

## **Surviving under pressure: Adaptation to mechanical forces as a key step in the evolution of multicellular life**

Initiative: "Leben?" - Ein neuer Blick der Naturwissenschaften auf die grundlegenden Prinzipien des Lebens

(beendet)

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One of the key steps in evolution was the development of multicellular animals (Metazoa) from unicellular organisms over 600 million years ago. While much research has focused on the molecular pathways required for morphogenesis and intercellular communication, one crucial aspect has largely been ignored: the necessity to cope with increased physical forces that arise in tissues of multicellular organisms and, without adaptation, would result in mechanically induced damage and cell death. Intriguingly, Metazoans have evolved characteristic structures that are present neither in single cell organisms nor in organisms with rigid cell walls. This project hypothesizes that these features have evolved to maintain the physical integrity of animal cells and thus are key in the development of multicellular life. To test this hypothesis, an interdisciplinary team with significant expertise in mechanobiology, biophysics, and materials science have been assembled. It will develop novel tools and strategies to quantify piconewton-scale forces at the cell surface and cell interior, detect mechanically induced cellular damage, genetically engineer cells devoid of the mechano-adaptive elements, and create synthetic microenvironments that enable precise control of the physical and biochemical cellular microenvironment. By applying assays to single cells and multicellular assemblies, the team will be able to unravel the molecular details of one of the key principles of life, the ability to withstand mechanical forces and its contribution to the evolution of multicellular organisms.

### **Projektbeteiligte**

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