REVIEWS

Christoph Harbsmeier, *Science and Civilisation in China. Volume 7, The Social Background, Part 1: Language and Logic in Traditional China.* Cambridge: Cambridge University Press. xxiv, 479, 1 pp.

Nathan Sivin

[Nathan Sivin's most recent books are Science in Ancient China *(1995),* Medicine, Philosophy and Religion in Ancient China *(1995) and* Science and Civilisation in China, Volume 6, Part 6. Medicine *(edited, 2000).]*

This is a deeply learned historical account of the classical Chinese language over the six hundred years after the time of Confucius, and of logical reasoning, implicit and explicit, through the seventh century A.D. The author notes at the outset that the book is "almost entirely concerned not with the history of science, but with the comparative history of the foundations of science." To put it more accurately, the author has much to say about the history of science, but does not consult its primary sources. By "the foundations" he mainly means grammar and logic (p. xxiv). The volume's many consequential findings and some of its limitations will interest readers of *East Asian Science, Technology, and Medicine.*

* * *

This survey of topics is largely comparative. It applies scholarship on several cultures, but is mainly based on the author's own study of Greek, Latin, Chinese and, to a smaller extent, Sanskrit texts. The volume takes up a series of questions about classical Chinese on which Sinologists have expressed greatly divergent but usually quite firm opinions. Let me give a few examples to show why the author's answers are often persuasive.

Can we find a single underlying logic in all cultures, or is each unique? Although ancient Chinese ways of "articulating and structuring thought" are "profoundly different" from European ones in ways that Harbsmeier sets out clearly, Aristotelians and Confucians use the same types of logical tools—negations, conditionals, quantifiers, and so on.

Does Chinese lack the linguistic tools needed to define classes? The author demonstrates to the contrary that categorical thought was highly developed (pp. 218-229). All four Aristotelian subject-predicate relations are normal in China; the absence of "the categorical syllogism" can only be due to a disinclination to use those relations in that way (p. 121). Chinese skillfully constructed explicit

logical arguments that are valid from the modern point of view (p. 261). Even in legal documents of the third century B.C. we find true term variables *(chia, yi* 甲乙, etc., like *A* and *B),* useful for articulating generalizations, and usually considered an Aristotelian invention (pp. 287-288). The author makes it clear that Chinese did not adapt these variables to philosophical reasoning, but shows no sign of awareness that they appear (along with even more elaborate forms) in scientific publications. Although logic was less important than in the Greek world, "the art of plausible reasoning" became a regular part of Chinese intellectual life (p. 265).

Was Hegel correct that ancient Chinese "lack the free space of inner reflection" and were incapable of "a non-empirical, abstract, and theoretical Science with a purely philosophical and cognitive perspective"? Harbsmeier cannot fully answer Hegel's tendentious question, which would require looking at scientific evidence, but he clears the air by questioning whether the West ever developed such a science (p. 25, n. 2). One need only add that European scientists decisively rejected that ideal well *before* Hegel's time.

Is it a fact that any Chinese word can serve as any part of speech, as frustrated novices often suspect? No, some are quite specific. The language, despite its flexibility, incorporates tendencies for words to play certain functional roles (pp. 134-138). Early Chinese tend to think of meanings not as absolute, but in relation to a particular writer's use of the word in a given context. But there are significant exceptions, not only the elegant and capacious definitions in the Mohist dialectical writings studied by A. C. Graham, but the extensive glossary of ethical terms in the *Hsin shu* 新書 of Chia I 賈誼 (early second century B.C.), here partly translated for the first time (pp. 60-62). Harbsmeier intriguingly adds that Elizabethan English, rather like Chinese, thrived on "categorical grammatical anarchy"; the rigidity of modern English seems to accompany a decline in its "expressive power and vivacity" (p. 124-127).

The truth of sentences has indeed been a consistent Chinese concern. But thinkers "have not tended to reify or hypostasise an abstract concept of truth as correspondence with facts" in the Greek style, or for that matter to reify any abstract concept (a matter that the author sees as "commendable," p. 195). On the other hand, abstraction is not at all unusual in China, as anyone who has encountered the Five Phases knows; but it "tends to be introduced only where it is essential to convey a message," rather than being, as in Europe, "a preferred stylistic device" (p. 234). Again it would have been helpful to add that some kinds of technical literature prefer abstraction.

Then there is the big question of whether the Chinese language was in some sense unsuited to express evolving scientific theory, a position frequently asserted over more than a century (invariably by people who had never read a scientific monograph). This question was long since laid to rest by historians of science in China and elsewhere, who have shown how rich ancient theory was. We have tossed out the parochial assumption that Chinese tried and failed to

develop in the direction of modern science, and have reoriented our attention to what they did aim to do.

The author, approaching the same question of language and science from the philological angle, finds many concrete, significant differences between Greek and Chinese. The latter tends less often to indulge in rhetorical and syntactic complexity. Greece and India are logocentric, concerned with the meaning and truth of assertions; Chinese focus instead "on what people really intended to convey by using these words." The important Chinese argument type that chains together a sequence of statements in the form "When *A* then *(tse* 則) *B,* . . . when *E* then *F"* to show that *F* follows from *A* does have a logical base, Harbsmeier demonstrates (pp. 280-282). Unlike the equally pervasive Greek syllogism, its concern is not strict logical implication but "regular concomitance" (thus "when" rather than "if"). In probing basic differences between Greek, Latin, and Chinese, Harbsmeier intriguingly compares Plato's *Protagoras* in a 1933 Chinese translation with the Jowett translation into English. He concludes, not surprisingly, that texts of this kind pose more difficulties, "syntactic and grammatical," for classical Chinese than for modern English (pp. 166-171; for an analogous study from a different point of view, see Robert Wardy's new *Aristotle in China* in the Needham Research Institute Studies series).

A large part of the volume is devoted to a survey of logic as its forms are implicit in philosophic writings, and as Chinese discussed it explicitly. This conspectus is an improvement on what the histories of Chinese philosophy have to say about the subject. The author has some analyses of early paradoxes, and reconstructs Kung-sun Lung's 公孫龍 legendarily vexatious "a white house is not a horse" dialogue, eschewing Graham's ingenious reconstruction and translating the received text with only a couple of emendations. This is possible because Harbsmeier discards the usual assumption that Kung-sun was a brilliant and coherent theoretician "advancing one consecutive logical demonstration" for a view of him as a sophist with "a somewhat flippant interest in argumentation for the purpose of creating entertaining puzzles" (pp. 298-311).

Harbsmeier pauses to berate the oft-execrated Chad Hansen for his notorious hypothesis which concludes from Kung-sun's dialogue that *ma* 馬 (horse) in particular and Chinese substantives in general are "mass nouns." That is, they stand not for individual things that can be counted but for a single stuff like water, scattered through time and space, that can only be measured (thus, among other things, the measure words used with nouns). Hansen has long since been confuted, which leaves outside observers wondering why Sinologists keep slapping him down.

On the whole I share Graham's enthusiasm for Hansen's challenge as, although fallacious, a breath of fresh air in a stodgy field. Harbsmeier includes in a long enumeration of actual mass nouns the "five *ch'i"* and "six *ch'i" (wu-ch'i, liu-ch'i* 五氣 六氣; pp. 311-321). That, he does not note, is precisely Hansen's triumph and failure. The notion of the mass noun, however wrong for horses, makes possible a powerful account of *ch'i* as the backbone of Han cosmology

and physical thought. This Hansen failed to realize, because like many Sinologists he is in thrall to the Awesome Taboo. This stupendous prohibition rules out, under penalties so hideous that no one has even imagined them, reading, under any circumstances whatever, any primary monograph on science, technology, or medicine. Hansen might still rise to the acclaim that surely awaits a mass noun study of *ch'i,* but so far the Awesome Taboo has made it unthinkable.

Harbsmeier proceeds to discuss naming in the *Hsun-tzu* 荀子, and then the logical and epistemological propositions in the Mohist dialectical writings. He points out that the aim of the Mohists' "logical analysis" (one of his translations for *pien* 辯) is "the fitting description of the world" (p. 329). The same, he concludes, is true of the writings of Wang Pi 王弼 and two other authors of the third century A.D. In all of these analyses, calling their subject "semantics" (the analysis of relationships between words and their meaning) rather than "logic" (which encompasses the whole art of reasoning) would have made the discussion of pre-Buddhist logic tighter.

The crown of this section—in fact of the book as a whole—is the author's own extensive study of Buddhist logic (*yin-ming* 因明), a set of practices that Chinese adapted, with considerable originality, from non-Buddhist sources in India. Harbsmeier makes a case that T'ang Chinese was quite precise and subtle enough to express this art's sophistication; in fact often the muddles in these writings are those of their Sanskrit sources. He replies to Nakamura Hajime's disdain for the fallacies in the Buddhist writings with a reminder that Plato's works are also "a happy hunting ground indeed for those who delight in logical blunders" (p. 368).

This Buddhist art amounts to "rigid formal logical analysis." On the other hand, the conclusion that it is "ultimately concerned not with formal logical validity, but with material truth" leaves the reader hungering to be told plainly whether it too is consistently a matter of semantics (p. 372). Unlike the syllogism, in the *yin-ming* propositions the conclusion comes first. It is actually "an art of formally justifying a thesis or tenet." Buddhists saw their logic as "the science of rules and conventions governing argumentation as a social institution . . . essentially 'rhetorical' . . . a tool for religious insight" (pp. 370, 408). It is significant that in China only "part of a small subculture" took up this pursuit, although in India as in the West "logicians belonged to the mainstream of intellectual endeavor" (p. 7).

Harbsmeier closes the book with some interesting reflections. Many are about "science," but he often uses this word idiosyncratically. What he refers to most often with it is logic and philology. He treats it like French *science* and German *Wissenschaft,* which are broad enough to include grammar, history, literary criticism, and much else. Speakers of English rejected this amplitude nearly two centuries ago.

The author also notes enigmatically that "the detailed impact of Chinese approaches to and experiences of logic on the practice of concrete sciences . . . will be treated in a separate volume by another author" (p. xxiv). What makes this

enigmatic is, first, that this volume often does generalize about that impact and, second, that there is no such fascicule among the few still to be published in this series. Such a plan may well have been among the many discussed at various times, but long before this book went to press, it was clear to everyone involved in Joseph Needham's project that this would be the only volume consecrated to language and logic.

The idiosyncratic usage of "science" does not always make the author's remarks less interesting, as when he notes that China provides "the only example that is known to us of a non-Indo-European tradition of scientific inquiry into language" (p. 409). But then the subsection on rhetoric and science identifies as "constraints upon scientific discourse" the lack of expressions that correspond to "that is to say" and "so to speak" (p. 412). Unaccompanied by evidence of constraint from scientific sources, but obviously not referring to constraints upon discussion of grammar and logic, this proposition is an example of the confusion that Harbsmeier's usage encourages.

The discussion of "reasoning in science" is given over to upbraiding Jean-Claude Martzloff, although his outstanding history of Chinese mathematics duly acknowledges that "the question of logic is the most fundamental question that there is." But Martzloff's choosing in his brief chapter to survey half a dozen varied modes of reasoning rather than, as Harbsmeier would prefer, to "present important methods of proof or logically significant presentation," makes it "intensely disappointing" (p. 413).

Here as throughout the book Harbsmeier's criteria of importance are those of the philologist and student of logic. They sometimes generate needless perplexities, as when he wonders why historians of science have not given Buddhist logic the attention it deserves. But he has already answered the question. First, he asserts that in order to study *yin-ming* seriously one must know Chinese, Japanese, Sanskrit, and Tibetan. The author himself does not cite Tibetan sources. Second, he admits that *yin-ming* did "not catch on even among Chinese Buddhists, not to speak of Chinese thinkers within other traditions" (pp. 367, 414).

For another example, he notices that pre-Buddhist Chinese authors seldom transcribe conversations; the polished classical formulations give only "the upshot of thought and speech." This "absence of extended inner dialogue," he tells us, affected considerably "the logical form of scientific writing," giving rise to "a profound difference in logical and scientific style between China and Europe." The result was good for the history of technology because it benefitted "the user of any mathematical theorems or procedures," but its success ended when "further progress in technology depended no longer on discoveries about numbers, physical objects and the like" (pp. 415-419).

Whatever this may be about, it is not about Chinese technology. A glance at technological documents (or at previous volumes in this series) reveals that manufacture and construction did not depend on mathematical theorems. It is also not about science, for anyone who has browsed in the European literature

will realize that there is next to no verbatim speech in its technical treatises. Philosophers and historians of science distinguish the "logic of discovery" from the "logic of justification," and find since the seventeenth century a consistent disjunction between how occidental scientists have made discoveries and how they have presented them. An exact, conversational account of a process of discovery would seldom have been accepted as a scientific paper from 1650 on. It is hard to draw any simple conclusion about the significance of Chinese "scribal reticence" from this complex picture.

The book ends with a most curious warning about "Political Correctness" (pp. 419-420). Harbsmeier finds that "the unperceived and therefore all the more powerful obligatory paradigms of scientific discourse on intellectual history" often crowd out "unflinching" analysis. That incomprehensible circumstance poses a particular danger in the "highly 'politicised' and sensitive area" of comparative studies because they aim "to promote respect for other civilisations." Now that China is "emphatically on the world map of the history of science and of intellectual history," it is time, he cautions us, that scholars "no longer remain advocates for the case of China," and instead "become fair judges of the relative strengths and weaknesses of the Chinese intellectual tradition." This is as vague as most imputations of "political correctness" about what evils it is unmasking.

I for one cannot make head or tail of this advice. I have been engaged for ten solid years in a project that compares the emergence of cosmology, science and medicine in ancient Greece and China. Never momentarily has my collaborator or I even imagined that pronouncing on either culture's strengths and weaknesses might have any useful role to play in our conclusions. Harbsmeier's highly judgmental attitude toward primary sources leads to a number of provocative interpretations for grammar, but I am delighted not to be compelled to adopt it for the study of thought.

* * *

This is on the whole a fine history of language and logic, which everyone who prepares graduate students for a life of research will find useful. In addition to the author's deep learning, his love and enthusiasm for language are likely to inspire them. It is problematic, however, in several ways that make it less trustworthy than it might have been.

First is the book's narrowness of vision. Although it refers to its subject as "the concept of scientific truth" (p. 207), it betrays no interest at all in what the scientific sources of its period have to say about truth and related matters. Its discussion of truth is based on the warhorses of Chinese philosophy, ignoring sources of the first importance for Han cosmology such as Yang Hsiung's 揚雄 *T'ai hsuan ching* 太玄經. The analyses are, with the rarest exceptions, limited to the viewpoints of philology and logic, with a welcome smidgeon of epistemology. It is largely (but not always) positivistic, looking at Chinese texts for "sound recognizable logic" (p. 279). At a couple of points the author recog-

nizes that "there is something profoundly unsatisfactory in this method" (pp. 7, 273). At another he wistfully agrees with Graham that instead "we should . . . allow ourselves the luxury of investigating as closely as we can exactly what did develop, and under what internal and external intellectual conditions" (p. 415). Although the author does that nicely here and there, for instance in a discussion of the large role of historical allusion in argument, that is not the thrust of the book. And despite the concluding reflections on topics that involve science and technology, what did develop in mathematics, physical science, engineering and medicine rests totally unexamined.

Second, the book seems in some respects to be out of date, beyond the fact that it was drafted by 1988. The author's linguistics, like that of most Sinologists, is the linguistics of the 1960's and 1970's. It is nostalgic to find an expert exercised over whether a given word is "'primarily' or 'basically' an intransitive verb or an adjective" (p. 138). Having found how greatly transformational linguistics simplifies the teaching of particles, I wonder what breakthroughs it might have yielded in the hands of a Harbsmeier (or a Pulleyblank, or a Cikoski; they also stayed a generation behind the cutting edge, which after all has moved beyond Chomsky).

Although the author is aware of sociolinguistics—at one point he defines "the anthropology of logic" (p. 414)—he does not practice it. His very occasional observations on social context enhance his explanations. Still, he usually treats documents in the old style, as authoritative texts rather than as assertions that one can fully understand only when the author's social and political ideals and circumstances are clear. A purely social analysis, of course, would be no more adequate than a purely philological one; the most illuminating historical studies demonstrate the unity of what goes on inside people's heads and their involvement in what goes on around them.

The author, in the style of an earlier generation, also uses generously, without specifying what he means by them, highly ambiguous terms such as "the Legalists" and "the Taoists." Scholars have regularly challenged their value as designations of real collectivities, and historical writing has generally turned out to be clearer without them. In this fascicule the first category, for instance, includes Shen Pu-hai 申不害, who H. G. Creel argued in detail had nothing to do with those whom historians in the 1970's were calling Legalists, as well as Han Fei 韓非, one of whose chapters becomes, in another part of this book, "Taoist theorising." Sometimes "the Taoists" are the *Lao-tzu* 老子 and *Chuang-tzu* 莊子, sometimes the *Huai-nan-tzu* 淮南子, which most experts today would consider highly eclectic (it quotes the *Lü shih ch'un-ch'iu* 呂氏春秋 more often than the *Lao-tzu).* But when Harbsmeier writes forthrightly of "the Taoists, who contributed most to the progress of science through the ages," he can hardly mean any of these. Then again, when he notes that "the Taoists" would "certainly" have argued that the opposing sides in any argument are both wrong, he cannot be referring to the contributors to science (pp. 53-54, 350, 238, 254, 331). The overwhelming majority of the latter, it has long been clear, were

philosophically conventional gentlemen, often officials (for detailed evidence see my "Taoism and Science," 1995, not in the bibliography).

Sometimes "the Taoists" are artifacts of misunderstanding, as in " . . . the Prince of Huai Nan in his study of Taoism assembled all the Taoists of the empire and humbled the grandeur of a princedom before the expositors of Taoist lore" (p. 278). What the *Lun Heng* 論衡 actually says is *Huai-nan wang hsueh tao, chao hui t'ien-hsia yu tao chih jen. Ch'ing i-kuo chih tsun, hsia tao-shu chih shih* 淮南王學道，招會天下有道之人。傾一國之尊，下道術之士 (Lau concordance ed., 24/95/7-9). This passage contains not a single ism. I would translate it more literally as "the king [one level below an emperor] of Huai-nan, when studying the Way, summoned possessors of ways from [throughout] the empire. He squandered the honor due [the ruler of] a state to humble himself before retainers who had [learned] the techniques of a way." There is nothing Taoist about striving to attain the Way, which was what Confucius and his successors, among many of diverse persuasions, did. The ways that the king's retainers possessed, in the ordinary usage of the time, could be technical skills at anything from assassination to immortality.

Third, the author often takes the translations in this book from his predecessors (in this instance, from the 1907 translation of Alfred Forke). Often he does not correct the old ones that need it, and at other times improves them when there are good reasons not to do so. Let me give a couple of examples from his use of A. C. Graham's translations, the first from the Mohist dialectical writings and the second from Mencius.

Graham translates the Canon (6B/4) *Hsing hsiu i chiu. Shuo tsai ch'ien-hou* 行脩以久。說在前後 "Travelling over a distance implies duration. Explained by: at first and afterwards." Harbsmeier's "Moving over a spatial extension uses a temporal extension" introduces, with no textual basis, the second-order abstract notion of extension. He thus misleadingly but clearly implies that the Mohists thought of distance and time as simply different kinds of extension. As he does so, he admits "we do not know exactly what paradoxes or paradox the Mohists had in mind"! He also rejects Graham's "implies" in order to interject a physical interpretation that I for one cannot comprehend, namely that moving over one extension "uses" another. Then, when he proceeds to the Interpretation, his English, "the mover is necessarily closer at first and further away only after that," implies not spatial extension but locations at different distances—exactly the point that Graham's lucid explanation makes in terms reminiscent of Zeno (p. 344).

Mencius has an interesting discussion of *ku,* 故, the appeal to the past that distracts rulers from sagehood (4B/26). It concludes with a homily about the sky: *T'ien chih kao yeh, hsing-ch'en chih yuan yeh, kou ch'iu ch'i ku, ch'ien sui chih jih-chih k'o tso erh chih yeh* 天之高也，星辰之遠也，苟求其故，千歲之日至可坐而致也. Graham in "a very important detailed discussion of this passage" translates *ku* throughout as "how *X* was before," and almost does justice to this passage with "Although the sky is so high and the stars so distant,

if we seek out *how they were before,* we can calculate a solstice a thousand years ahead without rising from our seats." Despite his professed admiration for Graham's handling of this text, Harbsmeier discards this interpretation for an inconsistent and positivistic one. He asserts that "even the traditionalist Confucian Mêng Tzu recognised the importance of objective causes or reasons *(ku* 故)," and translates accordingly: " . . . if one seeks out the (real) reasons *(ku),* one can calculate the solstices of a thousand years hence without stirring from one's seat." He understands two occurrences of *ku* earlier in the same passage, however, not as objective reasons but as clever, by which he implies specious, ones.

I find no instance in the Warring States era of *ku* as objective causes. I note that the great philosophical and astronomical author of the late Ming, Huang Tsung-hsi 黃宗羲, understood the word as Graham later did. He named a book of his own (on the computational techniques underlying the great astronomical treatise of 1279) *Shou-shih li ku* 授時曆故 (The Season-granting System as it was before, i.e., restored to its original state). In short, Mencius' text does not support Harbsmeier's inference that "Mêng Tzu . . . recommends a scientific observation of realities also in non-'scientific' contexts" (pp. 275-276).

At the same time, Harbsmeier perpetuates two misinterpretations in Graham's translation. *Chih* does not mean "calculate," and nothing in the text specifies or even suggests future solstices. What the text says has nothing to do with mathematical astronomy: "if we seek how they were before, as we sit there we can call before us [i.e., imagine] the winter solstices of a thousand years."

A final curious instance is a medical passage from *Tso chuan* 左傳 (Duke Chao, year 1), which ends: *Nü, yang wu, erh hui shih, yin tse sheng nei je huo ku chih chi* 女，陽物，而晦時，淫則生內熱惑蠱之疾. Harbsmeier fails to say that he reproduces Graham's translation of the whole item, with a few alterations that do not better it. For this sentence Graham has "woman being a thing of the sunshine but of the dark time, in excess she generates the diseases of inward heat and deluding poisons." Harbsmeier "corrects" the first half to "woman being a thing of *yang* but of a dark season," without explaining what "a dark season" might mean, and leaves the second half unaltered even though a poison can scarcely be a disease (p. 263).

Graham is right that in *Tso chuan, yin* and *yang* are still concrete, not yet *yin-yang*. "Sunshine" is unexceptionable. Both scholars are mistaken in reading *huo* and *ku* as a compound, as a moment with any standard reference book on early disease nomenclature would have revealed. I cannot agree with either interpretation of *erh* without persuasive evidence that it joined nouns before the Han; if it did, the phrase would be asserting that "woman" **is** a dark time, not of it. I therefore see no alternative to reading the *shih* after *erh* as what we call hereabouts a stative verb, meaning "to be timely, to occur at the proper time" *(Han-yü ta tz'u-tien,* sense 7). That makes a more defensible translation, still subject to correction with regard to *shih,* as "Women are things of sunshine, but darkness is the proper time [for sexual intercourse]. When it [copulation, *not* she] becomes

lewd, that gives rise to internal hot disorders, mental confusion, and demonic infestations."

Fourth, there is much more carelessness in quotation, writing, and documentation than is usual in this series. Some quotations from Chinese do not make sense in English, for instance Mencius asking Tai Pu-sheng "do you wish your kind to be good?" The Chinese is about a king, not a kind, and a sentence is omitted from the translation of this passage without any indication (3B/6, p. 51). There is obviously something wrong with "if you hear that something you do not know is like something you do not know, then . . . you know them both." There is nothing in the Chinese corresponding to the second "not" (p. 115). The writing is frequently quite verbose; in addition to examples above, we are told that Confucius "was interested in language within the context of the political and social context of his time" (p. 52). A number of sources cited in the book do not appear in the bibliography, including, to return to Graham, his publication of 1980 (cited pp. 101, 105).

* * *

Finally there is the question of science and civilization. I have already mentioned that the author uses "science" idiosyncratically, encouraging confusion among readers accustomed to the word's normal English usage. But a still more serious problem grows out of this one.

This volume would have become the standard monograph on its subject, I believe, if it had completely rather than halfway avoided science. The presence of the word in the series title does not dictate that the author extrapolate from his mastery of language to draw what turn out to be distinctly odd conclusions for the history of science. But he does so again and again.

The root problem is that the author is not interested in the history of science, that his finely honed curiosity does not extend to the exploration of its sources, and that his notion of its problems and methods are closer to those of the 1950's than to current practice in that field (which differs greatly from current practice in Sinology). Nevertheless he freely dispenses judgments about science and its history.

Let me give two examples. In his section on language and science the author tells us that "the graphological analysis of Chinese characters" in the *Shuo wen chieh tzu* 說文解子 dictionary (A.D. 100 or a little later), exemplified "rigid scientific methodology and systematic classification for *natural scientists* of later ages" (p. 409, my emphasis). With respect to science, this rigid methodology is a phantom, not only in China but in other civilizations.

A significant breakthrough in the history of science after the 1950's was discarding the myth of "the scientific method." Spokesmen such as Galileo and Descartes took their case to patricians outside the Church and its universities in order to carve out a space for their antischolastic enterprise. Their arguments that a fixed method gave science a power denied to other modes of thought im-

pressed many influential laymen. But idealized sequences of hypothetico-deductive steps never, in the seventeenth century or in the twentieth, reflected the unpredictable way research actually leads to results. In the year 2000 the secondary schools still teach "the scientific method," university students still unlearn it as they learn to do science, and working scientists still scoff at its naiveté. Historians understand it, in other words, as a figment of the logic of justification disguised, for the purpose of public relations, as the logic of discovery. Of course this does not tell us whether there was a rigid methodology in early Chinese alchemy or astronomy. That is an empirical question which the author does not raise.

The section on rhetoric and science (pp. 411-412) is even odder. In addition to the judgment about "constraints upon scientific discourse" mentioned above, it is largely taken up by a "folkloristic biography" of a "legendary carpenter" whom Harbsmeier nevertheless flatly asserts was born in 507 B.C. The long quotation is provided with no reference to the original source. The author simply says that it comes from the *Lu Pan ching* (no characters in the text, no listing in the bibliography). It turns out to be copied word for word, with trivial adjustments, from Klaas Ruitenbeek, *Carpentry and Building in Late Imperial China* (Leiden, 1993)—again no acknowledgement, no listing in the bibliography.

The volume under review concludes from this quotation that "throughout traditional Chinese history it would be profoundly uncongenial to separate out the technological from the religious-folkloric aspects of traditional Chinese architecture." It then takes a bold jump, asserting "that the rhetorical conventions of Classical Chinese, the literary traditionalism of Chinese prose, might stand in the way of the development of science and technology in China." Yes, it might; but did it? It would not be difficult, after all, to gauge its magnitude as a stumbling-block by looking into, say, the oft-studied *Ying-tsao fa shih* 營造法式 (1097). I would conclude from that and other books on architectural standards that the extent of "religious-folkloric aspects" in a given text will depend on who wrote it and for what purpose.

The writers of technological prose in China were usually officials, rarely craftsmen. To the extent that they understood what they described, they were able to describe what they saw. It is an elementary fallacy to imagine that the linguistic prejudices or mental habits of pedants or even elite enthusiasts determine technical innovation. What craftsmen in different social groupings believed, and how they integrated their beliefs with their work, are empirical questions. Again the author does not raise them.

Analogously, intellectual historians have known for some time that the prejudice of some literati against the study of nature did not prevent the maturation of sciences (not just technologies) as sophisticated as their pre-modern European counterparts. It did not even prevent Ming governments from adding substantial technical questions on mathematical astronomy and medicine to the metropolitan examinations, forcing every aspiring civil servant to learn these fields, as Benjamin Elman has just demonstrated in *A Cultural History of Civil Examina-*

tions in Late Imperial China. Anyone today who is unwilling to learn them is ill equipped to form global generalizations.

We would expect anyone who asserts that "from the -4th century onwards we find an almost totally unornate, unallusive hard-headed scientific style in China" to cite evidence from a range of scientific books. This volume of nearly five hundred pages does not cite a single book devoted to science or technology. Its sole recourse to the medical literature is a two-graph quotation from the first chapter of the *Huang-ti nei ching Su wen* 黃帝內經素問 (p. 222). Some very important monographs, both before A.D. 100 and after, are highly ornate and allusive. One would not have to read many chapters of the *Su wen* to discover that it is one of them. What "hard-headed" means I have no idea.

These sentiments about science, either stale or mysterious, form a consistent pattern. When the book judges that "in scientific texts, for example, we often find a strong tendency towards rhythmic regularity, which leads to uncertainty whether certain characters are heavily significant or purely euphonic and present only for the sake of rhythm" (p. 106), the only example given is the Buddhist logical texts. I do not find this rhythmic tendency frequent in books on the various natural sciences and medicine, although if the author had been curious he could have shown, citing rhymed mathematical and medical textbooks for novices, that it is not altogether unknown.

Strange indeed! I can only speculate that this pattern—a compulsion to tell readers what the history of science is about while maintaining a pristine ignorance of its sources—is a throwback to the Sinology of the late nineteenth and early twentieth centuries, in which a command of the classical language and of philological method entitled one to pronounce *ex cathedra* on any aspect of Chinese culture. Harbsmeier harshly reprimands Hansen, Marcel Granet (pp. 22-24), and others for exactly that sense of entitlement.

Unwillingness to follow one's chosen questions where they lead—the Awesome Taboo—detracts from what would otherwise have been a generally admirable book. When Harbsmeier decides to analyze "logical argumentation (*as opposed to* correlative explanation)" (p. 265, my emphasis), he rules out an adequate account of the language and logic of scientific writing, much of which depends on inseparable causal and correlative relations.

The last three sentences of the book rest in the primary sources: "One needs to be familiar with the ancient traditions and texts one wishes to compare. It is as simple as that. And it is as difficult as that" (p. 420). The word "wishes" is crucial. It would be unfair to fault this book for something the author does not want to do. But despite his lack of scholarly curiosity about science, he chooses nevertheless to make many historical judgments about its connections with language. It would be an epoch-making step to analyze the documents of science themselves, to excavate their patterns of language use, the semantics and the non-semantic logic embedded in them, to identify the motivations and interests of their authors, and to assess the outcome. Such a project would answer the crucial empirical question that this volume leaves not merely unanswered but

unexamined: whether the pre-Han classics played an important role, not notionally but actually, in forming the limits, if any, of technical discourse. Still, this volume is a highly meritorious work of conventional but ingenious philology. Every reader will learn from it, and that is occasion for gratitude.