ÚNLOCKING THE MYSTERY OF LIFE

Complete Script Draft—*67 Minute Version (full length)*

6/1/05

1. Sandpipers run on seashore.

2. Pajaro seascapes continue with inserts of scientists.

Narration

IN 1993, PROFESSOR PHILLIP JOHNSON, OF THE UNIVERSITY OF CALIFORNIA AT BERKELEY, INVITED A GROUP OF SCIENTISTS AND PHILOSOPHERS TO A SMALL BEACH TOWN ON THE CENTRAL COAST OF CALIFORNIA.

THEY CAME FROM MAJOR ACADEMIC CENTERS, INCLUDING CAMBRIDGE, MUNICH, AND THE UNIVERSITY OF CHICAGO TO QUESTION AN IDEA THAT HAD DOMINATED SCIENCE FOR 150 YEARS.

3. Pajaro scientists/ voice-overs.

Paul Nelson (voice over)

"I think Pajaro Dunes represented a turning point for many of us. Individually, we all had questions about evolutionary theory. But when we came together, each person brought something of their own to the table…and suddenly, we all had a glimpse of a new way of looking at life that none of us had individually seen before."

4. Dean Kenyon

Dean Kenyon (voice over)

"I would have to say that this was an intense period of time in my life. It just seemed that there was something here much more intellectually satisfying than the view that I had held up until this time."

5. Michael Behe

Mile Behe (voice over)

"Looking back on it now, I think that gave me the motivation to actually look at the evidence and just see where I thought it pointed."

6. Steve Meyer

Steve Meyer (voice over)

"I realized this was bigger than any one person or discipline. And this was the beginning of a community of scientists who were now ready to face the fundamental mystery of life's origin."

7. "Life" montage. Boxed images of eyes, fins, feet, plants, appear on the screen. This montage of different species builds at a frantic pace. It culminated with the single word:

LIFE

8. Voice over. As line is spoken, the rest of our title appears around the word, "LIFE."

UNLOCKING THE MYSTERY OF LIFE

9.Phil Johnson

Phil Johnson

"I sometimes wonder why anybody talks about anything else. Because this is the most interesting topic there is. Where did we come from? How did we get here? What brought us into existence? What is our relationship to reality as a whole?

10.Montage of living organisms continues. Paul Nelson.

Paul Nelson

"You look at the incredible diversity and complexity of life, and inevitably the question arises—what brought all of this into existence? Was it simply chance and necessity, undirected natural forces? Or, is there something else going on? Is there a purpose, a plan…a design, a design due to an intelligent cause? I think that is the fundamental question."

11. Beach/ scientists

Narration

THE SCIENTISTS WHO CAME TO PAJARO DUNES SET OUT TO REEXAMINE THE MYSTERY OF LIFE'S ORIGIN, FOR EACH HAD SIGNIFICANT DOUBTS ABOUT WIDELY HELD EVOLUTIONARY IDEAS.

12.Michael Behe

AMONG THEM, BIOCHEMIST, MICHAEL BEHE, QUESTIONED HOW NATURAL PROCESS COULD HAVE ASSEMBLED THE INTRICATE STRUCTURES FOUND WITHIN LIVING CELLS.

13. Dean Kenyon

Narration

DEAN KENYON WAS AN EVOLUTIONARY BIOLOGIST WHO NO LONGER THOUGHT THAT CHEMISTRY, ALONE, COULD ACCOUNT FOR THE ORIGIN OF LIFE ON EARTH.

14. Meyer, Dembski, Nelson

Narration

AND, STEPHEN MEYER, PAUL NELSON AND WILLIAM DEMBSKI WERE SEEKING A NEW APPROACH. ONE THAT COULD EXPLAIN THE ORIGIN OF THE GENETIC INFORMATION ENCODED IN LIVING ORGANISMS.

15. Scientists/ beach/ Darwin

THESE SCIENTISTS AND PHILOSOPHERS BEGAN TO FORMULATE AN ALTERNATIVE TO THE CENTRAL THEORY OF MODERN BIOLOGY. A THEORY BORN IN THE MIND OF A BRITISH NATURALIST. HIS NAME WAS CHARLES DARWIN.

Stock footage—Beagle sets sail (animated map)

Narration

IN 1831, DARWIN (THEN, 22 YEARS OLD) SET SAIL ON A FIVE YEAR SURVEY EXPEDITION FOR THE BRITISH EMPIRE.

17. Map of route to Galapagos Islands

Narration

HE JOURNEYED FROM ENGLAND ON THE HMS BEAGLE… TRAVELING AROUND THE SOUTHERN TIP OF SOUTH AMERICA…THEN NORTH TOWARD A CHAIN OF VOLCANIC ISLANDS IN THE PACIFIC CALLED, THE GALAPAGOS.

18. Galapagos animals and plants

Narration

ON THIS DESOLATE ARCHIPELIGO, 600 MILES OFF THE WESTERN COAST OF EQUADOR, CHARLES DARWIN ENCOUNTERED AN EXTRAORDINARY ARRAY OF BIRDS, REPTILES AND MAMMALS, THE LIKES OF WHICH HE HAD NEVER SEEN BEFORE.

19. Galapagos wildlife

Narration

FOR MORE THAN A MONTH, DARWIN STUDIED PLANT AND ANIMAL LIFE, TOOK EXTENSIVE NOTES AND COLLECTED SPECIMENS. THEN HE LEFT, NEVER TO RETURN.

20. Darwin/ book/ wildlife

Narration

25 YEARS PASSED AS HE DEVELOPED A THEORY ABOUT HOW THE DIVERSE FORMS OF LIFE ON EARTH HAD ORIGINATED.

21."Origins" title page

Narration

IN 1859, DARWIN PUBLISHED A BOOK TITLED, "ON THE ORIGIN OF SPECIES." IT'S IMPACT ON SCIENCE--AND ULTIMATELY, ALL OF WESTERN CULTURE--WAS DRAMATIC.

DARWIN ARGUED THAT ALL LIFE WAS THE PRODUCT OF PURELY UNDIRECTED NATURAL FORCES—TIME, CHANCE, AND A PROCESS HE CALLED, "NATURAL SELECTION.

22. Interview—Paul Nelson

Paul Nelson

"For 2500 years before Darwin, most prominent scientists and philosophers—people such as Plato, or Newton, or Kepler—viewed the world as the product of some kind of design or plan.

But, a fundamental shift occurs with Darwin's idea of natural selection, and a real change in scientific philosophy is set into motion."

23. Galapagos Islands—Establishing shots of island/finches.

Narration

DARWIN WAS NOT THE FIRST SCIENTIST TO PROPOSE A THEORY OF EVOLUTION… BUT HE WAS THE FIRST TO OFFER A PLAUSIBLE NATURALISTIC MECHANISM THAT COULD PRODUCE BIOLOGICAL CHANGE OVER LONG PERIODS OF TIME.

TO UNDERSTAND HOW NATURAL SELECTION WORKS CONSIDER THE FINCH POPULATIONS DARWIN ENCOUNTERED ON THE GALAPAGOS ISLANDS,

24. Paul Nelson

Paul Nelson (VO)

"Thirteen species of finches inhabit the Galapagos Islands, and they vary subtly in their body size and shape of their beak. Darwin returned to England with nine different species of these birds.

25. Multi-panel CU's birds beaks/ seed eating finch

Narration

ACCORDING TO CONTEMPORARY DARWINIAN THEORY, DIFFERENCES IN THE SIZES AND SHAPES OF BIRD'S BEAKS ARE THE DIRECT RESULT OF NATURAL SELECTION.

ONE EXAMPLE, OFTEN CITED, INVOLVES SPECIES OF SEED-EATING FINCHES.

26. Rainfall/ soft seeds/ seed eating finches

FOLLOWING SEASONS OF HEAVY RAIN, SMALL, SOFT SEEDS ARE PLENTIFUL THROUGHOUT THE ISLANDS. BIRDS WITH SHORT BEAKS CAN EASILY GATHER FOOD.

27. Pod eating finch/ dry island

HOWEVER, DURING PERIODS OF DROUGHT, THE ONLY SEEDS AVAILABLE ARE ENCASED IN HARD, TOUGH SHELLS THAT REMAIN ON THE GROUND FROM THE PREVIOUS YEAR.

IN THESE CIRCUMSTANCES, ONLY BIRDS WITH LONGER, SHARPER BEAKS CAN CRACK THE SHELLS AND EAT THE SEEDS.

28. Paul Nelson/ finches

Paul Nelson

"Those birds with the longer beaks survive because they can reach the food source, whereas other birds cannot. That long beak then confers what biologists now call a 'functional advantage.'

The finches with smaller beaks die out from starvation because they cannot reach that food source.

If the drought conditions continue, the environment causes a change in the features of the finch population as a whole. Over time, the long beaks are passed on to succeeding generations because those beaks enable those birds to survive."

29. Galapagos Wildlife.

Narration

NATURAL SELECTION WAS A POWERFUL IDEA. PHYSICAL VARIATIONS THAT PROVED ADVANTAGEOUS WOULD BE INHERITED BY SUCCEEDING GENERATIONS. THROUGH THIS PROCESS, POPULATIONS WOULD BE ALTERED…AND, (OVER TIME), FUNDAMENTALLY DIFFERENT, ORGANISMS WOULD ARISE…WITHOUT ANY FORM OF INTELLIGENT GUIDANCE.

30. Jonathan Wells

Jonathan Wells

"Darwin wanted to explain everything in the history of life in terms of undesigned, unintelligent natural processes.

"…and when he looked for an explanation, what he found was that a process he could observe in domestic populations also operates in the wild."

"Now, Darwin, himself, was very familiar with domestic breeding. He studies pigeon breeding, and he knew that—for centuries—human breeders had been able to make dramatic changes in populations by selecting only certain individuals to breed. Darwin really suggested that this same process operates in the wild.…

31. Paul Nelson

Paul Nelson

"For Charles Darwin, natural selection explained the appearance of design without a designer. There was no longer any need to invoke an intelligent cause for the complexity of life. In effect, natural selection became a kind of designer substitute."

32. Beach

Narration

TODAY, DARWINISM IS GENERALLY ASSUMED THROUGHOUT SCIENCE AND THE ACADEMIC WORLD…

33. Pajaro scientists/ beach

Narration

YET, DESPITE ITS WIDE ACCEPTANCE, A GROWING NUMBER OF SCIENTISTS AND SCHOLARS (INCLUDING THOSE WHO MET AT PAJARO DUNES) NOW CHALLENGE KEY ASPECTS OF DARWINIAN THEORY.

34. Pajaro scientists. Nelson.

Paul Nelson (VO)

"When we came together at Pajaro Dunes we certainly didn't agree on everything, but we did share a real dissatisfaction with the mechanism of natural selection and the role that it was playing in biological explanation."

35. Paul Nelson (on camera)

Paul Nelson

"Natural selection is a real process and it works well for explaining certain limited kinds of variations, small scale change. Where it doesn't work well is explaining what Darwin thought it could—namely, the real complexity of life."

36. Finches

Nelson (vo)

"We have a finch beak, and then you've got the finch, itself. A minor change in the structure of the beak versus the origin of the organism, itself. These are different scales of phenomena. These are different kinds of problems. And the important problem for biology is to explain where natural selection works, and where it doesn't. And why there's a difference."

37. Pajaro beach

Paul Nelson (vo)

"Evidence is a very powerful. And all of us had a sense that if we let that evidence speak for itself, that it would lead us in a very different direction—away from natural selection and towards a different conclusion about the origin and nature of life on earth."

38. Darwin Quote

Character voice— Charles Darwin

"Natural selection acts only by taking advantage of slight, successive variations. She can never take a great and sudden leap, but must advance by short and sure, though slow steps."

39. Behe walks down stairs

Michael Behe

"It's really interesting to notice that the more we know about life and the more we know about biology, the more problems Darwinism has, and the more design becomes apparent."

40. Behe walks down stairs, then outside building

Narration

SINCE 1988, DR. MICHAEL BEHE HAS INVESTIGATED COMPLEX BIOLOGICAL SYSTEMS THAT SEEM TO DEFY EXPLANATION BY NATURAL SELECTION.

41. Behe on camera

Michael Behe

"… for the longest time, I believed that Darwinian evolution explained what we saw in biology. Not because I saw how it could actually explain it, but because I was told that it did explain it. In schools I was taught Darwinian biology."

42. Behe types—silhouetted through door

Behe

"And through college and graduate school, I was in an atmosphere which just assumed that Darwinian evolution explained biology and, again, I didn't have any reason to doubt it."

43. Behe on camera

Mike Behe

"It wasn't until about ten years ago, that I read a book called, "Evolution, a Theory in Crisis," by a geneticist by the name of Michael Denton (an Australian). And he put forward a lot of scientific arguments against Darwinian theory that I had never heard before."

44. Behe in lab

Mike Behe

"…and the arguments, seemed pretty convincing. And, at that point, I started to get a bit angry because I thought I was being led down the primrose path. Here were a number of very good arguments…and I had gone through a doctoral program in biochemistry, became a faculty member… and I had never even heard of these things. And so, from that point on, I became very interested in the question of evolution and since have decided the Darwinian processes are not the whole the explanation for life."

45. Michael Behe in lab/ cell panels

Narration

MICHAEL BEHE'S SKEPTICISM DERIVED, IN LARGE MEASURE, FROM WHAT MODERN BIOLOGY HAS REVEALED ABOUT LIFE'S MOST FUNDAMENTAL UNIT—THE CELL.

46. Behe

Behe

"In the 19th Century, when Darwin was alive, scientists thought that the basis of life, the cell, was some simple glob of protoplasm, like a little piece of Jell-O or something that was not hard to explain at all…"

47. Paul Nelson

Nelson

"This perception didn't really change too much until the early 1950's. But, during the last half century our knowledge about the cell has just exploded."

48.Time lapse bacteria

Narration

TODAY, POWERFUL TECHNOLOGIES REVEAL ELABORATE MICROSCOPIC WORLDS.

WORLDS SO SMALL, THAT A THIMBLE FULL OF CULTURED LIQUID CAN CONTAIN MORE THAN FOUR BILLION SINGLE-CELLED BACTERIA…

…EACH PACKED WITH CIRCUITS, ASSEMBLY INSTRUCTIONS, AND MINIATURE MACHINES, THE COMPLEXITY OF WHICH, CHARLES DARWIN COULD NEVER HAVE IMAGINED.

49. Michael Behe

Behe (vo)

"At the very basis of life, where molecules and cells run the show, we've discovered machines. Literally, molecular machines."

50.Mike Behe

Behe

"…there are little molecular trucks that carry supplies from one end of the cell to the other. There are machines which capture the energy from sunlight and turn it into useable energy…"

51. Jed Macosko/ cells

Jed Macosko (VO)

"There are as many molecular machines in the human body as there are functions that the body has to do. So if you think about hearing, seeing,

smelling, tasting, feeling…blood clotting, respiratory action, the immune response…all of those require a host of machines."

52.Behe

Behe

"…when we look at these machines, we ask ourselves—'where do they come from?' And, the standard answer--Darwinian evolution, is very inadequate in my view…."

53. Michael Behe speaks at SMU

Narration

DURING THE EARLY 1990'S (AT A SERIES OF ACADEMIC CONFERENCES) BEHE FIRST SHARED HIS DOUBTS ABOUT THE ABILITY OF NATURAL SELECTION TO CONSTRUCT COMPLEX MOLECULAR MACHINES.

54. Photomicro flagellum

Narration

ONE MACHINE, PARTICULARILY, ATTRACTED HIS ATTENTION.

55. Michael Behe/ illustration of Bacterial flagellum

Michael Behe

"I remember the first time I looked in a biochemistry textbook and I saw a drawing of something called the bacterial flagellum, with all, all of its parts in all of its glory. It had a propeller and hook region and the, the drive shaft and the motor and so I looked at that and I said, that's an outboard motor. That, that's designed.? That's no chance assemblage of parts."

56. Photomicro flagellum

Narration

BEHE'S REACTION WAS NOT SURPRISING, FOR THE MOLECULAR MOTORS THAT DRIVE BACTERIA THROUGH LIQUID EACH DEPEND UPON A SYSTEM OF INTRICATELY ARRANGED MECHANICAL PARTS.

THESE PARTS COME INTO FOCUS WHEN PORTIONS OF A CELL ARE MAGNIFIED 50,000 TIMES…

57. Animation of flagellum grows out of photomicro image.

Narration

BIOCHEMISTS HAVE USED ELECTRON MICROGRAPH'S LIKE THIS ONE, TO IDENTIFY THE PARTS AND THREE DIMENSIONAL STRUCTURE OF THE FLAGELLAR MOTOR.

IN THE PROCESS, THEY HAVE REVEALED A MARVEL OF ENGINEERING ON A MINIATURIZED SCALE.

58. Animation/ Scott Minnich insert

Scott Minnich

"Howard Berg at Harvard has labeled it the most efficient machine in the universe. These machines, some of them, are running at 100,000 rpms. And are hard-wired into a signal transduction or sensory mechanism so that it's getting feedback from the environment."

59. Jed Macosko/ animation

Jed Macosko

"…and even though they are spinning that fast, they can stop on a dime. It only takes a quarter turn for them to stop and shift directions, and start spinning 100,000 rpm in the other direction."

60. Animation/ Behe insert/ animation

Mike Behe

"…and just like outboard motors on motorboats, it has a large number of parts which are necessary for the motor to work."

61. Scott Minnich/ animation

Scott Minnich

"The bacterial flagellum—two gears forward and reverse, water-cooled, proton motive force. It has a stator, it has a rotor, it has a U-joint, it has a drive shaft, it has a propeller. And they function as these parts of machines…

62. Scott Minnich on camera

Scott Minnich

"It's not convenient that we give them these names. It's truly their function."

63. Scientists at work in lab

Narration

SINCE ITS DISCOVERY, SCIENTISTS HAVE TRIED TO UNDERSTAND HOW A ROTARY MOTOR COULD HAVE ARISEN THROUGH NATURAL SELECTION.

AS YET, THEY HAVE FAILED TO OFFER ANY DETAILED DARWINIAN EXPLANATION.

64. Super "Irreducible complexity"

TO SEE, WHY WE MUST UNDERSTAND A FEATURE OF MOLECULAR MACHINES KNOWN AS "IRREDUCIBLE COMPLEXITY."

65. Scott Minnich

Scott Minnich

"Irreducible complexity was coined by Mike Behe in describing these molecular machines. Basically, what it says, is that you have multi-component parts to any organelle or system within a cell…all of which are necessary for function. That is, if you remove one part, you lose function of that system."

66. Mousetrap animation

THE IDEA OF IRREDUCIBLE COMPLEXITY CAN BE ILLUSTRATED BY A FAMILIAR, NON-BIOLOGICAL MACHINE—A MOUSETRAP.

67. Mousetrap CU's

THE TRAP IS COMPOSED OF FIVE BASIC PIECES--A CATCH TO HOLD THE BAIT …A STRONG SPRING… … A THIN BENT ROD CALLED THE "HAMMER"…A HOLDING BAR TO SECURE THE HAMMER IN PLACE…AND A PLATFORM UPON WHICH THE ENTIRE SYSTEM IS MOUNTED.

IF ANY ONE OF THESE PARTS IS MISSING OR DEFECTIVE, THE MECHANISM WILL NOT WORK. ALL COMPONENTS OF THIS "IRREDUCIBLY COMPLEX" SYSTEM MUST BE PRESENT, SIMULTANEOUSLY, FOR THE MACHINE TO PERFORM ITS FUNCTION—CATCHING MICE.

68. Bacterium animation

IRREDUCIBLE COMPLEXITY ALSO APPLIES TO BIOLOGICAL MACHINES INCLUDING THE BACTERIAL FLAGELLAR MOTOR.

69. Michael Behe (over animation)
Michael Behe

"…and all told they're about 40 different protein parts which are necessary for this machine to work…and, if any of those parts are missing, then either you get a flagellum that doesn't work because it's missing the hook or it's missing the drive shaft ..or, it doesn't even get built within the cell."

70. Scott Minnich
Scott Minnich

"In evolutionary terms, you have to be able to explain how you can build this system gradually when there's no function until you have all those parts in place."

71. Galapagos
Narration

THE "IRREDUCIBLE COMPLEXITY" OF MOLECULAR MACHINES POSES A SEVERE CHALLENGE TO THE POWER OF NATURAL SELECTION.

72. Galapagos wildlife

Narration

ACCORDING TO DARWIN'S THEORY, EVEN VERY COMPLEX BIOLOGICAL STRUCTURES (LIKE AN EYE, AN EAR, OR A HEART) CAN BE BUILT GRADUALLY, OVER TIME, IN SMALL INCREMENTAL STEPS.

YET, AS DARWIN MADE CLEAR, NATURAL SELECTION CAN ONLY SUCCEED IF THESE RANDOM GENETIC CHANGES PROVIDE SOME ADVANTAGE TO THE EVOLVING ORGANISM IN ITS STRUGGLE FOR SURVIVAL.

73. Darwin treatment. Portrait. Book excerpt.

Voice of Darwin

"As I have attempted to show, it is not necessary to suppose that the modifications were all simultaneous, if they were extremely slight and gradual.

"Natural Selection is scrutinizing the slightest variations…rejecting those that are bad, preserving and adding up all that are good."

74. Bacteria animation

Narration

BUT COULD DARWIN'S "SMALL, FAVORABLE VARIATIONS" HAVE PRODUCED A BACTERIAL FLAGELLUM? SOME SCIENTISTS DOUBT THE POSSIBILITY.

75. Jed Macosko

Jed Macosko

"How could something new like a bacteria flagellar motor and all of the components that go with it…how could it develop out of a population of bacteria that don't have that system? When each change, according to Darwin's theory, has to provide some kind of advantage.

76. Animation. Bacteria—limp tail

Narration

IMAGINE SUCH A SCENARIO, EARLY IN THE EARTH'S HISTORY.

AN EVOLVING BACTERIUM SOMEHOW DEVELOPES A TAIL (AND, PERHAPS EVEN THE PIECES NECESSARY TO ATTACH IT TO THE CELL WALL).

YET, WITHOUT A COMPLETE MOTOR ASSEMBLY, THIS INNOVATION WOULD PROVIDE NO ADVANTAGE TO THE CELL.

INSTEAD, THE TAIL WOULD LIE IMMOBILE AND USELESS—INVISIBLE TO NATURAL SELECTION WHICH, BY DEFINITION, CAN ONLY FAVOR CHANGES THAT AID SURVIVAL.

77. Paul Nelson

Paul Nelson (overlaps dead flagellum)

"The logic of natural selection is very demanding. Unless the flagellum mechanism is completely assembled, and actually works, natural selection simply cannot preserve it. It cannot be passed on to the next generation."

78. Jonathan Wells/ animation

Jonathan Wells

"The important thing to realize about natural selection is that it selects only for a functional advantage.

"In most cases, natural selection actually eliminates things…things that have no function, or have a function that harms the organism. So if you had a bacterium with a tail that didn't function as a flagellum, chances are natural selection would eliminate it."

79. Wells (cont.)

Jonathan Wells

"The only way you can select for a flagellum is if you have a flagellum that works and that means you have to have all the pieces of the motor in place to begin with.

So, natural selection can't get you the bacterial flagellum. It can only work after the flagellum is there and operating."

80. Flagellum background. Book cover

Narration

IN 1996, MICHAEL BEHE PUBLISHED A BOOK TITLED, "DARWIN'S BLACK BOX." IN IT, HE ARGUED THAT NATURAL SELECTION (DARWIN'S "DESIGNER SUBSTITUTE"), COULD NOT EXPLAIN THE ORIGIN OF THE BACTERIAL FLAGELLUM OR ANY OTHER IRREDUCIBLY COMPLEX BILOGICAL SYSTEM.

81. "Chapter 9" title—"Intelligent Design"

Narration

INSTEAD, BEHE CONCLUDED THAT THE INTEGRATED COMPLEXITY OF THESE SYSTEMS POINTED TO INTELLIGENT DESIGN.

82. Newspaper headings/ Science—Nature—NY Times

"DARWIN'S BLACK BOX" CREATED IMMEDIATE CONTROVERSY. OVER SEVENTY-FIVE PUBLICATIONS (INCLUDING SOME OF THE WORLD'S LEADING NEWSPAPERS AND SCIENTIFIC JOURNALS REVIEWED THE BOOK.

83. Review excerpts

Narration

SOME SCIENTISTS PRAISED BEHE'S WORK. WHILE OTHERS DISMISSED IT AS UNSCIENTIFIC AND RELIGIOUSLY MOTIVATED.

84. Flagellum parts float on black field. Pump

Narration

BEHE'S CRITICS ALSO INSISTED THAT HE HAD UNDERESTIMATED THE POWER OF NATURAL SELECTION. THEY ARGUED THAT THE FLAGELLAR MOTOR COULD HAVE BEEN CONSTRUCTED FROM PARTS USED TO BUILD SIMPLER MOLECULAR MACHINES--LIKE THIS NEEDLE-NOSED CELLULAR PUMP.

85. New machine

IF THE COMPONENTS OF THE PUMP ALREADY EXISTED, THEY COULD HAVE BEEN PRESERVED BY NATURAL SELECTION EVEN BEFORE THE BACTERIAL MOTOR AROSE.

THIS THEORY IS CALLED, "CO-OPTION."

86. Scott Minnich/ flagellum parts

Scott Minnich

"…it's essentially saying that evolution or natural selection, at some point, was able to borrow components of one molecular machine and build a new machine with some of these components."

87. Minnich walks

Narration

SCOTT MINNICH HAS STUDIED THE FLAGELLAR MOTOR FOR NEARLY 20 YEARS. HIS RESEARCH HAS LED HIM TO CHALLENGE THE CO-OPTION ARGUMENT.

88. Scott Minnich

Scott Minnich

"With a bacterial flagellum, you're talking about a machine that's got 40 structural parts. Yes, we find 10 of them are involved in another molecular machine, but the other 30 are unique, So where are you going to borrow them from?

Eventually you're going to have to account for the function of every single part is of originally having some other purpose> I mean, you can only follow that argument so far until you run into you run into the problem that you're borrowing from nothing…

89. Parts/ instructions

Scott Minnich

"…but, even if you concede that you have all the parts necessary to build one of these machines, that's only part of the problem. Maybe even more complex, is the assembly instructions. That is never addressed by opponents of the irreducible complexity argument.

90. Animation

Narration

STUDIES OF THE BACTERIAL MOTOR HAVE, INDEED, REVEALED AN EVEN DEEPER LEVEL OF COMPLEXITY—FOR ITS CONSTRUCTION NOT ONLY REQUIRES SPECIFIC PARTS, BUT ALSO A PRECISE SEQUENCE OF ASSEMBLY.

91. Minnich

Scott Minnich (144612)

You've got to make things at the right time. You've got to make the right number of components. You've got to assemble them in a sequential manner. You've got to be able to tell if you've assembled it properly so that you don't waste energy building a structure that's not going to be functional

92. Animation--House builds over blueprint

Narration

BUILDING A MOLECULAR MACHINE HAS BEEN COMPARED TO THE CONSTRUCTION OF A HOUSE—WHERE WORKERS FOLLOW A DETAILED BLUEPRINT AND PLAN FOR ASSEMBLY.

THE FOUNDATION OF A HOUSE IS POURED BEFORE THE WALLS ARE ERECTED.

PLUMBING AND ELECTRICAL FIXTURES ARE INSTALLED PRIOR TO ENCLOSING THE WALLS OF THE STRUCTURE.

WINDOWS MUST BE HUNG BEFORE SIDING IS APPLIED.
AND SHINGLES ARE ATTACHED ONLY AFTER PLYWOOD SHEETS ARE NAILED TO THE RAFTERS.

SO IT IS WITH THE CONSTRUCTION OF A FLAGELLAR MOTOR.

93. Scott Minnich/ animation

Scott Minnich

"You build this structure from the inside out. You are counting the number of components in a ring structure of the stator, and once that's assembled, there's feedback that says, "okay, no more of that component. " Now, a rod is added. A ring is added. Another rod is added. The U-joints added. Once the U-joints are at a certain size, and certain degree of, of bend (about a quarter turn), that's shut off...and then you start adding components for a propeller. These are all made in a precise sequence, just like you would build a building."

94.

Narration

TO BUILD THE MOTOR CORRECTLY REQUIRES A COMPLEX SYSTEM OF MACHINES THAT COORDINATE THE TIMING OF THE ASSEMBLY INSTRUCTIONS. BUT HOW COULD NATURAL SELECTION CONSTRUCT SUCH A SYSTEM?

95. Paul Nelson

Paul Nelson

The co-option argument doesn't explain this. You see, in order to construct that flagellar mechanism—or the tens of thousands of other such mechanisms in the cell—you require other machines to regulate the assembly in those structures. And those mechanisms, themselves, require machines for their assembly."

96. Jonathan Wells

Jonathan Wells

"If even one of these pieces is missing or put in the wrong place, your motor isn't going to work. So this apparatus to assemble the flagellar motor is, itself, irreducibly complex. In fact, what we have here, is irreducible complexity all the way down."

97. Scott Minnich

Scott Minnich

"We know a lot about the bacterial flagellum. We still have a lot to learn, but we know a lot about it and there's no explanation for how this complex molecular machine was ever produced by a Darwinian mechanism."

98. Origin of Species/ Darwin/ Quote crawl

Narration

150 YEARS AGO, SCIENTISTS DID NOT KNOW ABOUT IRREDUCIBLY COMPLEX MOLECULAR MACHINES. YET, CHARLES DARWIN ANTICIPATED THE DIFFICULTY THAT SYSTEMS SUCH AS THESE COULD POSE TO HIS THEORY.

99. Darwin quote

Darwin (vo)

"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."

Fade to black

100. Galapagos wildlife. Interview—Steve Meyer

Steve Meyer (vo)

"There are really two big questions in biology. How do you get new living forms-- with new structures like wings and eyes--from life that already exists? And, secondly, how did life on earth originate in the first place?"

Steve Meyer (on camera)

101.

"Now, of course we know that Darwin spent most of his life formulating an answer to the first of these two questions."

102. Tree of Life. Animation/ diagram

Narration

CHARLES DARWIN COMPARED THE HISTORY OF LIFE ON EARTH TO A GREAT BRANCHING TREE.

THE BASE OF THE TREE REPRESENTED THE VERY FIRST LIVING CELL… AND THE BRANCHES WERE NEW AND MORE COMPLEX LIFE FORMS THAT HAD EVOLVED, OVER TIME, FROM THE FIRST PRIMITIVE ORGANISM.

103. Close-ups of tree. Representations of life on branches

Steve Meyer (VO)

"Darwin wanted to explain how the branches on his tree of life originated. He was trying to show how natural selection could have modified existing organisms to produce the great diversity of plant and animal life that fills the earth, today. "

104. Trunk of tree/ simple cells/ volume "Origen of Species"

Steve Meyer

"But, when it came to the base of the tree (which represented the origin of the first life—the first living cell), Darwin had very little to say. In fact, in "Origin of Species," he didn't even address the question of how life might have originated from non-living matter."

105. Darwin's Letter

Narration

THE ONLY GLIMPSES WE HAVE OF DARWIN'S OPINIONS ON THE SUBJECT, APPEAR IN A LETTER HE WROTE TO A COLLEGUE NAMED, JOSPEH HOOKER.

106. Primordial earth

Charles Darwin (Character Voice)

"Regarding the first production of a living organism…

„if (and oh what a big if), we could conceive, in some warm little pond (with all sorts of ammonia and phosphoric salts, light, heat, and electricity present), that a protein compound was chemically formed, ready to undergo still more complex changes…

At the present, such matter would be instantly devoured …but this may not have been the case before living creatures were formed."

107. Old Darwin portrait supered over primordial waters

Narration

DURING THE FINAL YEARS OF HIS LIFE, DARWIN DID LITTLE TO DEVELOP HIS IDEA THAT A PRIMITIVE CELL MIGHT HAVE EMERGED FROM SIMPLE CHEMICALS IN THE PRIMORDIAL WATERS OF THE EARLY EARTH….

108. Alexander Oparin portrait

…BUT, LATER (IN THE 1920'S AND 30'S), A RUSSIAN SCIENTIST NAMED, ALEXANDER OPARIN, FORMULATED A DETAILED THEORY ABOUT HOW THIS COULD HAVE HAPPENED. IT WAS CALLED, "CHEMICAL EVOLUTION."

109. Steve Meyer—interview

Steve Meyer

"Oparin thought that he could explain the origin of the first life using Darwinian principles. He envisioned simple chemicals combining and recombining to form larger molecules. And then these larger molecules organizing themselves (with the help of chance variations and natural selection) into the first primitive living cell."

110. CFG Sunset surf

Narration

OVER THE NEXT THREE DECADES, MANY SCIENTISTS WORKED TO DEVELOP AND REFINE THESE IDEAS, AS THEY PONDERED THE QUESTIONS BOTH OPARIN AND DARWIN HAD RAISED. HOW COULD LIFE HAVE EVOLVED FROM SIMPLE CHEMICALS?

111. Kenyon walks through glass door

ONE MAN THOUGHT HE KNEW.

112. Dean Kenyon

Dean Kenyon

"The problem of biological origins (for a very long time I would say), has been a real deep interest to me just because of the scale of the problem. The importance of it. Where did we come from? Why are we here? Questions like these, probed from the perspective of natural science."

113. Steve Meyer—

Steve Meyer

"During the 1960's and 70's Dean Kenyon was one of the leading chemical evolutionary theorists in the world. Like others in his field, he was trying to explain how life on earth began through a purely natural process."

114. Book cover

Narration

IN 1969, KENYON CO-AUTHORED AN IMPORTANT BOOK ON THE ORIGIN OF LIFE.

115. Dean Kenyon

Kenyon

"Gary Steinman and myself thought that if we were to pull together all of the lines of empirical evidence that had accumulated, by the mid to late 60's, into one continuous argument, we were very enthusiastic about the possibilities for explaining the origin of the main life-building elements."

116. Kenyon/Protein animations

Narration

DESPITE HIS OPTIMISM, KENYON FACED A SIGNIFICANT PROBLEM.

TO EXPLAIN HOW LIFE BEGAN, HE FIRST HAD TO ACCOUNT FOR THE ORIGIN OF THE ESSENTIAL BUILDING BLOCKS OF EVERY CELL THAT HAS EXISTED ON EARTH. LARGE, COMPLEX MOLECULES CALLED PROTEINS.

117. Scott Minnich

Scott Minnich

"Proteins have a wide range of functions in the cell. Everything from structural requirements, in terms of scaffolding of the cell… to enzymes where they're actually processing molecules to harvest energy or to build components of the cell."

118. Jed Macasko

Jed Macosko

"Proteins do pretty much all of the jobs inside of the cell, except for storing genetic information (that's left to the DNA and RNA)…but all the day-to-day jobs, cleaning up the cell, making energy, it's all proteins.

119.

Narration

KENYON KNEW THAT PROTEINS WOULD HAVE BEEN AS IMPORTANT TO THE FIRST LIFE, AS THEY ARE TO LIVING CELLS, TODAY.

HE ALSO RECOGNIZED THE COMPLEXITY OF THEIR CONSTRUCTION.

120. Steve Meyer

Steve Meyer

"By the 1960's, scientists had determined that even simple cells are made of thousands of different types of proteins…and the function of these molecules derives from their highly complex three dimensional shapes."

121. Animation—proteins fit together

Steve Meyer (voice over)

"The irregular shapes of some proteins allow them to catalyze, or trigger chemical reactions, because of the hand in glove fit they have with other molecules in the cell…"

122. Protein animation

Meyer (voice over)

"…while other protein molecules form interlocking structural components."

123. Animation. Flagellum U-joint to protein to amino acid chain

Narration

THE INDIVIDUAL PARTS OF A BACTERIAL MOTOR LIKE THIS RING STRUCTURE, ARE EACH MADE OF EITHER A SINGLE PROTEIN MOLECULE…OR, AN ASSEMBLY OF PROTEINS FITTED TOGETHER INTO A SPECIFIC SHAPE.

124. ***Protein begins to unravel into amino acid chain***

Narration

THESE PROTEINS ARE, IN TURN, MADE OF SMALLER CHEMICAL UNITS CALLED, "AMINO ACIDS," THAT ARE LINKED TOGETHER IN LONG CHAINS.

125. Dean Kenyon (vo)

Dean Kenyon (vo)

"There is a very great degree of intricacy of architecture down in these cell units…in these protein forming amino acids.

126. Amino acids/ different chain folds

Narration

IN NATURE, TWENTY DIFFERENT TYPES OF AMINO ACIDS ARE USED TO CONSTRUCT PROTEIN CHAINS.

BIOLOGISTS HAVE COMPARED THEM TO THE 26 LETTERS OF THE ENGLISH ALPHABET.

127. Steve Meyer—Alphabet letters

Steve Meyer

"Alphabetic letters can be arranged in a huge number of possible combinations…and it's the sequential arrangement of the letters that determines if you have meaningful words and sentences."

128. "How Did Life Begin?"

Steve Meyer

"If the letters are arranged correctly, you'll get meaningful text. But if they're not arranged correctly, you'll get gibberish."

The same principle applies for amino acids and proteins."

129. Animation—amino acids assemble into chain, then fold

Narration

THERE ARE AT LEAST 30,000 DISTINCT TYPES OF PROTEINS, EACH MADE OF A DIFFERENT COMBINATION OF THE SAME 20 AMINO ACIDS. THEY ARE ARRANGED—LIKE LETTERS--TO FORM CHAINS OFTEN HUNDREDS OF UNITS LONG.

IF THE AMINO ACIDS ARE SEQUENCED CORRECTLY, THEN THE CHAIN WILL FOLD INTO A FUNCTIONING PROTEIN.

130. Jed Macosko/ folding chains

Jed Macosko

"Proteins are arranged with their amino acids in such a way that the amino acids collapse on each other into an architecture that is pre-programmed by the order of the amino acids. It folds into a certain structure and that structure can do a certain function.

So all proteins in the cell have a certain three-dimensional pattern that's based on the arrangement of amino acids in the chain."

131. Animation--Bad chain

Narration

THIS ARRANGEMENT IS CRITICAL. FOR, IF THE AMINO ACIDS ARE INCORRECTLY SEQUENCED, A USELESS CHAIN FORMS…AND, INSTEAD OF FOLDING INTO A PROTEIN; IT WILL BE DESTROYED IN THE CELL.

132. Steve Meyer

Steve Meyer (on camera)

"Proteins-- like written languages or computer codes—have a high degree of specificity. The function of the whole depends upon the precise arrangement of the individual parts."

133. Animation. Chain swirls into "donut-shaped" flagellum part.

Narration

BUT, WHAT PRODUCES THE PRECISE SEQUENCING OF AMINO ACIDS THAT GIVES RISE TO THE SPECIFIC SHAPES AND FUNCTIONS OF PROTEINS?

134.

Narration

DURING THE 1950'S AND 60'S, DISCOVERIES ABOUT PROTEIN STRUCTURE FORCED BIOLOGISTS TO CONFRONT THIS MYSTERY.

DEAN KENYON BELIEVED HE COULD SOLVE IT.

135.

IN HIS BOOK, "BIOCHEMICAL PREDESTINATION," KENYON AND HIS CO-AUTHOR, GARY STEINMAN, PROPOSED AN INTRIGUING THEORY.

136. Kenyon text

KENYON WROTE:

"LIFE MIGHT HAVE BEEN 'BIOCHEMICALLY PREDESTINED BY THE PROPERTIES OF ATTRACTION THAT EXIST BETWEEN ITS CHEMICAL PARTS—PARTICULARILY BETWEEN AMINO ACIDS IN PROTEINS."

137. Dean Kenyon

Dean Kenyon

"At the time Biochemical Predestination came out, I and my co-author were totally convinced we had the scientific explanation for origins."

138. Steve Meyer/ animation insert of amino acids building chain

Steve Meyer

"Kenyon proposed that the chemical properties of the amino acids caused them to be attracted to each other forming the long chains that became the first proteins—the most important components in the living cell. And, this meant that life was, effectively, inevitable. Predestined by nothing more than chemistry."

139.

Narration

MANY SCIENTISTS EMBRACED KENYON'S IDEAS…AND, OVER THE NEXT 20 YEARS, "BIOCHEMICAL PREDESTINATION" BECAME A BEST-SELLING TEXT ON THE THEORY OF CHEMICAL EVOLUTION.

140. Book cover

Narration

YET, FIVE YEARS AFTER THE BOOK'S PUBLICATION, KENYON QUIETLY BEGAN TO DOUBT THE PLAUSIBILITY OF HIS OWN THEORY.

141.

Kenyon

"It was during that whole period of time period that my doubts about certain aspects of the evolutionary camp became apparent….

Kenyon

"…when coming into contact with a powerful counter-argument, given to me by one of my students. And I could not refute that counter-argument."

142. Cell/ animations

Narration

KENYON WAS CHALLENGED TO EXPLAIN HOW THE FIRST PROTEINS COULD HAVE BEEN ASSEMBLED WITHOUT THE HELP OF GENETIC INSTRUCTIONS.

IN LIVING CELLS TODAY, CHAINS OF AMINO ACIDS ARE NOT FORMED DIRECTLY BY FORCES OF ATTRACTION BETWEEN THEIR PARTS (THE SCENARIO KENYON ENVISIONED ON THE EARLY EARTH)

INSTEAD, ANOTHER LARGE MOLECULE WITHIN THE CELL STORES INSTRUCTIONS FOR SEQUENCING THE AMINO ACIDS IN PROTEINS. IT IS CALLED "DNA."

143. Steve Meyer/ DNA

Steve Meyer

"Initially, Kenyon believed that proteins could have formed directly from amino acids, without any DNA assembly instructions…and that's why so many scientists were excited about his theory.

144. Animation—protein chain

Steve Meyer

But, the more he and others learned about the properties of amino acids and proteins, the more he began to doubt that proteins could self-assemble without DNA."

145. DNA animation

Narration

IN DNA, KENYON ENCOUNTERED A MOLECULE WITH A PROPERTY, HE COULD NOT EXPLAIN THROUGH NATURAL PROCESSES…

146. DNA animation

Narration

FOR, LOCKED SECURELY WITHIN ITS DOUBLE HELIX STRUCTURE IS A WEALTH OF INFORMATION-- IN THE FORM OF PRECISELY SEQUENCED CHEMICALS THAT SCIENTISTS REPRESENT WITH THE LETTERS, "A…C…T…AND G.

IN A WRITTEN LANGUAGE, INFORMATION IS COMMUNICATED BY A PRECISE ARRANGEMENT OF LETTERS. IN THE SAME WAY, THE INSTRUCTIONS NECESSARY TO ASSEMBLE AMINO ACIDS INTO PROTEINS ARE CONVEYED BY THE SEQUENCES OF CHEMICALS ARRANGED along THE SPINE OF THE DNA.

THIS CHEMICAL CODE HAS BEEN CALLED THE "LANGUAGE OF LIFE"…AND IT IS THE MOST DENSELY PACKED AND ELABORATELY DETAILED ASSEMBLY OF INFORMATION IN THE KNOWN UNIVERSE.

147. Steve Meyer

Steve Meyer

"Like other scientists working on the origin of life, Kenyon realized he had two choices. Either he had to explain where these genetic assembly instructions came from…or, he had to explain how proteins could have arisen—directly from amino acids—without DNA, in the primordial oceans. And in the end he realized, he could do neither."

148. Kenyon/ Primordial ocean

Dean Kenyon

"It's an enormous problem how you could get together, in one tiny submicroscopic volume of the primitive ocean, all of the hundreds of different molecular components you would need in order for a self-replicating cycle to be established…

Kenyon (vo)

"…and so my doubts about whether amino acids could order themselves into meaningful biological sequences on their own, without pre-existing genetic material being present, just reached, for me the intellectual breaking point near the end of the decade of the 70's."

149. Kenyon

Narration

AS KENYON RE-EVALUATED HIS THEORY, NEW BIOCHEMICAL DISCOVERIES FURTHER WEAKENED HIS CONVICTION THAT AMINO ACIDS COULD HAVE ORGANIZED THEMSELVES INTO PROTEINS.

150.

Dean Kenyon

"The more I conducted my own studies (including a period of time at the NASA-Ames Research Center), the more it became apparent that there were multiple difficulties with the chemical evolution account.

"And, further experimental work showed that amino acids do not have the ability to order themselves// into/ any biologically meaningful sequences."

151.

Narration

FACED WITH MOUNTING DIFFICULTIES IN HIS OWN THEORY—AND A GROWING BODY OF SCIENTIFIC DATA ABOUT THE IMPORTANCE OF DNA--KENYON WAS FORCED TO CONFRONT THE ABSOLUTE NECESSITY OF GENETIC INFORMATION.

152. Dean Kenyon

Dean Kenyon

"…the more I thought about the alternative that was being presented in the criticism…and the enormous problem that all of us in this field had neglected to address (the problem of the origin of genetic information, itself)…then I really had to reassess my whole position regarding origins."

153.

Narration

FOR DEAN KENYON, A NEW QUESTION BECAME THE FOCUS OF HIS SEARCH FOR LIFE'S ORIGIN.

WHAT WAS THE SOURCE OF THE BIOLOGICAL INFORMATION IN DNA?

154. Kenyon

Dean Kenyon

"…if one could get at the origin of the messages, the encoded messages within the living machinery then you would really be onto something far more intellectually satisfying than this chemical evolution theory."

155. Kenyon walks

Narration

YET, KENYON REALIZED THAT HE FACED A NARROWING SET OF OPTIONS. BY THE 1970'S, MOST RESEARCHERS HAD REJECTED THE IDEA THAT THE INFORMATION NECESSARY TO BUILD THE FIRST CELL ORIGINATED BY CHANCE, ALONE.

156. Scabble letters fall to table top

Narration

TO UNDERSTAND WHY, CONSIDER THE DIFFICULTY OF GENERATING JUST TWO LINES OF SHAKESPHERE'S PLAY, "HAMLET," BY DROPPING SCRABBLE LETTERS ON TO A TABLE TOP.

157. DNA/ printed text

THEN CONSIDER THAT THE SPECIFIC GENETIC INSTRUCTIONS REQUIRED TO BUILD THE PROTEINS IN EVEN THE SIMPLEST ONE-CELLED ORGANISM WOULD FILL HUNDREDS OF PAGES OF PRINTED TEXT.

158. Steve Meyer

Steve Meyer

"Of course, serious origin of life biologists didn't believe that life had arisen by chance, alone. Instead, they envisioned natural selection acting upon random variations among chemicals to produce the first life. But there was a problem with this proposal."

159. Primordial earth/ cell division

Narration

BY DEFINITION, NATURAL SELECTION COULD NOT HAVE FUNCTIONED BEFORE THE EXISTENCE OF THE FIRST LIVING CELL….

FOR IT CAN ONLY ACT UPON ORGANISMS CAPABLE OF REPLICATING THEMSELVES. CELLS EQUIPPED WITH DNA THAT PASS ON THEIR GENETIC CHANGES TO FUTURE GENERATIONS.

160.

Steve Meyer

"Without DNA, there is no self replication. But without self-replication, there is no natural selection. So you can't use natural selection to explain the origin of DNA without assuming the existence of the very thing you're trying to explain."

161.

Narration

CHANCE, NATURAL SELECTION, AND HIS OWN THEORY OF SELF-ORGANIZATION, HAD ALL FAILED TO EXPLAIN THE ORIGIN OF GENETIC INFORMATION…

NOW, KENYON SAW ONLY ONE ALTERNATIVE.

162.

Dean Kenyon

"We have not the slightest chance of a chemical evolutionary origin for even the simplest of cells…so, the concept of the intelligent design of life was immensely attractive to me and made a great deal of sense, as it very closely matched the multiple discoveries of molecular biology."

163. Zoom in to interior of cell

Narration

IN THE YEARS SINCE KENYON'S REJECTION OF CHEMICAL EVOLUTION, SCIENCE HAS REVEALED THE DETAILS OF AN ENTIRE SYSTEM OF INFORMATION PROCESSING THAT BEARS THE HALLMARKS OF INTELLIGENT DESIGN.

164. Animation

Narration

WITH COMPUTER ANIMATION, WE CAN ENTER THE CELL TO VIEW THIS REMARKABLE SYSTEM AT WORK.

165. Animation—approach and enter nucleus

AFTER ENTERING THE HEART OF THE CELL, WE SEE THE TIGHTLY WOUND STRANDS OF DNA--STOREHOUSES FOR THE INSTRUCTIONS NECESSARY TO BUILD EVERY PROTEIN IN AN ORGANISM.

166. Helix is unwound

Narration

IN A PROCESS KNOWN AS, "TRANSCRIPTION," A MOLECULAR MACHINE FIRST UNWINDS A SECTION OF THE DNA HELIX TO EXPOSE THE GENETIC INSTRUCTIONS NEEDED TO ASSEMBLE A SPECIFIC PROTEIN MOLECULE.

167. Transcription

ANOTHER MACHINE THEN COPIES THESE INSTRUCTIONS TO FORM A MOLECULE KNOWN AS "MESSENGER RNA."

WHEN TRANSCRIPTION IS COMPLETE, THE SLENDER RNA STRAND CARRIES THE GENETIC INFORMATION THOUGH THE "NUCLEAR PORE COMPLEX"—THE GATEKEEPER FOR TRAFFIC IN AND OUT OF THE CELL NUCLEUS.

168. Chain is formed

THE MESSENGER RNA STRAND IS DIRECTED TO A TWO-PART MOLECULAR FACTORY CALLED A RIBOSOME. AFTER ATTACHING ITSELF SECURELY, THE PROCESS OF TRANSLATION BEGINS.

169. Ribosomal action

INSIDE THE RIBOSOME, A MOLECULAR ASSEMBLY LINE BUILDS A SPECIFICALLY SEQUENCED CHAIN OF AMINO ACIDS.

THESE AMINO ACIDS ARE TRANSPORTED FROM OTHER PARTS OF THE CELL…AND, THEN LINKED INTO CHAINS OFTEN HUNDREDS OF UNITS LONG. THEIR SEQUENTIAL ARRANGEMENT DETERMINES THE TYPE OF PROTEIN MANUFACTURED.

170.

Narration

WHEN THE CHAIN IS FINISHED, IT IS MOVED FROM THE RIBOSOME TO A BARREL-SHAPED MACHINE THAT HELPS FOLD IT INTO THE PRECISE SHAPE CRITICAL TO ITS FUNCTION.

171. Protein escorted out of cell

AFTER THE CHAIN IS FOLDED INTO A PROTEIN, IT IS THEN RELEASED AND SHEPERDED BY ANOTHER MOLECULAR MACHINE TO THE EXACT LOCATION WHERE IT IS NEEDED.

172. Recap of animation

Dean Kenyon

"This is absolutely mind boggling to perceive at this scale of size such a finely tuned apparatus, a device, that bears the marks of intelligent design and manufacture."

173. Kenyon

Dean Kenyon

"And, we have the details of an immensely complex *molecular* realm of genetic information processing. And it's exactly this new realm of molecular genetics where we see the most compelling evidence of design on the earth"

Fade to black

174. Francis Crick quote over abstract defocused cell

"Biologists must constantly keep in mind that what they see was not designed, but evolved."

Francis Crick

175. Background racks focus to reveal a cluster of complex cells

Paul Nelson (vo)

"When I look at molecular machines, or the incredibly complex process by which cells divide, I want to ask, 'is it possible that these things had an intelligence behind them? That there was a plan and a purpose to this structure?"

176. Paul Nelson on camera/ title page

Paul Nelson

"Science ought to be a search for the truth about the world. Now, we shouldn't prejudge what might be true. We shouldn't say, 'I don't like that explanation, so I'm going to put it to one side."

Rather, when we come to a puzzle in nature, we ought to bring to that puzzle every possible cause that might explain it. One of the problems I have with evolutionary theory is that it artificially rules out a kind of cause even before the evidence has a chance to speak. And the cause that's ruled out is intelligence."

177. Darwin/ Steve Meyer

Steve Meyer

"…since the late 19th century, since the time of Darwin (in part, because of the writing of Darwin in the Origin of Species)—scientists came to accept a different convention, a definition of science that excluded the possibility of design as a scientific explanation. And that convention has a name—it's called, 'methodological naturalism'—and it just means that if you're going to be scientific, you must limit yourself to explanations that invoke only natural causes. You can't invoke intelligence as a cause.

And, yet, curiously, we make inferences to intelligence all the time. It's part of our ordinary reasoning…to recognize the effects of intelligence."

178. Egyptian excavation sequence

Narration

CONSIDER, FOR EXAMPLE, THESE HEIROGLYPHIC MESSAGES CARVED UPON THE RUINS OF EGYPTIAN MONUMENTS.

NO ONE WOULD ATTRIBUTE THE SHAPES AND ARRANGEMENTS OF THESE SYMBOLS TO NATURAL CAUSES LIKE SAND STORMS OR EROSION.

INSTEAD, WE RECOGNIZE THEM AS THE WORK OF ANCIENT SCRIBES—INTELLIGENT HUMAN AGENTS.

179. Easter Island

Narration

SIMILAR REASONING LEADS US TO CONCLUDE THAT THE MYSTERIOUS STONE FIGURES ON THE SHORES OF EASTER ISLAND WERE NOT FORMED BY THE ACTIONS OF WIND AND WATER OVER GREAT PERIODS OF TIME.

180. Topiary hedges in shapes of animals

NOR, DO WE PRESUME THAT PLANTS COULD GROW INTO THESE FAMILIAR SHAPES WITHOUT SOME MANNER OF INTELLIGENT GUIDANCE.

181. Steve Meyer

Steve Meyer

"Of course, we make these inferences all the time. And we know they're correct. But the question is, 'on what basis do we make these inferences?' What are the features that enable us to recognize intelligence?"

182. Dembski book cover

Narration

RECENTLY, IN A BOOK TITLED, "*THE DESIGN INFERENCE,*" MATHEMATICIAN, WILLIAM DEMBSKI, HAS MADE AN IMPORTANT BREAKTHROUGH IN UNDERSTANDING DESIGN REASONING.

DEMBSKI HAS IDENTIFIED THE SPECIFIC FEATURES OF ARTIFACTS THAT CAUSE US TO RECOGNIZE PRIOR INTELLIGENT ACTIVITY.

183. Bill Dembski

Bill Dembski

"I came to this trying to look at how do we reason about design. What are the logical moves that we have to go through in order to come to a conclusion of design?

And, what I am trying to do…is to establish reliable, empirical, scientifically rigorous criteria for deciding whether something is, in fact, designed."

"I was looking at the logic of it, and what I found was that you need improbability and you need specification, the right sort of pattern…"

184. Mt. Rushmore entrance/ heads of presidents

Narration

ACCORDING TO DEMBSKI, HUMAN BEINGS CORRECTLY DETECT THE ACTIVITY OF INTELLIGENCE WHENEVER THEY OBSERVE A HIGHLY IMPROBABLE OBJECT OR EVENT THAT ALSO MATCHES A RECOGNIZABLE PATTERN.

JUST SUCH A PATTERN IS FOUND IN THE BLACK HILLS OF SOUTH DAKOTA.

185. Paul Nelson/ Rushmore

Paul Nelson

"Now if you travel through the west, you'll see lots of different shapes on the mountainsides, most of which mean nothing at all. They're just rocks strewn in various patterns. But, what you don't see are the faces of Lincoln, Jefferson, Teddy Roosevelt, and George Washington on the mountainsides. The only place you see that is in South Dakota. And the reason it's there is because a sculptor--an eccentric sculptor--decided he wanted to honor these Presidents by spending the larger part of his life chiseling their faces in the side of the mountain.

That pattern is improbable. A random hillside is also improbable. But a random hillside doesn't specify anything. We do know though, that there were four men who were presidents of the United States, who had particular patterns in their faces…and those patterns on the mountainside in south Dakota match faces elsewhere."

186. Steve Meyer/ Rushmore detail

Steve Meyer

"If I look at the faces, I immediately recognize that they match the faces of the four presidents that are known from money or portraits in the National Gallery…or from paintings in books. And so, I realize that when I look at Mt. Rushmore, we not only have a highly improbable configuration of rock…but one which matches an independently given pattern that reliably indicates intelligence.

187. Paul Nelson

Paul Nelson

"…so we have a small probability, specification. It's design…"

188. Message in sand

Narration

ON A SEASHORE, ANOTHER IMPROBABLE PATTERN ETCHED INTO THE EARTH, ILLUSTRATES HOW WE DETECT DESIGN.

189. Message in sand

NO ONE WOULD INFER THAT THIS MESSAGE WAS WRITTEN BY THE MOVEMENT OF THE TIDES. INSTEAD, BECAUSE OF THE CHARACTERISTICS OF THIS PATTERN, WE IDENTIFY THE WORDS AS THE PRODUCTS OF INTELLIGENCE.

190. Steve Meyer

Steve Meyer

"That improbable arrangement also conforms to an independently given pattern…namely the shapes of the letters that we recognize from the English alphabet, and the words that that we know from English vocabulary. And so it's he improbability of the arrangement plus the fact that it conforms to an independently given pattern that triggers the awareness of design."

191. Beach

Narration

THIS ILLUSTRATION SUGGESTS THAT WILLIAM DEMBSKI'S CRITERIA FOR DESIGN DETECTION—SMALL PROBABILITY AND SPECIFICATION—ARE ESSENTIALLY EQUIVILENT TO INFORMATION…

192. Information montage

Narration

… THE TYPE OF INFORMATION PRESENT NOT ONLY IN PICTURES, WRITTEN TEXTS AND NUMERIC SEQUENCES, BUT ALSO ENCODED IN SOFTWARE AND RADIO SIGNALS.

193. SETI telescopes

Narration

THE ABILITY TO DETECT INFORMATION IN ELECTROMAGNETIC TRANSMISSIONS, HAS MADE POSSIBLE A UNIQUE SEARCH FOR INTELLIGENCE.

194. Telescopes/ galaxies

FOR MORE THAN THREE DECADES, ASTRONOMERS INVOLVED IN "SETI" (THE SEARCH OF EXTRATERESTRIAL INTELLIGENCE) HAVE MONITORED ELECTROMAGNETIC TRANSMISSIONS FROM OUTER SPACE IN AN ATTEMPT TO FIND INFORMATION-RICH PATTERNS.

195. SETI telescope

TYPICALLY, RADIO TELESCOPES RECEIVE EITHER RANDOM NOISE OR SIMPLE REPETITIVE SIGNALS…PRODUCED NATURALLY BY STARS, GALAXIES, AND OTHER CELESTIAL OBJECTS.

196. Telescopes/ galaxies/ prime numbers

Narration

BUT ASTRONOMERS RECOGNIZE THAT IF THEY EVER IDENTIFIED AN INFORMATION-BEARING SIGNAL, IT WOULD CONFIRM THE EXISTENCE OF INTELLIGENT LIFE BEYOUND THE EARTH

SOME HAVE SPECULATED, THAT AN EXTRATERRESTRIAL CIVILIZATION MIGHT HAVE ATTEMPTED TO COMMUNICATE BY TRANSMITTING MESSAGES IN THE UNIVERSAL LANGUAGE OF MATHEMATICS—PERHAPS, THROUGH A RECOGNIZABLE PATTERN LIKE A SERIES OF PRIME NUMBERS.

197. Bill Dembski

Bill Dembski

"You're not going to get that by chance. So you need complexity or improbability, lots of prime numbers…and you also need a pattern. And it has to be the right sort of pattern. It's not a pattern that you're imposing. It's a pattern that's there objectively."

198. Telescopes/ galaxies

Narration

TO DATE, SETI RESEARCH HAS FAILED TO DETECT ANY PATTERN OR INFORMATION THAT WOULD INDICATE INTELLIGENCE IN A DISTANT GALAXY…

199. Cell interiors

Narration

…BUT IN ANOTHER UNIVERSE, MUCH CLOSER TO HOME, SCIENTISTS HAVE DISCOVERED A WEALTH OF INFORMATION WITHIN THE NUCLEUS OF THE LIVING CELL.

200. Paul Nelson

Paul Nelson

"DNA has a structure that is ideal for carrying information. In the A's, C's, T's and G's—the bases of the double helix of DNA—is the potential for storing a tremendous amount of information."

201.

Narration

THERE IS, IN FACT, NO ENTITY IN THE KNOWN UNIVERSE THAT STORES AND PROCESSES MORE INFORMATION MORE EFFICIENTLY THAN THE DNA MOLECULE.

202. DNA strand

A FULL COMPLEMENT OF HUMAN DNA HAS THREE BILLION INDIVIDUAL CHARACTERS.

203. Genome printout/ DNA animation

Narration

ANALYSIS OF THE DNA MOLECULE'S CODING REGIONS SHOW THAT THE ITS CHEMICAL CHARACTERS HAVE A SPECIFIC ARRANGEMENT THAT ALLOWS THEM TO CONVEY DETAILED INSTRUCTIONS OR INFORMATION…MUCH LIKE LETTERS IN A MEANINGFUL SENTENCE OR BINARY DIGITS IN A COMPUTER CODE.

204. Steve Meyer

Steve Meyer

"Bill Gates has said that DNA is like a computer program only much more complex than any we've been able to devise. And if you reflect on that, for even a minute, it's a highly suggestive observation. Because we know that Bill Gates does not employ wind and erosion and random number generators to generate software. Rather, he employs intelligent engineers. Software engineers. So, everything we know tells us that information-rich systems arise from intelligent design—

205.

Steve Meyer

"But, what do we make of the fact that there is information in life? In every living cell of every living organism? That's the fundamental mystery. Where does that information come from?"

206. Steve Meyer in classroom

Narration

FOR THE PAST 15 YEARS, PHILOSOPHER AND SCIENTIST, STEPHEN MEYER HAS WORKED TO ANSWER THIS QUESTION.

MEYER HAS DEVELOPED AN ARGUMENT TO DEMONSTRATE THAT INTELLIGENT DESIGN PROVIDES THE BEST EXPLANATION FOR THE ORIGIN OF INFORMATION NECESSARY TO BUILD THE FIRST LIVING CELL.

207. Steve Meyer

Steve Meyer

"It's part of our knowledge base that intelligent agents can produce information-rich systems… so the argument is not based on what we don't know, but its based on what we do know about the cause and effect structure of the world."

208. Steve Meyer

Steve Meyer

"We know, at present, there is no materialistic explanation, no natural cause that produces information. Not natural selection, not self- organizational processes, not pure chance. But we do know of a cause that is capable of producing information and that is intelligence. And so when people infer design from the presence of information in DNA, they're effectively making what's called (in the historical sciences) an inference to the best explanation."

209. Steve Meyer on camera

Steve Meyer

"So when we find an information-rich system in the cell, in the DNA molecule specifically, we can infer that intelligence played a role in the origin of that system, even if we weren't there to observe the system coming into existence."

210. Pajaro Dunes

Narration

MEYER'S WORK ON THE ORIGIN OF GENETIC INFORMATION, IS NOW PART OF A COMPREHENSIVE SCIENTIFIC CASE FOR DESIGN THAT GREW OUT OF A MEETING OF SCIENTISTS AND PHILOSOPHERS ON THE CENTRAL COAST OF CALIFORNIA, IN 1993.

211. Scientists

THEIR OBJECTIVE WAS TO REASSESS AN IDEA THAT HAD DOMINATED BIOLOGY FOR MORE THAN A CENTURY. IN THE PROCESS, THEY GAVE BIRTH TO A THEORY THAT HAS BECOME KNOWN AS "INTELLIGENT DESIGN."

212. Paul Nelson/ wildlife

Paul Nelson

"To me, the great promise of design is that it gives us a new tool and explanation that belongs in the tool chest of science. Intelligent causes are real. They leave evidence of their existence. And a healthy science is a science that seeks the truth and lets the evidence speak for itself."

213. Phil Johnson

Phil Johnson

"The argument for intelligent design is based upon observation of the facts. Now that's my definition of good science. It's observation of the facts. And when you observe the facts, as Michael Behe has done, you observe this incredible pattern of interrelated complexity…

214. Mike Behe

Mike Behe

And the way we conclude intelligent design for the bacterial flagellum is the same way we conclude intelligent design for an outboard motor. When we see an outboard motor, we see the parts interact, and so on, we know that somebody made that. The reasoning is the same for biological machines, so the idea of design is a completely scientific one. Certainly, it might have religious implications, but it does not depend on religious premises."

215. Jonathan Wells

Jonathan Wells

"When I look at the evidence objectively, without ruling out the possibility of design…design just leaps up as the most likely explanation. And that's why I believe that it's true."

216. Scott Minnich

Scott Minnich

"…I think design is back on the table. We can't explain these systems by natural law and if we're searching for truth and they are in fact designed if we have to be design engineers to understand them, then I say, "What's the problem?" You know you go where the data leads you and the implications, yeah, they have profound metaphysical implications, but so be it."

217. Paul Nelson/ wildlife

Paul Nelson

"So, It's a powerful idea that the universe is rational and comprehensible, underwritten by a supreme intelligence that meant for this world to be understood, is something that underwrites the program of science because then you can look at the world and the world will make sense.

If it's all just a chaotic assemblage then there's no reason to expect any rationality out there. But, if it in fact, it's the product of a mind …then you can go out and science becomes this enormous, wonderful puzzle solving project in which you can expect to find rationality and beauty and comprehensibility, right at the foundation of things."

218.

Narration

150 YEARS AGO, CHARLES DARWIN TRANSFORMED SCIENCE WITH HIS THEORY OF NATURAL SELECTION. TODAY, THAT THEORY FACES A FORMIDABLE CHALLENGE.

INTELLIGENT DESIGN HAS SPARKED BOTH DISCOVERY AND INTENSE DEBATE OVER THE ORIGIN OF LIFE ON EARTH.

219. Recap montage of scientists

AND, FOR A GROWING NUMBER OF SCIENTISTS, IT REPRESENTS A PARADIGM. AN IDEA WITH THE POWER TO –ONCE AGAIN— REDEFINE THE FOUNDATIONS OF SCIENTIFIC THOUGHT.

218. Steve Meyer

Steve Meyer

"During the 19th century, scientists believed that there were two foundational entities—matter and energy. But as we begin the 21st century, there's a third fundamental entity that science has had to recognize, and that is information.

219. DNA animation

Steve Meyer

"And, so as we encounter the biology of the information age, the suspicion is growing that what we're seeing in the DNA molecule is actually an artifact of mind. An artifact of intelligence. Something that can only be explained by intelligent design."

220. DNA animation/ "Unlocking the Mystery of Life"

221. Credit roll