Communications to the Editor

TO THE EDITOR:

John S. Major's review of my book (*Mingtang and Buddhist Utopias in the History of the Astronomical Clock: The Tower, Statue and Armillary Sphere Constructed by Empress Wu,* published in *JAS* 51.3 [August 1992]:643–44) is severe indeed. He does not spare his harsh judgments and seems to have no doubts that it would be pernicious if the readers of the *Journal of Asian Studies* were tempted to read and rely on such a book, judging from the fact that he deems it necessary to warn them that it is "marred by tendentious reasoning, unwarranted speculation, a stupefying level of attention to minutiae." Flatly destroying my illusion that I had been extremely cautious and critical (once, at the beginning of the book, I even declared that, concerning the question of the clock, "I am the most sceptical of sceptics" [p. 13]), he accuses me of "a lack of critical skepticism." Besides, he does not believe that I may have been sincere and objective when defending Joseph Needham's position that the clock was invented in China. He feels obliged to warn the reader, then, that "Forte's purpose in defending Needham soon becomes clear, however; he wishes to demonstrate that Empress Wu's *tiantang* incorporated an astronomical clock." This must have been a terrible crime indeed if he concludes mercilessly that "this book cannot be considered a reliable guide to" the details of Empress Wu's *mingtang* complex.

After reading all this, one is astonished to notice how heavily, contrary to his own warnings, Major relies on the book. In fact, he unconditionally accepts my main thesis when he acknowledges that "the *mingtang* was transformed, at least temporarily, from a Confucian to a Buddhist symbol of sagely rule"; he values "the careful chronology of the tangled history of the building complex" and thinks that the book "contains much that is interesting and useful." He even accepts the relevant evidence I produced and agrees that "a cast bronze *dayi* ('big mechanism') was associated with the *mingtang-tiantang* complex, along with a bell, a drum, and statues of the twelve double-hours."

Actually, what seems to have shocked him and provoked his harsh reaction is my "supposition" (I thank Major for acknowledging that it is just a supposition) that the *dayi* (Great Regulator) may have incorporated a clockwork-driven armillary sphere and a clock. It is always the same story. Every time the clock question arises, there are always some people who condemn without appeal the one who has dared to furnish them with some hitherto unknown historical evidence for reflection, and with some reasons "to suspend absolute disbelief" (to use an appropriate and happy expression Christopher Cullen has applied to my suggestions) concerning the hypotheses put forward. One has not yet forgotten the attacks to which Joseph Needham was subjected precisely on this question of the Chinese clock, and that the last (to my knowledge) of his detractors, David S. Landes, some years ago even charged Needham with the accusation that in his researches "his wishes become affirmation" (see pp. 6–11 of my book).

Major has all the right to declare himself unconvinced by some or—if he prefers—by the totality of my hypotheses; he has none to declare that the book is marred by "a lack of critical skepticism," and similar statements, because this is simply not true, as any unprejudiced reader can testify.

Major reproaches me also with not having consulted a construction engineer about whether a wooden building of over 900 feet in height could possibly have

been constructed. Since he is so destructive, he could have at least contributed a small piece of constructive criticism by himself consulting an expert. In any case, he can find a provisional answer in the *Bulletin of the School of Oriental and African Studies* LIV.3 (1991) p. 610, where Christopher Cullen writes: "Calculations on the back of an envelope suggest that a pagoda-like structure of oak or similar wood is unlikely to fail by simple crushing under its own weight until it has reached over 2,000 feet in height. Failure as a result of wind-induced swaying would surely have come much earlier."

In conclusion, Major accuses me of "excesses of imagination." He may be right, but I am convinced that the real problem in any field is not this, insofar as the imaginative person always clearly distinguishes between which facts are firmly grounded and which are not and so informs the reader (as I am certain I did). The real problem, I might suggest, is total lack of imagination.

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JOHN S. MAJOR REPLIES:

The tone and style of Mr. Forte's letter reflect those of his book. I think that most readers will agree that "tendentious" is a fair description. In a characteristic rhetorical leap, Mr. Forte accuses me of believing that it would be "pernicious" if anyone were tempted to read his book. I believe no such thing; as Mr. Forte's citations demonstrate, my review was by no means wholly negative. It is, however, the job of a responsible reviewer confronted with a flawed book not only to point out, as I did, those portions that are good and useful, but also those portions that must be rejected or at least used with extreme caution.

It is, moreover, absurd for Mr. Forte to try to rank me with the enemies of Joseph Needham in his own private demonology. Having collaborated closely with Joseph Needham, Lu Gwei-djen, and John Combridge in a detailed study of Korean clockwork mechanisms and astronomical instruments,[1] I am probably at least as well acquainted as Mr. Forte with the work of Needham and his associates on Chinese clocks. From that vantage point of close familiarity, I would contrast Needham's scrupulous regard for evidence (as, for example, in his rejecting his initial hypothesis that the clocks of King Sejong were powered by Su Song-style waterwheels, when our collaborative work made it clear that they were, in fact, powered by float clepsydras instead) with Mr. Forte's willingness to rely on supposition and wishful thinking.

I agree with Needham—and with Mr. Forte—that the clock (defined as a mechanical device fitted with an escapement for the purpose of telling time) made its first appearance in China. I also contend, however, that the several clock designs independently developed in China and Korea were technological dead ends. They are fascinating in their own right, but they had little or no influence on the development of clocks in Europe. What then is one to make of Mr. Forte's passionate defense of Needham against all criticism? I do not doubt his sincerity, but it is clear that he is also advancing his own agenda. One need look no further than the title of his own book: He is committed to his own supposition that Empress Wu's *mingtang* complex included an astronomical clock. The supposition is not unreasonable, and I would be delighted if it were true. But he does not present evidence to demonstrate that it was so.

[1]Joseph Needham, Lu Gwei-djen, John Combridge, and John S. Major, *The Hall of Heavenly Records: Korean Astronomical Instruments and Clocks, 1380–1780* (Cambridge: Cambridge University Press, 1986).

Mr. Forte raises again the question of whether a 300-meter-tall *tiantang* could have been built in Tang China, or anywhere else. No matter what assumptions one might make about the design of such a building, it is clear that it would require tens of thousands of cubic meters of wood. Let us allow, for the sake of "imagination," that such a quantity of wood could have been assembled in the Tang capital in the short span of time available (in Forte's own account) for the construction of the *tiantang,* and that the Tang Chinese possessed the engineering techniques required to build a 300-meter-tall wooden structure. Could they have succeeded in doing so?

Consider that all stresses on structures can be reduced to two: compression and tension. Wood is highly resistant to compression; Cullen is correct in stating that a building of the dimensions specified would not have been crushed by its own weight. However, wood is highly vulnerable to shearing, the result of compression and tension differentially applied to a single construction member, or any number of members joined together. An uneven settling of the structure's foundation (and how would *that* have been constructed?) of only a few degrees, under the weight of tens of thousands of tons of wood, would bring the whole crashing to the ground; if the foundation miraculously remained true, shearing forces created by even a moderate wind would doom the building long before it attained its planned height.[2]

In my review of Mr. Forte's book, I attempted to moderate my criticisms. I regret that his aggrieved response now compels me to write more harshly. While I agree that imagination is an essential ingredient of creative scholarship, Mr. Forte (for all his self-proclaimed skepticism) shows a disturbing inability to distinguish imagination from fantasy.

[2]For an illuminating discussion of these issues, see M. Levy and M. Salvadori, *Why Buildings Fall Down* (New York: W. W. Norton, 1992).