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Multiclass queues and particle systems

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Consider a "./M/1 queue" — that is, a single-server queue with i.i.d. exponential service times. Burke's theorem says (among other things) that a Poisson process is a "fixed point" for this queue ; if the arrivals are a Poisson process, then so are the departures. I'll talk about extensions to priority queues with two or more classes of customers. The fixed points can be related to equilibria of the multiclass "TASEP" (totally asymmetric simple exclusion process). I'll emphasise the role played by ideas of interchangeability of queues. There are partial generalisations which connect the multiclass "ASEP" to queues with variable service rates ; at the moment the proofs of these are much less direct, involving manipulation of transfer matrices. I'll mention some open problems at the end.

This is joint work with Pablo Ferrari and Balaji Prabhakar.