A Visionary Decision
Jayadev Misra
8/3/1988

Ladies and Gentlemen:

I am pleased to be here and honored to be addressing you. I thank the organizers for giving me this opportunity to talk to you. I will go home with many pleasant memories: the excellent organization; the mountain trip and the Bavarian songs; this great farewell dinner; the hospitality of Profs. Bauer and Broy; lecturers, students and Willem Paul de Roever; the city of Marktoberdorf, and its pubs in particular. But I also leave with some sadness; we the lecturers have neglected a vital part of your education here: sales.

The act of selling involves two parties: a seller and a buyer. In this summer school you have seen ten smooth-talking salesmen peddle their theories and formal systems. My speech today is to the participants on how to resist these sales efforts; how to become, what Americans call, "informed buyers"; how to fight a new idea every inch of the way. In America, for over a century, we have successfully resisted the sales efforts of this English chap: Charles Darwin.

But first a major theoretical result. It had long been conjectured that there is a limit point at which any new idea is immediately rejected. This result has now been proven constructively; the limit point is known as the de Roever point.

I have done some historical research on successful resistance of sales efforts. I have been assisted in this work by an able research assistant. If you have been missing him in the lectures, or wondering about that suspicious trip to the Deutsche Museum on Sunday, now you know the answer. A hand for Professor Bauer, who has unearthed a rare document.

This is a transcript of a conversation that took place in ancient Rome; the date is around 100 A.D. In this corner, we have a smooth-talking Hindu salesman pushing the Hindu-Arabic numeral system. His motive is clear; he wants to get a foot-hold in Rome and then take over the rest of the continent by dumping low-cost mathematics which are produced using cheap foreign labor. Fortunately for the western civilization, in the other corner we have the informed Roman buyer who knows that Roman numerals are superior. I will now read out the document (I will use the abbreviation Hindu system for Hindu-Arabic system).

Hindu: Sir, I have brought some samples of our amazing new product, Hindu number system. You can do the four arithmetic operations in sublinear space and time. You just let the symbols do the work.

Roman: We have slaves to do our work. (pause) I have assembled a distinguished group of experts in the science of computation who are well aware of the superiority of the Roman System. Let us hear from them.

Dijkstra: I have been most impressed by the elegance and simplicity of calculations in the Roman System: Simple concatenation for addition and pairing for subtraction. They have avoided needless complexities such as multiplication and division. The Hindu System forces me to carry around many large tables in one small head.

Hoare: One can clearly see the large number of algebraic identities in the Roman System. Associativity of concatenation immediately tells us that addition is associative. Hindu System offers a poor basis for such deductions.

Backhouse: I was using the Hindu System. Since the position of each symbol in a number determines its value, I had to carry around too much context. That is why I switched to Roman numerals, and I have never been happier.

Bird: The Roman System allows you to abstract away from the actual numbers and study the operations, concatenation, for instance. The Hindu System is operational; it gives you an imperative procedure for addition and hence, forces you down to the level of numbers.

Broy: The Hindu System forces you to add in a deterministic fashion. The Roman System is clearly superior because it avoids overspecification.

Constable: The Roman System is object-oriented. A model for a Roman number is immediate—a flock of sheep, for instance. The meaning function maps each vertical bar to a sheep, and consistency of the whole system is immediately obvious.

Lampson: The Roman System maintains the relationship with reality all through a computation. When you have counted three bars, you have counted three sheep, for instance. In the Hindu System what do the figures represent halfway through an addition; what is the physical meaning of a carry? It is a symbolic jungle without any intuitive appeal. Then they have the most unnatural way of working—from right to left. Their system is too complex for average people.

Moore: The Roman System is most attractive from a theorem-proving viewpoint. It is faster to prove than compute.

van de Snepscheut: I see rich possibilities for symbol manipulation in the Roman System. By inventing new symbols, such as “V” and “X”, they can replace groups of other symbols. The Hindu System offers no such symbol manipulation possibilities because it lacks the flexibility of admitting new digits. Also, using a symbol to represent nothing—they call it a “zero”—is a poor design decision.

Hindu: Let us talk about multiplication. Consider the following arithmetic

problem dealing with consumptions of Christians by lions. Suppose that a lion can consume two Christians every hour. How do you compute the number of Christians that must be supplied to keep three lions happy for two hours?

Roman: That is simple. I will run a live simulation. (pause) You have seen that we can conceptualize, animate and communicate. We are now transferring this technology to the city of Carthage. We are planning to destroy them shortly, though.

Hindu: (Aside) Your number system will destroy them first. (Pause) Let me make a last effort. How can you divide in your notation?

Roman: People in the real world don't divide.

History does not record the name of this informed Roman buyer, but thanks to him and the group of experts, Europe enjoyed the beauty and elegance of the Roman System for the next twelve centuries.