1096-AD-1219 **Art B. Owen*** (owen@stanford.edu), Department of Statistics, Sequoia Hall, Stanford, CA 94305. *Monte Carlo, Quasi-Monte Carlo and randomized Quasi-Monte Carlo.*

Monte Carlo (MC) sampling is used to solve problems in virtually every branch of science and engineering, even problems without genuine randomness. MC involves simulating random quantities, starting with independent uniform random variables.

Simulating uniform random variables can be viewed as placing points at random inside a box. Why not just pick some really good points? With n observations MC typically has error $O(n^{-1/2})$, a slow rate of improvement. Spreading the points more evenly is known as quasi-Monte Carlo (QMC) sampling. QMC has typical error $O(n^{-1+\epsilon})$. Ignoring constants and regularity conditions, this is almost as good as squaring the sample size.

While QMC increases accuracy it loses one of the benefits of MC. MC lets us estimate error by repeated sampling. QMC is deterministic, so repeating it gives the same answer and provides no error estimate.

Randomized QMC(RQMC) uses independent random replicates of points all with the same QMC property, allowing replication based error estimates. Surprisingly, some RQMC methods reduce the error rate to $O(n^{-3/2+\epsilon})$. Where MC randomizes, QMC de-randomizes, then RQMC re-randomizes. Each step brings an improvement. MC, QMC and RQMC point sets are all designed via the algebra of finite fields. (Received September 13, 2013)