when the claims are not true. Judge Grossman made the following comment during the aforementioned FERC hearing that I believe is relevant here.

> I suppose it is a syndrome that this country seems to have suffered from for some time popularly known as the 'Watergate Syndrome,' where there is leveled upon everyone regardless of what is being done, tremendous suspicion, especially anybody in the business or industrial community.
>
> There is cast upon those who come forward and say I am going public with something that my employer doesn't want me to tell anybody, a halo, a presumption of holiness. The person doing that must be right or else he would not do it. And anybody who suggests that he is not right must be wrong. You are dealing with a firm in which we do not even know whether a problem even exists in its whole history, or even contemplated that an employee might go away with documents that firm might consider proprietary or privileged or even if they considered the possibility of this hearing, nobody has yet asked Dr. Lawler about this. Nobody seems to care. What you are trying to do is set up a security system that perhaps would be appropriate for a strategic defense department site and implying that LMS should have had such a system and foreseen that an employee was going to try to walk off with something. I do not find that credible.

In the interest of an objective evaluation of the workability of employee protection laws, we deserve this opportunity to respond.

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Galileo as a Scientist

The points I tried to make in my reply (Letters, 1 Aug. 1980, p. 544) to Whitaker (2 May, p. 446) were "unsupported" (Whitaker's letter of 10 Oct., p. 136), that is, unencumbered by footnotes, because I assumed that Whitaker was familiar with the underlying facts. This, apparently, is not the case. Let me therefore elaborate.

1) I admit that the copperplates of Galileo's drawings of the moon are more accurate, from the point of view of present-day knowledge, than the woodcuts, and those of my arguments which proceed from the latter are therefore rendered invalid—with a proviso to be spelled out in point 3 below.

2) However, not all troublesome aspects of Galileo's observations of the moon are thereby removed. For example, Galileo asks (*1*), "Why don't we see unevenness, roughness and waviness in the waxing moon's outermost periphery which faces west, in the waning

moon's other semicircular edge which faces east and in the full moon's entire circumference? Why do they appear perfectly round and circular?" Kepler wrote (*2*) (on the basis of naked-eye observations): "If you look carefully at the moon when it is full, it seems perceptibly to be lacking in roundness," and he answers Galileo's question by saying (*3*): "I do not know how carefully you have thought about this subject or whether your query, as is more likely, is based on the popular impression. For . . . I stated that there was surely some imperfection in this outermost circle during full moon. Study the matter and once again tell us how it looks to you" (*4*, *5*).

3) If we want to know, as I do, whether Galileo proceeded in accordance with the rules that are today regarded as constituting proper scientific method or, as I shall express myself, whether he proceeded Scientifically (with a capital S), then we have to compare Galileo's drawings and statements with the evidence and the standards of accuracy of *his* time and not of *our* time. For example, we must ask: Given the accepted means and standards of observation, were his observations "facts" (that is, were they repeatable and were they theoretically well founded)? To find an answer we must compare Galileo's observations with other observations, made by astronomers of his own time, as well as with the theories held concerning the reliability of vision, especially of telescopic vision. If it turns out that the phenomena reported by him were not confirmed by anyone else and that there were no reasons for trusting the telescope as an instrument of research, but that many reasons, both theoretical and observational, spoke against it, then it was as unScientific for him to push these phenomena as it would be unScientific today to push experimental results that lack independent corroboration and are obtained by as yet untried methods—no matter how closely his observations approach our own. For to be Scientific means to behave properly with respect to existing knowledge and evidence and not with respect to the knowledge and the observations of an unknown future.

4) In order to find out what Galileo's contemporaries might have said about his observations of the moon, I used the woodcuts. Note that I did not try to argue that Galileo was a lousy Scientist because the woodcuts differ from modern pictures of the moon; such an argument would have conflicted with the considerations made in point 3 above which guided my research. My assumption was, rather, that the moon as seen by the naked eye looks very different from the woodcuts, that it might have looked equally different to Galileo's contemporaries, and that some of them might have criticized the *Sidereus Nuncius* on the basis of their own naked-eye observations. This assumption is still valid, for the woodcuts accompanied most editions of that book. Does it apply to the engravings as well? It does, as is shown by Kepler's criticism as reported in (*2*). In addition there were many reasons why the telescope was not uniformly regarded as a reliable producer of facts [these reasons, both empirical and theoretical, are assembled in my book *Against Method* (*5*)]. Whitaker's assertion that Galileo's drawings of the moon are of a high quality when compared with modern pictures is irrelevant to this discussion.

5) The case of Galileo's lunar observations is only a small portion of my argument to the effect that Galileo *did not* proceed in a Scientific manner and *could not* have made his discoveries had he proceeded Scientifically. He progressed by violating what some scientists and numerous philosophers regard as very important rules of Scientific method. As historical research proceeds and changes our views of the past, the evidence I use in my argument is of course going to change as well. I am perfectly willing to concede that this may make Galileo more Scientific in some areas; but more recent discoveries (starting with Lane Cooper's unraveling of the myth of the Leaning Tower experiments) have shown that the number of areas where he becomes less Scientific is on the increase. This does not turn Galileo into a bad scientist, for the practice of science is and always has been very different from what both scientists and philosophers of science have said about it. It only shows that being Scientific does not mean being a good scientist.

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References and Notes

1. *Le Opere di Galileo Galilei*, A. Favaro, Ed. (Barbèra, Florence, 1964), vol. 3, p. 69; English version in *Discoveries and Opinions of Galileo*, S. Drake, Ed. and Transl. (Doubleday, New York, 1957), p. 38.
2. *Johannes Kepler, Gesammelte Werke*, F. Hammer, Ed. (Beck'sche, Munich, 1939), vol. 2, p. 219.
3. *Kepler's Conversations with Galileo's Sidereal Messenger*, E. Rosen, Ed. and Transl. (Johnson, New York, 1965), p. 28.
4. In his observations Kepler was most likely aided by his polyopia, which also gave him good insight into the problems of visual (and telescopic) observations.
5. P. K. Feyerabend, *Against Method* (New Left Books, London, 1975), p. 127, footnote 24 and the literature given there.