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The role of mechanical stress and Merkel cells in the formation of fingerprints

In spite of the great importance of fingerprint patterns in forensics and biometrics there is still no generally accepted theory how fingerprint patterns are formed in utero. Substantial evidence exists that mechanical forces are decisive for determining the direction of the ridges [1]. Further, it is well-supported that a certain skin cell, the Merkel cell, is the primary pattern forming agent [2]. However, until now no connection has been established between these findings.

In my talk I will present a model that links stress distribution in the developing embryonal skin to the Merkel cell. This model is an agent-based model with the Merkel cells as agents that are interacting with each other. As an outcome of the model I will explain what factors in fingerprint formation are genetically controlled and why indeed every fingerprint — even the ones of identical twins — is unique.

REFERENCES

- [1] M. Kücken and A.C. Newell, *A model for fingerprint formation*, Europhys Lett, **68**, 141–146
- [2] D.-K. Kim and K.A. Holbrook, *The appearance, density and distribution of Merkel cells in human embryonic and fetal skin: their relation to sweat gland and hair follicle development*, J Invest Dermat, **104**, 411–416