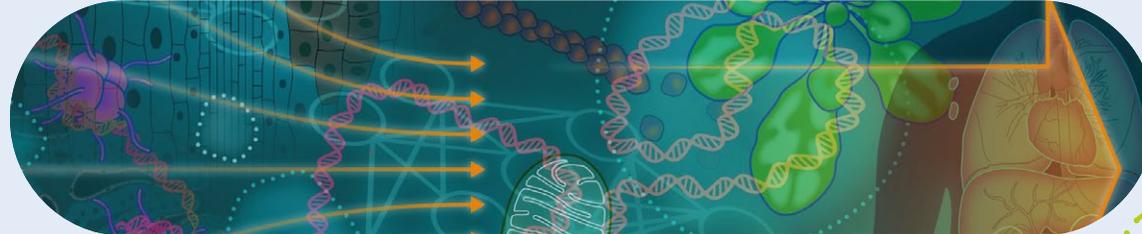
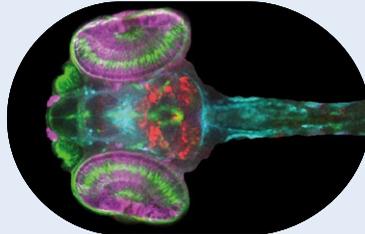


## Communicating In the Language of Life

The trillions of cells in our bodies form tissues and organs, coordinate their functions, and adapt to environmental conditions. This highly dynamic network only works because it shares a **common language: the activity of biological signals.**

In the Cluster of Excellence **CIBSS – Centre for Integrative Biological Signalling Studies** at the University of Freiburg, scientists join forces to understand how diverse biological signals are integrated to guide cellular decisions at all levels – from molecules to whole organisms.

Knowing how to communicate in this **'language of life'** will accelerate innovations that address societal challenges such as advancing human health and ensuring food security.




CIBSS

Centre for Integrative  
Biological Signalling Studies



CIBSS



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

CIBSS – Centre for Integrative Biological Signalling Studies  
Cluster of Excellence, University of Freiburg  
Schänzlestr. 18 | 79104 Freiburg | Germany  
[contact@cibss.uni-freiburg.de](mailto:contact@cibss.uni-freiburg.de)  
Tel. +49 761 / 203 97374

Centre for Integrative  
Biological Signalling Studies

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MAX PLANCK INSTITUTE  
OF IMMUNOBIOLOGY  
AND EPIGENETICS

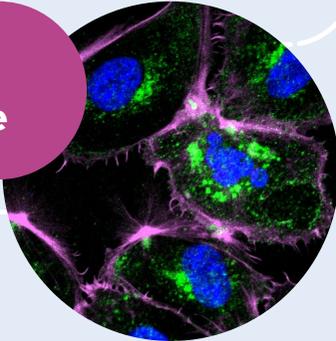


Funded by

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CIBSS is funded by the German Research Foundation (DFG) as part of the Excellence Strategy of the German Federal and State Governments – EXC-2189.

## Excellent Signalling Science



## From a Comprehensive Understanding ...

## ... Towards Innovation

### What is Signalling Science?

Biological signals include tiny metabolites, small molecules, large proteins, physical stimuli, and their combinations. Signalling science investigates the pathways that process these signals – the **molecular basis of decision-making**.

### What is CIBSS?

The Cluster of Excellence CIBSS unites over 70 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, interdisciplinary research projects.

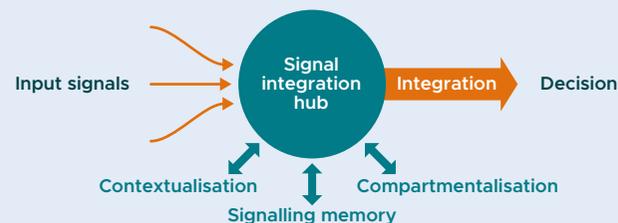
We **advance signalling science** through molecular, cell and developmental biology, biochemistry, structural and synthetic biology, genetics, immunology, plant sciences, bioinformatics, ethics and law.

CIBSS is funded in the **Excellence Strategy** of the German federal & state governments with € 45 million for a second 7-year period (2026 - 2032) by the German Research Foundation (DFG). We **invest in cutting-edge research, innovation, opportunities for CIBSS researchers** at all career stages, and **engagement with the public**.

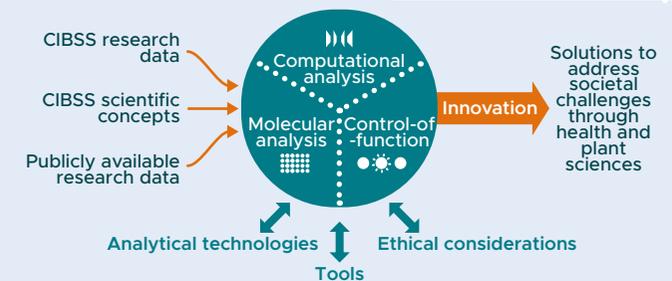
From molecules to cells and from cells to tissues and organs – **signal integration drives decision-making**. Signals from the environment, other cells and within the cell interact **across spatial and temporal scales**.

At CIBSS we study how cells **integrate, store and transmit** this multitude of biological signals.

Collaborations among CIBSS scientists and with national and international partners **uniquely position** us to gain a comprehensive understanding of biological signalling. We focus on the following **core mechanisms of signal integration**:



**Contextualisation** can make the same cell react very differently to the same signal depending on what other signals are present. **Signalling memory** influences decisions in response to previously encountered signals. Dynamic **compartmentalisation** controls signalling output and memory.



Novel chemical tools and cellular engineering approaches allow the precise **control of signalling pathways**. This enables CIBSS to **address global challenges** through innovation, such as:

**Climate adaptation in plants:** We study the biological signals that help plants to adapt their growth in a changing climate or under low nutrient levels to address agricultural challenges.

**Modulating immune function:** The immune system protects us from pathogens and cancer. We investigate signalling processes that increase the specificity and efficiency of immune cells to develop new therapies.

**Comprehensive computational approaches:** Advances in signalling research rely on integrating multimodal data. We use big data and machine learning to better understand signalling processes in diseases.