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# ATHENS *P*ROBABILITY COLLOQUIUM

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Math Dept, University of Athens

**“Simulating events of unknown probabilities via  
reverse time martingales”**

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**Abstract:** Let  $s \in (0,1)$  be uniquely determined but only its approximations can be obtained with a finite computational effort. Assume one aims to simulate an event of probability  $s$ . Such settings are often encountered in statistical simulations. We consider two specific examples. First, the exact simulation of non-linear diffusions. Second, the celebrated Bernoulli factory problem of generating an  $f(p)$ -coin given a sequence  $X_1, X_2, \dots$  of independent tosses of a  $p$ -coin (with known  $f$  and unknown  $p$ ). We describe a general framework and provide algorithms where this kind of problems can be fitted and solved. The algorithms are straightforward to implement and thus allow for effective simulation of desired events of probability  $s$ . Our methodology links the simulation problem to existence and construction of unbiased estimators.

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