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ON THE NATURE OF SCIENTIFIC KNOWLEDGE

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I found myself studying the philosophy of science as an outgrowth of my participation in the administration of the Applied Science and Engineering Faculty's Engineering Science Division at the time of the M*onteal Massacre.* On December 6. 1989 Marc Lepine,who had failed to gain admission to the University of Montreal's Ecole Polytechnique, shot 27 of the woman students, killing 14. In the ensuing outcry Canadian engineering scchools were subject to widespread criticism. much of it by feminist scholars As the division'sAssociate Chair I participated in the examination of our programmes and practices.Our main problem turned out to be too few women's washrooms in the Galbraith Engineering Building (!)

I also studied the relevant literature, concluding that there were serious problems in certain disciplines related particularly to *postmodernism*, which is skeptical of the idea of universal truths. In particular, while feminist analyses such as Germane Greer's *The Female Eunch* has enlightened us,feminist commentaries on scientific subjects seemed at best controversial and corrrupted by advocacy.(Ref. 2).

As an example, in 1992 Katharine Hayles, who is now "Distinguished Research Professor of English" at UCLA, published "Gender encoding in fluid mechanics :masculine channels and feminine flows" in *Difference: A Feminist Journal of Cultural Studies* (Ref 1, p. 97). But she apparently had not consulted anybody who knew the subject: she showed complete lack of understanding of basic elements , so that her claim of male bias was meaningless. It has also been claimed by certain sociologists of knowledge that social factors have penetrated such mathematically based knowledge as statistics (Ref. 1, pp, 76 & 84).

Scientific knowledge is not based on proof but on *induction*, more specifically on *Bayesian induction*. As defined by my 1962 copy of the OED, Induction is "the inference of a general law from particular instances." The term "Bayesian" acknowledges the contribution of the English clergyman Thomas Bayes, (1702-1761), who laid the foundation of the theory of probability required to update the likelihood of an inference being correct as instances accumulate. It follows that a written record of investigations must be available for criticism and comparison.

Furthermore, as suggested by US philosopher Ronald Giere (Ref. 2, p.177) scientific theories are best described as the cognitive equivalent of maps, with all the limits on both information and influence of social factors that this characterization implies .Thus, as in maps, map details may vary, depending on both purpose and scale. For example. Einstein's Theory of Gravity does not replace Newton's: it limits the range of applicability of the latter. As another example, the discipline of fluid mechanics—my specialty—uses Newton's laws and ignores the molecular nature of matter completely, treating both liquids and gases as continua, Furthermore, for some problems—such as predicting the speed of sound—one can ignore fluid friction completely. Even given the ever-increasing computer power—which enables direct solution of the fundamental equations of fluid mechanics directly—such simplifications are essential if one is to fully understand fluid phenomena.

To conclude, I hope this missive helps clarify the value and limitations of scientific knowledge.

References

1) Sullivan, P. A. 1998. An Egineer Dissects Two Case Studies: Hayles on Fluid Mechanics and MacKenzie on Statistics. In *A House Built on Sand. Exposing Postmodernist Myths about Science.* Noretta Koertge, editor. New York: Oxford University Press, pp. 71-98.
2) Sullivan. P.A. 2005. Are Postmodernist Universities and Scholarship Undermining Modern Democracy? In *Scientific Values and Civic Virtues*. Noretta Koertge, editor. New York: Oxford University Press. Pp 172-190