Book Review

Innumeracy - Mathematical Illiteracy and its Consequences
by John Allen Paulos

There was an extensive review of Paulos' work in the January 1, 1989 issue of the The New York Times Book Review section.

The widespread inability to grasp basic concepts about numbers leads to muddled personal decisions and misinformed government policies. *Innumeracy...* shows how to use math as a way of thinking and even a source of pleasure...*Douglas Hofstadter, author of Godel, Escher, Bach.*

John Allen Paulos has coined a new phrase - innumeracy - which is a mathematical analogue of functional illiteracy. He elaborates on this malady that he says claims most adults. Unfortunately, for most afflicted people, there is apparent lack of concern over this. What most people usually do is shrug their shoulders and justify their condition by saying, "I was never very good at math." For John Paulos, a professor of mathematics at Temple University, this is a terrrible tragedy and changes need to be made in order to turn this problem around.

A book meant for the numerate and innumerate alike, chock-full of examples taken from current events, conveyed in a style so lucid that one wonders why no one ever explained it this way before. *Sheila Tobias, author of Overcoming Math Anxiety*

If we continue as we have, the average innumerate citizen will continue to make muddled personal decisions (like playing the lottery) or be susceptible to pseudosciences (like Astrology). They should be able to use numbers (a kind of number sense) to understand common events around them.

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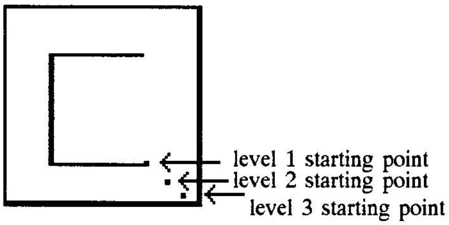
Problem of the Month

by Doug Moore

The Hilbert space-filling curve is discussed on pages 1965, 1966 in Volume 3 of James R. Newman's *The World of Mathematics* (Simon and Schuster, 1956). In that presentation, a given square is divided into four equal squares and the level 1 Hilbert curve joins the four midpoints. Then each of the four squares is divided into four equal squares and the level 2 Hilbert curve joins the sixteen midpoints, etc. It is an interesting Logo exercise to write a procedure for the level-n Hilbert curve drawn in this way, assuming that a procedure



for a Hilbert curve is at hand. In this article I have supplied the latter as found on pages 96-98 of the book *Turtle Geometry* (MIT Press) by Abelson and DiSessa.

Now one must obtain a formula for the starting point of the level-n curve, as indicated in the diagram, and a formula for the size of the level-n curve. This requires writing a procedure for finding the nth power of 2.

I found it convenient to start with a square 176 by 176. In this case the starting point formula generates the sequence:

(44, -44) 66, -66) (77, -77)

and the size formula generates the sequence:

88 44 22 11 .....

Here are the Abelson and DiSessa procedures for a left Hilbert curve and a right Hilbert curve:

```
to lhilbert :size :level
if :level = 0 [stop]
lt 90
rhilbert :size :level - 1
fd :size rt 90
lhilbert :size :level - 1
fd :size
lhilbert :size :level - 1
 rt 90 fd :size
rhilbert :size :level - 1
rt 90 fd :size
end
```

```
to rhilbert :size :level
if :level = 0 [stop]
rt 90
lhilbert :size :level - 1
fd :size lt 90
rhilbert :size :level - 1
fd :size
rhilbert :size :level - 1
 rt 90 fd :size
lhilbert :size :level - 1
rt 90 fd :size
end
```

I challenge you to write a procedure for a level-n Hilbert curve. Δ