
Preface

The Greek and Roman gods, supposedly, resented those mortals endowed with superlative gifts and happiness, and punished them. The life and achievements of Rufus Bowen (1947–1978) remind us of this belief of the ancients. When Rufus died unexpectedly, at age thirty-one, from brain hemorrhage, he was a very happy and successful man. He had great charm, that he did not misuse, and superlative mathematical talent. His mathematical legacy is important, and will not be forgotten, but one wonders what he would have achieved if he had lived longer. Bowen chose to be simple rather than brilliant. This was the hard choice, especially in a messy subject like smooth dynamics in which he worked. Simplicity had also been the style of Steve Smale, from whom Bowen learned dynamical systems theory.

Rufus Bowen has left us a masterpiece of mathematical exposition: the slim volume *Equilibrium States and the Ergodic Theory of Anosov Diffeomorphisms* (Springer Lecture Notes in Mathematics **470** (1975)). Here a number of results which were new at the time are presented in such a clear and lucid style that Bowen's monograph immediately became a classic. More than thirty years later, many new results have been proved in this area, but the volume is as useful as ever because it remains the best introduction to the basics of the ergodic theory of hyperbolic systems.

The area discussed by Bowen came into existence through the merging of two apparently unrelated theories. One theory was equilibrium statistical mechanics, and specifically the theory of states of infinite systems (Gibbs states, equilibrium states, and their relations as discussed by R.L. Dobrushin, O.E. Lanford, and D. Ruelle). The other theory was that of hyperbolic smooth dynamical systems, with the major contributions of D.V. Anosov and S. Smale. The two theories came into contact when Ya.G. Sinai introduced Markov partitions and symbolic dynamics for Anosov diffeomorphisms. This allowed the powerful techniques and results of statistical mechanics to be applied to smooth dynamics, an extraordinary development in which Rufus Bowen played a major role. Some of Bowen's ideas were as follows. First, only one-dimensional statistical mechanics is discussed: this is a richer theory, which yields what is

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needed for applications to dynamical systems, and makes use of the powerful analytic tool of transfer operators. Second, Smale's Axiom A dynamical systems are studied rather than the less general Anosov systems. Third, Sinai's Markov partitions are reworked to apply to Axiom A systems and their construction is simplified by the use of *shadowing*. The combination of simplifications and generalizations just outlined led to Bowen's concise and lucid monograph. This text has not aged since it was written and its beauty is as striking as when it was first published in 1975.

Jean-René Chazottes has had the idea to make Bowen's monograph more easily available by retyping it. He has scrupulously respected the original text and notation, but corrected a number of typos and made a few other minor corrections, in particular in the bibliography, to improve usefulness and readability. In his enterprise he has been helped by Jérôme Buzzi, Pierre Collet, and Gerhard Keller. For this work of love all of them deserve our warmest thanks.

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David Ruelle

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