

KEY - F'02 PHY307/607 Homework #1

Read the Preface and through p. 23 (up to the section with the poem “For want of...” of Chaos).

Please turn in original written responses to the following by the beginning of class on Aug. 29:

1. Where is Mitchell Feigenbaum now and what does he do? (Try a search engine, such as google.com – also try adding the word “conformal” to your search.)

Mitchell Feigenbaum is now a professor at Rockefeller University. He studies chaos and fractals, studying where these concepts apply in complex systems and how to study experimental systems which are chaotic. He has also spent some time working on maps and his mathematical techniques have been employed in the latest atlases for projections (approximating the spherical Earth by a flat page) and for placing map labels.

2. Discuss the butterfly effect in about half to a full page. (Besides the book, feel free to look at the web, but write up your own thoughts in your own words.) What are the implications of this principle? What questions do you have?

In the key here, I won't take up a full or half page:

- Lorenz, in his computer simulations, noted that a small difference in the starting weather conditions led to a big difference later. Gleick writes that Lorenz concluded that “long-range weather forecasting must be doomed.” This is because we never know the conditions precisely, so even though the weather evolves in a precise fashion, since small changes get amplified, the weather is essentially unpredictable.

- This differs from the predictability of planet orbits and the tides, which, at least over very long time intervals, are not chaotic.

- Gleick also emphasized the connection between aperiodic and chaotic systems. Systems (like moving planets, the weather, dripping faucets) that are simply repetitive don't tend to have chaos, while those that have cycles that don't quite repeat can be chaotic.