Scaling of fluctuations in growth and division in single bacterial cells.

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***Short Abstract* — The interplay between growth and division of single cells is studied in single cell experiments on Caulobacter C. over hundreds of generations. We find a primary internal unit of time that governs not just growth and division in the mean, but also the fluctuations in each. Moreover, we find how this unit of time scales with temperature, and consequently how the fluctuations themselves scale with temperature. We provide a complete theoretical description of the observations with no free parameters. Further, we introduce a mechanistic stochastic model which naturally leads to the observed scaling laws. When subjected to appropriate conditions, the cells undergo senescence, and we discuss how that affects this internal unit of time. Finally, as we chemically perturb a master cell cycle regulator, we discuss how and why synchronization of the divisions of these non-quorum sensing cells occurs.**

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