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Kinds of Science and Exploring the Past

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Abstract

"Working alongside experimental and observational work, historical science helps us continue to learn the unfolding story of how a beautiful universe, created by a loving God, came to be as we see it today."

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If asked to imagine a scientist, most of us will likely picture somebody wearing a white lab coat and safety glasses, leaning over an experiment in a lab. This is indeed a pretty good representation what *some* scientists do, yet we also recognize that scientific activity often takes different forms that go beyond the stereotypical image of the "scientific method" in action. This is especially true for areas of scientific research that simply cannot be reduced to a laboratory experiment, such as when studying large or distant objects, the behavior of individual objects or populations within their environmental context, or natural events that have taken place in the distant past.

Given these different ways to study creation, it is sometimes helpful to place them into categories. For example, in their book Origins, Haarsma & Haarsma[1] identify *experimental, observational*, and *historical* science, while recognizing that all three approaches play an important role throughout all fields of science. However, others have made the claim that *only* experimental and observational (or "operational") science is valid, with some groups going so far as to claim that historical science—any scientific study of events that occurred in the past—can provide *no* meaningful conclusions in the absence of "eyewitness" accounts.[2]

But is this really the case? Is historical science inherently inferior to observational science, and in particular to experimental science? Is it not possible to conduct any meaningful exploration of events that occurred in the distant past? Here I argue that so-called "historical" science is *not* inherently inferior to other scientific approaches but provides valid, valuable, and complementary contributions to the scientific study of creation.

First, we recognize that historical science is built upon the same assumptions as any other scientific activity.**3** One of the fundamental assumptions of scientific study is that there are physical cause-and-effect relationships for the natural phenomena we observe in the world,**4** and that the universe behaves in a consistent manner over time and space (cf. Gen 8:22, Ps 104, 119:89-90, Job 12:7-9, 38:33-37, Acts 14:17, Rom 1:20). Note that this assumption does not preclude the existence of supernatural phenomena, and it is important to remember that God is no less the author of the natural than the supernatural.**5** Moreover, through summer and winter, and springtime and harvest,**6** the providential reliability of creation is something we experience and rely upon in our interaction with the world every day. It is an inherent part of how we perceive the world around us.

For example, suppose hiking through a forest we encounter a fallen cottonwood tree near a stream. What conclusions might we make about what caused the tree to fall? What evidence might we look for? The same basic assumptions that support experimental and observational science also allow us piece together narrative explanations to better understand natural events that occurred in the past. Moreover, any (*noetic*) effects of sin that that impair our ability to interpret past events in creation apply to historical science no less—*but no more*—than for *any other human activity*, including observational and experimental science.**7**

Second, the stories we create about past events can be tested against any observational and experimental evidence that is available. In other words, our experiments and observations — conducted in the present — provide *constraints* on hypotheses of past phenomena. For example, from our fallen cottonwood tree, we can't come up with just *any* story imaginable**8** —the story we create about the past must be consistent with the available evidence if we are to accept it as meaningful (or "correct") in any way. In fact, without really even thinking about it, a story would quickly develop in our minds about how the tree came to be as we see it today based on the available evidence: is it cut smooth? is it scorched? numerous bite marks or shavings, or a beaver dam nearby? We'll likely even develop a reasonable estimate of the tree's age! To summarize, we can discriminate among proposed hypotheses using contemporary evidence, recognizing that our hypotheses are provisional and may be further strengthened—or weakened—by new data.

Third, because of the existence of this present-day (observational and experimental) evidence and constraints, historical science benefits from what has been called the *asymmetry of overdetermination*.**9** This means that we are typically left with more evidence of determining causes than is strictly necessary to make conclusions about some past event. To summarize this statement with a simple example: it is much harder to predict a volcanic eruption than to infer that one has already occurred! This is

because a volcanic eruption—even in the absence of human eyewitness accounts—leaves behind numerous pieces of physical evidence (so numerous in fact that we could say the event is *overdetermined*) that together provide witness(es) to the event. In addition, the exploration of such an event will invite the use many different types of scientific inquiry that may establish multiple causal relationships and refine our understanding of such natural processes.**10**

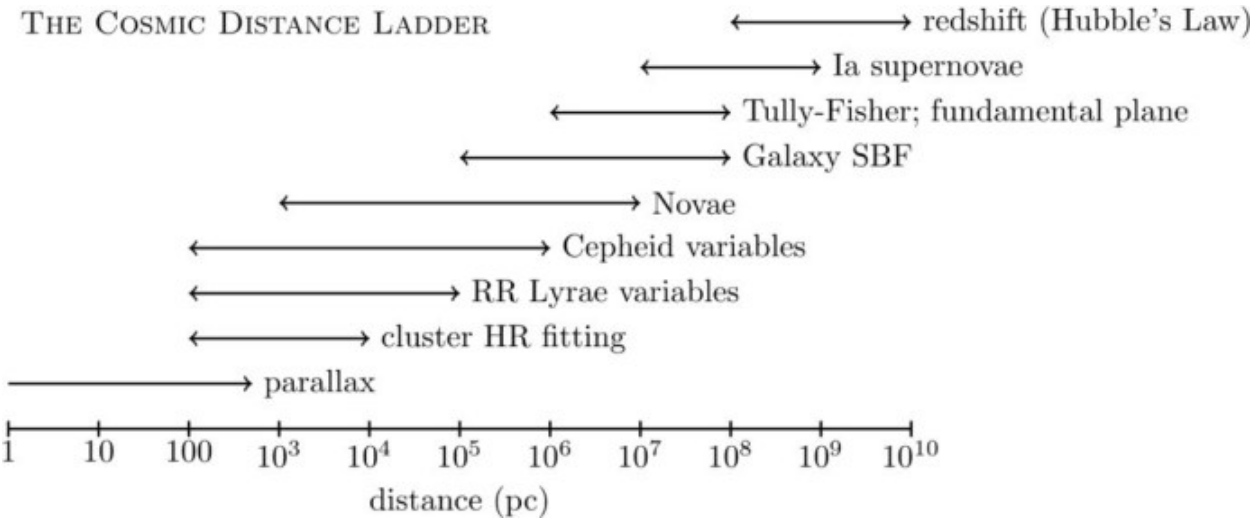

Figure 1. The cosmic distance ladder. Multiple overlapping methods can be used to determine distances to celestial objects. Because light travels at a finite velocity, these measurements provide a way of "looking into the past." Note that 1 parsec (pc) = 3.26 light-years = 19 trillion miles.

Fourth, the combined and complementary roles of different scientific approaches also help illustrate that the boundaries between observational, experimental, and historical science are often fuzzy or arbitrary, and in practice scientist typically don't articulate "kinds" or distinctions between them. This is especially evident in fields such as astronomy (see figure above) where any differences between observational and historical science break down: given the finite velocity of light, we are literally "looking into the past" every time we observe something, whether it is light from across a room (30 light-nanoseconds away),**11** Sirius (8.6 light-years way), the Andromeda Galaxy (2.5 million light-years away), or the ancient collisions of distant black holes and neutron stars.**12** In astronomy, observational science *is* historical science, where we see the past unfold before our eyes. What about the very long ages of stars, relative to the length of human observations? To address this, astronomers take advantage of the fact that we observe not just individual stars but entire populations, so we are witness to the complete stellar life cycle.

Taken together in practice, we find that all three methods continue to play an important role throughout scientific inquiry. Working alongside experimental and observational work, historical science helps us continue to learn the unfolding story of how a beautiful universe, created by a loving God, came to be as we see it today.

FOOTNOTES

1. D.B. Haarsma & L.D. Haarsma (2011) *Origins: Christian Perspectives on Creation, Evolution, and Intelligent Design*, Faith Alive, 2nd ed.
2. For example, Young-Earth Creationist (YEC) groups such as *Answers in Genesis* assert that there are *two* basic kinds of science: operational and historical, and that *only* operational science is valid. For a summary of their argument, see **https://answersingenesis.org/what-is-science/two-kinds-of-science/**. I assert that their approach is inaccurate and ahistorical, and that it produces unnecessary conflict in our understanding of the relationship between Scripture and Creation.
3. Including the same reliance upon networks of inferential assumptions outside of our immediate perception (for example, the atomic and subatomic structure of matter, or the behavior of nuclear reactions in the interiors of distant stars).
4. This also helps define the bounds of what can be determined by scientific inquiry in a *methodological* approach and is thus distinguished from the unbounded claims of *philosophical* (or *ontological*) naturalism. Note that one way in which experimental science is unique is that it often conducted to *eliminate* possible causes for observed phenomena.
5. Embracing this truth of God's work of the natural world, we recognize that there is no such thing as "mundane" in creation. As noted by Henry Drummond in 1893: "The doings of these things may seem to us no miracle, nevertheless it is a miracle that they have been done."
6. *Great is Thy Faithfulness* (1923) Thomas Chisolm
7. Or even our interpretation of Scripture itself: for a much more comprehensive discussion about the unity of knowledge and the relationship between general revelation and special revelation from a Reformed perspective, see the Committee on Creation and Science, Christian Reformed Church *Acts of Synod* 1991, Report 28, pp. 367-433.
8. We would *not*, for example, infer that the tree had been shot down by aliens, or that a pack of angry squirrels had attacked it, or that it had somehow just grown that way.

9. Cleland, C (2001) Historical science, experimental science, and the scientific method, *Geology*, 29(11), 987.
10. For example, the aftermath of the Mount St. Helens eruption included a wide range of scientific activity, including analysis of the chemistry and mineralogy of the volcanic ash rock, experimental testing of the behavior of igneous materials, measuring seismic activity in an active plate subduction region, exploring the impact of ash and mudflows on local waterways, and monitoring the population behavior of fauna and flora for months and years after the eruption. For a comprehensive summary of early scientific activity investigating this event, see Lipman, P.W. and Mullineaux, D.R. (1981) *The 1980 eruptions of Mount St. Helens*, Washington, USGS Professional Paper 1250, https://pubs.er.usgs.gov/publication/pp1250. This example shows how all types of science are used in complementary ways to investigate and analyze a natural event. Moreover, the recent occurrence and extensive study of this particular eruption provides opportunities to test and refine numerous hypothesis about other past natural events that may be less well constrained by the available evidence.
11. 1 light-nanosecond is approximately 1 foot, so it takes light about 30 ns to travel across a typical classroom
12. Moreover, the detection of such merger events (e.g. see Abbott et al. 2017, Multi-messenger Observations of a Binary Neutron Star Merge, *Astrophysical Journal Letters*, 848, L12) has provided strong support for standard cosmological theories initially developed in the early 20th century by Einstein, Hubble, LeMaitre and others. Given the relationship between observational and historical science in astronomy, the growing number of LIGO detections represent interesting cases where the occurrence of such ancient past events was *predicted* and later detected: historical events confirmed by observational and experimental work.