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Escherichia coli chromosomal loci segregate from midcell with universal dynamics

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The structure of the *Escherichia coli* chromosome is inherently dynamic over the duration of the cell cycle. Genetic loci undergo both stochastic motion around their initial positions and directed motion to opposite poles of the rod-shaped cell during segregation. We developed a quantitative method to characterize cell-cycle dynamics of the *E. coli* chromosome in order to probe the chromosomal steady state mobility and segregation process. By tracking fluorescently-labeled chromosomal loci in thousands of cells throughout the entire cell cycle, our method allows for the statistical analysis of locus position and motion, the step-size distribution for movement during segregation, and the locus drift velocity. The robust statistics of our detailed analysis of the wildtype *E. coli* nucleoid allow us to observe loci moving toward midcell prior to segregation, consistent with a replication factory model. Then as segregation initiates, we perform a detailed characterization of the average segregation velocity of loci. Contrary to origin-centric models of segregation, which predict distinct dynamics for *oriC*-proximal versus *oriC*-distal loci, we find that the dynamics of loci were universal and independent of genetic position.