



The Abdus Salam
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Optics, Vision and Evolution,
after Mitchell Feigenbaum 1944-2019

Abstract:

Some people in the audience may be aware of Feigenbaum's astonishing discovery of the universality of period doubling, and the constant $\delta=4.66920$ which carries his name. However, Mitchell Feigenbaum worked, in the last 13 years of his life, on other subjects, and wrote the manuscript (in TeX) of a book the title of which is: "Reflections on a Tube". This is closely related to his life-long interest in optics and aspects of vision. It deals with the optics of images reflected in a cylindrical mirror (usually called anamorphic pictures). He shows that the eye does not interpret ray-tracing, but caustics. But there are two caustics, and therefore, the viewer can actually see two different images in two different places. The visual system will often prefer one over the other. The question is the "which" and "why"? Starting from this discovery, Feigenbaum derived other aspects of this observation, dealing with the vision of fish, the "broken" pencil in water, or aspects of the floor of swimming pools. All these examples show two possible images. His study shows how a question in classical optics can lead to the interesting question in perception and the visual system.