

## Fractals are Anywhere!

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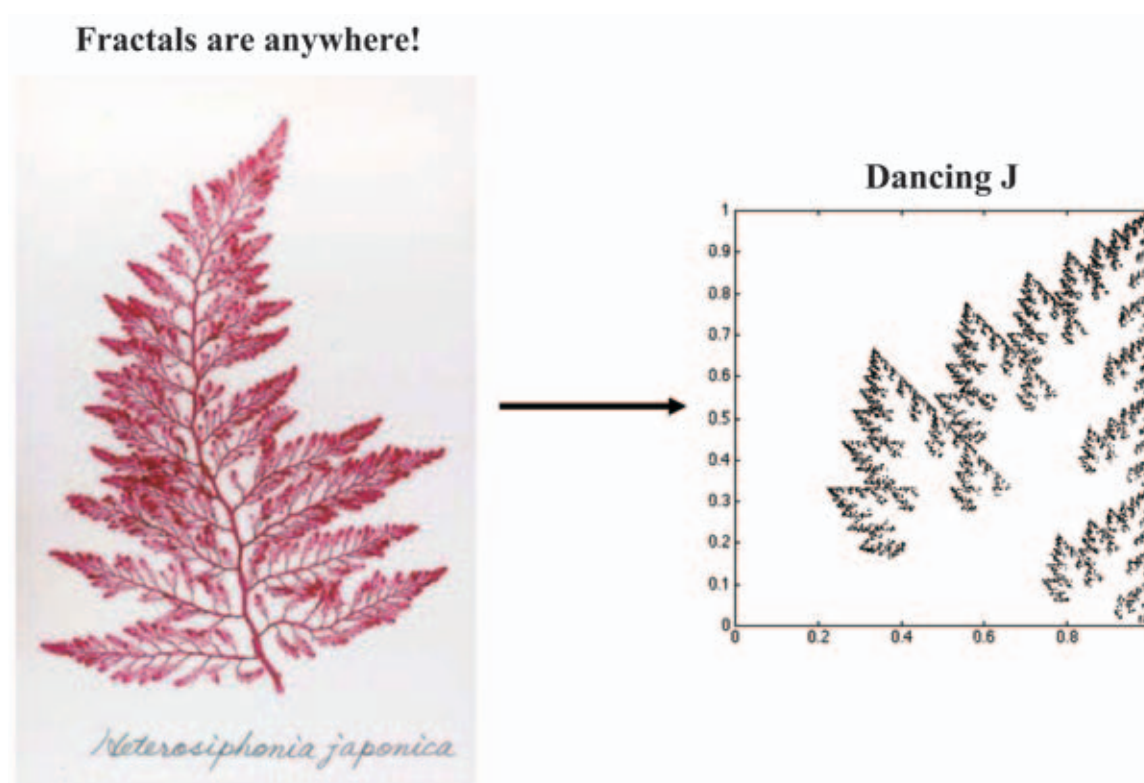


Fig. 1a

Fig. 1b

### Abstract

Nowadays various fields, such as physics, chemistry, biology, and economics, have been linked under the regime of nonlinear dynamics. Medicine is no exception. One of the hottest topics in circulatory medicine is to discover a marker that indicates cardiac sudden death. Fractal is a noted concept of nonlinear dynamics and may be a marker. It means self-similarity. Although a phenomenon that has a fractal nature looks complicated, its origin is a simple universal law.

**Fig. 1**     **a:** A kind of seaweed (*isohagi* in Japanese), courtesy of Michiyo Noda. Because its entire shape can be seen in smaller parts, this seaweed is a nature fractal. **b:** This figure was drawn with a computer, following 3 simple equations. It resembles the seaweed. The figure suggests that the origin of the shape of the seaweed may be rather simple.

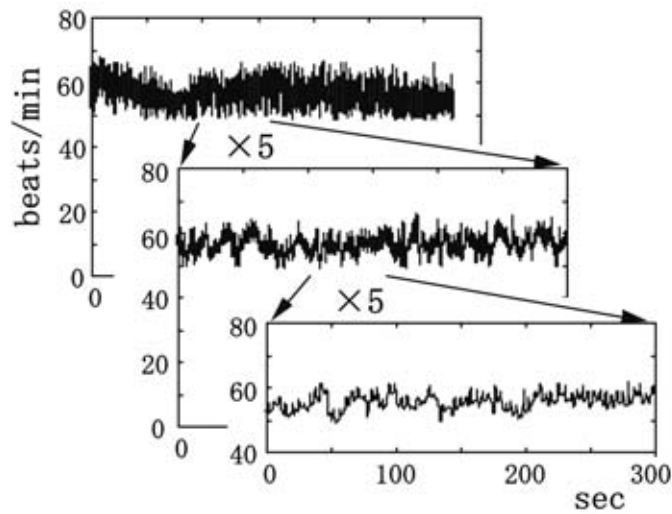


Fig. 2a

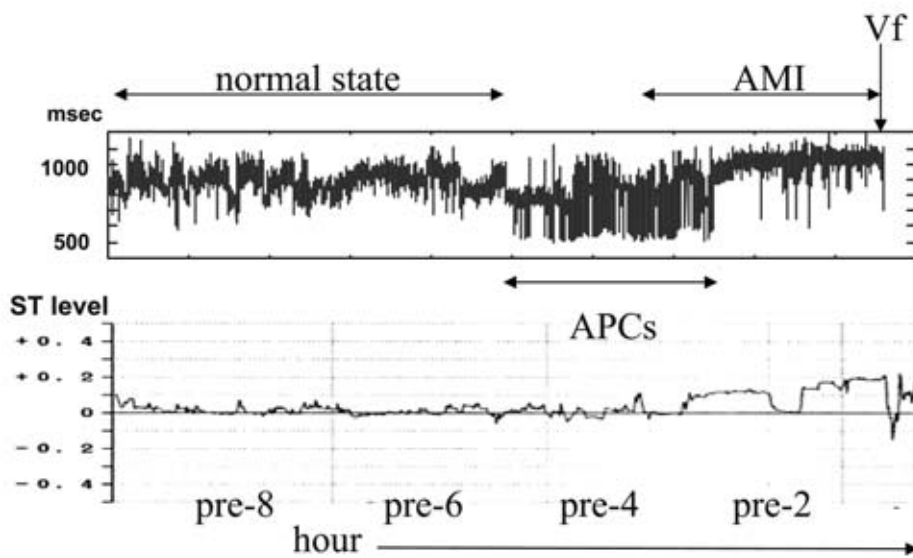


Fig. 2b

**Fig. 2** **a:** A beat-to-beat tachogram of a healthy subject. It resembles a fractal. In fact, whether it has a nature of fractal can be confirmed quantitatively. **b:** A Holter recording of a patient with acute myocardial infarction (AMI) preceding ventricular fibrillation (Vf). In the normal state the beat-to-beat tachogram fluctuates like that of the healthy subject. The fractal nature of heart rate variability may disappear before sudden cardiac death. APC: atrial premature contraction.