scientifically proven, it has grown in strength over the years.

We aim

To show that the Scriptures, and in particular those that bear on Creation, are reliable.

To lecture on Creation Science at universities, schools and churches.

To publish and distribute the journal 'Creation', pamphlets, books, DVDs, video, CDs/audio tapes demonstrating that the biblical account of special Creation is supported by true science.

Creation Studies Institute (<http://www.creationstudies.org/>)

Our Executive Director & Founder, Tom DeRosa left the seminary and the church thinking he was throwing away his faith, but in reality, he had only found a new religion: evolution.

However, in 1978, he accepted Jesus Christ as Lord of his life. Soon after, he studied the area of Creation at Coral Ridge Presbyterian Church and has come to the conclusion that a lack of knowledge of the biblical account of creation is greatly responsible for many barriers that keep people from Christ.

His commitment to breaking down those barriers, and to fill believers with the knowledge

that will allow them to do the same, is what led Tom to form Creation Studies Institute in 1988.

Creation Truth Foundation (<http://www.creationtruth.com/>)

The mission of any organization, especially a 501(c)(3) organization, as is Creation Truth Foundation Inc., is accomplished through dedicated projects that are specially designed to fulfill its mission statement.

CTF, began in 1989 as a not-for-profit corporation in the state of Alabama and moved its corporate distinction to Oklahoma in 1994 after Dr. Sharp, its founder, moved to Oklahoma.

Accordingly, CTF, being the parent organization, has departments (in some cases that function as dba's), whose primary function is to target specific aspects of the mission statement and to provide programs and projects for the fulfillment of their portion of the mission statement.

It is within this departmental framework that CTF, has been able to categorize and prioritize her programs and projects to best attain the fulfillment of their mission statement.

Creation Vs Evolution/All About God Ministries (<http://www.allaboutgod.com/>)

We write compelling websites that reach out to skeptics, seekers, believers, and a hurting world with powerful evidence for God and the Good News of Jesus.

We believe truth transforms lives. Therefore, we place our content on the first few pages of the most popular search engines in the world. That way, when people seek answers on the Web, we're there with the truth at the top!

To read some stories of people whose lives have been changed through these sites, click [here](#).

We are followers of Jesus. Like Jesus, we reject many of the issues found in “organized religion” (man-made attempts to reach God through rules and rituals). We consider the personal pursuit of God as paramount in each of our personal life journeys. We also believe that ultimate, saving Truth is found only through God’s Son, Jesus Christ. (Click [here](#) to read our Faith Statement.) We believe that the authoritative and primary source of that truth is the Bible as illuminated by the power of the Holy Spirit. Further, we believe that spiritual growth occurs in combination with being in God’s Word consistently and dealing with the things we suffer in this fallen world while being in fellowship with a local body of believers where there is an atmosphere of grace, love, and accountability.

Creation Worldview Ministries (<http://www.creationworldview.org/>)

This is a missionary association taking the truths of biblical foundations to the Church, both domestic and foreign, and to the secular world. This is an evangelistic and discipling ministry seeking to bring salvation and maturity in Jesus Christ, by lifting Him up that He might draw all people unto Himself.

Discovery Institute (<http://www.discovery.org/>)

Discovery Institute's mission is to make a positive vision of the future practical. The Institute discovers and promotes ideas in the common sense tradition of representative government, the free market and individual liberty. Our mission is promoted through books, reports, legislative testimony, articles, public conferences and debates, plus media coverage and the Institute's own publications and Internet website (<http://www.discovery.org>).

Current projects explore the fields of technology, science and culture, reform of the law, national defense, the environment and the economy, the future of democratic institutions, transportation, religion and public life, government entitlement spending, foreign affairs and cooperation within the bi-national region of "Cascadia." The efforts of Discovery fellows and staff, headquartered in Seattle, are crucially abetted by the Institute's members, board and sponsors.

Earth History Research Center (<http://origins.swau.edu/>)

The Earth History Research Center is a non-profit, non-sectarian organization of active scientists. Our mission is to develop a scientifically credible view of earth history consistent with scripture, to conduct scientific research related to this goal and to promote our view through publication and education. .

Eubios Ethics Institute (<http://www.eubios.info/>)

Eubios Ethics Institute is a nonprofit group that aims to stimulate the international discussion of ethical issues, and how we may use technology in ways consistent with "good life" (eu-bios). It aims at an integrated and cross-cultural approach to bioethics, and has a global network of partners.

European Association of Centres of Medical Ethics (<http://www.eacmeweb.com/>)

Website being updated.

European Journal of Parapsychology (<http://ejp.org.uk/>)

N/A

European Society for the Study of Science and Theology (<http://www.esssat.org/>)

In Europe with all its rich diversity, we are a voluntary
Society of scholars engaging in the
Study of ideas regarding our
Scientific knowledge and powers
As they interact with our
Theologies, our values, dreams and convictions.

Faith and Reason Ministries (<http://www.faithreason.org/>)

This ministry accepts modern science (including biological evolution and the Big Bang), a
valuable, yet non-perfect Bible, and a Jesus of history, divine.
Key Beliefs of Faith & Reason Ministries

The evidence clearly shows Jesus to be exactly who He claimed to be: the only Son of God
and as such God incarnate. God is infinite and good.

The Bible is the greatest book ever written. It contains the writings of great men of God who
were largely inspired by Him. However, like any other document, it is not absolutely perfect,
and in some places it is badly flawed.

The Earth is 4.5 billion years old, and life began billions of years ago with very primitive forms.
These forms slowly evolved into the wide variety of plants and animals we see today.

The universe, though finite and created by God, is unimaginably complex and vast. It contains
billions of galaxies typically composed of billions of stars; it also contains myriads of powerful
spiritual beings (both good and evil), and the likelihood of other life forms similar to man.

The fall of Satan and his angels occurred before the Big Bang to pervert the entire universe at
a very deep and fundamental level.

True belief in Jesus involves repentance from sin and brings the personal presence and power
of God into a human being's life. It also brings forgiveness, eternal life, and the solution to
man's dilemma upon the Earth.

Faraday Institute (<http://www.st-edmunds.cam.ac.uk/faraday/index.php>)

The Faraday Institute for Science and Religion is an academic research enterprise based at St
Edmund's College, Cambridge. The Institute has four main activities:

Scholarly research and publication on science and religion, including the organisation of
invited groups of experts to write joint publications.

To provide short-term courses in science and religion.

To organise seminars and lectures on science and religion.

To provide accurate information on science and religion for the international media and
wider public.

The Faraday Institute has a Christian ethos, but encourages engagement with a wide diversity of opinions concerning interactions between science and religion, without engaging in advocacy. It aims to provide accurate information in order to facilitate informed debate.

Farsight Institute (<http://www.farsight.org/>)

The Farsight Institute is a nonprofit research and educational institute, offering a large library of free materials on remote viewing.

Focus on the Family (<http://www.focusonthefamily.com/>)

Focus on the Family is a global Christian ministry dedicated to helping families thrive. We provide help and resources for couples to build healthy marriages that reflect God's design, and for parents to raise their children according to morals and values grounded in biblical principles.

We're here to come alongside families with relevance and grace at each stage of their journey. We support families as they seek to teach their children about God and His beautiful design for the family, protect themselves from the harmful influences of culture and equip themselves to make a greater difference in the lives of those around them.

Fund for UFO Research (<http://www.ufoscience.org/>)

Statement of Purpose

On the basis of more than 50 years of consistent reports of close-range, daylight observations by expert witnesses, of objects having radical appearance and performance, it is reasonable to conclude that we are faced with a phenomenon for which there is no conventional explanation.

It is the primary purpose of the Fund for UFO Research, Inc., to support all reasonable and scientific efforts to learn the nature of this phenomenon. The patterns of UFO appearance and behavior strongly suggest that they are not merely mis-identified natural and known artificial phenomena. It is apparent that the UFO phenomenon involves several aspects:

Extraterrestrial Hypothesis

While physical proof of the extraterrestrial origin of UFOs is not in the hands of civilian investigators, there is a growing mass of evidence that points to the distinct possibility that some UFOs represent the presence, near the Earth, of a non-human intelligence.

Government Secrecy

The release of thousands of pages of previously classified official military/intelligence documents (after denying their existence) makes it clear that the U. S. Government long concealed UFO information. There is no reason to assume this policy has ended.

UFO Crashes

In view of impressive first-hand testimony to July, 1947, events in New Mexico, it appears likely that the remains of at least one crashed UFO were recovered by the U. S. Government. In recent years, the desperate efforts of the U. S. Air Force to assign illogical explanations for the wreckage and bodies allegedly recovered, point to a cover-up or to incompetence.

"Alien Abductions"

While recognizing the bizarre content of so-called "abduction" accounts, their unusual degree of consistency, and supporting physical evidence, suggest a physical rather than a psychological explanation. Psychological studies of "abductees" so far tend to rule out psychopathology as the cause of more than a few reports.

--Don Berliner, FUFOR Chairman, June 13, 2001

Geological Society of America (<http://www.geosociety.org/>)

Established in 1888, The Geological Society of America provides access to elements that are essential to the professional growth of earth scientists at all levels of expertise and from all sectors: academic, government, business, and industry.

The Geological Society's growing membership unites thousands of earth scientists from every corner of the globe in a common purpose to study the mysteries of our planet and share scientific findings.

Geoscience Research Institute (<http://www.grisda.org/>)

Science and technology are powerful, respected, and highly successful. They have immensely improved our standard of living — from houses, appliances, food, health, and recreation to methods of communication, transportation, and record keeping — leading some to believe that all of humanity's problems can be solved by science. But can science aid in finding answers to philosophical questions about our origin and destiny and about our purpose for living? Can it solve the problems of war and mismanaged environments? Science has tried unsuccessfully and often in direct conflict with answers given in the Bible.

The most notable conflict is between the theory of evolution with its billions of years for the progressive development of life and the biblical account of the creation of life by God in six literal days a few thousand years ago. Does the success of science in other areas force us to conclude that scientific evidence for an evolutionary theory is irrefutable?

The Geoscience Research Institute, founded in 1958, was established to address this question by looking at the scientific evidence concerning origins. The Institute uses both science and revelation to study the question of origins because it considers the exclusive use of science as too narrow an approach. The Institute serves the Seventh-day Adventist church in two major areas: research and communication.

Global Consciousness Project (<http://noosphere.princeton.edu/>)

When human consciousness becomes coherent and synchronized, the behavior of random systems may change. Quantum event based random number generators (RNGs) produce completely unpredictable sequences of zeroes and ones. But when a great event synchronizes the feelings of millions of people, our network of RNGs becomes subtly structured. The probability is less than one in a billion that the effect is due to chance. The evidence suggests an emerging noosphere, or the unifying field of consciousness described by sages in all cultures.

The Global Consciousness Project is an international, multidisciplinary collaboration of scientists and engineers. We collect data continuously from a global network of physical random number generators located in 70 host sites around the world. The data are transmitted to a central archive which now contains more than 12 years of random data in parallel sequences of synchronized 200-bit trials every second.

Our purpose is to examine subtle correlations that reflect the presence and activity of consciousness in the world. We predict structure in what should be random data, associated with major global events. The data overall show a highly significant departure from expectation, confirming our prediction. Go to the Main Menu on the left to learn how the science is done. For some philosophical and interpretive perspectives, look to the Aesthetics menu.

Subtle but real effects of consciousness are important scientifically, but their real power is more direct. They encourage us to make essential, healthy changes in the great systems that dominate our world. Large scale group consciousness has effects in the physical world. Knowing this, we can intentionally work toward a brighter, more conscious future.

God and Science (<http://www.godandscience.org/>)

The mission of Evidence for God from Science is to proclaim the gospel of Jesus Christ and to encourage skeptics to examine the truth claims of Christianity. Having once been a skeptic myself, I understand that most skeptics assume Christianity is false before making a serious attempt to examine the evidence. Therefore, our goal is to present the scientific and biblical evidence that supports a rational belief in the existence and love of God.

Hastings Center (<http://www.thehastingscenter.org/>)

The Hastings Center is an independent, nonpartisan, and nonprofit bioethics research institute founded in 1969. The Center's mission is to address fundamental ethical issues in the areas of health, medicine, and the environment as they affect individuals, communities, and societies.

To achieve this mission, the Center has established four goals:

To pursue interdisciplinary research and education that includes both theory and practice.

To engage a broad audience of thoughtful people in the work of the Center.

To collaborate with policy makers, in the private as well as the public sphere, to identify and analyze the ethical dimensions of their work.

To strengthen the international dimensions of the Center's work.

HumGen International (http://www.humgen.org/int/index_lang.cfm?&lang=1)

Your resource concerning ethical, legal and social issues in human genetics

Ian Ramsey Centre (<http://www.ianramseycentre.org/>)

The Ian Ramsey Centre for Science and Religion (IRC) conducts research into religious beliefs and theological concepts in relation to the sciences. Research into beliefs focuses on the application of scientific tools to religious phenomena, such as in the Cognitive Science of Religion (CSR). Research into theological concepts focuses principally on those metaphysical principles, such as persons, that are important to theology and are being seen from new perspectives by current developments in science. Members of the Centre also carry out extensive work on the history of science and religion, often challenging simplistic accounts of what has been a complex and varied interaction.

Besides research, the Centre also runs a series of public seminars, generally once every two weeks during term time, attracting up to a hundred people. Recent speakers have included Ernan McMullin, O'Hara Professor of Philosophy Emeritus at Notre Dame, on Darwin and the other Christian Tradition, Sarah Coakley, Norris-Hulse Professor in Divinity at Cambridge, on Evolution and the Problem of Divine Providence and Roger Scruton, Visiting Professor of Philosophy at Oxford, on Neuroscience and the Soul. Speakers over the next twelve months include Iain McGilchrist on neuroscience, religion and the divided brain and Dame Jocelyn Bell Burnell, famous for her work on the discovery of radio pulsars.

Due to the extremely high level of public interest in matters connected with science and religion, members of the Centre are also frequently asked to give public presentations, provide comments to the media and give talks at schools. Such appearances contribute to the many ways in which the Theology Faculty has an impact in the wider community. In the last twelve months, members of the Centre have contributed to programmes and articles for the BBC, Channel 4, the Times Higher Education Supplement, the Church Times and the Catholic Times. In the international media, the Centre has also been consulted recently by Avvenire in Italy and NHK Japan Public Broadcasting.

Institute for Creation Research (<http://www.icr.org/>)

Who We Are

After more than four decades of ministry, the Institute for Creation Research remains a leader in scientific research within the context of biblical creation. Founded by Dr. Henry Morris in 1970, ICR exists to conduct scientific research within the realms of origins and earth history, and then to educate the public both formally and informally through graduate and professional training programs, through conferences and seminars around the country, and through books, magazines, and media presentations.

ICR was established for three main purposes:

Research. As a research organization, ICR conducts laboratory, field, theoretical, and library research on projects that seek to understand the science of origins and earth history. ICR scientists have conducted multi-year research projects at key locations such as Grand Canyon, Mount St. Helens, Yosemite Valley, Santa Cruz River Valley in Argentina, and on vital issues like Radioisotopes and the Age of the Earth (RATE), Flood-activated Sedimentation and Tectonics (FAST), and other topics related to geology, genetics, astro/geophysics, paleoclimatology, and much more.

Education. As an educational institution, ICR offers formal courses of instruction, conducts seminars and workshops, and presents radio and television lectures, as well as other means of instruction. With 30 years experience in graduate education, first through our California-based science education program (1981-2010), and now through the M.C.Ed. degree program at the School of Biblical Apologetics, ICR trains men and women to do real-world apologetics with a foundation of biblical authority and creation science. ICR also offers a one-year, non-degree training program for professionals called the Creationist Worldview. Additionally, ICR scientists and staff speak to over 200 groups each year through seminars and conferences. And many of the faculty are contributing

authors to ICR's new Science Education Essentials curriculum products for Christian K-12 teachers.

Communication. ICR produces and/or publishes books, films, periodicals, and other media for communicating the evidence and information related to its research and education to its constituents and to the public in general. ICR's central publication is Acts & Facts, a full-color monthly magazine with a readership of over 200,000, providing articles relevant to science, apologetics, education, and worldview issues. ICR also publishes the daily devotional Days of Praise with over 300,000 readers worldwide. Additionally, the scientists and staff at ICR publish various books and videos on medicine, history, apologetics, theology, and science. The three radio programs produced by ICR can be heard on some 1,500 outlets around the world.

Institute for New Energy (<http://www.padrak.com/ine/>)

None available

Institute for the Study of Christianity in an Age of Science and Technology

(<http://www.iscast.org/>)

To develop and advocate a Christian perspective in the science-religion dialogue within the science community, the Christian community and society generally in the Australasian and international communities.

Institute of Noetic Sciences (<http://www.noetic.org/>)

Broadening our knowledge of the nature and potentials of mind and consciousness and applying that knowledge to enhancing human well-being and the quality of life on the planet.

Institute on Religion in an Age of Science (<http://www.iras.org/Welcome.html>)

IRAS is a non-denominational, independent society with three purposes:

- to promote creative efforts leading to the formulation, in the light of contemporary knowledge, of effective doctrines and practices for human welfare;
- to formulate dynamic and positive relationships between the concepts developed by science and the goals and hopes of humanity expressed through religion;
- to state human values and contemporary knowledge in such universal and valid terms that they may be understood by all peoples, whatever their cultural background and experience, and provide a basis for world-wide cooperation.

We at IRAS take the natural world seriously as a primary source of meaning. Our quest is informed and guided by the deepening and evolving understandings fostered by scientific inquiry.

From here, our quests for meaning take us in divergent directions. For some, the natural world and its emergent manifestations in human experience and creativity are the focus of exploration. Some go on to encounter and celebrate the sacred in such explorations. For some, understandings of the natural world are interwoven with understandings inherent in various religious traditions, generating additional paths of exploration and encounter. As a result, we articulate our emerging orientations with many voices, voices that are harmonious in that we share a common sense of place and gratitude.

We acknowledge as well a shared set of values and concerns pertaining to peace, justice, dignity, cultural and ecological diversity, and planetary sustainability. Although we may differ as to how these concerns are best addressed, we are committed to participating in their resolution.

Intelligent Design and Evolution Awareness Center (<http://www.ideacenter.org/>)

The mission of the IDEA Center is:

- To promote, as a scientific theory, the idea that life was designed by an intelligence;
- To educate people about scientific problems with purely natural explanations for the origins and evolution of life;
- To challenge the philosophical assumptions of Darwinism, naturalism, and materialism;
- To support academic freedom for legitimate intellectual viewpoints in academia and the culture as a whole;
- To facilitate discussion, debate, and dialogue concerning these issues in a warm, friendly, and open atmosphere where individuals feel free to speak their personal views;
- To help students on university and high school campuses, and others, to start IDEA Clubs to fulfill this mission.

Intelligent Design Network (<http://www.intelligentdesignnetwork.org/>)

Intelligent Design Network, Inc. is a nonprofit organization that seeks institutional objectivity in origins science.

Objectivity results from the use of the scientific method without philosophic or religious assumptions in seeking answers to the question: Where do we come from?

We believe objectivity in the institutions of science, government and the media will lead not only to good origins science, but also to constitutional neutrality in this subjective, historical science that unavoidably impacts religion. We promote the scientific evidence of intelligent design because proper consideration of that evidence is necessary to achieve not only scientific objectivity but also constitutional neutrality.

Intelligent Design Undergraduate Research Center (<http://www.idurc.org/index.htm>)

Unavailable

International Association of Bioethics (<http://bioethics-international.org/index.php?show=index>)

Bioethics is the study of the ethical, social, legal, philosophical and other related issues arising in health care and in the biological sciences.

The Association has the following educational and scientific objectives:

- To facilitate contacts and the exchange of information between those working in bioethics in different parts of the world;
- To organize and promote periodic international conferences in bioethics;
- To encourage the development of research and teaching in bioethics;
- To uphold the value of free, open and reasoned discussion of issues in bioethics.

International Consciousness Research Laboratories (<http://www.icrl.org/>)

Our mission is pursued via collaborative initiatives in Basic Research, Educational Outreach, and Pragmatic Applications, all of which focus on the exploration and representation of the role of consciousness in physical reality. These are described in some detail on the Activities pages that follow. ICRL thereby serves as the coordinating hub of a diverse, yet unified community of participants bringing many varied skills and backgrounds to a shared vision for the future. For example, ICRL staff advise some research activities of Psyleron, Inc. - an emerging technology company providing consciousness-related research tools, such as random event generators.

International Network on Feminist Approaches to Bioethics (<http://www.fabnet.org/>)

FAB was launched in 1992 at the Inaugural Congress of the International Association of Bioethics. FAB aims

to develop a more inclusive theory of bioethics, taking seriously the standpoints and experiences of women and other marginalized social groups;
to examine assumptions of bioethical discourse that privilege those already in power;
and to create new methodologies and strategies responsive to the disparate conditions of women's lives across the globe.

International Society for Complexity, Information and Design (<http://www.iscid.org/>)

The International Society for Complexity, Information, and Design (ISCID) is a 501(c)(3) non-profit organization which provides a forum for free and uncensored inquiry into complex systems. The day-to-day operation of the society centers on the Archive, to which members and nonmembers may submit articles. Once uploaded onto the archive, each article has a commenting facility to which members may append comments. At the author's request, after three months on the archive, articles passed on by the editorial board enter the quarterly online peer-reviewed journal of the society: Progress in Complexity, Information, and Design (PCID).

International Society for Science and Religion (<http://www.issr.org.uk/>)

Our central aim is the facilitation of dialogue between the two academic disciplines of science and religion, one of the most important current areas of debate in terms of understanding the nature of humanity. This includes both the enhancement of the profile of the science-religion interface in the public eye, as well as the safeguarding of the quality and rigour of the debate in the more formal, academic arena.

International Society for the Study of Subtle Energies and Energy Medicine
(<http://www.issseem.org/>)

The mission of ISSSEEM is to serve as an open forum for scientific and intuitive exploration of integrative healing, applied spirituality, and the subtle realms.

International Society of Life Information Science (<http://wwwsoc.nii.ac.jp/islis/en/islis.htm>)

The relegation of twentieth century science and technology as mere investigative tools to probe the isolated physical world resulted in the creation of a material-oriented paradigm (framework) devoid of consciousness, spirit and mind.

However, there seems to be an increased awareness about the possible existence of phenomena that related to the realm of consciousness, spirit and mind-phenomena that cannot be explained nor understood in the conventional, twentieth century paradigm.

The International Society of Life Information Science (ISLIS), by gathering collective wisdom of the world, seeks:

to clearly recognize and identify these unsolved phenomena using positive scientific methodology

to solve and understand characteristic and the underlying principle of the unsolved phenomena

to build up a new paradigm for science and technology in the twenty-first century

to contribute to the innovation of science and technology and consequently, to the peaceful culture and social welfare of mankind

John Ray Initiative (<http://www.jri.org.uk/>)

“To promote responsible environmental stewardship in accordance with Christian principles through Education, Research and Advocacy.”

John Templeton Foundation (<http://www.templeton.org/>)

The John Templeton Foundation serves as a philanthropic catalyst for discoveries relating to the Big Questions of human purpose and ultimate reality. We support research on subjects ranging from complexity, evolution, and infinity to creativity, forgiveness, love, and free will. We encourage civil, informed dialogue among scientists, philosophers, and theologians and between such experts and the public at large, for the purposes of definitional clarity and new insights.

Our vision is derived from the late Sir John Templeton's optimism about the possibility of acquiring “new spiritual information” and from his commitment to rigorous scientific research and related scholarship. The Foundation's motto, “How little we know, how eager to learn,” exemplifies our support for open-minded inquiry and our hope for advancing human progress through breakthrough discoveries.

Joint Centre for Bioethics - University of Toronto (<http://www.jointcentreforbioethics.ca/>)

To improve healthcare through leadership in bioethics research, education, practice, and public engagement.

Kansas Citizens for Science (<http://www.kcfs.org/>)

Kansas Citizens for Science is a not-for-profit educational organization that promotes a better understanding of what science is, and does, by:

Advocating for science education

Educating the public about the nature and value of science

Serving as an information resource

KCFS was instrumental in challenging the 1999 Kansas State Board of Education's decision to adopt state science standards that removed key aspects of the theory of evolution as well as other critical concepts in earth science and cosmology, and in resisting the efforts to insert Intelligent Design-influenced changes into the 2004 Science Standards.

In both cases, when moderates regained the majority on the Board, excellent science standards were reinstated.

KCFS is dedicated to keeping the public informed about this issue, and to helping defend quality science and science education in our state.

Kennedy Institute of Ethics - Georgetown University

(<http://kennedyinstitute.georgetown.edu/>)

The Kennedy Institute of Ethics is one of the world's premier bioethics institutes. Founded at Georgetown University in 1971, its faculty includes founders of the field as well as next-generation leaders. With a top-ranked graduate program, the world's most comprehensive bioethics library, a highly praised intensive summer course for health care practitioners, and faculty expertise on issues such as health care reform, death and dying, clinical research ethics, abortion, and environmental ethics, the Institute is a renowned resource for the University, the policy world, and the global bioethics community.

Kolbe Center for the Study of Creation (<http://www.kolbecenter.org/>)

The Kolbe Center for the Study of Creation is a Roman Catholic lay apostolate dedicated to glorifying the Most Holy Trinity by proclaiming the truth about the origins of man and the universe. The Kolbe Center seeks to educate the public, particularly within the Catholic Church, in the truth of creation as revealed in Sacred Scripture and Sacred Tradition and as confirmed by the findings of modern science. With the help of experts in the fields of theology, philosophy, and natural science, the Kolbe Center also seeks to show the superiority of special creation over all forms of molecules-to-man evolution as an explanation of the origins of man and the universe. According to the molecules-to-man, or macro-evolutionary, theory of origins, all living things are descended from non-living matter. During billions of years, this non-living matter changed into all of the different kinds of living

organisms. According to the special creation model of origins on the other hand, God created the various kinds of living things, including man, by divine fiat and later, after the Fall, engineered a global flood that produced most of the "fossil record."

The Kolbe Center is committed in a special way to defending the Catholic teaching that "the literal and obvious sense of Scripture" as intended by the sacred authors must be believed unless reason or necessity force us to reject that teaching in favor of an exclusively figurative interpretation. Pope Leo XIII emphatically upheld this teaching in his encyclical *Providentissimus Deus*, which has never been overruled by any subsequent magisterial teaching. From the middle of the nineteenth century until the middle of the twentieth century, the apparent evidence for Darwin's molecules to man evolutionary theory seemed to contradict the literal and obvious sense of the author(s) of Genesis, chapters 1-11, as consistently understood and taught by the Fathers, Popes, and Councils. The modern "anti-culture of death" grew out of the macro-evolutionary theory whose fundamental principles have since been contradicted by the discoveries of modern science.

The Kolbe Center aims to equip Catholic evangelists with a decisive advantage in the third millennium by rooting their apologetics in an intellectually respectable, and true, teaching on creation. Once persuaded of the bankruptcy of molecules-to-man evolution and of the reasonableness of special creation, the practical atheist will be able to hear the Gospel of Jesus Christ and the claims of the Catholic Church. Children will be free to know their God as an almighty, all knowing, and all loving Creator, rather than as a distant, impersonal First Cause. The Catholic evangelist, too, will be liberated from the impossible task of trying to present the Gospel within a framework taken from a materialistic theory. And, in doing so, he will be following in the footsteps of St. Paul, who evangelized the pagans, agnostics, and practical atheists of Athens by speaking of creation (cf. Acts 17:22-31).

The Kolbe Center seeks to carry out its mission through publications, mass media, seminars, and conferences in the United States and throughout the world. Its conferences provide a forum for prominent Catholic theologians, philosophers, and natural scientists who defend the Magisterium and the inerrancy of Scripture and who present the evidence from their respective disciplines in favor of special creation and against molecules-to-man evolution. The Kolbe Center has an Advisory Council made up for the most part of experts in theology, philosophy, and natural science, most of whom have at least a master's degree in their areas of expertise. (See attached list.)

Lindeboom Institute (<http://www.lindeboominstituut.nl/sitemanager.asp>)

The Prof.dr. G.A. Lindeboom Institute (PLI) is a centre for medical ethics. Its purpose is to study and publish on medical ethical issues and to collect documentation on such issues. The institute works within the Christian tradition and therefore finds its authoritative direction and inspiration in de Bible.

Metanexus Institute (<http://www.metanexus.net/>)

Metanexus is an invented word to name a new way of thinking and being in the universe. The approach is multiperspectival and scientifically rigorous. "Metanexus" literally means "transcending connections" and "transformational networks." This metaphysical and epistemological approach implied in the term is informed in part by the process and relational worldview advocated by A.N. Whitehead and others.

We began in October 1997 as the "Meta-List," an email distribution list hosted by William Grassie, then a recent graduate and professor at Temple University. A year later we incorporated as the Interfaith Center for Science and evolved into the Philaephia Center for Religion and Science. With a grant from the John Templeton Foundation to PCRS, the Meta-List became a dynamic website branded at www.metanexus.net. In 2000, PCRS changed its name to the Metanexus Institute on Religion and Science.

Metanexus Institute has hosted a dozen international conferences, published a number of books, and managed many research projects. We have been blessed with many dedicated and talented staff, board members, and partners in over 400 universities in 45 countries. Metanexus's online publications have served many millions over fourteen years.

The constructive engagement of religion and science evolved into Transdisciplinary approaches to foundational questions.

Today we refer to this as Big History, an integrated narrative approach to teaching and interpreting science. It is in the context of Big History that we can most profitably debate and create solutions to the Big Problems humanity faces in the 21st century. Big History is also the most constructive context for pondering Big Questions - meaning and purpose, beauty and goodness, truth and transcendence, science and the sacred.

Minnesota Center for Healthcare Ethics (<http://www.mnhealthethics.org/>)

The Minnesota Center for Health Care Ethics promotes ethically informed health care decision making, from the bedside to the boardroom, from patient care to public policy. Its mission is to:

- assist patients, families, health care professionals, students, educators, administrators, and policy makers in ethically informed decision making
- generate and communicate ethical concepts, principles, and frameworks
- explore the perspectives that diverse faith and cultural traditions bring to health care decision making
- promote health care ethics education in clinical and academic settings
- make scholarly contributions to the fields of health care ethics and policy

Missouri Association for Creation (<http://www.gennet.org/>)

The Missouri Association for Creation (M.A.C.) was founded in 1972 by two graduate students at the University of Missouri in Columbia. These students felt a need to establish a forum from which they could critically examine the scientific evidence as it pertains to the origin of the Cosmos in general and living organisms in particular. As the name chosen for the organization suggests, they were convinced on the basis of their own study that a careful consideration of the scientific evidence would overwhelmingly favor a creation model over against an evolutionary model of origins. They found that a critical evaluation of the scientific evidence for both models of origins, creation and evolution, was rarely attempted in the science classroom or in any instructional materials then in use. To satisfy their own curiosity and enthusiasm they met monthly with other interested students, faculty, and members of the local community to hear invited speakers and hold discussions and debates.

Today M.A.C. is headquartered in St Louis, Missouri and has members throughout the state as well as in other parts of North America. Though the vast majority of our members would consider themselves Christians, we are not a church and engage in no prayer or worship activity as an organization. Our primary function is to serve as an educational resource on the topic of origins. Our membership includes many scientists, parents, educators, students, clergy, and lay people. We are convinced that truth must find its own way in a free market of ideas.

M.A.C. is registered in the state of Missouri as a not-for-profit scientific and educational organization. M.A.C. was granted tax exempt status by the I.R.S. as a section 501 (C) (3) organization in 1976. M.A.C. is not a subsidiary or sponsor of any other creationist group nor do we engage in political or legal efforts to force our views on others, including the public schools.

Our starting premise is that there are really only two fundamentally different explanations for the origin of the Cosmos (order) and its living inhabitants: 1) it is the result of purposeful design imposed on matter, or 2) it is the result of chance and the intrinsic properties of matter, i.e. spontaneous self assembly. There are perhaps combinations of these two views, but is difficult to imagine a third distinctly different view. We are concerned that most people are exposed to only one view of origins and thus we seek to give them an opportunity to critically examine the evidence and alternatives. We believe that a resolution to the question of which of these views (models) is most plausible must depend on a careful reexamination of the fossil record, contemporary cell biology, genetics, mathematical probability and the most fundamental laws of nature such as the Second Law of Thermodynamics.

Mt Blanco Fossil Museum (<http://www.mtblanco.com/>)

The Mt. Blanco Fossil Museum is a scientific and educational institution dedicated to a correct interpretation of Earth history and fossil remains. We believe that the fossil record speaks of catastrophic events happening several thousand years ago rather than slow processes taking place over millions or billions of years as is held by the popular establishment.

Mutual UFO Network (<http://www.mufon.com/>)

I. Investigate UFO sightings and collect the data in the MUFON Database for use by researchers worldwide.

II. Promote Research on UFOs to discover the true nature of the phenomenon, with an eye towards scientific breakthroughs, and improving life on our planet.

III. Educate the public on the UFO phenomenon and its potential impact on society.

IV. Ensure the Economic Viability of MUFON such that the organization achieves its mission and goals

National Academy of Sciences (<http://www.nasonline.org/site/PageServer>)

The National Academy of Sciences (NAS) is an honorific society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare.

The NAS was established by an Act of Congress that was signed by President Abraham Lincoln on March 3, 1863, at the height of the Civil War, which calls upon the NAS to "investigate, examine, experiment, and report upon any subject of science or art" whenever called upon to do so by any department of the government. Scientific issues would become more complex in the years following the war, and to expand the expertise available to it in its advisory service to the government, the NAS created the National Research Council under its charter in 1916. To keep pace with the growing roles that science and technology would play in public life, the National Academy of Engineering was established under the NAS charter in 1964, and the Institute of Medicine followed in 1970.

Since 1863, the nation's leaders have turned to these non-profit organizations for advice on the scientific and technological issues that frequently pervade policy decisions. Most of the institution's science policy and technical work is conducted by its operating arm, the National Research Council (NRC), which was created expressly for this purpose and which provides a public service by working outside the framework of government to ensure independent advice on matters of science, technology, and medicine. The NRC enlists committees of the nation's top scientists, engineers, and other experts, all of whom volunteer their time to study specific concerns. The results of their deliberations have inspired some of America's

most significant and lasting efforts to improve the health, education, and welfare of the population. The Academy's service to government has become so essential that Congress and the White House have issued legislation and executive orders over the years that reaffirm its unique role.

The Academy membership is composed of approximately 2,100 members and 380 foreign associates, of whom nearly 200 have won Nobel Prizes. Members and foreign associates of the Academy are elected in recognition of their distinguished and continuing achievements in original research; election to the Academy is considered one of the highest honors that can be accorded a scientist or engineer. The Academy is governed by a Council consisting of twelve members (councilors) and five officers, elected from among the Academy membership. Dr. Ralph J. Cicerone is the president of the National Academy of Sciences.

National Association of Biology Teachers

(<http://www.nabt.org/websites/institution/index.php?p=1>)

The National Association of Biology Teachers empowers educators to provide the best possible biology and life science education for all students.

National Center for Science Education (<http://ncse.com/>)

The National Center for Science Education (NCSE) is a not-for-profit, membership organization providing information and resources for schools, parents and concerned citizens working to keep evolution in public school science education. We educate the press and public about the scientific, educational, and legal aspects of the creation and evolution controversy, and supply needed information and advice to defend good science education at local, state, and national levels. Our 4000 members are scientists, teachers, clergy, and citizens with diverse religious affiliations.

National Geographic Society (<http://www.nationalgeographic.com/>)

The National Geographic Society has been inspiring people to care about the planet since 1888. It is one of the largest non-profit scientific and educational institutions in the world. Its interests include geography, archaeology and natural science, the promotion of environmental and historical conservation.

National Science Teachers Association (<http://www.nsta.org/>)

The National Science Teachers Association (NSTA), founded in 1944 and headquartered in Arlington, Virginia, is the largest organization in the world committed to promoting excellence and innovation in science teaching and learning for all. NSTA's current membership of 60,000 includes science teachers, science supervisors, administrators, scientists, business and industry representatives, and others involved in and committed to science education.

New Mexicans for Science and Reason (<http://www.nmsr.org/>)

New Mexicans for Science and Reason (NMSR) consists of individuals, including scientists and non-professionals alike, who share the goals of promoting genuine science, the scientific method, and rational and critical thinking. We share a sense of wonder at both the marvels of the universe, and at the majestic scientific theories which describe these marvels so elegantly and accurately.

We are often called a "Skeptics" group, although we aren't the kind of skeptics who refuse to believe anything, even in the light of compelling evidence. Rather, we tentatively accept those findings which are supported by the data. Though our eyes can't see electrons, for example, our instruments can detect them, our theories predict their behavior, and thus they are quite "real" to us. We are skeptical, however, of those groups who misuse and misrepresent science. We oppose the use of fabrication, flawed logic, distortion of facts, and pseudoscientific propaganda by any and all groups who twist science to suit their own ends, whether they are creationists, advocates of intelligent design, proponents of the idea that aliens crashed at Roswell, extreme academic cultural critics who deny objective reality, or promoters of unproved claims such as therapeutic touch, psychic "DNA Activation," telepathy, astrology, channeling, precognition, crystal healing, cold fusion, tapping of zero-point energy, and perpetual motion machines.

NMSR is a science organization; it is not a civil liberties or an anti-religious organization. Several of our members, like scientists in general, belong to various religious groups. We see no inherent conflict between science and religion, in that science concerns the natural world (the one accessible to our senses and instruments), while religion concerns the possibility of a supernatural world accessible only through faith. While we respect and cherish religious freedom, we stand ready to challenge those who promote bad science to further their goals, religious or otherwise.

In addition to monthly meetings and publication of NMSR Reports, NMSR members work with government officials, other science groups, and print and broadcast media in efforts to promote science and reason. NMSR also works with national groups including the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP), publisher of *Skeptical Inquirer* (Box 703, Amherst, NY, 14228-2743, (716) 636-1425), and the National Center for Science Education, a national pro-science organization (P.O. Box 9477, Berkeley, CA 94709, 1-800-290-6006).

Nuffield Council on Bioethics (<http://www.nuffieldbioethics.org/>)

The Nuffield Council on Bioethics is an independent body that examines and reports on ethical issues in biology and medicine. It was established by the Trustees of the Nuffield Foundation in 1991, and since 1994 it has been funded jointly by the Foundation, the Wellcome Trust and the Medical Research Council.

The Council has achieved an international reputation for advising policy makers and stimulating debate in bioethics.

Ohio Citizens for Science (<http://www.ohioscience.org/>)

OCS represents Ohio's great diversity of religions, political views, philosophies, and scientific traditions. What we share in common is the goal of improving science education in our schools for the good of our communities, our state, our country, and our world.

Ohio's children need contact with real working scientists. Science and technology is the future of Ohio's economy. Our students need to see how the jobs are done so they can see themselves doing those jobs when they grow up. And sci-tech jobs change constantly. Our students need to gain self-confidence in their intelligence and intellectual skills so that as adults they can enjoy continuing to learn. This can come only from contact with real scientific theories, and from understanding the unity of science and the methods of scientific inquiry.

"OCS has a number of short- and long-range goals including:

1) Science Standards

Short-range: To defend the current draft of Ohio's new science standards from the recent political attack.

Long-range: To see the level of scientific literacy rise in Ohio so that those standards will be re-written in 5-10 years to include even more science.

2) Contact with scientists

Short-range: To help scientists educate community groups about the role of evolutionary theory in the world of science today so they can understand why it is essential to include it in the science standards.

Long-range: To promote contact between students and scientists in all fields through visits by scientists to schools, and visits by students to universities, businesses, laboratories and other sites of scientific activity."

Orgone Biophysical Research Laboratory (<http://www.orgonelab.org/>)

Welcome to James DeMeo's research web site, and home page for the Orgone Biophysical Research Laboratory. DeMeo has been investigating the work of the late Dr. Wilhelm Reich since 1970, and founded OBRL in 1978. With cooperative assistance from a network of

professionals and institutes supportive of Wilhelm Reich's original discoveries, OBRL has grown to become one of the world's primary centers for genuine and uncompromised research and educational programs focused upon Orgonomy, the science of orgone (life) energy functions in nature, as developed by Reich in the first half of the 20th Century.

Origins Resource Association (<http://www.originsresource.org/>)

Origins Resource Association is a nonprofit organization of scientists, educators, and citizens concerned about what we see as the brainwashing of our society into an unquestioning belief in evolution. Our mission is to furnish resources to help counter this trend.

ORA began in 1980 under the name Louisiana Citizens for Academic Freedom in Origins, or LCAFO. (You can see why we changed to a shorter name!) The organization was founded to furnish material and expertise to the state of Louisiana in support of the "Balanced Treatment Act." This Act contained two main provisions: (1) Evolution could be presented in Louisiana public schools as theory but not proven scientific fact; and (2) Public school students should also be exposed to whatever evidence favored creation.

While the U.S. Supreme Court ultimately struck down the Act on technical grounds (click the "Legal Issues" link above for details), we have continued to pursue our mission of furnishing quality educational resources and services. These include lectures, seminars, workshops, Sunday school classes, and Bible college classes on the creation/ evolution controversy both locally, across the nation, and overseas in countries such as Peru, Haiti, India, China, Turkey, Honduras, South Africa, Uganda, Zambia, Kenya, Singapore, Malaysia, and Cambodia.

As our group expanded beyond Louisiana to include members in south Mississippi and Alabama, we changed our name to Origins Resource Association. (ORA is so much easier than LCAFO!) We meet sporadically at various locations in southeast Louisiana or southwest Mississippi. Visitors and new members are always welcome.

Origins/Leadership University (<http://www.leaderu.com/index.html>)

Leadership U is:

- a "one-stop shopping superstore" in the marketplace of ideas
- a searchable collection of resources and interactive opportunities
- a ResourceBASE containing thousands of articles, reviews, research papers, essays, books & book chapters, commentaries, video & audio files, poems and more
- rooted in the university--sponsored by Faculty Commons, the faculty outreach and training arm of Campus Crusade for Christ International, Leadership U includes resources from the high school to research levels, with an emphasis on the scholarly
- a multi-disciplinary vehicle to help reach professors, students and other thinkers with the best in Christian thought on a variety of compelling issues

a growing community of apologists for the historical Christian faith who are engaging their culture on a variety of fronts

a current-issues-based approach to the deeper issues facing humanity (e.g., evil and suffering, morality and ethics, public policy, philosophy, origins and eternity)

Parapsychological Association (<http://www.parapsych.org/>)

The Parapsychological Association is an international professional organization of scientists and scholars engaged in the study of psi (or 'psychic') experiences, such as telepathy, clairvoyance, psychokinesis, psychic healing, and precognition. The primary objective of the PA is to achieve a scientific understanding of these experiences.

First established in 1957, the PA has been an affiliated organization of the American Association for the Advancement of Science (AAAS) since 1969. The PA is a non-profit, non-adjudicating organization that endorses no ideologies or beliefs other than the value of rigorous scientific and scholarly inquiry.

Parapsychology Foundation (<http://www.parapsychology.org/>)

The Parapsychology Foundation is a not-for-profit foundation which provides a worldwide forum supporting the scientific investigation of psychic phenomena. The Foundation gives grants, publishes pamphlets, monographs, conference proceedings and the International Journal of Parapsychology, hosts the Perspectives Lecture Series, conducts the Outreach Program, maintains the Eileen J. Garrett Library with its collection of more than 12,000 volumes and 100 periodicals on parapsychology and related topics, and is proud of its quality paperback imprint, Helix Press. For more information on any aspect of the Foundation, choose a page from the above navigation options or click on one of the logos of our four other websites below.

Pascal Centre for Advanced Studies in Faith and Science (<http://pascalcentre.org/>)

In seeking to provide Christian leadership in a secular culture, the Pascal Centre addresses not only current, but also new and forgotten questions. For many the question how science can help to understand the Bible has high priority, but the Centre also explores how Christian faith can contribute to an understanding of nature. The Centre approaches this not just in the sense that faith motivates the study of God's creation, but it explores how religious beliefs affect the very content of scientific explanation.

The Pascal Centre was founded in 1988 by Redeemer College, a private, non-denominational Christian liberal arts and sciences university in Ancaster, Ontario, Canada. The founding Director, Jitse van der Meer holds a Ph.D. in biology and an M.A. in philosophy of science. Eighteen years later Redeemer College has become Redeemer University College. The current Director is Wayne D. Norman, emeritus professor of psychology and Director of Research and Faculty Development.

The Centre has also changed over the years. Although the mission of the Centre remains the same, the means of accomplishing our aims is different. In the early years, the Pascal Centre hosted visiting scholars, funded various small publications and sponsored educational colloquia. Gradually there has been a shift with major emphasis being given to focussed, international conferences and workshops with published proceedings.

With the launch of this web site, the Pascal Centre begins the process of accomplishing its mission in cyberspace. That mission, to explore how religious beliefs and scientific insights mutually interact, is as important today as it was in 1988. We welcome your comments as we take a position, along with others, investigating the science-religion interface.

Pew Charitable Trusts (<http://www.pewtrusts.org/>)

The Pew Charitable Trusts is driven by the power of knowledge to solve today's most challenging problems. Pew applies a rigorous, analytical approach to improve public policy, inform the public and stimulate civic life.

We partner with a diverse range of donors, public and private organizations and concerned citizens who share our commitment to fact-based solutions and goal-driven investments to improve society.

Planetary Society (<http://planetary.org/home/>)

To inspire the people of Earth to explore other worlds, understand our own, and seek life elsewhere.

Priests for Life (<http://www.priestsforlife.org/>)

Priests for Life has come to signify two distinct but related movements within the wider pro-life movement.

On one level, as described below, Priests for Life refers to a very specific effort to galvanize the clergy to preach, teach, and mobilize their people more effectively in the effort to end abortion and euthanasia.

On another level, Priests for Life represents a family of ministries that reach and enrich every aspect of the pro-life movement, for clergy and laity alike, in a wide variety of activities. This has come to pass precisely because priests are not ordained for themselves, but for the people. So in activating clergy, we are activating all the segments of the Church, the pro-life movement, and the wider society in the defense of life.

We refer to this wider family of ministries as Gospel of Life Ministries, to indicate that what unites them all is the Gospel of Life, the good news that life is victorious over death!

So whether you are clergy or laity, young or old, active or inactive, and whatever your religious or ethnic background, you're in the right place if you want to do something to restore protection to the most vulnerable members of the human family!

Probe Ministries

(http://www.probe.org/site/c.fdKEIMNsEoG/b.4213839/k.AF17/Probe_Ministries.htm)

Probe's mission is to present the Gospel to communities, nationally and internationally, by providing life-long opportunities to integrate faith and learning through balanced, biblically based scholarship, training people to love God by renewing their minds and equipping the Church to engage the world for Christ.

Public Responsibility in Medicine and Research (<http://www.primr.org/>)

Public Responsibility in Medicine and Research (PRIM&R) advances the highest ethical standards in the conduct of biomedical, social science, behavioral, and educational research. We accomplish this mission through education, membership services, professional certification, and public policy initiatives.

Reasons to Believe (<http://www.reasons.org/>)

RTB exists to spread the Christian Gospel by demonstrating that sound reason and scientific research—including the very latest discoveries—consistently support, rather than erode, confidence in the truth of the Bible and faith in the personal, transcendent God revealed in both Scripture and nature. We specifically engage influencers, educators, pastors, and other leaders with our integrative creation model, while we encourage and equip fellow believers to participate with us in our mission.

Rhine Research Center (<http://www.rhine.org/>)

The Rhine Research Center is an integrative center for the study of consciousness. We are a hub for ground-breaking research and educational activities on the nature of human consciousness – its reach, its reality, its durability, its healing capacity, and its spiritual dimension.

Rocky Mountain Creation Fellowship (<http://www.youngearth.org/>)

The Mission of the Rocky Mountain Creation Fellowship is to develop a network of people who are committed to the education and proclamation of the inerrant word of God and its literal, six consecutive twenty-four hour days of creation

Santa Fe Institute (<http://www.santafe.edu/>)

The Santa Fe Institute is a transdisciplinary research community that expands the boundaries of scientific understanding. Its aim is to discover, comprehend, and communicate the common fundamental principles in complex physical, computational, biological, and social

systems that underlie many of the most profound problems facing science and society today.

Science Against Evolution (http://www.ridgecrest.ca.us/~do_while/sage/)

Science Against Evolution is a California Public Benefit Corporation whose objective is to make the general public aware that the theory of evolution is not consistent with physical evidence and is no longer a respectable theory describing the origin and diversity of life.

Science and Religion Forum (<http://www.srforum.org/>)

Began
at a meeting in Durham, England in 1975 ...

Acknowledges
that the issues at the interface of religion and science are complex ...

Organises
an annual conference on topics at the interface of religion and science ...

Publishes
Reviews in Science and Religion, a journal that commissions reviews of the latest work in the field of science and religion...

Promotes
discussion between scientific understanding and religious thought ...

Is open
to people of any religion or none.

Scientific and Medical Network (<http://www.scimednet.org/>)

The Network seeks to provide a forum for pursuing truth, wherever it leads, to widen the intellectual horizons of science and of society as a whole, to stimulate research at the frontiers of human knowledge and experience, and to make the results of such research more widely known through its educational programmes. The Network is committed to no dogma or creed. It encourages intellectual discernment and is wary of the ill-founded and sensational claims of 'pseudo-science'. In asking searching questions about the nature of life and the role of the human being, the Network abides by its guidelines of open-minded, rigorous thinking and care for others at all times.

Secular Web Library/Internet Infidels (<http://www.infidels.org/>)

The Secular Web is owned and operated by Internet Infidels, Inc., a 501(c)(3) nonprofit educational organization dedicated to defending and promoting a naturalistic worldview on

the Internet. Naturalism is the "hypothesis that the natural world is a closed system" in the sense that "nothing that is not a part of the natural world affects it." As such, "naturalism implies that there are no supernatural entities," such as gods, angels, demons, ghosts, or other spirits, "or at least none that actually exercises its power to affect the natural world." [1] And without miraculous interventions into nature from a spiritual realm, neither prayer nor magick are more effective than a placebo.

SETI Institute (<http://www.seti.org/>)

The mission of the SETI Institute is to explore, understand and explain the origin, nature and prevalence of life in the universe.

We believe we are conducting the most profound search in human history — to know our beginnings and our place among the stars.

The SETI Institute is a private, nonprofit organization dedicated to scientific research, education and public outreach.

The Institute comprises 3 centers, the Center for SETI Research, the Carl Sagan Center for the Study of Life in the Universe and the Center for Education and Public Outreach.

Founded in November 1984, the SETI Institute began operations on February 1, 1985. Today it employs over 150 scientists, educators and support staff. Research at the Institute is anchored by two centers. Dr. Jill Tarter leads the Center for SETI (Search for Extraterrestrial Intelligence) Research as Bernard M. Oliver Chair for SETI. Dr. David Morrison is the Director for the Carl Sagan Center for the Study of Life in the Universe. Edna DeVore leads our Center for Education and Public Outreach.

Sigma Xi (<http://www.sigmaxi.org/>)

To enhance the health of the research enterprise, foster integrity in science and engineering and promote the public's understanding of science for the purpose of improving the human condition.

Skeptics Society (<http://www.skeptic.com/>)

THE SKEPTICS SOCIETY is a scientific and educational organization of scholars, scientists, historians, magicians, professors and teachers, and anyone curious about controversial ideas, extraordinary claims, revolutionary ideas, and the promotion of science. Our mission is to serve as an educational tool for those seeking clarification and viewpoints on those controversial ideas and claims.

Society for Psychical Research (<http://www.spr.ac.uk/main/>)

The period which saw the formation of the Society for Psychical Research was a time of intense intellectual ferment and uncertainty, with natural sciences making great strides in explaining the world in terms which challenged the traditional, religious views. At the same time, since the 1850s, there was a virtual explosion of extravagant paranormal claims and interest in them, in all strata of society throughout the Western world, related to the spread of the new religion of Spiritualism. While stories of apparitions, clairvoyant visions, precognitive dreams and other miraculous events have accompanied mankind since time immemorial, the new mediums (of whom there were many) were very influential in gaining credence for their claims of being able to contact the dead, and the issues raised by both science and spiritualism were the subject of fierce debate.

The SPR, the first learned society of its kind, was founded in London in 1882 for the purpose of investigating “that large body of debatable phenomena designated by such terms as mesmeric, psychical and “spiritualistic”, and to do so “in the same spirit of exact and unimpassioned enquiry which has enabled Science to solve so many problems” (quoted after Gauld, 1968, p. 137).

Working in that scientific spirit, the leaders of the SPR quickly created a methodological and administrative framework for investigating the phenomena, including the foundation of a scholarly journal for reporting and discussing psychical research worldwide. Owing to their efforts, “psychical research was becoming a science, with disciplined experimental methods and standardised methods of description, established by some of the finest minds of the day”. (Broughton, p. 64)

Society for Scientific Exploration (<http://www.scientificexploration.org/>)

The Society for Scientific Exploration (SSE) is a leading professional organization of scientists and scholars who study unusual and unexplained phenomena. Subjects often cross mainstream boundaries, such as consciousness, ufos, and alternative medicine, yet often have profound implications for human knowledge and technology.

We publish a peer-reviewed journal, host annual meetings, and engage in public outreach. While our Full members are professional or experienced scientists and scholars, Associate and Student memberships are available to everyone. Consequently, we have a diverse and active membership, who promote critical thinking and rigorous—yet open-minded—scientific exploration.

South Bay Creation Science Association (<http://www.creationinthecrossfire.com/>)

None available

Southern Cross Bioethics Institute (<http://www.bioethics.org.au/>)

Southern Cross Bioethics Institute is an independent, non-sectarian, autonomous institution committed to research into important bioethical issues affecting the whole community - locally, nationally and internationally. The Institute was established in 1987 in the South Australian capital, Adelaide.

Its foundation was part of an initiative by the Southern Cross Care Inc., an independent provider of care and accommodation for Australia's older people.

The Southern Cross Bioethics Institute adheres to universal human values, human rights, and the laws of humanity, including the inviolable and inalienable right to life of every member of the human family, whatever the age, status or ability of that member, from conception to natural death.

Since bioethics addresses all kinds of issues faced by society in general, and particularly the very fundamental issues of human life and procreation which have at stake fundamental human rights, dignity and freedom, the Institute represents an effective contribution to the making of public policy in a non-party-political fashion.

The staff of the Institute are involved in continuous bioethical research, writing, and professional consultation on various subjects like reproductive technology, ethical issues in care of the aged, abortion, euthanasia, biotechnology, embryo experimentation, organ donation, resource allocation and many others.

The Southern Cross Bioethics Institute is a community resource. We have educational services for individuals, students, institutions, community groups and politicians of all political persuasions. The Institute provides expert comments and submissions to governments, research committees and international forums.

Stand to Reason (<http://www.str.org/site/PageServer>)

Our mission statement explains what kind of activity we're involved in. Stand to Reason's mission can be stated like this:

Stand to Reason trains Christians to think more clearly about their faith and to make an even-handed, incisive, yet gracious defense for classical Christianity and classical Christian values in the public square.

Regardless of the precise wording, our mission has six important elements:

What is our principle activity? Training

Who do we train? Christians

What do we train them to do? Think clearly and make a defense

What is the manner in which they do this? Intellectually fair, gracious and incisive

What will the scope of our defense? The doctrines and ethics of classical Christianity

Where is this defense made? The public square

We focus on the basics, the fundamentals of theology and ethics, and the fundamental tools of thought. This distinguishes us from other organizations. For example, the Christian Research Institute (CRI) is a place to get information. Though we do give information, STR is the place to get educated. We teach not just what to think, but how to think. STR is not that unique in the information we give, but in the way we use the information.

STR teaches the value of using our minds to love God and share the Gospel. We teach careful reasoning and well thought-out answers so that Christians will participate in public discussion (at home, at work, or at the university) so that the Christian world view has a place in the debate. We encourage Christians to develop coherent answers to questions that challenge Christianity so that their faith is deepened and thereby are emboldened to share the Gospel.

What we do is in contrast with what we don't do.

We don't do analysis of specific cults of Christianity, though indirectly we help undermine their impact.

We don't engage in political action per se, though our arguments may pertain to issues that have political ramifications.

We are not principally an evangelistic organization, though we expect our efforts to aid in fulfilling the Great Commission. We are plowers and sowers, not harvesters.

We don't do public advocacy, as in debates. Our principal goal is not to be the spokesperson of Christianity. Instead, we want to train many in the Body of Christ to be spokespersons. Our public advocacy (as opposed to our public training) is principally for the purpose of modeling.

Students for Life of America (<http://www.studentsforlife.org/>)

The mission of Students for Life of America (SFLA) is to end abortion by educating students about the issues of abortion, euthanasia, and infanticide; identifying pro-life student leaders; equipping student pro-lifers with the training, skills and resources to be effective and successful; promoting student activity to other local, college and national organizations.

Students for the Exploration and Development of Space (<http://seds.org/>)

SEDS is an independent, student-based organization which promotes the exploration and development of space.

SEDS believes in a space-faring civilization and that focusing the enthusiasm of young people is the key to our future in space.

TalkOrigins Foundation (<http://www.talkorigins.org/foundation/>)

The TalkOrigins Foundation, Inc., is a Texas nonprofit corporation created on April 26, 2004. The Foundation is intended to provide a mechanism to cover the cost of hosting and maintaining the TalkOrigins Archive and its related sites (Talkdesign.org, The Panda's Thumb) through grants, contributions, and other revenues.

Tree of Life (<http://tolweb.org/tree/>)

The Tree of Life Web Project is a collection of information about biodiversity compiled collaboratively by hundreds of expert and amateur contributors. Its goal is to contain a page with pictures, text, and other information for every species and for each group of organisms, living or extinct. Connections between Tree of Life web pages follow phylogenetic branching patterns between groups of organisms, so visitors can browse the hierarchy of life and learn about phylogeny and evolution as well as the characteristics of individual groups.

Triangle Association for the Science of Creation (<http://www.tasc-creationscience.org/>)

TASC's mission is to rebuild and strengthen the foundation of the Christian faith by increasing awareness of the scientific evidence supporting the literal Biblical account of creation and refuting evolution.

Twin Cities Creation Science Association (<http://www.tccsa.tc/>)

TCCSA exists to present evidence for creation and a young earth in ways that will cause:

1. Christians, especially young people, to be strengthened in their faith, fortified against the attacks on their faith by the evolutionary establishment, and be trained and motivated to intelligently discuss these matters with their peers, teachers and the community at large.
2. Pastors and other church leaders to understand the relevance of creation to the integrity of the gospel and the authority of Scripture.
3. Unbelievers to be confronted with the scientific evidence for creation.
4. People to not only become creationists but to become born again Christians through the confession of their sins and acceptance of the finished work of Jesus Christ on the cross.

Wellcome Trust (<http://www.wellcome.ac.uk/>)

We are a global charitable foundation dedicated to achieving extraordinary improvements in human and animal health.

We support the brightest minds in biomedical research and the medical humanities. Our breadth of support includes public engagement, education and the application of research to improve health. Find out more about our vision and what we do.

We are independent of both political and commercial interests.

Zygon Center for Religion and Science (<http://zygoncenter.org/>)

The Zygon Center for Religion and Science (ZCRS) is dedicated to relating religious traditions and scientific knowledge in order to gain insight into the origins, nature, and destiny of humans and their environment, and to realize the common goal of a world in which love, justice, and responsible patterns of living prevail. Seeking to harness religion and science together in this shared purpose, ZCRS takes its distinctive name from the Greek word for “yoking” or “joining.” ZCRS brings together scientists, theologians, philosophers, and other scholars to address basic questions and issues of human concern that include:

- how we understand the world in which we live and our place in that world;
- how traditional concerns and beliefs of religion can be related to that understanding;
- how the joint reflection of scientists, philosophers, and theologians can contribute to the welfare of the human community;
- how dialogue and cooperation can be promoted among the world's religions;
- how to promote international discussion of the Center's theme areas.

APPENDIX C

CENTRALITY ANALYSIS TABLES

Table 10: Inter-organizational network degree centrality

Organization Name	Organizational field	Degree	Share
American Association for the Advancement of Science	Mainstream Science	177	19.4
Hastings Center	Bioethics	52	5.7
Discovery Institute: Center for Science and Culture	Intelligent Design/Creationist	44	4.8
International Society for Complexity, Information and Design	Intelligent Design/Creationist	35	3.8
National Academy of Sciences	Mainstream Science	35	3.8
John Templeton Foundation	Science-Religion	31	3.4
Access Research Network	Intelligent Design/Creationist	30	3.3
Committee for Skeptical Inquiry	Pro-Science	26	2.9
Faraday Institute	Science-Religion	24	2.6
Metanexus Institute	Science-Religion	24	2.6
American Institute of Physics	Mainstream Science	20	2.2
Parapsychological Association	Pseudo-Science	20	2.2
Intelligent Design and Evolution Awareness Center	Intelligent Design/Creationist	19	2.1
Santa Fe Institute	Pro-Science	19	2.1
Origins/Leadership University	Intelligent Design/Creationist	18	2.0
Christians in Science	Science-Religion	17	1.9
American Astronomical Society	Mainstream Science	14	1.5
Astronomical Society of the Pacific	Mainstream Science	13	1.4
Institute of Noetic Sciences	Pseudo-Science	13	1.4
Center for Theology and the Natural Sciences	Science-Religion	12	1.3
SETI Institute	Pro-Science	11	1.2
A Rocha	Science-Religion	10	1.1
Geological Society of America	Mainstream Science	10	1.1
Global Consciousness Project	Pseudo-Science	10	1.1
American Society for Bioethics and Humanities	Bioethics	9	1.0

Planetary Society	Pro-Science	9	1.0
Center for Bioethics - University of Pennsylvania	Bioethics	8	0.9
International Society for Science and Religion	Science-Religion	8	0.9
Kennedy Institute of Ethics - Georgetown University	Bioethics	8	0.9
Public Responsibility in Medicine and Research	Bioethics	8	0.9
Rhine Research Center	Pseudo-Science	8	0.9
Secular Web Library/Internet Infidels	Pro-Science	8	0.9
Center for Bioethics - University of Minnesota	Bioethics	7	0.8
John Ray Initiative	Science-Religion	7	0.8
National Center for Science Education	Pro-Science	7	0.8
Sigma Xi	Pro-Science	7	0.8
Society for Scientific Exploration	Pseudo-Science	7	0.8
American Institute of Biological Sciences	Mainstream Science	6	0.7
Ian Ramsey Centre	Science-Religion	6	0.7
Institute on Religion in an Age of Science	Science-Religion	6	0.7
Science and Religion Forum	Science-Religion	6	0.7
European Society for the Study of Science and Theology	Science-Religion	5	0.5
Institute for Creation Research	Intelligent Design/Creationist	5	0.5
National Science Teachers Association	Mainstream Science	5	0.5
New Mexicans for Science and Reason	Pro-Science	5	0.5
Center for Bioethics and Human Dignity	Bioethics	4	0.4
Cognitive Sciences Laboratory	Pseudo-Science	4	0.4
International Association of Bioethics	Bioethics	4	0.4
International Network on Feminist Approaches to Bioethics	Bioethics	4	0.4
Society for Psychical Research	Pseudo-Science	4	0.4
American Society of Law, Medicine and Ethics	Bioethics	3	0.3
Au Sable Institute of Environmental Studies	Science-Religion	3	0.3
Canadian Scientific and Christian Affiliation	Science-Religion	3	0.3
Creation Research Society	Intelligent Design/Creationist	3	0.3
Fund for UFO Research	NA	3	0.3
International Society of Life Information Science	Pseudo-Science	3	0.3
Joint Centre for Bioethics - University of Toronto	Bioethics	3	0.3
Kansas Citizens for Science	Pro-Science	3	0.3
Mutual UFO Network	NA	3	0.3
Counterbalance Foundation	Science-Religion	2	0.2
Creation Ministries International	Intelligent Design/Creationist	2	0.2
HumGen International	Bioethics	2	0.2
International Consciousness Research Laboratories	Pseudo-Science	2	0.2
Nuffield Council on Bioethics	Bioethics	2	0.2
Parapsychology Foundation	Pseudo-Science	2	0.2
Priests for Life	NA	2	0.2
Southern Cross Bioethics Institute	Bioethics	2	0.2
Students for Life of America	NA	2	0.2
Zygon Center for Religion and Science	Science-Religion	2	0.2

Affiliation of Christian Geologists	Science-Religion	1	0.1
American Scientific Affiliation	Science-Religion	1	0.1
Answers in Genesis	Intelligent Design/Creationist	1	0.1
Australasian Bioethics Association	Bioethics	1	0.1
Boundary Institute	Pro-Science	1	0.1
Farsight Institute	Pseudo-Science	1	0.1
Intelligent Design Undergraduate Research Center	Intelligent Design/Creationist	1	0.1
International Society for the Study of Subtle Energies and Energy Medicine	Pseudo-Science	1	0.1
Kolbe Center for the Study of Creation	Intelligent Design/Creationist	1	0.1
Lindeboom Institute	Bioethics	1	0.1
National Association of Biology Teachers	Mainstream Science	1	0.1
Probe Ministries	Intelligent Design/Creationist	1	0.1
Scientific and Medical Network	Pseudo-Science	1	0.1
Skeptics Society	Pro-Science	1	0.1
Triangle Association for the Science of Creation	Intelligent Design/Creationist	1	0.1
Wellcome Trust	Bioethics	1	0.1

Note: 62 organizations had zero degree centrality and are not presented here.

Table 11: Inter-organizational network closeness centrality

Organization Name	Organizational field	Farness
American Association for the Advancement of Science	Mainstream Science	9,635
Hastings Center	Bioethics	9,670
John Templeton Foundation	Science-Religion	9,678
Committee for Skeptical Inquiry	Pro-Science	9,680
Metanexus Institute	Science-Religion	9,682
Society for Scientific Exploration	Pseudo-Science	9,690
Discovery Institute: Center for Science and Culture	Intelligent Design/Creationist	9,693
International Society for Complexity, Information and Design	Intelligent Design/Creationist	9,694
Origins/Leadership University	Intelligent Design/Creationist	9,695
Center for Bioethics - University of Pennsylvania	Bioethics	9,696
Center for Theology and the Natural Sciences	Science-Religion	9,696
Faraday Institute	Science-Religion	9,698
A Rocha	Science-Religion	9,699
International Association of Bioethics	Bioethics	9,699
Christians in Science	Science-Religion	9,700
Public Responsibility in Medicine and Research	Bioethics	9,700
Center for Bioethics - University of Minnesota	Bioethics	9,702
HumGen International	Bioethics	9,702
SETI Institute	Pro-Science	9,702
National Center for Science Education	Pro-Science	9,703
Sigma Xi	Pro-Science	9,703
Institute on Religion in an Age of Science	Science-Religion	9,704
New Mexicans for Science and Reason	Pro-Science	9,706
Secular Web Library/Internet Infidels	Pro-Science	9,706
Planetary Society	Pro-Science	9,707
Santa Fe Institute	Pro-Science	9,709
Au Sable Institute of Environmental Studies	Science-Religion	9,710
Astronomical Society of the Pacific	Mainstream Science	9,711
American Astronomical Society	Mainstream Science	9,712
American Institute of Physics	Mainstream Science	9,712
National Academy of Sciences	Mainstream Science	9,712
American Institute of Biological Sciences	Mainstream Science	9,713
Geological Society of America	Mainstream Science	9,713
National Association of Biology Teachers	Mainstream Science	9,714
National Science Teachers Association	Mainstream Science	9,714
Triangle Association for the Science of Creation	Intelligent Design/Creationist	9,714
Institute of Noetic Sciences	Pseudo-Science	9,735
American Society for Bioethics and Humanities	Bioethics	9,736
Canadian Scientific and Christian Affiliation	Science-Religion	9,736
International Society for Science and Religion	Science-Religion	9,742
Center for Bioethics and Human Dignity	Bioethics	9,745

International Network on Feminist Approaches to Bioethics	Bioethics	9,745
Kennedy Institute of Ethics - Georgetown University	Bioethics	9,746
Nuffield Council on Bioethics	Bioethics	9,747
Joint Centre for Bioethics - University of Toronto	Bioethics	9,748
Science and Religion Forum	Science-Religion	9,748
Southern Cross Bioethics Institute	Bioethics	9,748
American Society of Law, Medicine and Ethics	Bioethics	9,749
European Society for the Study of Science and Theology	Science-Religion	9,750
Ian Ramsey Centre	Science-Religion	9,750
Parapsychological Association	Pseudo-Science	9,753
Kansas Citizens for Science	Pro-Science	9,755
American Scientific Affiliation	Science-Religion	9,757
Counterbalance Foundation	Science-Religion	9,757
Global Consciousness Project	Pseudo-Science	9,757
Intelligent Design and Evolution Awareness Center	Intelligent Design/Creationist	9,759
Zygon Center for Religion and Science	Science-Religion	9,760
Access Research Network	Intelligent Design/Creationist	9,762
Farsight Institute	Pseudo-Science	9,769
International Consciousness Research Laboratories	Pseudo-Science	9,769
John Ray Initiative	Science-Religion	9,772
Kolbe Center for the Study of Creation	Intelligent Design/Creationist	9,772
Probe Ministries	Intelligent Design/Creationist	9,772
Boundary Institute	Pro-Science	9,781
Skeptics Society	Pro-Science	9,785
International Society of Life Information Science	Pseudo-Science	9,808
Rhine Research Center	Pseudo-Science	9,808
International Society for the Study of Subtle Energies and Energy Medicine	Pseudo-Science	9,814
Australasian Bioethics Association	Bioethics	9,824
Lindeboom Institute	Bioethics	9,824
Wellcome Trust	Bioethics	9,826
Cognitive Sciences Laboratory	Pseudo-Science	9,830
Society for Psychical Research	Pseudo-Science	9,830
Institute for Creation Research	Intelligent Design/Creationist	9,832
Parapsychology Foundation	Pseudo-Science	9,832
Affiliation of Christian Geologists	Science-Religion	9,834
Intelligent Design Undergraduate Research Center	Intelligent Design/Creationist	9,841
Scientific and Medical Network	Pseudo-Science	9,909
Creation Ministries International	Intelligent Design/Creationist	9,910
Creation Research Society	Intelligent Design/Creationist	9,910
Answers in Genesis	Intelligent Design/Creationist	9,911

Note: 62 organizations had zero closeness centrality and are not presented here. The Fund for UFO Research, Mutual UFO Network, Priests for Life and Students for Life of America are not presented here as their closeness centrality is infinite due to their disconnection from the main network

component.

Table 12: Inter-organizational network betweenness centrality

Organization Name	Organizational field	Betweenness
American Association for the Advancement of Science	Mainstream Science	2177.29
Hastings Center	Bioethics	728.47
Society for Scientific Exploration	Pseudo-Science	602.64
John Templeton Foundation	Science-Religion	412.07
Discovery Institute: Center for Science and Culture	Intelligent Design/Creationist	311.90
Intelligent Design and Evolution Awareness Center	Intelligent Design/Creationist	304.00
Parapsychological Association	Pseudo-Science	295.82
Committee for Skeptical Inquiry	Pro-Science	275.16
Institute of Noetic Sciences	Pseudo-Science	247.66
Institute for Creation Research	Intelligent Design/Creationist	233.00
Metanexus Institute	Science-Religion	202.17
International Society for Complexity, Information and Design	Intelligent Design/Creationist	188.92
Origins/Leadership University	Intelligent Design/Creationist	154.90
SETI Institute	Pro-Science	85.89
Center for Bioethics and Human Dignity	Bioethics	79.50
International Network on Feminist Approaches to Bioethics	Bioethics	79.50
Access Research Network	Intelligent Design/Creationist	79.00
Kansas Citizens for Science	Pro-Science	79.00
Nuffield Council on Bioethics	Bioethics	79.00
Secular Web Library/Internet Infidels	Pro-Science	79.00
Society for Psychical Research	Pseudo-Science	79.00
Faraday Institute	Science-Religion	77.42
Center for Theology and the Natural Sciences	Science-Religion	56.05
A Rocha	Science-Religion	48.79
Global Consciousness Project	Pseudo-Science	46.42
International Association of Bioethics	Bioethics	40.14
Institute on Religion in an Age of Science	Science-Religion	39.80
Christians in Science	Science-Religion	25.33
Public Responsibility in Medicine and Research	Bioethics	20.25
American Society for Bioethics and Humanities	Bioethics	16.30
Canadian Scientific and Christian Affiliation	Science-Religion	14.66
Sigma Xi	Pro-Science	12.96
Center for Bioethics - University of Pennsylvania	Bioethics	12.64

Science and Religion Forum	Science-Religion	8.93
European Society for the Study of Science and Theology	Science-Religion	7.86
International Society for Science and Religion	Science-Religion	7.37
Rhine Research Center	Pseudo-Science	4.74
National Center for Science Education	Pro-Science	3.71
New Mexicans for Science and Reason	Pro-Science	2.62
Ian Ramsey Centre	Science-Religion	1.79
Astronomical Society of the Pacific	Mainstream Science	1.00
Kennedy Institute of Ethics - Georgetown University	Bioethics	1.00
American Astronomical Society	Mainstream Science	0.50
American Institute of Physics	Mainstream Science	0.50
John Ray Initiative	Science-Religion	0.50
National Academy of Sciences	Mainstream Science	0.50
Cognitive Sciences Laboratory	Pseudo-Science	0.33

Note: 99 organizations had zero betweenness centrality and are not presented here.

APPENDIX D

ERGM MODELS

The models are presented in an additive manner, presenting individual coefficients first, then presenting each possible combination of coefficients until including all coefficients in model 28. Models 1 through 8 include only structural estimates; these are intended to show the effect of structural characteristics in producing the overall network structure. These effects include the number of edges in the network, the number of isolates, transitive relations ('triangle' coefficient), degree centralities of 1 – 5, and star networks of size 1 – 5 ('*k*-star' coefficient). A 5-star is a network with a single node with 5 nodes connected to it and no connections between the other 5 nodes, so the central node plays a very powerful role. Models 9 through 28 also include 'organizational focus' and 'homophily' coefficients. The first coefficient shows the effect of field membership on the network structure, while the second coefficient measures the effect of within-field ties on network structure.

Independent variables	Coefficients							
	Model 1	Model 2 ¹	Model 3 ¹	Model 4 ¹	Model 5 ¹	Model 6 ¹	Model 7 ¹	Model 8 ¹
Edges	-4.133 (0.078) ***	-0.279 (0.003) ***	-4.686 (0.170) ***	-8.153 (0.003) ***	-6.933 (0.634) ***	-2.603 0.2501 ***	-1.612 12.730 ***	-4.290 (0.027) ***
Isolates		-0.575 (0.000)	1.325 (0.117) ***	-0.166 (0.000) ***	-0.455 (0.381) ***		1.534 (0.234) ***	0.369 (0.448) ***
Triangle			1.999 (0.101) ***		1.713 (0.126) ***			2.154 (0.107) ***
K-star(K)								
K = 1				-0.229 (0.030) ***	-0.035 (0.000) ***			
K = 2				1.095 (0.001) ***	0.684 (0.160) ***			
K = 3				-0.320 (0.000) ***	-0.301 (0.053) ***			
K = 4				0.069 (0.000) ***	0.065 (0.000) ***			
K = 5				-0.006 (0.000) ***	-0.005 (0.000) ***			
Organizational Focus ²								
Creation Science						-2.682 (0.277) ***	-1.279 (0.300) ***	-1.326 (0.131) ***
Intelligent Design						-0.349 (0.247) ***	0.240 (0.250) ***	-0.057 (0.004) ***
Pseudo/Fringe-science						-0.510 (0.199) *	0.066 35.700	-0.027 (0.003) ***
Ethics						-0.506 (0.187) **	0.337 52.260	-0.268 (0.002) ***
Pro-science						-0.764 (0.249) **	0.029 (0.253)	-0.332 (0.004) ***
Anti-abortion						-1.614 (0.724) *	-1.655 (0.726) *	-0.126 (0.016) ***
Ufology						-1.614 (0.724) *	-1.426 (0.726) *	-0.105 (0.013) ***
Christian organization (non-Creation science)						-0.707 (0.279) *	-0.529 56.600	-0.784 (0.004) ***
Science-religion						-0.077 (0.179)	0.473 44.030	-0.204 (0.002) ***
Science outliers						-0.378 (0.349)	-0.105 (0.000) ***	-0.287 (0.009) ***

* p < .05
 ** p < .01
 *** p < .001
 ...g
 estimated.
² Organizations with a mainstream science focus provide the reference category for the organizational focus parameters.

Table C-1. Inter-organizational network ERCM models - continued

Independent variables	Coefficients			
	Model 15 ¹	Model 16 ¹	Model 17 ¹	Model 18 ¹
Edges	-1.922 (0.274) ***	-8.462 (0.001) ***	-4.148 (0.492) ***	-8.416 (0.005) ***
Isolates	1.838 (0.624) **	-0.923 (0.001) ***	0.628 (0.299) *	-0.403 (0.009) ***
Triangle		1.237 (0.133) ***	1.719 (0.112) ***	1.222 (0.001) ***
K-star(K)				
K = 1		-0.056 (0.000) ***		-0.031 (0.013) *
K = 2		0.785 (0.168) ***		0.846 (0.001) ***
K = 3		-0.285 (0.000) ***		-0.345 (0.062) ***
K = 4		0.059 (0.010) ***		0.077 (0.012) ***
K = 5		-0.005 (0.000) ***		-0.006 (0.001) ***
Organizational Focus ²				
Creation Science	-1.883 (0.257) ***		-1.239 (0.479) **	-0.267 (0.009) ***
Intelligent Design	-0.914 (0.301) **		-0.122 (0.131)	0.644 (0.040) ***
Pseudo/Fringe-science	-1.496 (0.220) ***		-0.866 (0.039) ***	0.296 (0.006) ***
Ethics	-1.989 (0.187) ***		-1.316 (0.433) **	-2.350 (0.030) ***
Pro-science	-0.904 (0.421) *		-0.397 (0.057) ***	0.383 (0.028) ***
Anti-abortion	-15.650 (0.000) ***		-14.250 84.700)	-13.140 (0.001) ***
Ufoology	-15.650 (518.1)		-14.250 (0.000) ***	-13.160 (0.001) ***
Christian organization (non-Creation science)	-0.619 (0.395) ***		-0.676 (0.020) ***	0.227 (0.023) ***
Science-religion	-0.878 (0.089) ***		-0.583 (0.049) ***	0.317 (0.017) ***
Science outliers	-0.857 (0.249) ***		-0.459 (0.099) ***	0.302 (0.015) ***
Homophily				
Creation Science	1.990 (0.148) ***	1.501 (0.005) ***	1.860 (0.009) ***	1.985 (0.025) ***
Intelligent Design	3.767 (0.362) ***	3.307 (0.001) ***	3.811 (0.025) ***	2.362 (0.001) ***
Mainstream Science	0.726 (0.161) ***	2.223 (0.005) ***	1.184 (0.564) *	2.158 (0.006) ***
Pseudo/Fringe-science	3.510 (0.140) ***	2.664 (0.003) ***	2.874 (0.052) ***	2.551 (0.014) ***
Ethics	3.881 (0.162) ***	1.562 (0.004) ***	3.300 (0.156) ***	6.734 (0.002) ***
Pro-science	2.037 (0.290) ***	2.319 (0.001) ***	2.380 (0.024) ***	2.421 (0.005) ***
Anti-abortion	55.270 (0.000) ***	22.320 (0.000) ***	51.590 (0.000) ***	52.580 (0.000) ***
Ufoology	55.270 (0.000) ***	22.550 (0.000) ***	51.590 (0.000) ***	52.580 (0.000) ***
Christian organization (non-Creation science)	1.897 (0.421) ***	2.901 (0.000) ***	2.639 (0.010) ***	2.864 (0.004) ***
Science-religion	2.609 (0.138) ***	2.113 (0.001) ***	1.955 (0.626) **	1.680 (0.019) ***
Science outliers	7.863 (0.000) ***	6.315 (0.000) ***	12.340 (0.000) ***	5.085 (0.000) ***

* p < .05

** p < .01

*** p < .001

¹ Model was fit using Markov Chain Monte Carlo estimation. Coefficients and standard errors were not uniquely determined. The coefficients shown in table represent the model with the best fit out of 10 models estimated.

² Organizations with a mainstream science focus provide the reference category for the organizational focus parameters.

Independent variables	Coefficients					
	Model 9	Model 10 ¹	Model 11 ¹	Model 12 ¹	Model 13 ¹	Model 14 ¹
Edges	-8.278 (0.718) ***	-7.636 (0.781) ***	-4.866 (0.124) ***	0.464 (0.129) ***	-5.409 (0.217) ***	-9.942 (0.680) ***
Isolates	-0.523 (0.380)	-1.041 (1.122)		1.585 (0.250) ***	-0.831 (0.294) **	-0.182 (0.000) ***
Triangle		1.750 (0.128) ***			1.853 (0.108) ***	
K - star(K)						
K = 1	-0.021 (0.000) ***	-0.033 (0.000) ***				-0.132 (0.000) ***
K = 2	1.063 (0.140) ***	0.709 (0.168) ***				1.195 (0.000) ***
K = 3	-0.324 (0.047) ***	-0.340 (0.000) ***				-0.326 (0.000) ***
K = 4	0.067 (0.009) ***	0.075 (0.000) ***				0.064 (0.000) ***
K = 5	-0.005 (0.001) ***	-0.006 (0.001) ***				-0.005 (0.000) ***
Organizational Focus ²						
Creation Science	-0.772 (0.009) ***	-0.570 (0.199) **				
Intelligent Design	0.467 (0.020) ***	0.746 (0.317) *				
Pseudo/Fringe-science	0.540 (0.007) ***	0.905 (0.295) **				
Ethics	0.019 (0.269)	0.150 (0.217)				
Pro-science	0.273 (0.003) ***	0.386 (0.203)				
Anti-abortion	0.158 (0.007) ***	0.731 (1.050)				
Urology	0.157 (0.002) ***	0.728 (1.103)				
Christian organization (non-Creation science)	0.324 (0.014) ***	-0.078 (0.653)				
Science-religion	0.660 (0.019) ***	0.655 (0.352)				
Science outliers	0.290 (0.010) ***	0.376 (3.634)				
Homophily						
Creation Science			-0.794 (0.516) ***	-2.899 (0.288) ***	1.208 (0.214) ***	2.558 (0.001) ***
Intelligent Design			4.193 (0.479) ***	4.006 (1.730) *	3.505 (0.024) ***	4.847 (0.000) ***
Mainstream Science			3.367 (0.320) ***	4.457 (1.468) **	2.438 (0.160) ***	2.610 (0.000) ***
Pseudo/Fringe-science			3.085 (0.290) ***	3.722 (0.645) ***	2.567 (0.043) ***	3.642 (0.000) ***
Ethics			2.952 (0.251) ***	4.997 (0.504) ***	1.893 (0.028) ***	3.121 (0.000) ***
Pro-science			2.807 (0.490) ***	3.230 (1.337) *	2.653 (0.090) ***	3.864 (0.000) ***
Anti-abortion			18.452 (35.411)	22.136 ###	20.672 (0.000) ***	24.130 (0.000) ***
Urology			18.452 (35.411)	22.136 #	20.672 (0.000) ***	24.130 (0.000) ***
Christian organization (non-Creation science)			3.095 (0.636) ***	3.262 (2.552)	2.996 (0.258) ***	4.316 (0.000) ***
Science-religion			3.447 (0.263) ***	3.680 (0.432) ***	1.614 (0.040) ***	3.227 (0.000) ***
Science outliers			5.580 (1.231) ***	5.582 (1.567) ***	5.267 (0.000) ***	6.613 (0.000) ***

* p < .05

** p < .01

*** p < .001

¹ Model was fit using Markov Chain Monte Carlo estimation. Coefficients and standard errors were not uniquely determined. The coefficients shown in table represent the model with the best fit out of 10 models estimated.

² Organizations with a mainstream science focus provide the reference category for the organizational focus parameters.

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