

## Communicating In the Language of Life

Within our bodies, there is a highly dynamic activity of biological signals. These signals allow cells and tissues to form organs, coordinate their functions, and adapt to environmental conditions.

In the Cluster of Excellence **CIBSS – Centre for Integrative Biological Signalling Studies** at the University of Freiburg, scientists are working to understand how a multitude of biological signals work together to encode and transmit information and instruct cellular decisions.

Knowing how to communicate in this 'language of life' will help develop innovations that address societal challenges in biomedicine and plant sciences.



Centre for Integrative  
Biological Signalling Studies



[www.cibss.uni-freiburg.de](http://www.cibss.uni-freiburg.de)

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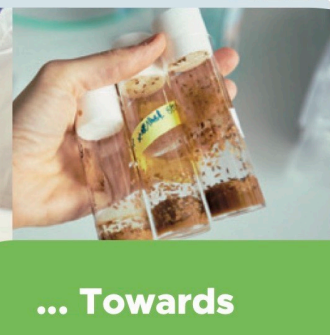
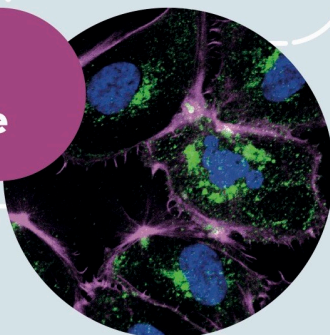
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## Excellent Signalling Science



## From a Comprehensive Understanding ...

## ... Towards Innovation

### What is Signalling Science?

Biological signals include signalling molecules, metabolites, physical stimuli and their combinations. Signalling science is the diverse field of research that investigates these signals: how they are controlled, how they interact, and how they orchestrate biological processes.

### What is CIBSS?

CIBSS is a Cluster of Excellence dedicated to pushing the boundaries of signalling science. CIBSS brings together 75 research groups from 6 faculties of the **University of Freiburg**, the **Medical Center**, and the **Max Planck Institute of Immunobiology and Epigenetics** in highly collaborative and interdisciplinary research projects.

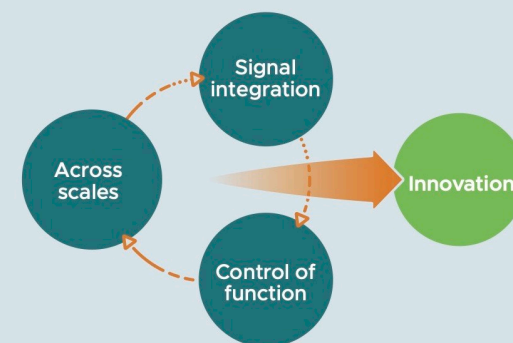
CIBSS is being funded in the German Excellence Strategy of the Federal and State governments with an initial grant of € 37 million for the period 2019 to 2025 by the German Research Foundation (DFG). CIBSS invests this money in scientific innovation and opportunities for CIBSS researchers at all career stages.

### An Interdisciplinary Approach to Signalling Science

Biological signals control all aspects of multicellular life. This is why CIBSS combines expertise in cell and developmental biology, genetics, biochemistry and structural biology, molecular and synthetic biology, immunology, plant sciences, bioinformatics, ethics and law.

Through interdisciplinary collaboration among CIBSS scientists and with national and international partners, CIBSS is uniquely positioned to gain a comprehensive understanding of **the fundamental principles of biological signalling**:

- Signalling molecules determine the development and function of entire organs. Processes that take only fractions of a second trigger lifelong changes. How do signals work **across spatial and temporal scales**?
- Signals interact with each other and have context-dependent meanings. Which mechanisms of **signal integration** allow cells to make decisions?
- Novel tools from chemistry and synthetic biology enable the precise **control of function** of signalling pathways. How can we use these opportunities for research and innovation?



Knowing how cells and tissues perceive and compute biological signals, and how they can be precisely controlled, enables CIBSS to address global challenges through innovation, such as:

**Climate adaptation in plants:** Plants adapt their growth to external conditions. Understanding the biological signals that enable plants to thrive in a changing climate or with low nutrient levels helps to address agricultural challenges.

**Modulating immune function:** The immune system defends us against pathogens and cancer. Understanding the signals that increase the specificity and efficiency of immune cells opens up new prospects for therapeutic advancements