



# Hangzhou Lectures on Eigenfunctions of the Laplacian (AM-188) (Annals of Mathematics Studies)

*Christopher D. Sogge*

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## Hangzhou Lectures on Eigenfunctions of the Laplacian (AM-188) (Annals of Mathematics Studies)

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Based on lectures given at Zhejiang University in Hangzhou, China, and Johns Hopkins University, this book introduces eigenfunctions on Riemannian manifolds. Christopher Sogge gives a proof of the sharp Weyl formula for the distribution of eigenvalues of Laplace-Beltrami operators, as well as an improved version of the Weyl formula, the Duistermaat-Guillemin theorem under natural assumptions on the geodesic flow. Sogge shows that there is quantum ergodicity of eigenfunctions if the geodesic flow is ergodic.

Sogge begins with a treatment of the Hadamard parametrix before proving the first main result, the sharp Weyl formula. He avoids the use of Tauberian estimates and instead relies on sup-norm estimates for eigenfunctions. The author also gives a rapid introduction to the stationary phase and the basics of the theory of pseudodifferential operators and microlocal analysis. These are used to prove the Duistermaat-Guillemin theorem. Turning to the related topic of quantum ergodicity, Sogge demonstrates that if the long-term geodesic flow is uniformly distributed, most eigenfunctions exhibit a similar behavior, in the sense that their mass becomes equidistributed as their frequencies go to infinity.

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