

## DEGENERATE PARABOLIC PROBLEMS IN EVOLUTIONARY DYNAMICS.

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We study the evolution of the probability density of an asexual, one locus population under natural selection and random evolution. This evolution is governed by a Fokker-Planck equation with degenerate coefficients on the boundaries, supplemented by a pair of conservation laws. It is readily shown that no classical or standard weak solution definition yields solvability of the problem. We provide an appropriate definition of weak solution for the problem, for which we show existence and uniqueness. The solution displays a very distinctive structure and, for large time, we show convergence to a unique stationary solution that turns out to be a singular measure supported at the endpoints. An associated hyperbolic problem is also studied and a multiscale approach that is appropriate to large populations is also developed. This is joint work with F.A.C.C. Chalub.

### References

- [1] F.A.C.C. CHALUB AND M.O. SOUZA, Discrete versus continuous models in evolutionary dynamics: from simple to simpler — and even simpler — models, *Math. Comp. Model.*, **47**, 743–754, 2008.
- [2] F.A.C.C. CHALUB AND M.O. SOUZA, A non-standard evolution problem arising in population genetics, *Comm. Math. Sci.*, **7**, 489–502, 2009.
- [3] F.A.C.C. CHALUB AND M.O. SOUZA, From discrete to continuous evolution models: a unifying approach to drift-diffusion and replicator dynamics, *Theor. Pop. Biol.*, **76**, 268–277, 2009.
- [4] F.A.C.C. CHALUB AND M.O. SOUZA, The SIR epidemic model from a PDE point of view, *Math. Comp. Model.*, **53**, 1568–1574, 2011.
- [5] F.A.C.C. CHALUB AND M.O. SOUZA, The frequency-dependent Wright-Fisher model: diffusive and non-diffusive approximations, *Submitted*, 20qq.

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