

Reading Guide 9

Complex adaptations

This week, we ask whether natural selection can construct complex adaptations. This is the first of several weeks we will spend on the topic. In recent decades, opponents of evolution have devised new labels for this subject, including *irreducible complexity*, and *specified complexity*. We'll cover these newer manifestations in the coming weeks. In the current week, we cover the debate from the 1860s through the 1930s.

9.1 Charles Pritchard [1866]

Charles Pritchard ran the school to which Charles Darwin sent his sons. The two men knew each other well and seem to have respected each other. Pritchard had expertise in mathematics, astronomy, and botany; and he taught these subjects to the young Darwins. Later in life, he was elected the Saluvian Professor of Astronomy at the University of Oxford. Pritchard was also quite religious, and in 1866 was asked to deliver a sermon at the annual meeting of the British Association. In the published version of this sermon, Pritchard included an appendix attacking Darwin's *Origin of Species*. Today's assignment is from this appendix.

1. Why, in Pritchard's view, is it impossible for the vertebrate eye to evolve by natural selection?
2. Rephrase this argument in general terms.
3. Pritchard argues that constructing a vertebrate eye by natural selection would involve an event of very low probability. What event is he talking about? I'm not asking about his metaphor, involving words shaken out of a hat. I'm asking about the biological meaning of this metaphor.
4. Comment on Pritchard's argument that, without divine guidance, evolutionary changes would be unlikely to move always toward the state represented by the human eye.

9.2 Joseph John Murphy [1866]

Murphy (1827–1894) was a Belfast businessman, who wrote several books. He was twice president of the Belfast Natural History and Philosophical Society. His orientation was secular, as the following quote suggests:

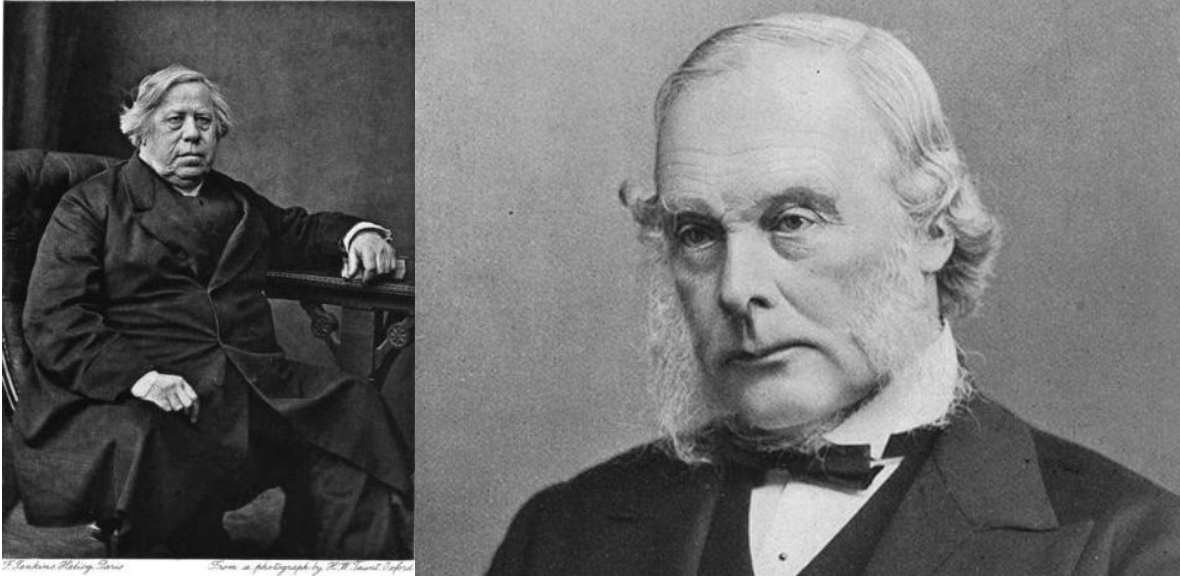


Figure 9.1: Charles Pritchard (left) and Joseph John Murphy (right)

The things of science and the things of faith ‘have no point of contact, and have absolutely nothing to do with each other.’

Murphy accepted parts of Darwin’s theory, but certainly not all of it. The assigned reading was his presidential address to the Natural History and Philosophy Society. He delivered this address just a few months after Pritchard’s sermon.

1. Which parts of Darwin’s theory does Murphy accept?
2. Why, in Murphy’s view, is it impossible for the vertebrate eye to evolve by natural selection?
3. How does Murphy calculate the probability that mutation will improve a complex character, such as the vertebrate eye?
4. What (if anything) is the difference between the arguments of Pritchard and Murphy about evolution of complex adaptations?

9.3 Darwin on complex adaptations

1. How can natural selection produce complex adaptations?

Darwin discusses this issue under the heading “On the origin and transition of organic beings with peculiar habits and structure.” The argument about complexity was made by several of the anti-evolutionists you have read in this course. In this section, Darwin responds. What is his response? What are its strengths? Its weaknesses? Imagine yourself reading it in the 19th century. Would you have been convinced?

2. What is the point of Darwin’s argument that organs can change function?

3. What is the point of his argument that some animals—such as web-footed geese who do not swim—have adaptations not suited to their way of life?
4. Darwin discusses several adaptations that are shared by distantly-related animals. For example: the electric organs of fish and the camera-like eye shared by cuttlefish (squids) and vertebrates. What point is he making here?
5. He also discusses related animals (snails) that use very different organs to breathe air. What is his point? How does this support his theory?
6. Imperfection. Why does Darwin expect natural selection to produce imperfect adaptations?

9.4 Douglas Dewar [1931, ch. 7 & pp. 83–86]

This reading shows us the argument from complexity in the 1930s. This is 60 years after the authors we have just discussed, so be alert for changes in what is argued and what is assumed.

In the assigned reading, Dewar argues that several proposed evolutionary changes would have intermediate stages that were maladaptive. Pages 83–86 emphasize that this problem is most acute for complex organs with interacting parts, and also for complementary adaptations in separate individuals.

1. Compare and contrast Dewar’s argument with those of Pritchard [1866], Murphy [1866], and Jenkin [1973, p. 319]. In other words, express each argument in general terms and identify any differences between them. What progress has been made on this issue since 1870?
2. Evaluate Dewar’s argument against the response that Darwin [1872, pp. 146–148, p. 165] made to Pritchard and Murphy.

Bibliography

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Joseph John Murphy. Presidential address to the Belfast Natural History and Philosophical Society. *Northern Whig*, 19 November 1866.

Charles Pritchard. *The Continuity of the Schemes of Nature and of Revelation. A Sermon Preached, by Request, on the Occasion of the Meeting of the British Association at Nottingham. With Remarks on some Relations of Modern Knowledge to Theology*. Bell and Daldy, London, 1866.