Researchers go skin deep to explore what causes wrinkles

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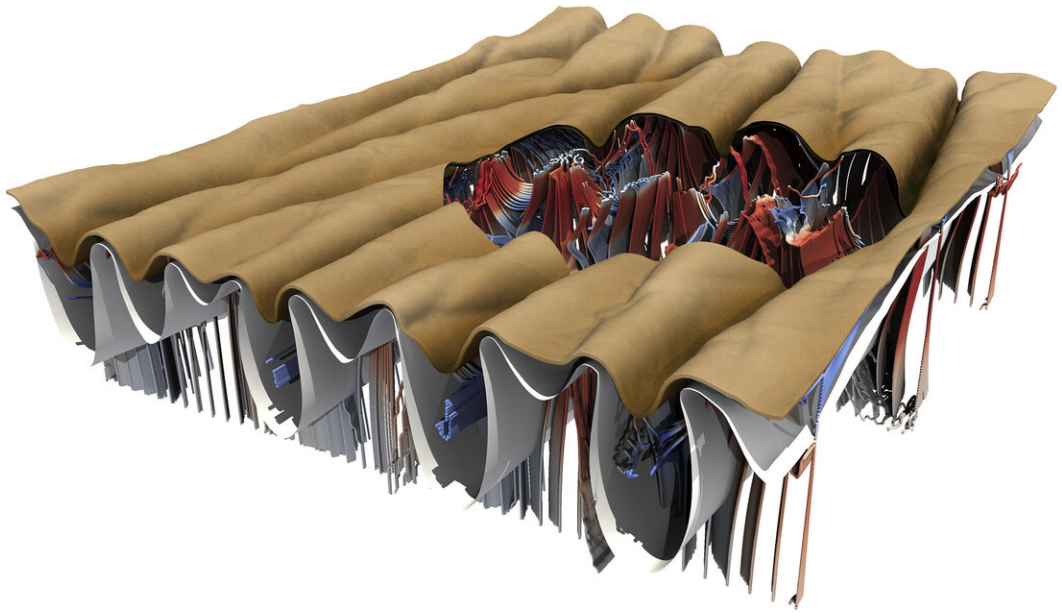

Three dimensional characterisations of skin wrinkles can help scientists gain a deeper understanding of the conditions that cause certain wrinkles. Credit: Univesity of Southampton

The prospects – and consequences – of ageing are of concern to us all, especially when considering the likelihood of developing wrinkles. They are not only a hallmark of ageing but also play a fundamental role in how we physically interact with many products and devices, from moisturiser cream and make up to razor and the fabrics of our clothes.

Moisture levels in our skin play a major role in the development of wrinkles, particularly micro-wrinkles at the surface which can become much deeper, larger and more visible when the outermost skin layer – the stratum corneum – a 10-20 micrometres assembly of dead cells – becomes dryer. This can easily happens as a result of dryer environmental conditions (e.g. heated room, long-haul flight).

Developing innovative and effective solutions for the prevention and treatment of wrinkles has mainly focused on biochemical approaches (i.e. cream) in the past. Now, researchers at the University of Southampton and the University of Cape Town in South Africa, working with colleagues at the University of Stanford in the USA, have applied a biomechanical perspective to understanding what causes wrinkles.

The team has developed a number of quantitative computer models to create three-dimensional characterisations of skin wrinkles which could help scientists, both in academia and industry, to gain a deeper understanding of the conditions that cause certain types of micro-wrinkles. By exploiting physics-based information from these models, the research team believes that it might be possible for industry to soon begin designing innovative preventive and longer-term treatment solutions that could delay and mitigate the effects of ageing on our skin.

"The outermost layer of our skin is mainly composed of dead cells bound by lipids," says Dr. Georges Limbert, Associate Professor in Mathematical Modelling in Biophysics at Southampton's Centre for Advanced Tribology and the Biomechanics and Mechanobiology

Laboratory at the University of Cape Town, and lead author of the research published in the journal *Soft Matter*. "Besides its critical physiological functions as a biochemical barrier, this very thin layer plays a key role in determining the characteristics of skin micro-wrinkles, even in younger people."

"As relative humidity drops, this outer layer – the stratum corneum – becomes dryer and stiffer," Dr. Limbert continues. "When this happens, the micro-wrinkles at the surface of the skin, induced by facial muscle actions like smiling, become much deeper, larger and, therefore, more visible. This can happen in a matter of a few hours so the immediate answer – and one we all know – is to keep our skin hydrated in order to minimise the creation of micro-wrinkles. "

"However, now, we have quantitative computer models that can help scientists to gain a deeper understanding of how certain types of skin wrinkles arise and, therefore, how we can exploit this knowledge to design innovative preventive and treatment solutions that can delay and mitigate the effects of ageing on our skin," Dr. Limbert concludes. "The underlying mechanical principles that condition the morphologies and patterns of wrinkles are essential in evaluating, and ultimately, predicting, how an ageing or aged skin interacts with its environment. This also holds the promise to provide fundamental insights into the physiology and biophysics of skin in health, disease and ageing."

More information: G. Limbert et al. On skin microrelief and the emergence of expression micro-wrinkles, *Soft Matter* (2018). DOI: 10.1039/c7sm01969f

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