Lesson 5: God Is—Evidence for Design

I. The Intelligent Design argument
   A) Is Intelligent Design science? Of course, there have been several recent court cases involvingID, with all of them resulting in keeping ID out of the classroom. I can see both sides of the argument, as we've talked about in previous classes. There does indeed come a point in the ID argument that insists that there must be a Creator—which, by definition, is theolgy, not science.
      1. However, this is not to say that ID is unscientific, because it does raise definitive scientific spectres that will ultimately defeat Darwin.
      2. Also, just because the courts say that it shouldn't be taught in classrooms does not keep us from teaching it to our own children ourselves, whether at home, in bible classes and in sermons. I hope that this lesson will give you the tools you need to be able to teach it to your children or to other adults who may not be aware of what it is.
   B) Intelligent Design says that life is so complex and so intricate that it must have been created by a Designer.
   C) The arguments for Intelligent Design are not new, but the evidence—the proof—is. Michael Behe, a Biochemist at Lehigh University wrote about “irreducible complexity” and offered several examples of it.
   D) Dr. Behe explains it thus:
      1. “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 a part is by definition nonfunctional. An irreducibly complex biological system, if there is such a thing, would be a powerful challenge to Darwinian evolution. Since natural selection can only choose systems that are already working, then if a biological system cannot be produced gradually it would have to arise as an integrated unit, in one fell swoop, for natural selection to have any thing to act on.”
   E) Others have also recognized it
      1. "Genes and enzymes(proteins) are linked together in a living cell - two interlocked systems, each supporting the other. It is difficult to see how either could manage alone. Yet if we are to avoid invoking either a Creator or a very large improbability, we must accept that one occurred before the other in the origin of life. But which one was it? We are left with the ancient riddle: Which came first, the chicken or the egg?" **Robert Shapiro, Origins, 1986, p135**
      2. "DNA cannot do its work, including forming more DNA, without the help of catalytic proteins, or enzymes. In short, proteins cannot form without DNA, but neither can DNA form without proteins." **Horgan, John, "In the Beginning," Scientific American, vol. 264 (February 1991), pp. 117-125.**
   F) Darwin himself recognized it, even if he didn't name it:
      1. "...if it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down."

II. A mouse trap as an irreducibly complex entity—it has five parts, all of which are required to function properly. It has (1)a wooden platform that acts as a base; (2)a metal, u-shaped hammer

that actually traps the mouse; (3)a spring that provides the power to the hammer as it unloads; (4)a sensitive catch that triggers the hammer when pressure is applied; and (5)a holding bar that holds the hammer back until the catxch is released. Now, the question of whether something is irreducably complex is simple: can any part of the mouse trap be missing and the mousetrap still work? Clearly, the answer is no.

A) Now, a second concept to understand is the concept of physical precursor. For example, I could use a BB gun to kill a mouse, or I could trap one alive in a cage and then release it into the wild. Both of those methods would do the job of getting that mouse, one way or the other, out of my house. They are conceptual precursors of the mouse trap, but the key distinction to make is that neither of them are physical precursors to the simple mouse trap like we described. In order for them to be physical precursors, in the biological sense, would mean that nature could transform a BB gun, step by Darwinian-step into a mouse trap, which, of course, cannot be done.

B) A third concept that distinguishes irreducibly complex things is the idea of minimal function. Returning to the mousetrap example, how well would the moustrap work if the usually wooden base were made from a few sheets of paper? What would happen if the catch didn't release unless it took the weight of a really fat cat to trigger it? What if the usually metal hammer was made of sewing thread? Obviously, in all these cases, the mousetrap would not function—that is, you wouls still have something that resembled a mouse trap, but it wouldn't actually kill a mouse. It simply would not have the necessary functionality. Minimal function simply means that whatever system is under consideration must accomplish its intended task under physically realistic circumstances.

III. Our challenge? A single, simple(!) example. The answer: cellular cilium

A) Some cells swim using a cilium, which is a simple structure that resembles a hair and beats like a whip. Do you remember the beginning of the movie Look Who's Talking? Those digital sperm were using cilia to move—real life ones, do, too. If a cell is in a liquid, it uses its ciia to move itself around in the liquid like a boat. If a bunch of cells with cilia are lined up against each other, the beating cilia move liquid over the sheet of cells—that's exactly how the cells that line our respiratory tract work. The coordinated beating action of hundreds of cilia removes foreign particles—dust, pollen, whatever—that were accidentally inhaled.

B) The electron microscope was a necessary invention for biologists to understand the parts that make up a cilia. I won't attempt to explain all of it in detail, I'll just try to cut to the bare minimum. You can see in the figure two pictures. The one on top is a cross section of a cilium—think of that as looking at the end of a hair that has been cut. The two circles in the middle is what we want to concentrate on the most. Those two protofilaments are shown from the side in the bottom half of the figure. We'll return to the figure in a moment.

1. A basic strategy of biochemistry is to take apart molecular systems and try to put them back together. During the process of reassembly, you stop at several intermediate points to find out which components are critical for proper function and, more basically, to find out whether functionality has been restored.
2. This procedure has been carried out with cilia and some interesting things have been found. It turns out that cilia can be separated from cells by vigorous shaking. After shaking, thousands of cilia-equipped cells, you can spin the concoction rpidly to cause the heavier cellular particles to separate from the lighter, now-separated cilia, so that you wind up with a test tube full of isolated cilia.
3. Now, you can strip the membrane off the cilia and supply the remaining portion of the cilia with a chemical form of energy called ATP. In doing so, a bochemist can cause the the cilia to beat in the whiplike fashion they do when fully sheathed in their membrance

and attached to a cell. The implication is that the motor to power the cilia lies within the cilia itself. We applied the ATP to provide a "cehmical" eletric current to some, for now, unknown motor within the cilia and not within the separated cell (or the membrane that we stripped off, for that matter).

4. The next clue for how cilia works comes from when we chemically remove the Dynein arms. If the rest of the cilia is left intact, removal of the Dynein arms paralyzes the cilia. Then, adding fresh Dynein to the stiff cilia restores motive ability to them
5. One final clue comes from removing the Nexin linkers. You can use a special enzyme to cut the linkers from the body of the cilia and then apply the ATP to see what happens. When we removed the Dynein, the cilia were paralyzed. In this instance, when the Nexin linkers are removed, the individual microtubules slide past one another much like you can extend a radio or TV antenna. In fact, the microtubules continue to slide until they are about ten times their original length.
6. So, these clues have led to a model for how a cilia works—refer to the bottom of the figure now. Imagine several cans of tuna stacked one on top of the other, with a little arm connecting two adjacent stacks. That little motor arm can push down on the opposing stack. In this case, when the motor arm pushes down, the other previously slack connections at the top and bottom of the stacks go taught. As they tighten, the stack of tuna cans must bend. Then, the little motor arm stops pushing on the opposing stack and, because the connectors, or linkers, are flexible, both stacks rebound to their orignial position, where the process starts all over.
7. Okay, so now that we have a model for how a cilium works, you have to ask yourself "which parts are needed for the cilium to work?" The mictrotubules are necessary,a s they make up the sliding strands. The motor—the Dynein arm—is necessary, otherwise the cilia are stiff and remain motionless. It also requires the linkers to tug on neighboring strands to convert linear motion into bending motion. In short, all of the parts are requied for proper cilium function.
8. Thus, as we did with the moustrap, you conclude that the cilium is irreducibly complex. So, the next question is, how did the cilium arise? Is there a physical precursor tot he cilium that could have been transformed through Darwinian evolution? Ths short answer is, no. There are no known physical precursors to the cilium and, though evolutionary biologists have tried to explain possibilities for their arrival, none are satistfactory. This is true because even if, for example, you had some chemical stew in which you had a bunch of microtubules, lots of Dynein and some Nexin thrown in for good measure, it is essentially impossible to derive a sequence in which both swimming might actually occur and where the intermediate steps were an improvement for the cell such that natural selection would favor the change.
9. Afte completing a thorough literature search for journal articles describing the evoution of cilia, Behe had this to say: "The amount of scientific research that has been and is being done on the cilium—and the great increase over the past few decades in our understanding of how the cilium works—lead many prople to assume that even if they themselves don't know how the cilia evolved, *somebody* must know. But a search of the professional literature proves them wrong. Nobody knows."
10. In fact, even our simple model doesn't tell the whole story. Analysis shows there are more than two hundred different kinds of proteins in a cilium, so its actual complexity is far greater than we have considered.

C) There are many other examples from microbiology, according to Behe.
   1. The bacterial flagellum
   2. The clotting of blood

3. Lyosomes, the garbage collecting mechanism within animal cells
4. Several, if not most, portions of our immune systems (factory B cells, for example)
5. Vision/eyesight

D) The evidence is simply overwhelming in support of Intelligent Design