$\cdot \frac{1}{4})^{1-d} = c(\frac{1}{3})^{1-d}(\frac{1}{4})^{1-d}$. Substituting the first equation into the second yields $)^{1-d} = \frac{1}{3} \cdot (3)^d$ or $4 = 3^d$. Then $d = \log 4/\log 3$, as before. ●

e exponent $1 - d$ in Richardson's equation isn't as mysterious as it may seem. unit f, the estimated length $L(f)$ of a self-similar curve should be the number times their length. Moreover, the number of units is proportional to $n = (\frac{1}{r})^d =$ hat is, $L(f) = c \cdot n \cdot f = c \cdot (1/f)^d \cdot f = c \cdot f^{1-d}$. We want to solve Richard's n for d, based on empirical values for f and $L(f)$. With two unknowns, c and eed two values of f and $L(f)$. From $L(f_1) = c(f_1)^{1-d}$ and $L(f_2) = c(f_2)^{1-d}$, $L(f_1)/L(f_2) = (f_1/f_2)^{1-d}$ and finally

$$d = 1 - \frac{\log[L(f_1)/L(f_2)]}{\log(f_1/f_2)}. \tag{5.4}$$

5.50 shows the coastline of England and Wales from Bristol to Liverpool. If we e the length of this coastline by using $f_1 = 57$-mi segments, we need 5 seg- so $L(f_1) \approx 285$ mi. For $f_2 = 28.5$ mi, we need $12\frac{1}{2}$ segments, so $L(f_2) \approx$; $f_3 = 14.25$ mi gives 32 segments and $L(f_3) \approx 456$ mi. As we shorten the igth, we can follow the contour better, taking into account more and more multitude of peninsulas and bays. When we use f_1 and f_2, Eq. 5.4 gives $- \log(285/356)/\log(57/28.5) \approx 1.32$. ●

hat $d \approx 1.36$ when you use f_2 and f_3 and $d \approx 1.34$ when you use f_1 and f_3.

e values of d that Richardson found for coastlines are remarkably stable over a f scales f. (Such values can't be stable over all possible scales unless the object

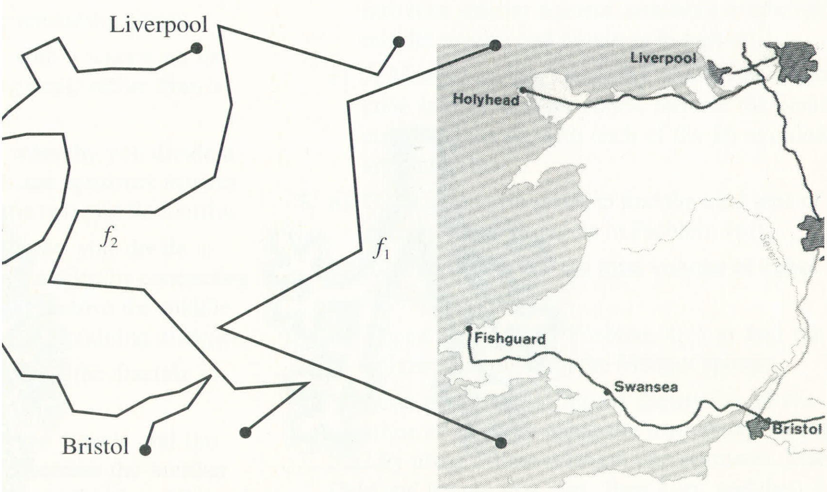

Figure 5.50 The mapped coastline of Wales and part of England and approximate outlines produced by using segments of different lengths.