

Lecture 23

Bacon on Crucial Instances

Patrick Maher

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What Bacon planned to do next [21]

The Tables of First Presentation and the Rejection or process of Exclusion being completed, and also the First Vintage being made thereupon, we are to proceed to the other helps of the understanding in the Interpretation of Nature and true and perfect Induction . . .

I propose to treat, then, in the first place, of Prerogative Instances; secondly, of the Supports of Induction; thirdly, of the Rectification of Induction [and six other things].

What he actually did

Bacon's discussion of prerogative instances goes to Aphorism 51. In Aphorism 52 he wrote:

Now I must proceed to the supports and rectifications of induction, and then to concretes, and Latent Processes, and Latent Configurations, and the rest, as set forth in order in the twenty-first Aphorism; that at length (like an honest and faithful guardian) I may hand over to men their fortunes, now their understanding is emancipated and come as it were of age; whence there cannot but follow an improvement in man's estate and an enlargement of his power over nature.

But after a few more words of inspiration, the book ends.

What I'll do

- Bacon's discussion of prerogative instances is long (39,000 words). He describes 27 kinds of prerogative instance; they are a very diverse collection.
- In this lecture I'll talk about one kind of prerogative instance, called *crucial instances*. They are the 14th kind Bacon discusses.
- Bacon gives this kind a longer discussion than most and subsequent philosophers have referred to it more often than to the others.

Among Prerogative Instances I will put in the fourteenth place Crucial Instances, borrowing the term from the crosses [signposts] which are set up where roads part, to indicate the several directions . . . I explain them thus. When in the investigation of any nature the understanding is so balanced as to be uncertain to which of two or more natures the cause of the nature in question should be assigned on account of the frequent and ordinary concurrence of many natures, crucial instances show the union of one of the natures with the nature in question to be sure and indissoluble, of the other to be varied and separable; and thus the question is decided, and the former nature is admitted as the cause, while the latter is dismissed and rejected.

The translation on the web calls them *Instances of the Fingerpost*, but Bacon's Latin term is *Instantias Crucis*, and they are usually called *crucial instances*, so I altered the translation here.

The alternatives and their consequences

Let the nature in question be weight or heaviness. Here the road will branch into two, thus. It must needs be that heavy and weighty bodies either tend of their own nature to the center of the earth, by reason of their proper configuration; or else that they are attracted by the mass and body of earth itself as by the congregation of kindred substances, and move to it by sympathy. If the latter of these be the cause, it follows that the nearer heavy bodies approach to the earth, the more rapid and violent is their motion to it; and that the further they are from the earth, the feebler and more tardy is their motion (as is the case with magnetic attraction).

Bacon's crucial instance

With regard to this, then, the following would be a crucial instance. Take a clock moved by leaden weights, and another moved by the compression of an iron spring. Let them be exactly adjusted, that one go not faster or slower than the other. Then place the clock moving by weights on the top of a very high steeple, keeping the other down below, and observe carefully whether the clock on the steeple goes more slowly than it did on account of the diminished virtue of its weights. Repeat the experiment in the bottom of a mine, sunk to a great depth below the ground; that is, observe whether the clock so placed does not go faster than it did on account of the increased virtue of its weights. If the virtue of the weights is found to be diminished on the steeple and increased in the mine, we may take the attraction of the mass of the earth as the cause of weight.

Critique

- Bacon's instance, if it was observed, would definitely show that weight decreases as distance from Earth increases.
- Bacon assumed:
 - If weight is due to attraction by the Earth then it will increase as the body gets closer to the Earth.
 - If weight is due to the nature of the body then it won't change as the body gets closer to the Earth.
- Both assumptions were plausible but not proved true.
 - Attraction need not increase as distance decreases, e.g., pulling something on a rope.
 - A body going to the center by its own nature could do so with greater force as the distance diminishes.
- A crucial instance must conclusively decide between the alternatives. Since Bacon's assumptions hadn't been proved, his instance doesn't do that.

The alternatives

Let the nature investigated be the polarity of the iron needle when touched with the magnet. With regard to this nature the road will branch into two, thus. Either the touch of the magnet of itself invests the iron with polarity to the north and south; or it simply excites and prepares the iron, while the actual motion is communicated by the presence of the earth, as Gilbert thinks, and labors so strenuously to prove.

To see the difference, suppose we move the Earth's axis so it no longer points to Polaris.

- If the first hypothesis is right, a magnetized needle would still point towards Polaris.
- If the second hypothesis is right, a magnetized needle would not point towards Polaris.

Bacon's crucial instance

Now with regard to this question a crucial instance would be the following. Take a magnetic globe and mark its poles; and set the poles of the globe toward the east and west, not toward the north and south, and let them remain so. Then place at the top an untouched iron needle, and allow it to remain in this position for six or seven days. The needle while over the magnet (for on this point there is no dispute) will leave the poles of the earth and turn toward the poles of the magnet; and therefore, as long as it remains thus, it points east and west. Now if it be found that the needle, on being removed from the magnet and placed on a pivot, either starts off at once to the north and south, or gradually turns in that direction, then the presence of the earth must be admitted as the cause; but if it either points as before east and west, or loses its polarity, this cause must be regarded as questionable, and further inquiry must be made.

Critique

- On both stated alternatives, the needle will point north-south when placed on the pivot.

Either the touch of the magnet of itself invests the iron with polarity to the north and south; or it simply excites and prepares the iron, while the actual motion is communicated by the presence of the earth.

So this isn't a crucial instance between those alternatives.

- Bacon's instance would decide between:
 - Magnetization causes the needle to point north-south (for whatever reason).
 - Magnetization causes the needle to point in the direction the magnet's poles were in at the time of magnetization.

But the second hypothesis is obviously false, since needles have been magnetized many times without orienting the magnet north-south, and these needles always point north-south.

- 1 What does Bacon mean by a “crucial instance”?
- 2 What does Bacon propose as a crucial instance for deciding whether heavy objects (a) go to the center of the earth by their own nature, or (b) are attracted by the earth? Is Bacon’s proposal really a crucial instance for these hypotheses? Explain.
- 3 What does Bacon propose as a crucial instance for deciding whether touching an iron needle by a magnet (a) itself gives the needle a tendency to point north-south, or (b) only prepares the iron and it is the earth that turns the needle north-south? Is Bacon’s proposal really a crucial instance for these hypotheses? Explain.



Francis Bacon.

Novum Organum.

London, 1620.

[English translation on the web](#); quotations are from this.

Numbers in brackets are aphorism numbers from Book II.