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Wojbor A Woyczynski* (waw@case.edu), Department Of Statistics, Case Western Reserve University, Cleveland, OH 44106. *Nonlinear and Nonlocal Evolution Equations: Porous Media and Evolutionary Ecology.*

One of the motivations of our work (joint with B. Jourdain and S. Meleard) was to generalize the probabilistic approximation of the classical strongly nonlinear porous medium equation, which describes percolation of gases through porous media. The usual Barenblatt solutions have a very rigid type of self-similarity and our goal was to allow a more general class of anomalous diffusions in the model. The talk will discuss the relevant mathematical difficulties related to the combination of strong nonlinearity and fractional Laplacian operators.

Another model that led us to new types of nonlinear and nonlocal (stochastic in some cases) evolution equations was related to the phenomenon of Darwinian evolution resulting from the interplay of phenotypic variation and natural selection through ecological interactions. The population was modeled as a stochastic point process whose generator captures the probabilistic dynamics over continuous time of birth, random mutation, and death, as influenced by each individual's trait values, and interactions between individuals. In the case we were interested in, the probability distribution of mutations had a heavy tail and belonged to the domain of attraction of a stable law and the corresponding diffusion admitted jumps. (Received August 19, 2012)