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No Free Lunch

Why William Dembski thinks mathematics proves ID (and why he's wrong)

by John Brandt

A favorite tactic of creationists arguing against evolution has long been the “judo argument.” A judo argument (a term coined by the late science-fiction author and science popularizer Isaac Asimov) is an argument that evolution violates some theorem or scientific law that’s even more firmly established than evolution itself; therefore, the argument goes, evolution is no more scientific than creationism.

The judo argument most familiar to the public, of course, is that evolution violates the second law of thermodynamics. But this is easily refuted: the second law of thermodynamics doesn’t prohibit spontaneous local decreases in entropy (as in the highly organized winds of a hurricane, or the highly organized structure of a living organism) provided they are offset by an equal or greater entropy increase elsewhere (in the case of the hurricane or green plants, absorption of short wavelengths of sunlight and the emission of longer far-infrared wavelengths). Less-sophisticated creationists still make this argument, but Intelligent Design (ID) advocates rarely do so anymore.

ID’s fundamental argument, of course, is that living things have features (such as bacterial flagella) that could not have evolved through natural selection because they are “irreducibly complex;” that is, any simpler version of the feature would supposedly perform no useful function and therefore, could not be selected for naturally. But that argument has an obvious problem: there’s no *proof* that bacterial flagella are irreducibly complex, so ID proponents are reduced to arguing that no one has thought of a plausible means for them to have evolved. Since “plausible” is in the eye of the beholder, this is essentially a “God of the gaps” argument, and biologists have been disconcertingly successful at filling in those gaps. Wouldn’t it be better if there were something like the second law of thermodynamics that *proved* life was irreducibly complex?

EVENTS CALENDAR

November Program

Saturday, 10 November 2007
2 PM

Center for Nonprofit
Management 2900 Live Oak
Street in Dallas

The Secret

Erling Beck will tell how
“The Secret” mixes self help with
mysticism.

Social Dinner/Board Meeting

Saturday, 17 November 2007
7 PM

Good Eats
6950 Greenville Avenue in
Dallas

Let us know if you are coming.
We need to reserve a table.
214-335-9248

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This is what William Dembski claims to have found, in the form of an obscure pair of theorems from computer science (a branch of mathematics dealing with what computers can and cannot do) called the No Free Lunch (NFL) theorems. This is a particularly insidious judo argument because:

- The NFL theorems are, like all mathematical theorems, provably correct: unlike even the second law of thermodynamics, there is no possibility they could be falsified.
- The NFL theorems are quite technical and therefore easy to misunderstand (or to mischaracterize).

Search problems

The NFL theorems deal with two related kinds of problems in computer science: *search* and *optimization*. *Search* refers to the problem of finding a path from a given starting point to one of a set of “goal states.” A couple of everyday examples are unscrambling a Rubik’s Cube and winning a game of chess. With the Rubik’s Cube, the starting point is a scrambled cube, and the goal state is the unscrambled cube, where each side is a single solid color. With chess, the starting point is the familiar arrangement of pieces at the beginning of the game; the goal states are board positions in which your opponent is checkmated.

To study search problems, computer scientists use a simple abstraction called a *graph*. A graph is defined mathematically as two sets: a set of *nodes* and a set of pairs of nodes called *arcs*. A graph’s nodes represent a search problem’s various states, and its arcs represent valid moves between those states. Graphs for some problems have “one-way” arcs (for example, in chess, certain moves can’t be undone; pawns can move forward but not backward, and captured pieces can’t be “uncaptured”), so in general, arcs are “ordered” pairs of nodes: each arc has a “from” node and a “to” node, and an arc in the reverse direction may or may not exist. A *path* is a sequence of nodes, each of which has an arc leading from the previous to the next.

Given that definition, solving a search problem is equivalent to finding a path from the node representing the starting point to one of the nodes representing a goal state. Obviously, for a complex problem like a game of chess or a Rubik’s Cube, the sets of nodes and arcs will be very large; but given enough time and paper, in theory they could be written out for any imaginable problem.

Computer programmers use a variety of procedures (called *algorithms*) to “teach” computers to solve problems. For search problems, the most general search algorithm is called a “blind” search. A blind search incorporates no knowledge specific to the problem to be solved; therefore, it can search any graph.

A blind search is easy to describe: the computer simply examines all nodes that can be reached from the starting node by traversing a single arc, then all nodes that can be reached from *those* nodes, etc. until a goal node is found.

A blind search works well for simple problems. Not only does it find a solution if one exists, it always finds a solution with the fewest possible moves! But for complex problems like a Rubik's Cube, it's completely impractical: there are just too many possibilities for any real computer to consider in a realistic amount of time. To solve complex problems like the Rubik's Cube, a special-purpose algorithm is used instead – one that is written specifically to solve Rubik's Cube problems and nothing else.

So an obvious question is: Does a general-purpose algorithm exist, which can efficiently solve complex problems like the Rubik's Cube? To get a handle on this question, note that for a given number of nodes, there are only a finite number of possible graphs. (To be precise, there are $2^{n(n-1)}$ possible graphs having n nodes.) Thus, it's meaningful to talk about “all possible search problems” of a given size.

The *No Free Lunch Theorem for Search* simply states that *no computer algorithm will consistently outperform the blind search algorithm, when averaged over all possible graphs containing a given number of nodes.*

At first glance, this would seem to be bad news for the field of artificial intelligence, because no matter how cleverly a computer is programmed, there are bound to be some search problems it can't solve in any practical amount of time. So are computer programs destined to be “idiot savants,” good at, say, solving Rubik's Cube, but completely stumped when confronted with Rubik's Revenge?

Maybe not. One important thing to notice about “all possible graphs” of a given size is that the vast majority consists of complete randomness; there's no rhyme, reason, or pattern to the way the various nodes are interconnected by arcs. (Finding a path through a maze is an example of such a “random” problem.) Even we intelligent humans have to resort to blind search when confronted with such problems; we shouldn't be surprised that computers do also.

So it may indeed be possible to program a computer to efficiently solve the broad array of problems we humans can figure out. The No Free Lunch Theorem for Search may be merely a theoretical result with little practical consequence.

To be fair, there are a few search problems that act like random graphs even though they're not. Indeed, the entire field of cryptography is based on the difficulty of solving such problems. But these problems seem to be very much the exception rather than the rule.

Optimization problems

Optimization refers to the problem of finding a set of values that produce a minimum or maximum (or at least, a suitably

small or large) value for a complicated mathematical function, perhaps while obeying certain constraints. A simple everyday example might be trying to order the least expensive meal at a restaurant that met some minimal nutritional requirements (say, between 500 and 800 calories, at least 10 grams of protein, etc.). You would need to consider various combinations of entrees, side dishes, and beverages, including any “combos” offered by the restaurant, to get the best deal.

A search problem can be considered a special case of an optimization problem by simply declaring a function $F(x)$ to be minimized, where x is the sequence of moves from the starting point, and $F(x)$ is 0 if that sequence leads to a goal state, and 1 if it doesn't. (In practice, a more “informative” function is usually used which decreases in value as the state reached by the sequence gets “closer” to a goal state.)

There is a No Free Lunch Theorem for optimization corresponding to the one for search, which states there is no general-purpose optimization algorithm that consistently outperforms the “blind” method of simply trying all possible combinations and selecting the best one. This is easy to prove: if there were a “free lunch” algorithm for optimization, it could be used for searches also, by using it to optimize the simple function $F(x)$ described above. But we already know there's no “free lunch” for search; therefore, there can't be one for optimization either.

This is where Dembski thinks he's disproved evolution. Dembski thinks of biological fitness as a function to be optimized, and variation plus natural selection as an optimization algorithm. “Aha,” he says, “the No Free Lunch Theorem proves evolution can't optimize fitness any better than blindly trying, say, all possible DNA sequences, and we know this is hopeless! Therefore, evolution can't possibly work; an Intelligent Designer must be involved.”

But Dembski forgets that the same considerations apply to the optimization theorem as to the search theorem. The overwhelming majority of possible optimization problems are completely random, and we wouldn't expect there to be any way to solve them other than blindly trying every combination. But just as we humans can usually solve real-world search and optimization problems despite No Free Lunch, it's perfectly plausible that evolution could solve the real-world problem of optimizing biological fitness. (Note that optimization problems, including biological survival, usually don't require the absolute best solution, but only a solution that's “good enough,” which makes optimization substantially easier than it might otherwise be.)

Indeed, computer programmers often use “evolutionary algorithms,” which mimic biological evolution, to solve optimization problems efficiently, even when a systematic method for finding a good solution is far from obvious.

Dembski is aware that evolutionary algorithms exist, and that they often work well. He charges that they work because computer programmers “smuggle” the desired solution into their programs. But this is ridiculous: why on earth would we bother with evolutionary algorithms if we knew of a more straightforward technique to get a good answer? Computer programmers don’t use evolutionary algorithms just to prove evolution works; they use evolutionary algorithms because that technique is often the *only technique known* for finding good solutions to some problems. The fact that they work even when the programmer has no idea how to find a solution directly is good evidence that Dembski is wrong. □

John Brandt is President of the North Texas Skeptics.

An encounter with medical dowsing

by Kristine Danowski

When I first moved to Arizona, I didn’t know many people there. So when my neighbor “Diane” introduced herself and invited me to a Native American lecture, I decided to go. My neighbor said I would be very impressed with it, and she wanted to leave the details a surprise. Okay, I said, what the heck.

There was only one other person there besides me, the presenter, and Diane. At first I felt bad, but then I was glad. The presenter was Diane’s husband “John,” who said he was half-Cherokee. John told us he was an ordained minister in a church he started himself, and the church combined Cherokee religion with Christianity. John described how he and his followers were persecuted in the USA and even banned from Mexico. To me it sounded bizarre. However, the more bizarre was yet to come.

John told us that he was a medical dowser. He used his holy dowsing rod to detect illnesses in humans and other animals. John warned us that the “medical establishment” and the “AMA [presumably the American Medical Association]” have attacked him personally for his medical dowsing. To make matters worse, John asserted that people have also made racist remarks to him about his medical dowsing, which he claimed was a Cherokee tradition. He told us that he pitied all his woefully misguided critics.

At this point, I tried to stop rolling my eyes. Here was yet another quack claiming a medical-establishment conspiracy to conceal the benefits of an unconventional method. It was so stereotypical that I had to try not to laugh.

John asked me and the other guest to volunteer for his dowsing. He assured us it was painless and noninvasive. Comparing it to water dowsing, he told us that he can find impurities in the blood that are characteristic of disease. Needless to say, I was reluctant to appear to support this chicanery. Had I known in advance the topic would be something as ridiculous as medical dowsing, I would not have attended. I guess Diane kept the topic a surprise for a reason.

The other attendee volunteered to be dowsed. John then took out his dowsing rod. Larger than a typical water dowsing rod, it looked like a tree branch and was forked at one end. John asked the volunteer to sit in a straight-backed chair, “center” herself, and relax. He again assured her that the process was painless, although he said she might feel a tingling sensation as he uncovered her trouble spots.

Starting at the volunteer’s head, John slowly ran the dowsing rod over one side of her body, then the other. He kept the rod about eight inches away from her body. When he reached a major organ, he paused the rod and said he felt something was awry. He asked the volunteer if she “ever had trouble” with the area in question. He seemed to be merely cold reading for common illnesses as he waved the rod over a particular spot on her body.

For example, John asked her if she ever had had headaches. Who hasn’t had a headache? Moving down to her neck, he asked about neck problems; she revealed she had had whiplash from an automobile accident several years previously. At her throat he asked her if she had had her tonsils out; she said yes. What a surprise - someone who’s had her tonsils out. When he reached her heart, he asked her about heart problems. When he reached her abdomen, he asked her about stomach problems. She admitted to a tummy ache or two. Again, who hasn’t had indigestion or a stomach ache? John asked her if she had had her appendix out; she said yes. When he moved the rod over her lower back, he asked her about backaches. Again, many people have had back pain; it’s not an uncommon problem. Never did John ask about a specific illness, such as ulcers or arthritis.

When the volunteer answered his questions affirmatively, John claimed success. When she answered negatively, as she did most of the time, he merely moved on. This is typical of cold readers. At the end of the demonstration, the volunteer said that John correctly revealed many medical problems. She seemed very impressed and enthusiastic about medical dowsing. She confirmed that she felt tingling when John hovered the

dowsing rod over her trouble spots. She did not seem to notice that she had confirmed his guesses.

Then John and Diane urged me to be dowsed. I declined, but then I thought I could at least inject some critical thinking into this ridiculous scene. So I decided to try it. Sitting in the chair, I took a few deep breaths and put on my game face. John commenced his dowsing. I must admit the whole process gave me the creeps.

Waving his big stick over my head, John asked me if I had ever had headaches. "You're the psychic. You tell me," I told him.

John was genuinely surprised. "You're not going to help me?" he laughed uncertainly.

"Nope. Why should you need any help? You're the psychic. You tell me," I repeated.

"Oh, I didn't know you were one of *those*," John said a bit crossly.

Well, I didn't know you were one of *those*, either, I thought.

John continued his medical dowsing. Honestly, I expected him to stop and claim that my negative vibes or something was interfering with him. But he persevered; maybe he thought I would relent as he continued. But I didn't. As he did with the previous volunteer, he hovered his dowsing rod over me and asked if I had any problems with the area in question. I always answered "you're the psychic. You tell me." He then moved the rod down to the next area and the next question.

When John and his dowsing rod arrived at my abdomen, something strange happened (as if this wasn't strange enough.) John asked me if I ever had had spleen problems. I repeated my usual answer, but John kept the rod hovering over my abdomen. "I feel some strong vibrations from your spleen. Are you sure you've never had any spleen problems?" I repeated my mantra. "Well, I feel you have some spleen problems," he said somewhat impatiently. When I neither confirmed nor denied his claim, he moved on. Why he picked my spleen, I don't know. Maybe he thought he could catch me off-guard. For the record, I have never had any spleen-related medical problems.

After claiming I had problems with my ankles, which again I neither confirmed nor denied, John completed his dowsing of me. He appeared baffled with the outcome, probably because I didn't help him. "I really feel you have problems with your spleen and ankles," he concluded. "Other than that, you're very, very healthy. You are very lucky to be so healthy."

"I guess so."

"Did you feel anything when I dowsed you? It was painless, wasn't it?" he persisted.

"Feel anything? You just waved a stick over me. Why should that hurt?" I asked reasonably.

Diane chimed in. "Aren't you glad John helped you? He did this for you for free. Usually you have to pay \$175."

One hundred seventy-five dollars for some guy to spend 10 minutes waving a big stick over you, I thought angrily. I knew there had to be a catch. John and Diane seemed sincere, but of course that was meaningless. Clearly they were not altruists.

I explained to them that John was merely cold reading, claiming credit for his hits, and ignoring his misses, of which there were considerably more than hits. Far from helping us, John didn't tell the first volunteer anything she didn't already know. I told them I could do the same thing. Although I remained cordial, John was insulted. He told me he had had training and "a special gift" from his Cherokee ancestors which I could never attain. He implied I was a racist, yet I never once mentioned his ethnicity, nor did doing so occur to me. There is a distinct difference between racism and legitimate criticism.

I responded that John didn't tell me or the other attendee anything specific. What exactly are "spleen problems," for example? Should I see a doctor? If John could truly diagnose illness, he would be specific. Instead John was deliberately vague, whether he realized it or not, so that the dowsees would fill in the blanks. I should add that I was not confrontational or accusatory at all; I remained conversational and mildly interested. John replied that for detailed diagnoses, we would have to return for a more thorough dowsing, which of course cost more money. What he gave us here was a quick demonstration.

I asked John if he had ever been tested scientifically. Had he ever had his "diagnoses" confirmed by medical professionals? Was his accuracy ever evaluated in a double-blind trial? John and Diane were dumbfounded. Clearly no one had ever questioned them so thoroughly, and I didn't even attempt an explanation for medical dowsing's alleged mechanism. They just looked at each other and said they were trying to help people, and if I had a problem with that, then that was too bad for me. I said that if they really wanted to be sure they were helping people, they would get tested independently. Then I let it go. Obviously I wasn't going to convince them.

We all left together, and the other attendee kept looking at me quizzically. I inferred that I had surprised her as well. She

didn't seem so enthusiastic now. Still, she said she would follow up with John another time. I never saw either of them again.

For the record, I had never heard of medical dowsing before this experience. In addition, not only did John completely miss on his guesses about me, but he also completely missed a known, genuine medical problem. But I suppose discovering the latter would require a more costly dowsing.

After the demo I saw Diane occasionally. I always greeted her cheerfully, but she never socialized with me again. After a few months, I didn't see her at all. I asked another neighbor where she was. This neighbor told me that John and Diane moved because John was being charged with practicing medicine without a license. This neighbor said that John and Diane were always trying to sell her John's homemade remedies, which she never bought. Calling John a huckster, this neighbor said that John claimed his patent medicine business was Cherokee, and the charges against him were religious persecution.

I wonder if John and Diane thought I was involved in their downfall. After all, I am one of *those*. □

Kristine Danowski is Vice President of the North Texas Skeptics.

Energy and prayer

by John Blanton

Skeptics, it's getting hectic out here.

It seems as long as we offer up a \$12,000 reward we will never be lonely. Also, as long as the supply of tomfoolery holds out. Are we worried?

Shirley has contacted us. Here is her story:

I was poisoned with nuclear chemical waste while in the Army. As a result, I developed brain damage. In 2002 I began seeing energy. As time past, I noticed patterns in the energy. With the help of some local college students, I learned how to read and understand these patterns. It seems that I am now able to see and understand a person's personality, childhood and

most recent experiences without looking at the person or talking to them. The only criteria that I know I need is a quiet comfortable room.

Shirley lives in far off Nacogdoches and wants to come to Dallas to give us a demo. Prasad Golla is currently negotiating with Shirley on a means to evaluate her claim. Before we actually test someone for the prize we ask them to give us a meaningful demonstration. By this method we have in the past eliminated a number of would be claimants when they failed to demonstrate anything close to what they claimed. In fact, we have thus far eliminated all claimants who have submitted to this test. ^{1,2}

Bob phoned from Long Island, New York. He can cure people through the power of prayer. He wants us to gather a group of sick people, and he will come on down and show us his stuff. Bob misunderstands. We will not be gathering a group of anybody. If Bob will only read the Challenge statement, it's up to him to work up the test. He's going to find out soon enough, just as soon as he decides to quit ranting on the phone and get down to business.

Bob makes another mistake common to nearly all claimants. He doesn't seem to have the ability to describe exactly what he can do. For example, a few months back Rosemary Hunter claimed God talked to her and allowed her to read peoples minds. I had to remind Rosemary to claim only what she could prove. If she were able to read my mind she would still have to prove God talked to her. Rosemary's tale is recounted in the August issue of this newsletter. ³

In the mean time, events are developing. Within a few weeks we will be able to report on progress with Shirley and Bob. Stand by. □

John Blanton is the Webmaster of the North Texas Skeptics

References

- 1 See the Challenge page for details:
<http://www.ntskeptics.org/challenge/challenge.htm>
- 2 See the story of Russell Shipp for another account of a failed claimant:
<http://www.ntskeptics.org/2003/2003may/may2003.htm#mind>
- 3 <http://www.ntskeptics.org/2007/2007august/august2007.htm#challenge>

Skeptic Ink

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What's new

by Robert Park

[Robert Park publishes the What's New column at <http://www.bobpark.org/>. Following are some clippings of interest.]

SPUTNIK AT 50: ITS INFERNAL BEEPING DROVE US NUTS.

A month later, Sputnik II was taking radiation measurements. Our embarrassment was compounded by the Vanguard debacle 2 months later. But just 4 months after Sputnik I, Explorer I detected the Van Allen radiation belts - the first major discovery of what lay beyond the ionosphere. The U.S. had taken the lead in the scientific exploration of space, and has never relinquished it. Forget the dogs and chimpanzees and astronauts - the herd shot round the world - they have made no contribution at all to life here on Earth. It is our space machines that expand our knowledge of the universe and enrich our lives. We urgently need more space machines to tell us what's happening to Earth

POLITICAL SCIENCE: SCIENCE HELD HOSTAGE TO POLITICS.

How did Sputnik II miss the Van Allen belts, you might wonder? The data recorder on board wasn't working. Scientists wanted to delay launch to make repairs. Khrushchev refused - he was headed to an important international conference and wanted to announce another success. Thus, at the dawn of the Space Age, science was already held hostage to politics.

Yesterday at the Carnegie Institution in Washington, Hillary Clinton spoke on "Reclaiming our Commitment to Science and Innovation." Her strongest words came after the speech in an interview with the NY Times. She called for protection of research from "political pressure," including restoration of cuts in space-based climate research.

MALICIOUS: AUTHOR OF FRAUDULENT PAPER SUES CRITIC.

We've been reporting on the Columbia prayer study for six years (WN 23 Feb 07). It claimed that the prayers of total strangers halfway around the world doubled the success of in Vitro fertilization. As problems showed up, one author, the Ob/Gyn Dept Chair at Columbia Univ. said he had nothing to do with the work, a breach of scientific ethics. Another, a business-man/fertility-doctor who operates fertility clinics in Korea and California, was charged with plagiarism in Korea in a separate case. A third author, a parapsychologist and lawyer, went to federal prison for an unrelated swindling conviction. Meanwhile, Bruce Flamm, clinical professor of Ob/Gyn at U.C. Irvine, who uncovered much of this, thought the J. of Reproductive Medicine should pull the paper, and Columbia should disavow it - neither happened. So Flamm kept up the pressure. The result? Kwang Y. Cha, the fertility-clinic operator, is suing Flamm for defamation. The infamous paper, meanwhile, can still be found at the Journal site <http://www.reproductivemedicine.com/Features/2001/2001Sep.htm>.

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