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Migration of amoeba cells in an electric field[1] ISABELLA GUIDO, EBERHARD BODENSCHATZ, Max Planck Institute for Dynamics and Self-Organization, Goettingen, Germany — Exogenous and endogenous electric fields play a role in cell physiology as a guiding mechanism for the orientation and migration of cells. Electrotaxis of living cells has been observed for several cell types, e.g. neurons, fibroblasts, leukocytes, neural crest cells, cancer cells. Dictyostelium discoideum (Dd), an intensively investigated chemotactic model organism, also exhibits a strong electrotactic behavior moving toward the cathode under the influence of electric fields. Here we report experiments on the effects of DC electric fields on the directional migration of Dd cells. We apply the electric field to cells seeded into microfluidic devices equipped with agar bridges to avoid any harmful effects of the electric field on the cells (ions formation, pH changes, etc.) and a constant flow to prevent the build-up of chemical gradient that elicits chemotaxis. Our results show that the cells linearly increase their speed over time when a constant electric field is applied for a prolonged duration (2 hours). This novel phenomenon cannot be attributed to mechanotaxis as the drag force of the electroosmotic flow is too small to produce shear forces that can reorient cells. It is independent of the cellular developmental stage and to our knowledge, it was not observed in chemotaxis.

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Isabella Guido
Max Planck Institute for Dynamics and Self-Organization, Goettingen

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