Casting Doubt on Ptolemy

The Crime of Claudius Ptolemy. ROBERT R. NEWTON. Johns Hopkins University Press, Baltimore, 1977. xvi, 412 pp., illus. $22.50.

Ptolemy is commonly considered one of the outstanding scientists of antiquity. His most famous work, the *Syntaxis Mathematike*, better known as the *Almagest*, is seen as a model of clear exposition in which each result is derived from a set of stated observations by rigorous mathematical procedures that are carefully described. This view has been challenged by a number of post-Renaissance scientists, most recently by R. R. Newton. In *The Crime of Claudius Ptolemy*, the latest in a series of studies, Newton asserts that Ptolemy fabricated *all* his own observations to fit a predetermined theory; that is, that the observations were made up to agree with the numerical tables, rather than that the tables were based on the observations as Ptolemy asserted. Moreover, Newton concludes: "His work is [also] riddled with theoretical errors and failures of comprehension. . . . The *Syntaxis* has done more damage to astronomy than any other work ever written, and astronomy would be better off if it had never existed" (pp. 378–379).

Unfortunately, Newton's arguments in support of these charges are marred by all manner of distortions, misunderstandings, and excesses of rhetoric due to an intensely polemical style. Those who denigrate Ptolemy typically claim that he "borrowed" his results from Hipparchus. The evidence is almost always taken from the *Almagest*, which is the largest repository of information about Hipparchus, whose major works are all lost. So, for example, Newton argues that Ptolemy's value for E (the maximum lunar equation) came from Hipparchus. In support of this he refers to Ptolemy's remark that he used the same method as Hipparchus to find this parameter. There is, however, overwhelming evidence that Hipparchus had values for E that differ significantly from Ptolemy's value, and the evidence is from Pappus citing lost works of Hipparchus as well as from Ptolemy (*1*). Moreover, the method is probably due to Apollonius, who preceded Hipparchus (*2*). If anything, recent studies have shown that Ptolemy overpraises Hipparchus, the great "seeker of truth," and we now know that many Hipparchian parameters derive from the Babylonians (see, for example, *3*).

Newton's misunderstanding of the recent secondary literature can be illustrated by his treatment of Ptolemy's procedure for finding the obliquity of the ecliptic (the angle between the celestial equator and the ecliptic) from noon altitudes of the sun. Britton (*4*) showed that with the instrument Ptolemy described he could not take the measurement at noon because at that time the graduated arc would be entering the shadow cast by the instrument. If, as is most likely, he took the observations about half an hour before noon and extrapolated the noon altitude from the observed altitude, he would get the results he claims to have obtained, and not the correct value. The reason is that a subtle error (not even mentioned by Newton) enters the extrapolation that remained unnoticed from antiquity through modern times. By no stretch of the imagination can one say that Britton was arguing that Ptolemy made an error of half an hour in determining noon (Newton, p. 100, and a news report in *Science* [*5*] notwithstanding).

On his own account the strongest argument for Newton's case is that Ptolemy's observations of the equinoxes agree with Hipparchus's solar model very closely but differ from modern recomputation by about a day, from which Newton concludes that the data were fabricated: "Whatever assumptions [the reader] makes, he cannot explain the errors in Ptolemy's times by the hypothesis that they were obtained from observation" (p. 92). First, Ptolemy gives full credit to Hipparchus for his solar model (though the tables in the *Almagest* may not be in the form that Hipparchus used). Second, the errors in the observations and their agreement with Hipparchus are not in doubt. But how did Ptolemy proceed? He was prepared to make his observations at the times predicted by Hipparchus's theory, and when he failed to come up with better results he kept his predecessor's theory. Ptolemy described the difficulties with these observations that may even lead to multiple apparent equinoxes, and other problems have been noted by Britton (*6*; cited by Newton, p. 93). For example, Ptolemy does not consider the effects of atmospheric refraction, which Britton shows cannot be neglected (and which Newton neglects). But this brings up another point. Ptolemy presents the solar theory before his lunar, stellar, and planetary theories because the solar theory is invoked in all of them. Indeed, it is probable that the success of his lunar theory was taken by him as confirming evidence for his solar theory. But even the *observations* depend on the solar theory, and his planetary observations began in A.D. 127, well before his solar observations. His research program was surely to assume that Hipparchus's solar theory was correct in order to use it to deal with the hitherto unsolved problems of planetary motion. To reject this solar theory at the end of his research would have meant rewriting the entire book and perhaps redoing many of the observations. Having published all the necessary procedures, Ptolemy preferred to indicate the difficulties and to leave it to his successors to come up with better solutions.

Finally, it has long been known that many of Ptolemy's planetary and lunar parameters are more accurate than his observations. But to posit unknown predecessors as does Newton (p. 367) is a move of desperation. Indeed, Ptolemy tells us that he had more observations at his disposal than he cites (*Almagest* IX, 2), and this suggests that those displayed were chosen for their agreement with a theory that in some sense derives from the larger body of observations. There are a number of ways to pursue this line of research, but Newton's work does not point us in that direction.

BERNARD R. GOLDSTEIN
Department of History and Philosophy of Science, University of Pittsburgh, Pittsburgh, Pennsylvania 15260

References

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Persons and Situations

Personality at the Crossroads. Current Issues in Interactional Psychology. Papers from a symposium, Stockholm, June 1975. DAVID MAGNUSSON and NORMAN S. ENDLER, Eds. Erlbaum, Hillsdale, N.J., 1977 (distributor, Halsted [Wiley], New York). x, 454 pp. $24.95.

One assumption behind much personality theorizing has been that people can be meaningfully described in terms of characteristics such as friendliness or honesty or persistence. To have utility for psychologists this view requires that there be reasonable consistency in these behaviors across a range of relevant situations. That there is such consistency is compellingly self-evident. Unfortunately it has not been demonstrated in research; instead the importance of situational fac-