

# Digits and dynamics – A tour of Benford’s Law

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Benford’s Law (BL), a notorious gem of mathematics folklore, asserts that leading digits of numerical data are usually not equidistributed, as might be expected, but rather follow one particular logarithmic distribution. Since first recorded by Newcomb in 1881, this apparently counter-intuitive phenomenon has attracted much interest from scientists and mathematicians. This lecture will introduce and discuss some of the intriguing aspects of BL, and relate them to problems in probability and number theory and, above all, dynamics.

In view of their pivotal role as models of many real-world processes, it is natural to ask whether dynamical systems can actually comply with BL in some sense or other and, if so, whether something about dynamics can in turn be learned from this. The lecture will answer both questions in the affirmative. Moreover, all real data sets, such as e.g. data recorded from a dynamical system, necessarily are finite, and determining exactly what, and what not, BL means for such data will emerge as a formidable challenge in itself.

## References and Literature for Further Reading

- [1] A. Berger and T.P. Hill, A basic theory of Benford’s Law, *Probab. Surv.* **8**, 1–126 (2011).
- [2] R.A. Raimi, The First Digit Problem, *Amer. Math. Monthly* **83**(7), 521–538 (1976).
- [3] F. Benford, The law of anomalous numbers, *Proc. Amer. Philosoph. Soc.* **78**, 551–572 (1938).