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Real-time restriction mapping of DNA stretched in nanofluidic devices ROBERT RIEHN, WALTER REISNER, SHUANG FANG LIM, YAN MEI WANG, ROBERT H. AUSTIN, Department of Physics, Princeton University, Princeton, NJ 08544, MANCHUN LU, EDWARD C. COX, Department of Molecular Biology, Princeton University, Princeton, NJ 08544 — We present real-time sequence-specific restriction mapping of single DNA molecules stretched in nanofabricated channels. In these channels, DNA is linearized and extended to up to 3/4 of its contour length, permitting attribution of the cutting sites to specific regions in the genetic code. We will present real-time restriction of genomic viral DNA with the enzymes Sma I, Sac I, Kpn I. We are able to determine cutting sites and can quantify the cutting rates at different genomic locations. Complete digestion can be achieved within less than 10 seconds. Our device operates in a quasi-continous mode, which we achieved by controlling the concetration of the necessary co-factor Mg^{2+} throughout the mixed micro- and nanofluidic device. DNA was observed using fluorescence micrcoscopy and intercalating DNA stains.

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