**Origins 101--12**

**Data, Interpretation, and Evaluating Scientific Claims**

Script

1. Origins 101—Data, Interpretation, and Evaluating Scientific Claims
2. We’ve talked a lot about data and interpretation so far. / In this presentation, we will define them, give examples, and practice telling the difference between them. / We will also compare the effects of worldviews on interpretation, / differentiate between appropriate and inappropriate conclusions from data, / and learn some suggestions for how to evaluate the claims of science.
3. Let’s start with some definitions. / Data are facts or pieces of information. / The word datum is singular and would refer to just one fact. / Data is usually considered to be plural—referring to multiple facts or pieces of information. / But sometimes it is used as a singular collective noun—referring to a body of facts or information
4. We get data from things we observe and things we measure or quantify in some way.
5. We can observe the colors on this frog
6. Or that the stripes go different directions on this zebra.
7. We can observe that the Mississippi River flows toward the Gulf of Mexico…
8. …that the leaves of non-evergreen trees turn colors in the fall…
9. ….and that *Dimetrodon* fossils are found in the Permian layers.
10. We can measure things like the height of a Sequoia tree / or the distance around a tree trunk.
11. We can measure the length of an acorn,
12. The number of times a hummingbird’s wings beat per second,
13. And how many leaves are on a poison ivy plant
14. An interpretation is a conclusion we draw about the data. / It may deal with how or why something happens--
15. Like how leaves turn color in the fall,
16. Why one tree is taller than another,
17. Or why hummingbird wings beat faster than eagles’ wings.
18. The scientific process is all about gathering data and interpreting data.
19. Data is important at two places in the scientific process—/ the data you notice to begin with, / and the data you gather as you experiment. / Interpretations are important at two places as well. / The hypothesis you make is kind of like a preliminary interpretation, / and the conclusions you draw at the end are interpretations.
20. Interpretations can be right / or they can be wrong.
21. And sometimes different interpretations are mutually exclusive—which means that they both can’t be true at the same time.
22. Interpretations are affected by the worldview of the scientist who makes them.
23. Your worldview is like a lens through which you view your world. It colors the way you think about all kinds of things—including life’s most important questions / like where did I come from? / Or How can I know what is true?
24. Let’s define two worldviews that we will be talking a lot about. / Naturalism is a worldview that believes nature is all that exists and uses the scientific method to investigate reality. / A biblical worldview believes that reality includes both the natural and the supernatural, and looks to the Bible for ultimate truth.
25. Both of these worldviews value science and look for natural explanations about reality / by gathering data through our senses.
26. But a biblical worldview will also consider the possibility of divine intervention—/ naturalism will not.
27. Let’s take a look at the way these worldviews affect the interpretation of scientific data/ Lots of animals have the same pattern of bone structure in their forearms. / This is data that can be observed by anyone.
28. Scientists with different worldviews look at the same data but arrive at different interpretations of the data. / A scientist with a naturalistic worldview will conclude that all these animals have the same pattern of bone structure because they evolved from a common ancestor. / But a scientist with a biblical worldview will conclude that God efficiently used an effective design in multiple animals.
29. A variety of trilobites are found throughout the Paleozoic layers. / Their presence in these layers and their absence from the layers above is observable data.
30. Scientists from both worldviews conclude that trilobites were living creatures that died and were fossilized.
31. But scientists from different worldviews have different ideas about where the trilobites came from to begin with. / A scientist with a naturalistic worldview would say that trilobites evolved early in the history of life, / but a scientist with a biblical worldview would say that trilobites were created.
32. Scientists from different worldviews have different ideas about what kind of catastrophic events caused the trilobites to become extinct.
33. Can you tell which of these statements represents data and which is an interpretation? / Dinosaur fossils appear in the Mesozoic layers. / Dinosaurs did not exist until after the Permian layers were deposited.
34. The location of dinosaur fossils in certain layers is observable data. / Using their relative location to draw conclusions about when they existed is interpretation.
35. Listen to each of these statements and decide whether you think it is data or interpretation. Pause the video if you need more time to think about it. (Read each statement)
36. The two statements in yellow are data. The fact that dinosaur bones are only found in the Mesozoic layers—not below the Triassic or above the Cretaceous in the Cenozoic—is data. It can be verified by anyone who does the research. The other three statements about what happened to the dinosaurs are not things that can be verified by observation or experimentation. They are interpretations of the data that are derived from implications of the respective worldviews.
37. As you listen to another set of statements, see if you can differentiate the data from the interpretations. (read the statements) Pause the video if you need more time to think about your answers.
38. The fact that birds have feathers is observable data that can be easily verified.
39. The fossil evidence indicates that certain creatures with dinosaurian skeletons also had feathers, so this is data as well.
40. The claim that dinosaurs evolved into birds is an interpretation of that data just mentioned showing that some fossils with dinosaurian skeletons also have feathers
41. The idea that God created both birds and some dinosaurs with feathers is also an interpretation of data. Both of these interpretations are influenced by the worldviews of the scientists who make them. Remember that interpretations can be true or they can be false. And sometimes—like in this case—interpretations can be mutually exclusive. Dinosaurs cannot have both evolved from birds AND been created by God with feathers.
42. This last statement is also an interpretation, that suggests *why* dinosaurs might have benefited from having feathers. It is not directly observable but would be based on a combination of several kinds of evidence.
43. Some interpretations are more specific than others. / The more detailed an interpretation, the more data is needed to support it
44. Take these ammonite fossils or this T-rex skeleton for example. Their placement in the fossil record is data.
45. A fairly simple interpretation of the data is that these creatures used to be alive, died, and became fossilized. / A more specific claim would be that these creatures died because of a meteorite strike / or because of Noah’s flood. More data would be needed to support these more specific claims.
46. The location of these fossils in the layers of the geologic column is data.
47. That the trilobite fossil from the Paleozoic was buried before the *Smilodon* in the Cenozoic is a fairly simple interpretation of the data based on the principle of superposition. / The idea that the trilobite was buried weeks before the *Smilodon* is a more specific interpretation, / as is the idea that it was buried millions of years before.
48. It takes more evidence to substantiate interpretations that include specific amounts of time than it does to support the simple claim that the trilobite was buried first.
49. We need to be careful not to make interpretations that are not justified by the data.
50. Look at these boulders for example. Their size and position are data. Depending on the data, an appropriate interpretation may be that they appear to have been deposited there by fast-flowing water. But to conclude that they were definitely deposited there by Noah’s Flood would be a conjecture not justified by the data.
51. Paleontologists have discovered some soft tissue—like blood vessels and bone cells—in fossilized dinosaur bones. / That is data. / Which interpretation best fits this particular piece of evidence? / That dinosaurs died in the flood? / or that dinosaur bones are thousands rather than millions of years old?
52. Since we wouldn’t expect soft tissue to be preserved for millions of years, a reasonable interpretation of this data would be that dinosaur bones are only thousands rather than millions of years old. Without any additional evidence, speculating on how the dinosaur died goes beyond this particular data.
53. Let’s look at one final example. Dr. Leonard Brand studied fossil trackways in the Coconino Sandstone of the Grand Canyon. The traditional interpretation of the trackways was that they had been made on desert sand dunes. Dr. Brand performed some laboratory experiments to see whether the trackways were most like tracks made on dry sand, moist sand, or wet sand. Which of these conclusions is inappropriate because it goes beyond the data?
54. Dr. Brand’s results did, in fact, show that the trackways were most like the tracks made underwater in his experiments, so this conclusion is appropriate. Without additional evidence, though, it would be inappropriate to conclude that the animals who made these tracks were definitely trying to escape during Noah’s Flood.
55. Let this black rectangle represent the data we have just looked at—the boulder, soft tissue in the dinosaur bone, and the fossil trackways. / Then let this oval represent the reasonable, appropriate interpretations we have suggested to explain the data. / Let this larger rectangle represent other interpretations that go beyond the data. While it may actually be true that the boulder was deposited, the dinosaur was killed, and the trackways were deposited during the flood, we need to be careful not to jump to that conclusion without enough data to support it. If we do, we can damage the reputation of creationists by giving the impression that we are not careful scientists.
56. The more data that is explained by an interpretation, the more confidence we may have in the interpretation.
57. Another important thing to remember when we talk about interpretations of data is that scientists avoid using the word proof. Scientists really don’t prove things. They gather evidence but are always open to the possibility that new evidence will change their previous conclusions.
58. So when we are talking about scientific evidence, it is better to say that the evidence is consistent with creation or the flood, rather than that the evidence *proves* something.
59. This doesn’t mean we are any less confident that God created the world or that there was a worldwide flood. But it does acknowledge that our belief in those things is based on more than just the scientific evidence.
60. So, how should we evaluate scientific claims? / The first step is to distinguish between the data and interpretation. / Let’s say you see a story on the news about the discovery of a dinosaur fossil with the imprint of a feather, / and the scientist being interviewed states that dinosaurs evolved into birds. / Being able to recognize that the presence of the feather imprint in the fossil is the data / and the claim about dinosaurs evolving into birds is an interpretation of that data that requires additional evidence is a really good start.
61. Next, evaluate how extensive the interpretation is. / Let’s say the claim is about a certain fossil. / Is the claim something simple like “this fossil was buried first, before the fossils in a higher layer” / or does it make a more extensive claim like how the fossil was buried / or when it was buried? / If it’s more specific or extensive, is there enough other evidence to support it?
62. Be aware of the worldview that probably affected the interpretation, but remember: / Evolutionists are not always wrong, / and creationists are not always right.
63. Ask yourself whether the interpretation conflicts with any other evidence. / This could include scientific data or other evidence from the Bible. / If the interpretation does conflict with any other evidence, what other interpretations are possible?
64. Sometimes evaluating scientific claims will leave you with unanswered questions, but that’s okay. For ideas about how to handle them, watch our next presentation.