

Letters

Galileo

The essay by R. E. Gibson, "Our heritage from Galileo Galilei" (18 Sept., p. 1271), requires comment, containing, as it does, a rather unworthy depreciation of modern scientists. The author suggests that the scientist of today is in danger of forgetting scientific principles and relying on "authority" much in the fashion of reliance on authority in the Church. He writes, "The present tendency is for the scientific community, now grown powerful, to behave much as the church did in Galileo's time," and he likens the exclusion of religious beliefs from scientific theories to the Church's curbing of the dissemination of scientific discoveries in Galileo's time.

While Gibson may think that Cardinal Bellarmine was a "friend" of Galileo and that Galileo received "a full measure of recognition and acclaim from [his] contemporaries," one wonders what Galileo thought when warned by Bellarmine under orders of Paul V "to relinquish altogether the opinion that the sun is the centre of the world and unmovable, and that the earth moves, nor henceforth to hold, teach or defend it in any way whatsoever, verbally or in writing" [A. D. White, *A History of the Warfare of Science with Theology in Christendom* (Dover, New York), vol. 1, p. 137]. Galileo did not enjoy "the acclaim and recognition" of his contemporary Urban VIII, who forbade a monument over his grave because "it would be an evil example for the world if such honors were rendered to a man who had been brought before the Roman Inquisition for an opinion so false and erroneous; who had communicated it to many others, and who had given so great a scandal to Christendom" (*ibid.*, p. 146). Gibson writes that "the authorities of the church interposed no objection to the Copernican theory of the universe being held as an hypothesis," which, if technically true before 1616, did not remain so. By 1633, after the

Papal Bull of Urban VIII, "all writings which affirm the motion of the earth" were forbidden. Not until 1835, when a new edition of the *Index* removed these forbidden works from condemnation, did the Church permit belief in the modern astronomical view.

The equating of the present influence of the scientific community with the absolute power vested in the Church in Galileo's time is rather startling, and the presumption that there are many scientists today who rely on "authority" or "prefer to buy their mental inventory second hand" is without foundation. The rhetorical questions Gibson poses at the end of his article offer strange windmills for tilting at; without serious trouble, one can find examples to support both yes and no answers to all of them.

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. . . I confess my embarrassment at the serious blunder of the 11 theological consultants (of whom one, Father Giustiniani, was, like myself, a Jesuit!) in declaring that the heliocentric theory was "formally heretical." The Roman curia that chose these 11 theologians might have based their choice on qualifications other than theological competence. Their attitude toward astronomy was obviously based on an erroneous understanding of scriptural theology, a stand that has since been reversed by higher authorities.

While regretting the theological error of these theologians, I must also point out one small weakness in Galileo's scientific reasoning. The one proof that he offered in support of the heliocentric theory was the phenomenon of ocean tides. No scientist today would accept the validity of this proof. It was not until after the observational data of Brahe and Kepler had been analyzed in the light of Newton's law of gravitation that the theory could be accepted as proved scientifically.

I think Gibson's central point is the

abuse of human authority. The point is very well taken. History is teeming with examples of such abuses. However, I doubt whether Gibson himself would go to the opposite extreme and reject human authority altogether. Mankind's collective effort at vision is still being hampered by poor visibility, and this poor visibility is inhomogeneous. Most of us will still want to cling to the "authority" of the few who enjoy better visibility and are willing to share it with us. Pedagogically, a total rejection of human authority is not realistic, nor feasible, nor necessary, nor even possible.

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Gibson subtitles his paper with the warning, "Galileo's refusal to rely on authority for scientific truth is a principle we may be in danger of forgetting." In line with this warning, after quoting Einstein's statement that "Only experience and careful reflection are accepted by [Galileo] as criteria of truth," Gibson makes the following all-important observations:

. . . but "experience and careful reflection" require work—hard unspectacular work. Lazy people prefer to avoid this; they prefer to buy their mental inventory second hand. There is always a strong tendency for humanity at large to invite dogmas based on authority as the easy way of life, and there are always plenty of dogmatists who seek and enjoy the *cathedra* from which their words are accepted without question.

It may interest some of your readers to learn that one of Galileo's great predecessors and an early exponent of experiments, Galen of Pergamon (fl. 2nd century A.D.), himself fell victim to such laziness and resorted to the *cathedra*. The late George Sarton expressed this succinctly in *Galen of Pergamon*, his 1952 Logan Clendening Lectures on the History and Philosophy of Medicine at the University of Kansas (University of Kansas Press, Lawrence, 1964):

The main point is that Galen understood the need of experiments, being one of the very few Greeks who did; this was not merely an intuition. He justified it in saying that the experimental path is long and arduous but leads to the truth, while the short and easy way (uncontrollable assertion) leads away from it.

That is Galen's main title to glory for historians of science, and it is a very high one. . . .

Unfortunately, instead of sticking to the straight and narrow road of experiment, the very road which he had discovered, he

became impatient; the philosopher in him beat the experimentalist. Instead of making some more experiments which would have explained this or that detail in the mechanism of a living body, he wanted to devote himself right away to "general physiology" and began to expound comprehensive theories, which transcended his knowledge and experience immeasurably, and were therefore absolutely futile. How did he fail to see that, who had seen so clearly the need of experiment? The deviations of a man's intelligence can never be accounted for, because they stem from irrational feelings and desires. Galen was primarily a writer, who craved philosophical and literary fame. He got what he dreamt of (as we often do); he might have aimed much higher but, unfortunately, he did not [pp. 48-49].

Let us all heed these forceful warnings!

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. . . Was Galileo a moral coward or a martyr in the cause of science? Arthur Koestler, in an article in the *London Observer* of 2 February ("The greatest scandal in Christendom"), suggests that the late medieval popes, far from being persecutors of science, were its patrons. As may be seen in a surviving manuscript copy, dated 1606, of a lecture by Galileo ["Trattato della sfera," *Opere* (Edizioni Nazionale, Florence, 1929-30), vol. 2, p. 203], Galileo feared being hissed off the stage, like poor Copernicus, not by the Jesuits but by his fellow professors. Events proved his fears well founded. Galileo developed his Copernican convictions in his early 20's, but until he was 46 kept very quiet about them and taught the Ptolemaic astronomy; he clearly felt undisposed, for the best part of 20 years, to wage his much-romanticized "passionate fight against authoritarian dogma."

In the widely circulated "Letter to Castelli," cited by Koestler, Galileo dogmatically assumed the scientific truth of the Copernican hypothesis—which is all it then was—and forced a showdown by demanding that the Church either endorse it or condemn it altogether. In his *Dialogue of the Two Systems* he had the fool Simplicio repeat Pope Urban's escape clause for the believer—that a hypothesis may explain the facts satisfactorily, but God may have produced the same phenomena by different means; thus he publicly cocked a snook at his old friend the Pope. In short, Galileo asked for a showdown, and he got a trial.

As to the row with Pope Urban, the point is this: Galileo had no evidence

at hand to prove the Copernican theory. Jupiter's moons proved Aristotle wrong, but not Copernicus right. Galileo's data in *Siderius Nuncius* supported Tycho Brahe's compromise system, in which the planets revolved round the sun and with the sun round the earth. The world had to wait two centuries till Bessel detected the apparent shrinking and expansion of the fixed stars because of the earth's motion in orbit. (Foucault's pendulum, to which Gibson refers, did not show the orbiting of the earth.)

It is true, as Gibson says, that lazy people buy, or just lift, their mental inventory secondhand—including, I would add, the schoolmen's outworn ideas about Galileo's martyrdom. (Incidentally, the schoolmen were the only intellectuals of *their* day, and shouldn't be sneered at even if their ideas no longer stand up.) Even history has a rigorous discipline; science has no monopoly of this attribute. A historian would want to see some exact evidence before linking Galileo's concepts with the Declaration of Independence.

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Grants and University Authority

American universities are undergoing considerable change as a consequence of large-scale support of research and related enterprises by outside agencies. Although some of these changes are desirable and are generally conceded to improve the institutions, others appear to be disadvantageous. Among the latter is the tendency toward loss of control by university administrators, individually and collectively, who are responsible for the organizational and fiscal integrity of their institutions. This problem was enunciated by President Pusey when, in his *1961 Report to the Faculties and Governing Boards of Harvard University*, he wrote:

The availability of Federal Grants for project research tends in any university to divide the responsibility of the faculty, and to weaken the influence of the president and deans, in planning the content, emphasis, and direction of research and teaching.

Although grant agencies have been careful not to exercise control, nevertheless they certainly exert influence, if only through the power of the purse. The loyalty of the faculty member

tends to veer away from his institution and dean to the funding agency and its program director. One hears also of the disappearance of the "local" and the emergence of the "cosmopolitan," whose loyalties are to his field and to the agency which supports it and who feels little compunction about "picking up his grants" and moving from institution to institution. And always the finger is pointed at the federal agency, as though this influence were peculiar to it. That is not the case. Similar influence certainly may be attributed to private foundations and voluntary health agencies which award grants aimed primarily at the individual faculty member. And many agencies, non-federal as well as federal, frequently ignore the institution altogether and deal directly with the faculty member or fellowship recipient, particularly in relation to awards which take the recipient away from his institutional functions.

Every institution can document this. Recently one smallish institution, within a very short period, experienced at least ten instances in which awards were made without any prior consultation with the institution and apparently without considering whether it would be benefited or harmed. The awards emanated from six different agencies, one federal and five nonfederal, and consisted of "leave" fellowships for faculty members, research grants, and fellowships for foreign visitors invited by the agency. In none of these instances was any contact made with an institutional representative before the arrival of the letter announcing the award. In some instances, the institution was not even informed that the award had been made. It is easy to reply that the institution could, if it chose, refuse the tendered grant or refuse to permit the recipient to accept it. But imagine the consequences of so doing if a leading faculty member were concerned.

It is clear that thoughtless actions such as these by either government or private agencies may contribute very considerably to loss of control by the university or its departmental chairmen, deans, or president. And with weakening of local controls comes increased private-entrepreneurism and even anarchy. Surely this is not the intent of the donor agencies. It is apparent that more care and consideration is required.

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