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Noncommutative harmonic analysis, by Michael E. Taylor. Mathematical Surveys and Monographs, Vol. 22, American Mathematical Society, Providence, 1986, xvi + 328 pp., $68.00. ISBN 0-8218-1523-7

Harmonic analysis began as a technique for solving partial differential equations, in the work of Daniel Bernoulli on the vibrating string equation and Fourier on the heat equation. Since then, both subjects have blossomed into independent, wide-ranging, central mathematical disciplines with many subspecialties and with connections to almost all branches of mathematics, pure and applied. I do not think Bernoulli or Fourier would have been surprised by the developments in partial differential equations, but they surely would have been astounded by the growth of harmonic analysis. I also think they would have been pleased by Michael Taylor's new book, which explores some of the recent connections between harmonic analysis and partial differential equations, very much in the spirit of their pioneering work.

The modern definition of harmonic analysis is roughly the following: there is a linear space of functions $\mathscr{F}$, real or complex valued, ordinary or generalized, defined on a domain X on which a group G acts. One seeks first to identify those functions in $\mathscr{F}$ which transform in as simple a fashion as possible under G, then one seeks to expand the general function in $\mathscr{F}$ as a series or integral of these simple functions, and finally one seeks to use the expansion to solve problems which are compatible with the action of G. The simplest cases, such