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**Marius V Ionescu\*** ([Marius.Ionescu@dartmouth.edu](mailto:Marius.Ionescu@dartmouth.edu)), 6188 Bradley Hall, Dartmouth College, Hanover, NH 03755, and **Paul S Muhly** ([pmuhly@math.uiowa.edu](mailto:pmuhly@math.uiowa.edu)), Department of Mathematics, The University of Iowa, Iowa City, IA 52242. *Fractals, wavelets, and groupoids.*

We use the Deaconu-Renault groupoid and the theory of Exel's  $C^*$ -algebras associated with irreversible dynamical systems to expand and provide a unifying framework for the work of Bratelli, Jorgensen, Dutkay, et. al. They have related wavelet analysis, both for classical wavelets and for wavelets on fractals, to representations of the Cuntz algebra. Our approach shows how their Cuntz representations may be tied more closely to the underlying geometry of the situations they consider. In the classical setting of wavelets on the circle, we show how the multiresolution analysis methods developed by Mallat may be seen as an artifact of the cohomology of the groupoid. This is a groupoid interpretation of some recent work of Larsen and Raeburn. (Received July 23, 2006)