

## Ancestors knew how to harness horsepower ...

Sir— Vaclav Smil's Millennium Essay "Horse power" (*Nature* 405, 125; 2000) came as a pleasant surprise to me, as I would not have imagined that the readers of *Nature* were interested in this topic.

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However, it is not true that "ancient throat-and-girth harnesses choked the animal". This mistake was first made in the 1920s by Richard Lefebvre des Noëttes. His theory that slavery stemmed from the inability of the ancients to use animal power efficiently was very popular in his day. It lingers on in popular literature, although it has long been disproved: as Jean Spruytte showed in the 1970s, there were several ways of harnessing horses in antiquity, none of them choking the animals, and there is no connection between animal harnessing and slavery. (See, for example, Spruytte's *Early Harness Systems*, J. A. Allen, London, 1982.) Lefebvre des Noëttes had two different harnessing techniques mixed together in his mind. So Smil is right that the horse-collar was an improvement, but only an improvement on a existing technique.

Second, as far as one can tell, ancient and medieval horses were very small, often barely the size of present-day ponies. There is no incontrovertible evidence of the breeding of "heavy war animals needed to carry armoured knights" that has so often been supposed. In medieval times, large horses were a rare luxury. We lack the data on horse size to know what happened before the eighteenth century, so we cannot know whether armoured knights did ride big horses.

My last point concerns ploughs. The replacement of wood by iron and steel obviously allowed many improvements in the general structure and design of ploughs. But the case of mould-boards is special. The idea that "iron mould-boards only crossed from China to Europe in the seventeenth century" is speculative. There is no evidence of metallic mould-boards coming from China to Europe in time to be used as models by European makers of ploughs. (Chinese mould-boards, incidentally, were made of an alloy, cast iron, rather than of plain iron.) In Europe, wooden mould-boards were simply covered by more and more iron sheets to protect against wear. In some regions, wooden mould-boards were made with a curve from late medieval times.

Finally, wooden mould-boards had their own advantages. In the Gâtinais, north of Orléans, for example, arable soils are quite clayey and stick to iron mould-boards, whereas wooden mould-boards get soaked on their surface, forming a lubricating film of water that prevents the earth from sticking to it. Hence wooden mould-boards were used in this area even when ploughs were made completely of iron, up until the era of the tractor.

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## ... so animals could pull their weight, and more

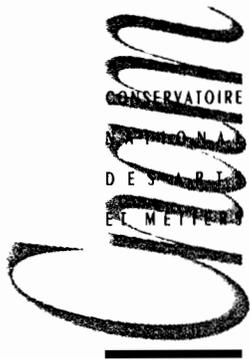
Sir— Vaclav Smil's Millennium Essay "Horse power" presents a good overview of the important role of draught horses in agricultural production in North America during the last century<sup>1</sup>. Some points worth adding are that mules were another key source of draught power on many farms<sup>2</sup>, and that the larger draught-horse breeds are, during brief exertions, capable of developing even more than the three horsepower Smil mentions.

Records of draught-horse championship pulling trials in the United States show that a team of two animals could develop 30 horsepower when pulling loads over a set distance<sup>3</sup>. Similar performances have been recorded for teams in Europe and elsewhere. Average working performance for one horse is 0.75 to 1.0 horsepower<sup>4</sup>.

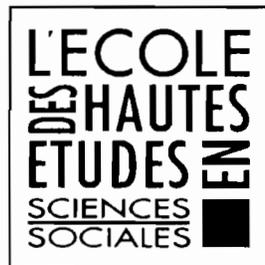
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1. Smil, V. *Nature* 405, 125 (2000).
2. Leaflet 225 "Quick Reference Map of Horses and Mules by States" (Horse and Mule Association of America, Chicago, 1936).
3. Collins, E. V. & Caine, A. B. *Testing Draft Horses* (Iowa Experiment Station Bulletin 240, Ames, 1926).
4. Goe, M. R. & McDowell, R. E. *Animal Traction: Guidelines for Utilization* (Cornell International Agriculture Mimeograph 81, Ithaca, NY, 1980).



CENTRE D'HISTOIRE DES TECHNIQUES



Paris, le 7 juillet 2000

Monsieur le Rédacteur en Chef  
de la revue *Nature*

*(Peter Wzobel, Rédacteur Danaja)*

Sir,

It is some time since Vaclav Smil's essay on "The millenium of the horse" was published in *Nature* (11 May 2000, p. 125). Its publication was for me a rather pleasant surprise, since I would not have imagined that the redactors and readers of *Nature* were interested by that kind of sujet. However, there are in this essay some inexactitudes which should not be allowed to pass on freely.

It is not exact that "the ancient throat-and-girth harness choked the animals", for example. This mistake has a quite old history. It was first made in the 1920s (see *La force animale à travers les âges*, 1924, and *L'attelage et le cheval de selle à travers les âges*, 1931, by Lefebvre des Noëttes). The second of those books was immensely successful at the time, since the author had the clever idea to explain slavery by the inability of the Ancients to use animal power efficiently, and to explain its disappearance by the development of the horse-collar in medieval times. This theory still lingers on in popular literature, although it has been shown to be wrong long ago and by all accounts. There is no connection whatsoever between slavery and horse-harnessing, as was shown by Marc Bloch in the 1930s. More recently, it has also been shown that Lefebvre des Noëttes' reconstruction of ancient harnesses was technically mistaken. Jean Spruytte, who took the matter all over again in the 1970s (see *Etudes expérimentales sur l'attelage*, 1977, engl. transl. as *Early Harness Systems*, 1982, and *Attelages antiques libyens*, 1996) found that there were several ways of harnessing horses in Antiquity, none of them being so clumsy as to choke the animals (as could be expected anyway). The mistake of Lefebvre des Noëttes was to confuse two different harnessing techniques, mixing them into a chimera of his own making that actually choked the horses, but that did not exist anywhere at

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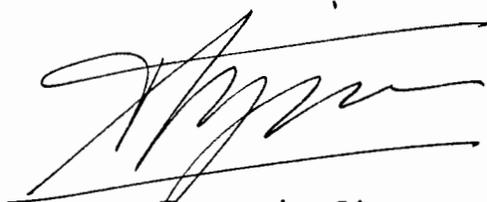
any time. So the horse-collar was an improvement, but only an improvement of a harnessing technique that existed before medieval times.

There is also a problem with the size of horses. As far as it is possible to tell, ancient and medieval horses were very small, often hardly the size of present-day ponies. There is no incontrovertible evidence of "the breeding of heavy war animals needed to carry armoured knights" that has so often been supposed. It seems that in medieval times, "large" horses (but how large is "large"?) were a rare luxury, only to be got from far off countries like the South of Italy or of Spain. Concerning the size of horses, the fact is simply that we lack the data that would allow us to understand what happened before, say, the 18th century. Rationalizations on the big horses for the carrying of armoured knights should not be taken for what they are not - proven facts. /rc

My last remark bears on ploughs. The replacement of wood by iron and steel made of course possible a lot of improvements in the general structure and design of ploughs. But the case of mould-boards is special. Again, the idea that "iron mould-boards only crossed from China to Europe in the 17th century" is little else than hearsay. First, Chinese mould-boards were made of cast-iron, not of iron. Second, there is no evidence of metallic mould-boards coming from China to Europe in time to be used as models by European makers of ploughs. Third, the evolution of things in Europe followed another path : wooden mould-boards were simply more and more covered by iron sheets as a protection against wear. Wooden mould-boards could be made curved, and they were in some regions, since late medieval times at least. And lastly, wooden mould-boards had their own advantages. In the Gâtinais (a *pays* located some way North of Orléans) for example, arable soils are quite clayey and stick to iron mould-boards, whereas wooden mould-boards get soaked on their surface, forming a lubricating film of water that prevents the earth from sticking to it. So, people there kept by wooden mould-boards, even when the ploughs were all-iron besides, until the tractor era.

Technology is no simple matter, and its history still less so. Grand generalizations are attractive, but they should not be made disregarding the accuracy of the details.

Yours sincerely,



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Directeur d'études Ehess