



Behe's Black Box

- ◆ **Creation versus evolution**
- ◆ **Advent of “intelligent design”**
- ◆ **Michael Behe's irreducible complexity**
- ◆ **Darwin's Black Box**
- ◆ **Behe in the light of modern science**



The Trick of Intelligent Design

- ◆ **Problem: The Genesis account is too obvious a miracle and too easy to refute.**
- ◆ **ID creationists accept modern cosmology and evolution of species. They don't accept 100% natural causes.**
- ◆ **The miracles claimed by IDCs are, to them, tiny and easy to accept. They are usually hidden at microscopic level.**
- ◆ **These “tiny” miracles are no less miraculous than Genesis.**
- ◆ **Some matter is moved that would not have moved by natural means. A magic finger has been introduced to nudge the experiment.**
- ◆ **Deus ex machina**



Irreducible Complexity

- ◆ **Many biochemical processes exhibit complex interdependencies.**
- ◆ **Removing (or altering) any one of the dependencies makes the process unworkable.**
- ◆ **Mutation working with natural selection can only implement one component within a single generation.**
- ◆ **Previous generations must have existed without this component—with an incomplete, useless process.**
- ◆ **The other components should have been deselected by natural selection—the entire process could not have been produced through mutation/natural selection.**



Evolution to either intermediate state is OK.



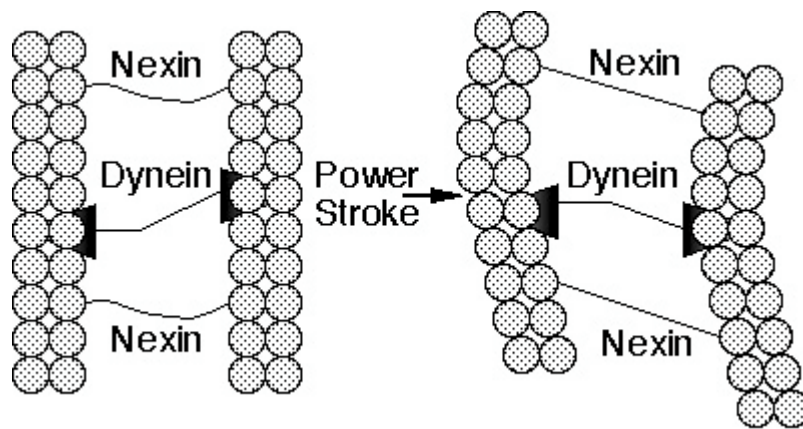


Behe's Examples

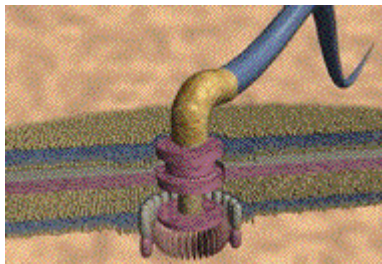
- ◆ **Cilia and flagella**
- ◆ **Blood clotting chemistry**
- ◆ **The immune system**
 - Irreducible complexity of the immune system
 - Behe's comments on immune evolution research
 - Scientists' comments on Behe's claims
- ◆ **Bombardier beetle**
- ◆ **Mousetrap example**



Behe's Examples



http://www.arn.org/docs/behe/mb_mm92496.htm



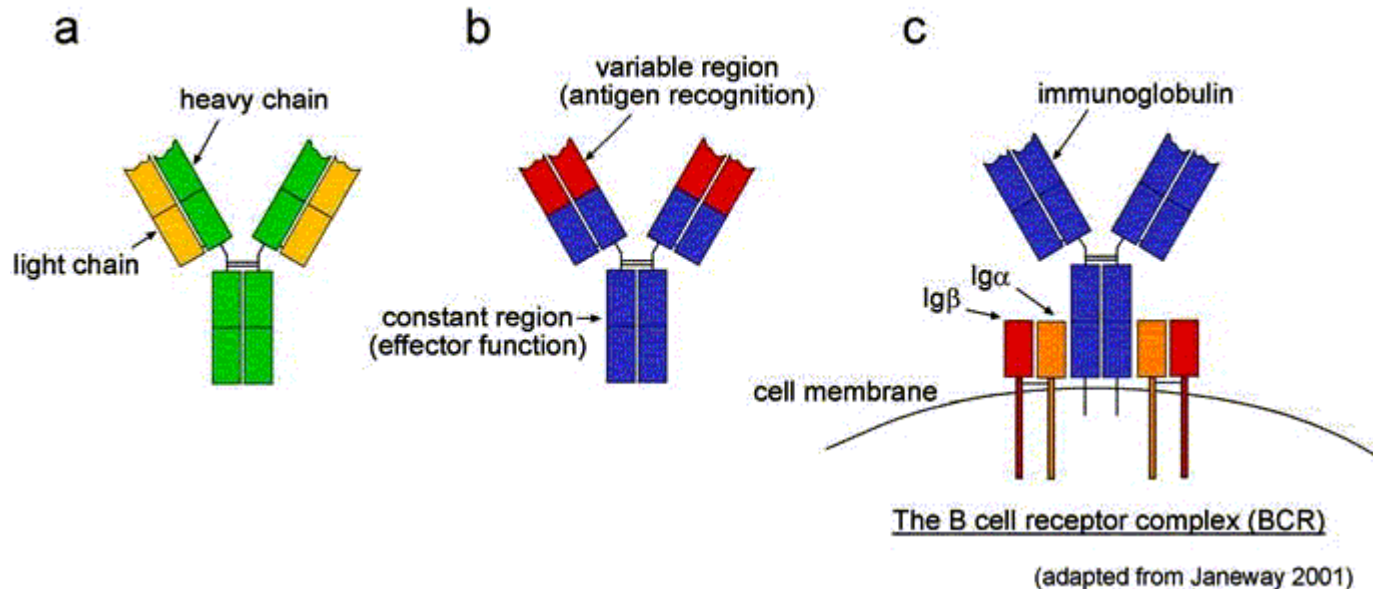
<http://www.arn.org/mm/mm.htm>

- ◆ Schematic drawing of part of a cilium. The power stroke of the motor protein, dynein, attached to one microtubule, against subfiber B of a neighboring microtubule causes the fibers to slide past each other. The flexible linker protein, nexin, converts the sliding motion to a bending motion.
- ◆ The bacterial flagellum is an example of what Michael Behe describes as an irreducibly complex system. In his book, *Darwin's Black Box*, he explains that such irreducibly complex systems could not have arisen by a gradual step-by-step Darwinian process.



Clonal Selection Operation

Figure 1: Immunoglobulins (Ig)

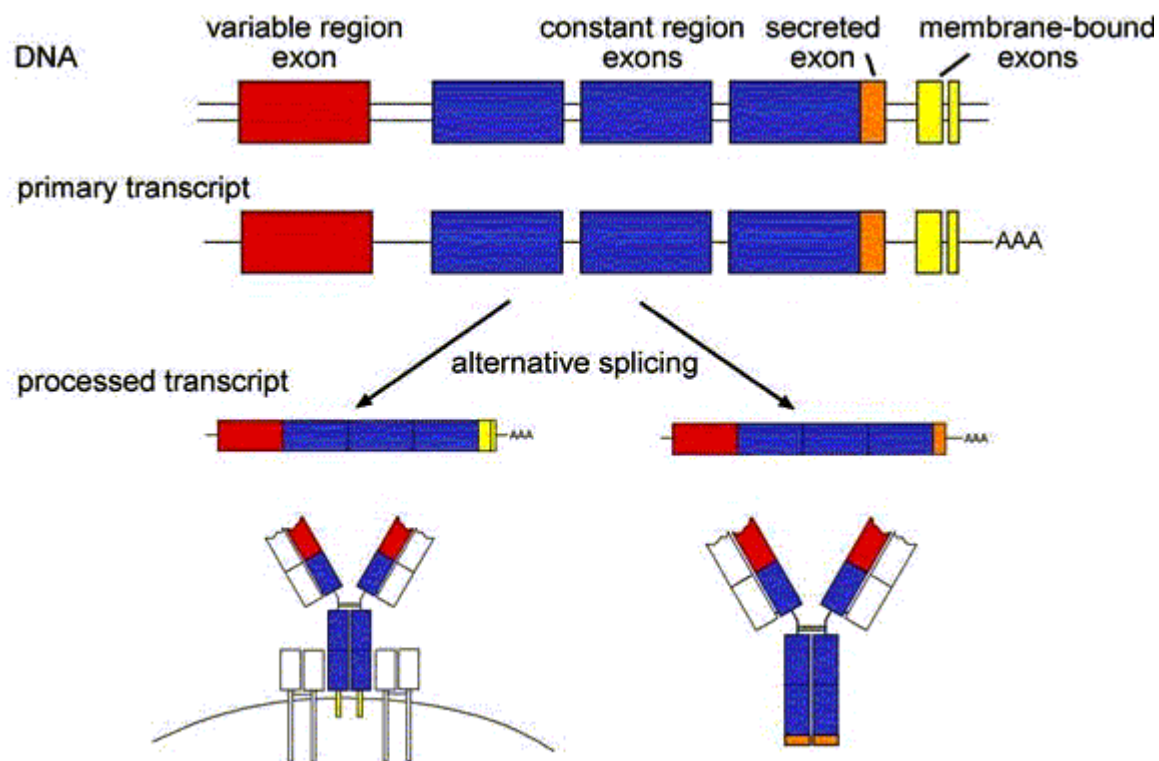


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Clonal Selection Operation

Figure 2: The two forms of Ig



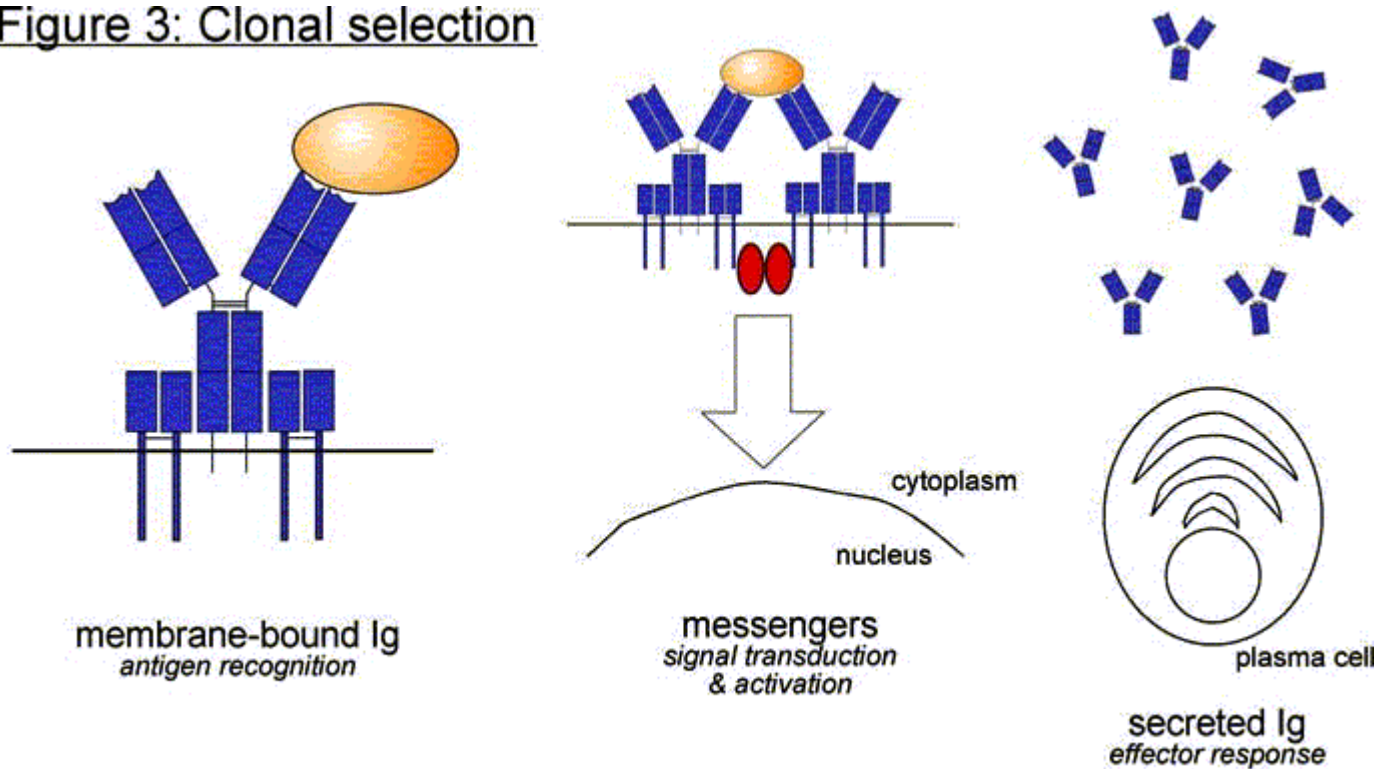
(adapted from Janeway 2001)

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Clonal Selection Operation

Figure 3: Clonal selection



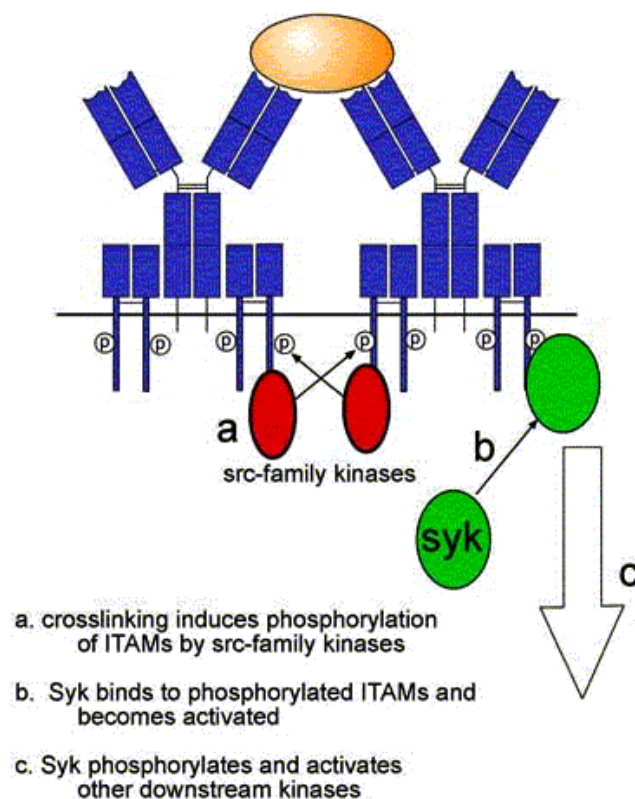
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Clonal Selection Operation

Figure 4: Crosslinking



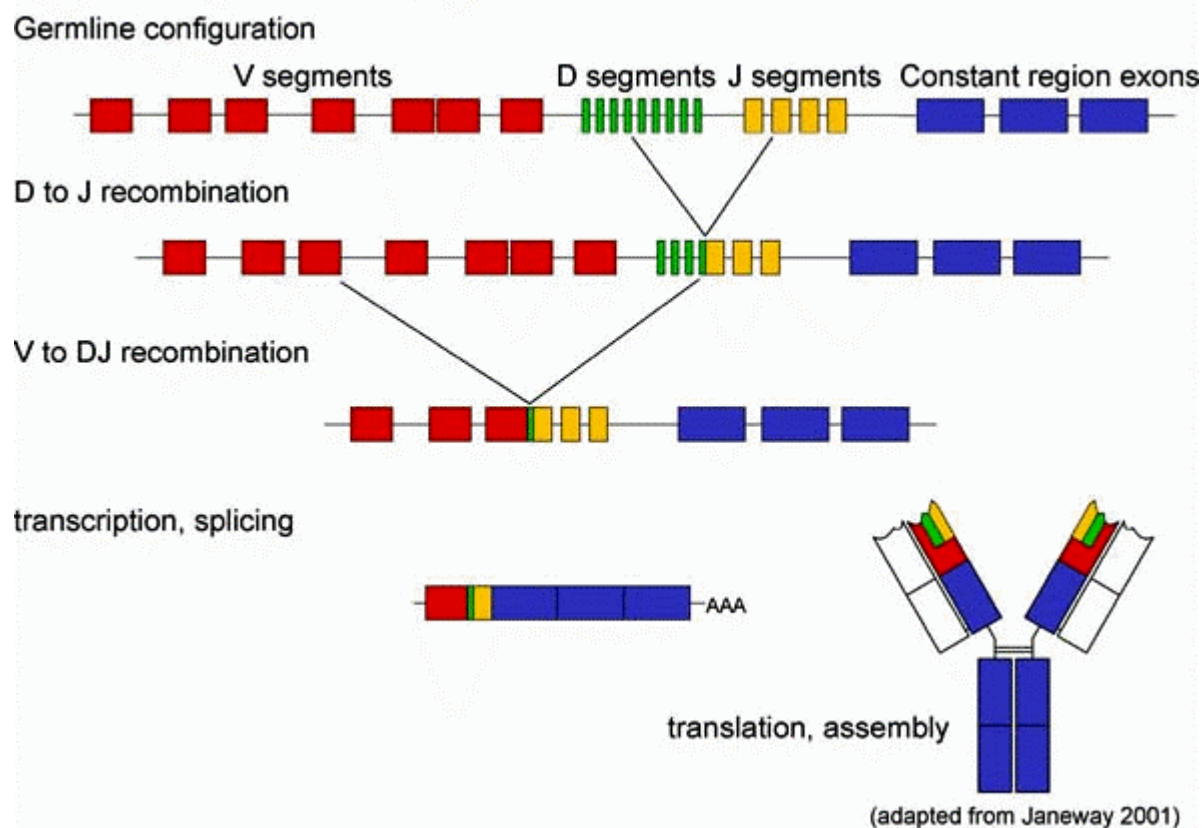
(adapted from Janeway 2001)

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V(D)J Recombination

Figure 5: V(D)J Recombination

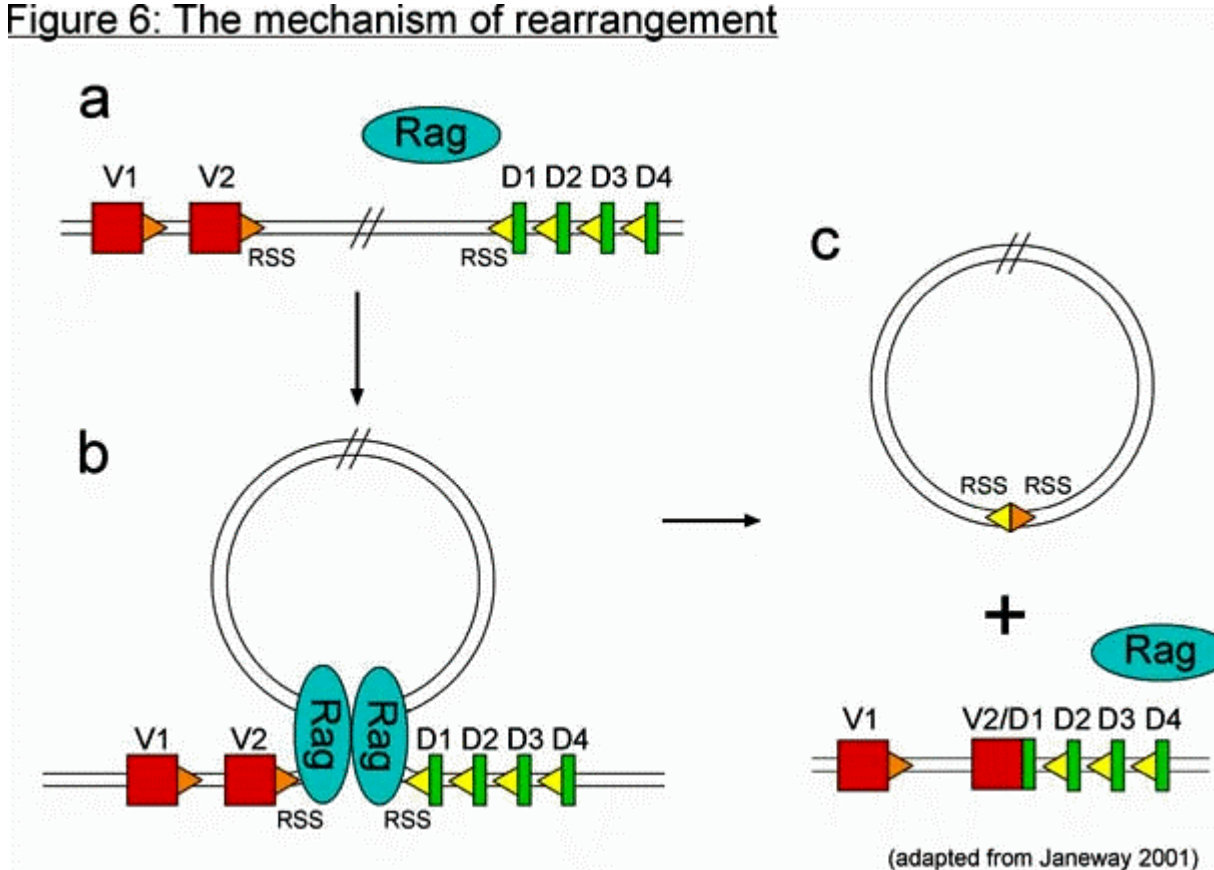


http://www.talkdesign.org/faqs/evimmune/ei_figure005.jpg



V(D)J Recombination

Figure 6: The mechanism of rearrangement



http://www.talkdesign.org/faqs/evimmune/ei_figure006.jpg



Behe's Position on Clonal Selection Systems

- ◆ **"A cell hopefully trying to evolve such a system in gradual Darwinian steps would be in a quandary. What should it do first? Secreting a little bit of antibody into the great outdoors is a waste of resources if there's no way to tell if it's doing any good. Ditto for making a membrane-bound antibody. And why make a messenger protein first if there is nobody to give it a message, and nobody to receive the message if it did get one? We are led inexorably to the conclusion that even this greatly simplified clonal selection could not have come about in gradual steps." (Page 125)**



Behe's Stand

- ◆ **"Yet for the Darwinian theory of evolution to be true, it [modern biochemistry] has to account for the molecular structure of life. It is the purpose of this book to show that it does not." (page 25)**
- ◆ **"Biochemistry has pushed Darwin's theory to the limit. It has done so by opening the ultimate black box, the cell, thereby making possible our understanding of how life works."**
- ◆ **"The result of these cumulative efforts to investigate the cell - to investigate life at the molecular level - is a loud, clear, piercing cry of "design!" The result is so unambiguous and so significant that it must be ranked as one of the greatest achievements of the history of science..."**

<http://www.cbs.dtu.dk/staff/dave/Behe.html>



Behe's Stand

- ◆ But no bottles have been uncorked, no hands slapped. Instead, a curious, embarrassed silence surrounds the stark complexity of the cell. When the subject comes up in public, feet start to shuffle, and breathing gets a bit labored. In private people are a bit more relaxed, many explicitly admit the obvious but then stare at the ground, shake their heads, and let it go at that.
- ◆ Why does the scientific community not greedily embrace its startling discovery? Why is the observation of design handled with intellectual gloves? The dilemma is that while one side of the elephant is labeled intelligent design, the other side might be labeled God." (pages 232-233).

<http://www.cbs.dtu.dk/staff/dave/Behe.html>



David W. Ussery on Behe

- ◆ **"...only two articles even attempt to suggest a model for the evolution of the cilium that takes into account real mechanical considerations" (page 68).**
 - A quick PubMed search (<http://www.ncbi.nlm.nih.gov/PubMed/>, (all the PubMed searches were done in July, 1998 - here I just typed in "cilia" and "evolution"), revealed 107 articles, many of which discuss exactly the types of mechanisms Behe claims are missing from the literature

<http://www.cbs.dtu.dk/staff/dave/Behe.html>



David W. Ussery on Behe

- ◆ **"Even though we are told that all biology must be seen through the lens of evolution, no scientist has ever published a model to account for the gradual evolution of this extraordinary molecular machine." (page 72, emphasis his).**
 - I found 125 articles, several of which DO discuss and give models for gradual evolution of flagella, with titles such as "*The flagella apparatus of spermatozoa in fish. Ultrastructure and evolution.*" So my point in all of this is that Behe hasn't done his homework.

<http://www.cbs.dtu.dk/staff/dave/Behe.html>



David W. Ussery on Behe

- ◆ **"The fact is, no one on the earth has the vaguest idea how the coagulation cascade came to be." (page 97).**
 - A quick PubMed search (once again I encourage the skeptical reader to look for herself) revealed 27 articles that concern the evolution of the whole system. However, in addition, I just looked for articles about the evolution of "thrombin", in the past two years - and found several interesting references - especially in light of how this would fit in with the evolution of the more complicated signal cascade that Behe refers to in this section. Work is being done and published in this area - no, we don't have all the answers - but I think it's a bit presumptuous to claim that "no one" knows how this could possibly have evolved.

<http://www.cbs.dtu.dk/staff/dave/Behe.html>



David W. Ussery on Behe

- ◆ **"A search to see what titles have both evolution and vesicle in them comes up completely empty." (page 114).**
 - Using the PubMed site, once again, I have found articles that Behe claims aren't there. I found 4 articles published before 1996 (example: Cowan D, Linial M, Scheller RH, "Torpedo synaptophysin: evolution of a synaptic vesicle protein," *Brain Res.* 1990 Feb 12; 509(1): 1-7) ; if I look in the abstracts as well, I pick up another 126 articles.

<http://www.cbs.dtu.dk/staff/dave/Behe.html>



David W. Ussery on Behe

- ◆ **"Molecular evolution is not based on scientific authority. There is no publication in the scientific literature - in prestigious journals, specialty journals, or books - that describes how molecular evolution of any real, complex, biochemical system either did occur or even might have occurred." (page 185)**
 - In the five specific examples of "irreducible complexity", I entered the search terms suggested, and came up with several hundred articles about the evolution of these systems, in a matter of a few minutes. ... As far as books go, I have a book called "Molecular Evolution", by Wen-Hsiung Li (Sinauer Associates, Inc., Publishers, Sunderland Massachusetts, U.S.A., 1997, 487 pages).

<http://www.cbs.dtu.dk/staff/dave/Behe.html>



David W. Ussery on Behe

- ◆ **"Cech* won the Nobel prize for his work. The awarding citation alludes to the impact of Cech's work on origin-of-life studies. Cech himself, however, rarely mentions the origin of life in connection with his work." (page 283)**

- The talk I heard on Tuesday morning, given in a large auditorium, with perhaps a thousand people attending, was all about Cech's work on the molecular origins of life. The experiments on molecular evolution of RNA started in the early 1980's and are continuing today. I found 17 of his papers where he discusses molecular evolution, the most recent was a few weeks ago, and the others are spread out, dating back to 1982. Again, I used the PubMed link - just type in "Cech TR and Evolution".

*Thomas R. Cech Winner of the 1989 Nobel Prize in Chemistry

<http://www.cbs.dtu.dk/staff/dave/Behe.html>



David W. Ussery on Behe

- ◆ **"If there is a detailed Darwinian explanation for the production of AMP out there, no one knows what it is..." (page 161).**
 - I strongly encourage the reader to take the time to have a look at this article, as well as the "news and views" article which describes the significance of this finding (pages 223-225 of the same issue (17-Sept-98) of Nature). Using a similar method of selection, other enzymatic activities for RNA have been found, such as an ester transferase (a postulated precursor to ribosomal RNA; Chem. Biol., 5:23-34, 1998).

<http://www.cbs.dtu.dk/staff/dave/Behe.html>



David W. Ussery on Behe

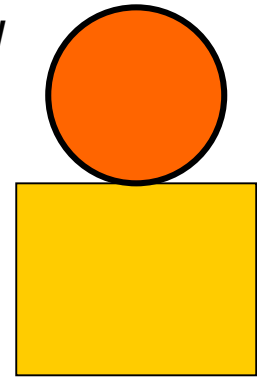
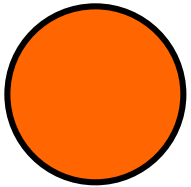
- ◆ **"We can look high or we can look low, in books or in journals, but the result is the same. The scientific literature has no answers to the question of the origin of the immune system. " (page 138).**
 - Now a clear, simple, molecular mechanism has been proposed: the immune system we know today could have arisen due to a single insertion of a transposable element. (A transposable element is a piece of DNA which codes for a protein which will then bind to the DNA loop the DNA around and splice out the DNA, and then the DNA mini-circle can be spliced into another location of the genome...). (Nature, 394:718-719; 744-751, 1998).

<http://www.cbs.dtu.dk/staff/dave/Behe.html>



The Real Black Box

Nature limits what can happen. Changes in systems must follow natural laws. This is a limitation of evolution through natural selection.

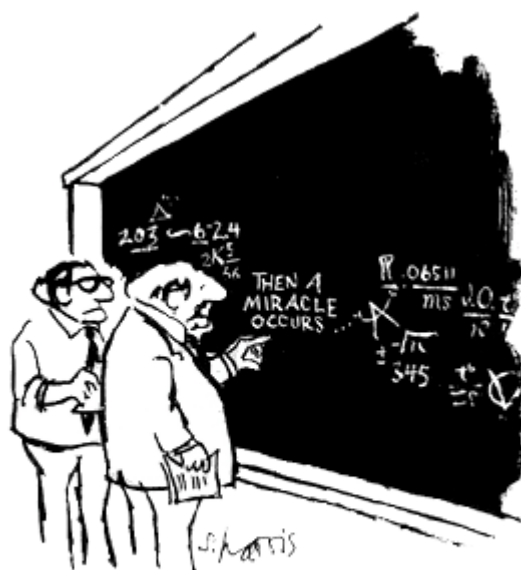


- Intelligent design allows the laws of nature to be broken. Magical things can happen.
- This is magic.
- This is Behe's Black Box





Deus ex Machina



"I think you should be more explicit here in step two."

- ◆ Intelligent design is really a “god in the machine” solution to scientific puzzles.
- ◆ Creationists encounter a problem that cannot be readily resolved and resort to miracles for an explanation.
- ◆ This is sometimes called “God of the gaps.” When there is a gap in our knowledge, God is offered as the solution.



Public's Perception

- ◆ Perhaps a reading of Darwin's Black Box by Michael J. Behe, molecular biologist and not a Christian, would shed some light. Dr. Behe states in his book that what he calls “irreducibly complex systems” (the eye, cilia, bacterial flagellum, bombardier beetles, blood clotting and others) cannot have arisen through Darwinian natural selection, because they cannot function properly without all their component parts intact, and that without all their parts working they don't do anything useful. Dr. Behe concludes that life as we know it must have had some intelligent design behind it.
 - Terry Leatherwood of Irving, Texas, *The Dallas Morning News*, August 17, 1999



Behe Responds

- ◆ **Well, perhaps I am a real biochemist, but am simply "ignorant" of work on the evolution of irreducibly complex biochemical systems? Perhaps. But I am not unaware that evolution is a controversial subject, and certainly tried to cover all bases when researching and writing my book. I have no death wish. I do, after all, have to live with my departmental colleagues, a number of whom are Darwinists. So I searched the literature as thoroughly as I could for relevant information and tried to be as rigorous as possible. Perhaps there are step-by-step, Darwinian explanations in the literature for the complex systems I describe in my book, but if there are I haven't seen them, nor has anyone brought them to my attention. (1997)**

http://www.arn.org/docs/behe/mb_toresp.htm



Getting off the Train (Before it Stops)

