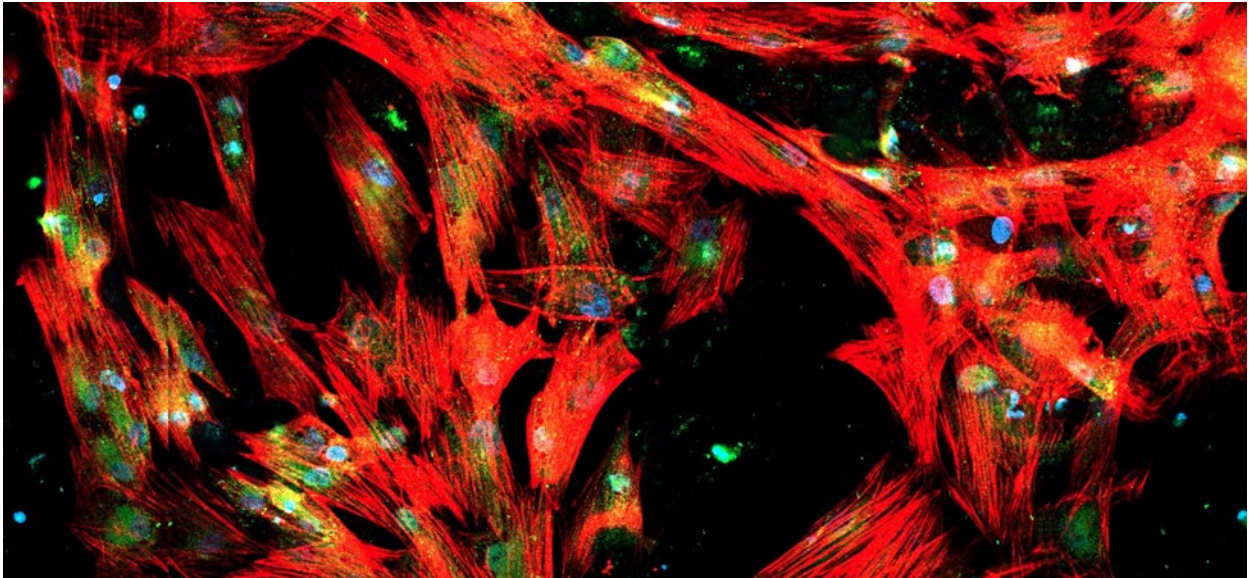


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Research in Graubünden

## A look at cell biology

How does a cell know what to do?



*Human cells cultivated and stained in vitro. Image: Carolina Cordeiro.*

It all started with a single cell. The cell that is the beginning of you, me, your pet, the dinosaurs and ultimately all living creatures on earth. But how does a cell know what it should do and what it should be? The information is mainly found in the genetic material that we possess in the form of deoxyribonucleic acid - DNA for short. This is the main instruction manual that, like a recipe book, determines what a cell will do and how it will interact with the surrounding cells. But that's not the end of the story. Every human being is made up of trillions of cells, and there are at least 200 different cell types, all performing different tasks. Just think of the cardiomyocytes that work tirelessly to keep our hearts beating throughout our lives and the white blood cells that protect us from external agents such as bacteria and viruses. They all have the same DNA.

So what makes a cardiomyocyte a cardiomyocyte or a blood cell a blood cell? The DNA is the same in every cell of the same individual, but is read out differently. The cells respond to environmental stimuli or to signals from other cells and coordinate perfectly to create a highly organized form of life for each multicellular organism. This is done by using ribonucleic acid (RNA) as a temporary copy of DNA, which is used by the cells as an everyday instruction for their work. To stick with the recipe book analogy: It's like photocopying pages from the recipe book and taking the copies into the kitchen to cook tonight's menu. With the RNA molecules, the cells have the template to produce tens of thousands of proteins - we hardly know them all. Some of them are like building blocks and are necessary to support the structure. Others, the enzymes, are responsible for extremely fast and efficient biochemical reactions.

Some proteins are required for the transport of other proteins or other molecules inside and outside the cells. Some ensure very early in embryonic development that the limbs and organs are in the right position and shape, much like an architect or a construction manager ensures that the building is solid and has all the necessary structures. It's like a society where everyone has their role and you work together to achieve a common goal, in this case the creation and maintenance of a living being. Unfortunately, DNA is sometimes damaged or misread. For this reason, diseases or conditions can develop that are both hereditary, such as cystic fibrosis, and acquired, such as cancer. Nevertheless, it is fascinating to understand how *\*we\** function and how many things go on inside us without us being aware of it. Getting an insight into these things is what makes the work of a cell biologist so exciting.

Elena Della Bella and Martin Stoddart



*Elena Della Bella*



*Martin Stoddart*

### **About the AO Research Institute Davos**

The aim of the AO Research Institute Davos is to advance patient care through innovative orthopaedic research and development. Further objectives are to contribute to high quality applied preclinical research and development with a focus on clinical applications and solutions, and to investigate and improve the performance of surgical procedures, devices and substances.

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