



World Food System Center

Member Booklet 2025

Member Groups of the World Food System Center

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Members of the World Food System Center

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D-BIOL

D-BSSE



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D-HEST

D-HEST



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D-USYS & D-MTEC

D-MTEC

D-CHAB

D-BAUG



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DR. CHRISTIAN STAMM Environmental Climatology
DR. CHRISTIAN ZÜRBRÜGG Water and Simulation
PROF. RENE ROSSI Biomimetic Membranes and Textiles

D-GESS

Eawag

Empa



Measuring soil with digital device and tablet.

FUNCTIONAL COORDINATION CHEMISTRY

Using new sensing technologies to inform about more sustainable agricultural practices.



Research Areas

- Inorganic Chemistry;
- Functional Materials;
- Chemical Sensors.

Regions

Switzerland.

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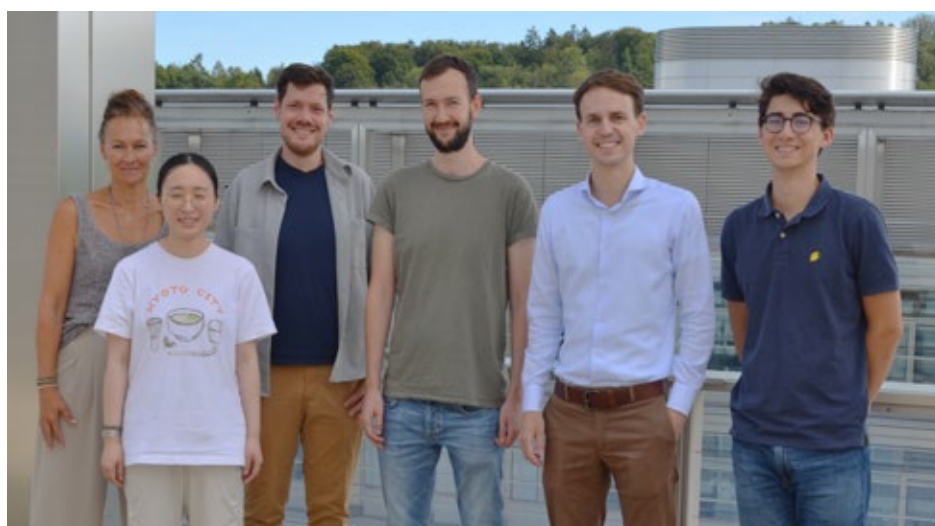
www.bezdek.ethz.ch

Contribution to the WFSC

The Functional Coordination Chemistry Group carries out research at the intersection of inorganic chemistry and sensor science and develops stimuli-responsive materials. Specifically, they apply molecular design principles to advance new sensing technologies for the detection of environmentally-relevant analytes. Their goal is to make low-cost and distributable chemical sensors for real-time soil health monitoring and thereby help to inform about sustainable agricultural practices.



Prof. Máté Bezdek





Vineyards in Napa, California (Photo: Reid Griggs).

FOOD SYSTEMS BIOTECHNOLOGY

Developing approaches to study microbial ecosystems at the interface of foods.



Research Areas

- Food biotechnology;
- Microbial ecology;
- Bioinformatics and software engineering;
- Food fermentation;
- Human microbiome.

Regions

Switzerland, USA, and global.

Partners

University of Basel; University of Lausanne; Changins; Unispital Basel; University of California; Davis; and Rutgers University.

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Contribution to the WFSC

The Food Systems Biotechnology Group develops and utilizes computational and experimental approaches to study microbial ecosystems at the interface of foods and human health, with the ultimate goal of engineering microbial communities to promote food quality and security, and to optimize functional roles in human digestion and health. This includes characterizing the temporospatial organization of microbiomes in food production systems both pre- and post-harvest, as well as establishing a predictive understanding of the interactions between diet, the gut microbiome, and human health.



Prof. Nicholas Bokulich





Seasonality at Oensingen, one of the Swiss Fluxnet sites.

GRASSLAND SCIENCES

Ensuring a sustainable resource use in the world food system.



Research Areas

- Ecosystem biogeochemistry;
- Plant & ecosystem physiology;
- Functional plant diversity;
- Policy advice and outreach.

Regions

Mainly in Switzerland and Germany.

Partners

Universities of Zurich, Bern and Basel; Agroscope; Institute for Forest, Snow and Landscape Research (WSL); Institute for Materials Science and Technology (Empa); Max Planck Institute (MPI) for Biogeochemistry; Friedrich-Schiller-University, Jena; Universities of Freiburg, Helsinki, Aberdeen; and international project consortia.

Contact

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Contribution to the WFSC

The group of Grassland Sciences analyzes terrestrial ecosystems and their provision of ecosystem services in a process- and system-oriented approach. The research and teaching is divided into the two pillars of availability/sustainable production and stability/environmental change, focusing on ensuring a sustainable resource use in the world food system.



Prof. Nina Buchmann





Yellow leaves in August indicate drought stress on field site in Saillon (VS).

PHYSICS OF SOILS AND TERRESTRIAL ECOSYSTEMS

Providing insight into sustaining plant growth during drought.



Research Areas

- Soil-plant interactions;
- Agriculture in water-limited regions;
- Crop physiology and phenotyping;
- Drought.

Regions

Switzerland; Germany; USA (California); Senegal; India; Australia.

Partners

Forschungszentrum Jülich GmbH (FJZ); Helmholtz-Zentrum für Umweltforschung - UFZ - Leipzig-Halle; OpenGeoHub Foundation - Wageningen; Université catholique de Louvain (UCLouvain) - Louvain-la-Neuve; Hebrew University of Jerusalem (Ha'Universita Ha'Ivrit Bi'Yerushalayim); Università degli studi di Trieste; Technical University of Munich; Desert Research Institute, Reno, USA; University of Minnesota.

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Contribution to the WFSC

The Physics of Soils and Terrestrial Ecosystems Group studies the mechanisms that confer drought tolerance to crops and trees and allow them to grow under water-limited conditions. Their research is at the interfaces between the soil and plants and plants and the atmosphere and provides fundamental insight into sustaining plant growth during drought.



Prof. Andrea Carminati

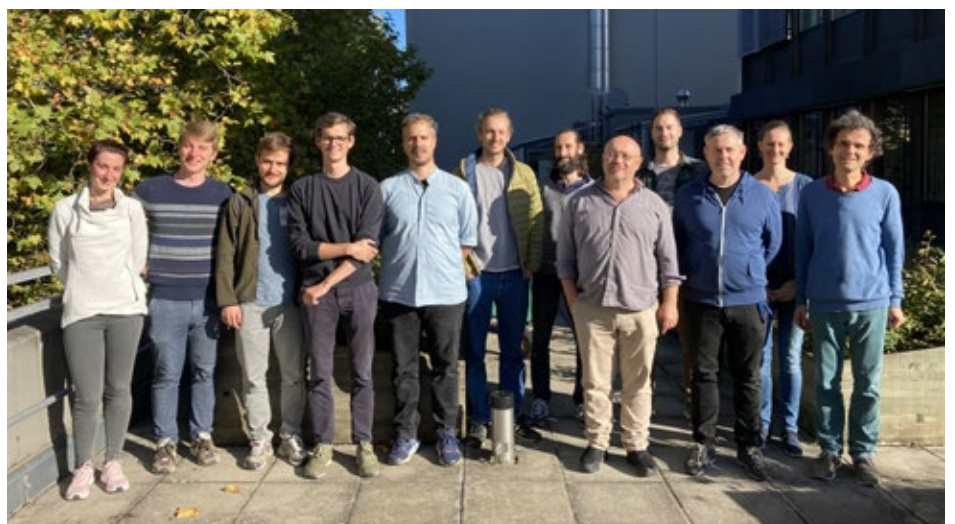




Illustration of the global biocomplexity.

GLOBAL ECOSYSTEM ECOLOGY

Understanding the relationship between biodiversity and climate change by studying ecosystems.



Research Areas

- Global vegetation ecology;
- Global microbial ecology;
- Global restoration ecology;
- Global landscapes;
- Science communication and policy impact.

Regions

Switzerland; Costa Rica; Panama; Brazil; Ireland; Wales.

Partners

EPFL; WSL; Lund University; University of Alicante; University of Michigan; Lawrence Livermore National Laboratory; University of the Sunshine Coast; University of Central Florida; Yale University; Wageningen University and Research Centre; University of Minnesota; Nanjing University; Fudan University; Beijing Normal University; Weizmann Institute of Science; The Nature Conservancy; World Economic Forum; 1t.org; Google; Terraformation; Restor; Spun; Funga; Earthshot Foundation; X-Prize.

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Contribution to the WFSC

The Global Ecosystem Ecology Group studies ecosystems at a global scale to understand the relationships between biodiversity and climate change. Their work contributes to the scientific foundation for ecosystem management and informs and empowers people to protect and restore Earth's biodiversity to fight climate change and improve human well-being. The group uses a range of methods to understand the distribution and function of forests, urban vegetation, and microbiomes to better maintain or improve biodiversity and the services it provides to all.



Prof. Tom Crowther





Larval stage of the Mexican bean beetle, *Epilachna varivestis* (Coleoptera: Coccinellidae).
(Photo: Hannier Pullido)

BIOCOMMUNICATION AND ENTOMOLOGY



Exploring the role of chemical signaling in ecology, which has practical relevance for sustainable food production and other pressing societal challenges.

Research Areas

- Plant-insect interactions;
- Chemical ecology of vector-borne disease;
- Chemically mediated interactions between plants;
- Plant responses to olfactory cues;
- Evolutionary ecology of plant signaling and defense;
- Biological communication and information-mediated ecological interaction.

Regions

Brazil, Greece, Kenya, Switzerland, and USA.

Partners

International Center of Insect Physiology and Ecology (IC-IPE); Pennsylvania State University; University of Virginia; and Instituto Nacional de Ciência e Tecnologia - Centro de Energia, Ambiente e Biodiversidade (INCT-CEAB).

Contact

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Contribution to the WFSC

The Biocommunication and Entomology Group explores the role of chemical signaling in mediating ecological interactions among species, with a particular focus on characterizing olfactory cues and signals and their role in information transfer. Most of the work focuses on multitrophic interactions among plants, insects, and microbes, and on the interactions of insect disease vectors with their plant and animal hosts. The overarching goal is to answer key basic science questions in ecology and evolution with implications for human health and the sustainable management of natural and agricultural ecosystems.



Prof. Consuelo De Moraes



(Photo: Hannier Pullido)



Highly eroding landscape in the Eastern Congo Basin.

SOIL RESOURCES

Raising awareness for the limitations, dynamics and services of soil resources in order to improve their preservation and to better sustain human nutrition.



Research Areas

- Global scale erosion and soil carbon cycling in collaboration with earth system modelers;
- Regional scale nutrient and soil dynamics using remote sensing and modeling approaches;
- Local scale experimental work on biogeochemical cycling in relation to pedogenesis, climate, geology and human activity.

Regions

Switzerland, Germany, Democratic Republic of Congo, Rwanda, Uganda, Antarctica, and Norway.

Partners

Ghent University; Université Catholique de Louvain; Université Catholique de Bukavu; Université de Lubumbashi; ICRAF; IITA; and Max Planck Institute for Biogeochemistry.

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Contribution to the WFSC

The Soil Resources Group studies environmental processes, in particular related to soil development and biogeochemical cycles. The aim is to understand how soil processes interact, and how they are affected by human activity. The research is often located in underrepresented areas that are undergoing strong changes in climate and land use. A particular hot spot of the group's work is in tropical Africa, which is characterized by population growth and rapid deforestation. Here, more sustainable soil management and improvement of soil health will be essential for future food security.



Prof. Sebastian Dötterl





The agricultural and food sector.

AGRICULTURAL ECONOMICS AND POLICY



Improving the understanding of production and risk management decisions for better policies in the agricultural and food sector.

Research Areas

- Agricultural economics;
- Agricultural policy evaluation and design;
- Risk management in agriculture;
- Economics and policy of agricultural pollutants;
- Climate change and climate risks in agriculture.

Regions

Mainly Switzerland and other European countries.

Partners

University of Bonn; Wageningen University; Agroscope; University of Göttingen; Institut National de la Recherche Agronomique (INRA); and Technical University of Munich.

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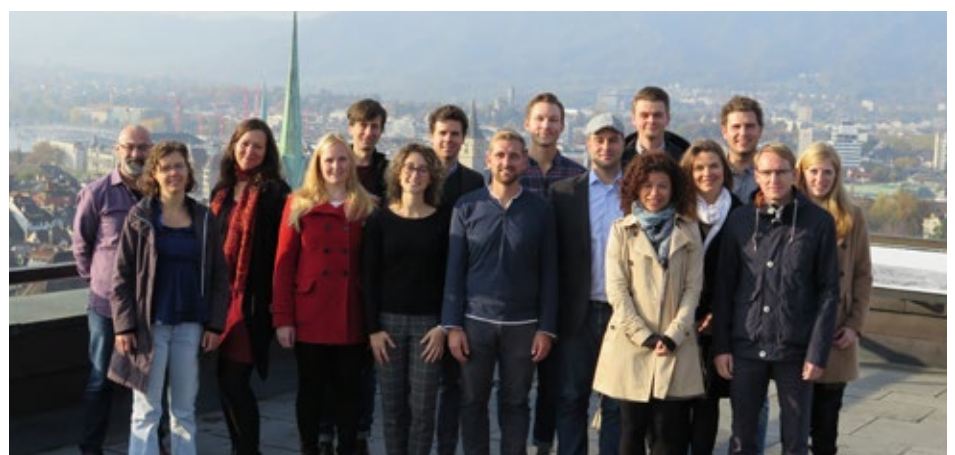
www.aecp.ethz.ch

Contribution to the WFSC

Research of the Agricultural Economics and Policy Group improves the understanding of linkages among policies, the environment, production and risk management decisions taken in the agricultural sector. Our mission is i) to better understand the decisions taken by farmers, ii) to contribute to evaluation and design of agricultural policies and risk management instruments, iii) to contribute to resilient and sustainable agricultural and food systems. Building upon microeconomic theory and models, the research conducted in the group employs different methodological approaches including econometric analysis, economic experiments and surveys as well as farm- and regional level optimization modeling.



Prof. Robert Finger





Intercropping of rice and legume *Stylosanthes guianensis* to investigate N and P dynamics in a rice-legume based crop rotation, Madagascar highlands (Photo: Oliver Zemek).

PLANT NUTRITION

Understanding nutrient dynamics to develop nutrient management systems that preserve and enhance the natural resource base and contribute to food security.



Research Areas

- Nutrient speciation in soils;
- Processes controlling nutrient cycling in soil/plant/fertilizers systems;
- Development of integrated nutrient management schemes in agroecosystems.

Regions

Australia, Burkina Faso, Colombia, Côte d'Ivoire, Sri Lanka, South Africa, Switzerland, and USA.

Partners

CSRS, Côte d'Ivoire; CIAT, Colombia and CIAT, Vietnam; ICRAF, Côte d'Ivoire; FiBL, Switzerland; IITA, Nigeria; INERA, Burkina Faso; Universities of: New England and Sydney, Australia; Ghent, Belgium; Amazonia, Florençia, Colombia; Nazi Boni, Burkina Faso; Houphouet Boigny, Côte d'Ivoire; Copenhagen, Denmark; Cotonou, Benin; Lincoln, New Zealand; Peradeniya, Sri Lanka; Stanford; and UC Santa Barbara, USA.

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Contribution to the WFSC

Integrated nutrient management schemes are necessary to achieve food security. Crops and grasslands need to be provided with sufficient nutrients in appropriate forms to be productive. Also, nutrient management affects the technological and nutritional value of plant products. Furthermore, ecological stability is affected by nutrient management, as nutrient losses trigger environmental degradation and resources such as soil or mineable phosphorus deposits are not renewable on the human time scale. It is the mission of the Plant Nutrition Group to tackle these issues.



Prof. Emmanuel Frossard





Pollination services - Apis dorsata on a coffee flower.

ECOSYSTEM MANAGEMENT



Building knowledge on ecological and evolutionary processes to ensure sustainable food production and biodiversity conservation in forested landscapes.

Research Areas

- Agroforestry and land use change;
- Oil palm;
- Tropical rainforest ecology;
- Pollination services;
- Forest restoration.

Regions

Cameroon, Colombia, India, Indonesia, Zambia, and Scotland.

Partners

Centre for International Forest Research; Agricultural Research Centre for International Development (CIRAD), France; Luc Hoffmann Institute, Switzerland; Sepilok Forest Research Centre, Malaysia; University of Agricultural Sciences Bangalore, India; University of Edinburgh, UK; and World Wide Fund for Nature (WWF).

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Contribution to the WFSC

The Ecosystem Management Group seeks to determine how the goals of food production and biodiversity conservation can be achieved in context of rapid land transitions, climate change, and growing demands for agricultural products. This responds to the global need to address global food security challenges while sustaining a wide range of environmental values and services.



Prof. Jaboury Ghazoul





Application of pesticides to develop dynamic plant uptake models for Life Cycle Assessment.

ECOLOGICAL SYSTEMS DESIGN

Modeling and analyzing food production systems to assess overall impacts of food products.



Research Areas

- Life Cycle Assessment method development;
- Environmental decision-support tools for industry and authorities;
- Combination of methodological work with actual case studies (agricultural production, wood, consumer products, waste management, energy supply and use).

Regions

Mainly global assessments (incl. Africa, the Americas, Asia, and Europe).

Partners

Coop; Syngenta; World Wide Fund for Nature (WWF); Research Institute of Organic Agriculture (FiBL); and the Joint Research Centre of the European Commission (JRC).

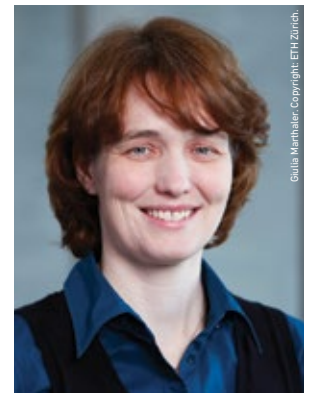
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Contribution to the WFSC

The Ecological Systems Design Group provides expertise in Life Cycle Analysis and other methods like Material Flow Analysis and Scenario Assessment, which allows for environmental evaluation of food production systems throughout their whole value and impact chain. These methods provide a comprehensive view of the environmental impacts associated with food, therefore providing the WFSC with methods for modeling, analyzing, evaluation and improving the resource efficiency and environmental impacts of food products. The group works on food waste; nutritional aspects as well as global models for impacts regarding water consumption, land occupation and soil degradation and consequences on global species loss; as well as trade in the global food system.



Prof. Stefanie Hellweg





Circular economy in the food sector.

SUSTAINABILITY AND TECHNOLOGY



Improving the understanding of technological innovation, institutional dynamics, and organizational strategies as key drivers towards a de-carbonized, circular economy.

Research Areas

- Circular economy;
- Food waste reduction;
- Nature regeneration;
- Packaging.

Regions

Switzerland, Europe, and global.

Partners

Fraunhofer Institutes (IZM , IVV); University of Cambridge; World Resource Forum; Alliance To End Plastic Waste; Denner; BASF.

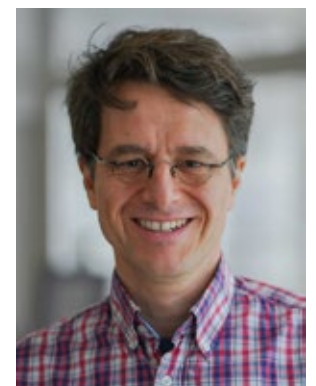
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Contribution to the WFSC

As part of the WFSC, the Sustainability and Technology group focuses on the transition to decarbonized, circular food ecosystems. The Circular Economy Group within SusTec is led by Dr. Catharina Bening. Starting out with research which was largely related to packaging and plastics, the group is also exploring the transformative potential of sustainable technological innovations and the essential shifts in institutional frameworks and regulations needed to reduce resource consumption and foster the regeneration of nature.



Prof. Volker Hoffmann





Food culture near Bolgatanga, Ghana (Photo: Sara Baga).

AGROECOLOGICAL TRANSITIONS

Helping to create a more sustainable and fair agri-food system with critical social-ecological systems research.



Research Areas

- Agroecology and Agroforestry;
- Food sovereignty, democracy and farmers' rights;
- Agricultural landscapes;
- Food system resilience;
- Political ecology of food;
- Transdisciplinary co-creation of knowledge.

Regions

Brazil, Bolivia, Peru, Nicaragua, Colombia, Democratic Republic of the Congo, Kenya, Ghana, Zambia, and Switzerland.

Partners

Universidade Federal Rural do Rio de Janeiro; Universidad Mayor de San Andrés; Universidad Nacional de Colombia; International Institute of Tropical Agriculture; Catholic University of Bukavu; University of Nairobi; Biovision, Swiss Research Institute of Organic Agriculture; Landwirtschaft mit Zukunft; University of Bern; Uniterre; Ecotambo; Munaipata Café de Altura; ViCAFE; Universidad Mayor de San Andrés, La Paz; Centre for Training and Integrated Research in Arid and Semi-Arid Land Development, Nanyuki; Technikum Urbane Agrarökologie; and Participatory Science Academy, Zurich.

Contribution to the WFSC

The Agroecological Transitions (AET) group aims to contribute to sustainable and fair agri-food systems from critical social-ecological systems research. Agroecology is - following FAO - a realm where science, practice and social movements converge to seek a transition to sustainable food and agricultural systems, built upon the foundations of equity, participation and justice. By using mixed-methods and informed by theory, we investigate topics of diversified, democratically organized and culturally acceptable agriculture and food systems across regions in the Americas, Africa and Europe.



Prof. Johanna Jacobi

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The process of drilling a water well.

SUBSURFACE ENVIRONMENTAL PROCESSES



Understanding the impact of land use changes and climate change on groundwater resources for their protection and of the related ecosystems.

Research Areas

- Fate and transport of contaminants in soils and aquifers.
- Microbial ecology in the subsurface;
- Impact of land use changes and climate change on groundwater resources.

Regions

Switzerland, European countries, African countries, and USA.

Partners

EMPA; PSI; University of Rennes; and Technical University of Valencia.

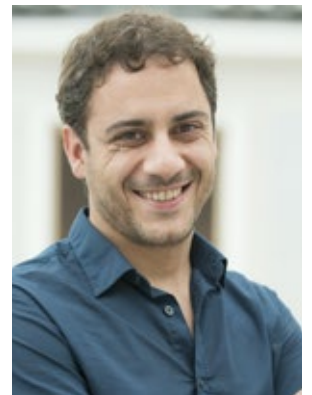
Contact

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Contribution to the WFSC

The Subsurface Environmental Processes Group studies the effects of land use changes and climate change on water resources, particularly on groundwater recharge. Their aim is to improve the fundamental understanding of biogeochemical reactions and transport mechanisms affecting these chemicals in the subsurface, and provide predictive models helping as decision support tools for stakeholders and policy makers. More sustainable groundwater management, both quantity and quality protection, will be essential for future food security.



Dr. Joaquin Jimenez-Martinez





Field experiments are conducted in southern China together with scientists from Nanjing Agricultural University to test various soil amendments for reducing Cd and As uptake into rice.

SOIL CHEMISTRY



Understanding soil chemical processes controlling nutrient and contaminant behavior in terrestrial ecosystems to sustain soil quality and food security.

Research Areas

- Trace metal speciation and bioavailability in contaminated soils and sediments;
- Rhizosphere processes and plant uptake of Cd and As in irrigated rice;
- Redox biogeochemistry of Fe and its coupling with other element cycles (C, N, P, As, Hg, and others).

Regions

Bulgaria, China, Germany, Switzerland, and Thailand.

Partners

Nanjing Agricultural University; Kasetsart University; Bulgarian Academy of Sciences; and University of Tübingen.

Contact

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Contribution to the WFSC

Understanding biogeochemical processes controlling trace element speciation, bioavailability, and plant uptake in agricultural and wetland ecosystems is essential for ensuring safe food production and sustaining soil quality. Current projects of the Soil Chemistry Group investigate the biogeochemical cycling of Fe, Mn, S, As, Cd, and Hg in redox-affected soil environments, including contaminated rice paddy fields. One of their goals is to develop soil management strategies to minimize the uptake of toxic elements by food crops such as rice.



Prof. Ruben Kretzschmar





Students of the transdisciplinary case study 2016 on solid waste management in the Seychelles discussing with local stakeholders.

USYS TdLab – TRANSDISCIPLINARITY LAB



Conceptualizing and testing educational and research approaches to tackle complexities of sustainable development.

Teaching and Research

- The TdLab provides teaching activities addressing topics from a problem-oriented perspective. Students learn to tackle complex real-world problems, collaborate in teams across different disciplines and engage in a dialogue with stakeholders.
- In line with our teaching, our research crosses disciplinary boundaries and is organized in close collaboration with stakeholders.
- We develop with the td-net of the Swiss Academies a toolbox for the co-production of knowledge among different science disciplines and society.
- The TdLab has established 'sustainability learning labs', test-fields to co-design, analyse, and implement solutions for sustainable development in the global South and Switzerland.

Regions

Benin, Ethiopia, Germany, Ghana, Seychelles, Switzerland, and Vanuatu.

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Partners

Teaching and research groups within the ETH domain and beyond; universities; stakeholders and bodies from civil society; and the public and private sector.

Contribution to the WFSC

The TdLab provides problem oriented and research-based inter- and transdisciplinary teaching courses from the bachelor through the doctoral levels; theories, methodologies, and tools to integrate knowledge from both different disciplines and practice; and a framework to engage with stakeholders in the research process.



Dr. Pius Krütli, Co-Director





Vibrio, a type of rod shaped bacteria, known to cause Cholera (Photo: Biomedical Beat, 2009).

Food Microbiology

Ensuring a safe world food supply without pathogens.



Research Areas

- Food safety, pathogenic microorganisms that occur in food and feed;
- Fundamental research in molecular biology and microbial ecology;
- Development of rapid diagnostic procedures for detection of foodborne pathogens;
- Novel biocontrol measures to restrict contamination with, and development of, pathogens in foods.

Regions

Germany, Switzerland, UK, and USA.

Partners

Other academic groups, and various SME.

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Contribution to the WFSC

The group of Food Microbiology focuses their research on microbial pathogens in food and the corresponding bacteriophages, developing new, cutting-edge methods for detection and control of these bacteria. Further, they construct and use genetically engineered microorganisms for manufacturing and preservation of food. This helps to secure food safety for a healthy food supply in developing and developed countries.



Prof. Martin Loessner





Studying the performances of different grass-legume-herb mixtures and grass pure stands when cut or grazed (foreground) and when facing drought stress (background).

FORAGE, GRASSLAND, GRAZING SYSTEMS



Developing sustainable grassland-based forage production systems to ensure global food security.

Research Areas

- Functional plant diversity and community structure as drivers of ecosystem multifunctionality and as adaptation and mitigation options to climate change;
- Prevention and regulation of weed species and poisonous plants in grasslands;
- Weed species and poisonous plants in grasslands;
- Sustainable management strategies for forage production of permanent and temporary grassland;
- Cultivar testing and development of grass-legume seed mixtures, fertilization guidelines.

Regions

Switzerland, many European countries, and consortia with partners from Australia, Canada, China, New Zealand, and USA.

Partners

Other Agroscope research groups; ETH; universities and applied universities of Switzerland; Swiss Grassland Society (AGFF); Agridea; and international universities and research institutes.

Contact

Agroscope
Forage Production and Grassland Systems
Reckenholzstrasse 191
8046 Zürich

Contribution to the WFSC

The group of Forage Production and Grassland contributes to sustainable food production by developing forage production strategies that optimize the use of the farm's own resources (biodiversity, manure, farm grown forage), minimize the need of external inputs (fertilizers, pesticides, feedstuff) and allow adaptation and mitigation to climate change. They contribute to the development of productive, yet environmentally friendly, grassland-based forage production systems for organic and conventional farming from lowland to alpine conditions.



Prof. Andreas Lüscher

www.agroscope.admin.ch/agroscope/en/home/topics/plant-production/forage-grassland-grazing-systems.html





Investigating the economic feasibility of microalgae as an alternative protein source. (Photo: Rainer Spitzenberger)

SUSTAINABLE FOOD PROCESSING



Developing system oriented food processing via the consideration of the total value chain including emerging needs in society and their environmental, economic and social impact.

Research Areas

- Emerging multi-hurdle technologies for gentle preservation of healthy and high quality food;
- Novel protein based biorefineries, with focus on algae and insects, for more sustainable food production;
- Modular micro process engineering approaches to improve upscaling;
- Nutritional combined environmental life cycle assessment.

Regions

Australia, China, Europe, Kenya, Nigeria, South Africa, and USA.

Partners

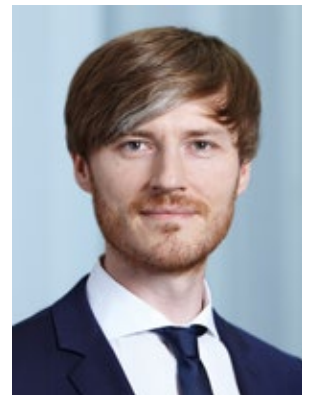
Bühler AG; Migros; Nestlé SA; German Institute of Food Technologies (DIL); University Stuttgart; Agroscope; HS Sion; luFoST; and Institute of Food Technology (IFT).

Contact

ETH Zurich
Sustainable Food Processing
LFO E 12.2
Schmelzbergstrasse 9
8092 Zurich
www.sfp.ethz.ch

Contribution to the WFSC

The Sustainable Food Processing Group focuses on a system oriented approach in production, considering the total value chain and including emerging needs in society. A multi-indicator sustainability assessment as guidance tool is the foundation of the emerging food process development. Selected mechanical, biotechnological, thermal and non-thermal techniques to realize biomass use efficiency, waste reduction and high quality food production are evaluated. Innovative raw materials from algae and insects are utilized within urban farming and processing concepts to enable new ways of sustainable food supply.



Prof. Alexander Mathys





Applying digital image analysis to measure pathogen virulence.

PLANT PATHOLOGY

Controlling plant pathogens to reduce losses of staple food crops.



Research Areas

- Pathogen population genetics and evolutionary biology;
- Biological control of soil-borne pathogens;
- Diseases of perennial crops;
- Resistance breeding strategies;
- Pathogen origins and emergence.

Regions

Australia, Brazil, China, Denmark, Germany, Iran, Italy, New Zealand, The Netherlands, and USA.

Partners

INRA; USDA; Australian National University; CSIRO Plant Industry; Curtin University; UNESP, Brazil; and FAFU, China.

Contact

ETH Zurich
Plant Pathology
LFW B 16
Universitätstrasse 2
8092 Zurich

www.path.ethz.ch

Contribution to the WFSC

The group of Plant Pathology works on major diseases infecting the important food crops (wheat, barley, rice) in order to reduce disease losses. The research spans the spectrum in agriculture, from molecular- to ecosystem-orientation, which allows for a highly cross-disciplinary and global orientation which fits with the objectives of the WFSC. The focus is on delivery of fundamental knowledge in key areas of plant pathology in a problem-solving, innovative manner.



Prof. Bruce McDonald





Food Trade.

FOOD SYSTEMS ECONOMICS AND POLICY



Analyzing policies and institutional arrangements to help promoting sustainability goals in global food systems.

Research Areas

- Food Systems;
- Agrifood employment;
- Poverty reduction, health, nutrition, and gender equality;
- Implications of policies, institutions, and technologies.

Regions

Africa, Asia, and Latin-America.

Partners

IFPRI, World Bank, and several universities in North America (e.g., Minnesota, Michigan) and Europe (e.g., Leuven, Copenhagen).

Contact

ETH Zurich
Food Systems Economics and Policy
SOL E 9.1
Sonneggstrasse 33
8092 Zurich

<https://fsep.ethz.ch>

Contribution to the WFSC

The Food Systems Economics and Policy Group conducts applied research that contributes to a better understanding of how to promote sustainability goals in global food systems. A special focus lies on the analysis of policies, institutional arrangements, and technologies and their role in poverty reduction, decent employment, health and nutrition, and gender equality in lower-income countries. Our research considers and features diverse actors within food systems (such as farmers, workers, cooperatives, and entrepreneurs in the formal and informal sector) who are engaged in primary agricultural production, food processing, food services and beyond.



Prof. Eva-Marie Meemken





Small-Angle X-ray Scattering (SAXS) machine, measuring the interaction of a sample with X-rays to study its nanostructure.

FOOD AND SOFT MATERIALS

Developing healthy, functional foods with affordable and sustainable processes and materials.



Research Areas

- Food physics, nanotechnology and food materials science;
- Self-organization of proteins, polysaccharides and lipids;
- Understanding structure-properties relationship in complex food systems;
- Characterization of structure in processed foods;
- Design of functional foods from proteins and lipids.

Regions

Switzerland.

Partners

Australia, Canada, China, Finland, Germany, India, Israel, Kenya, New Zealand, Romania, Spain, Portugal, and UK.

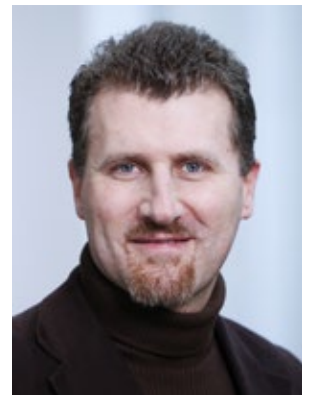
Contact

ETH Zurich
Food & Soft Materials
LFO E 22
Schmelzbergstrasse 9
8092 Zurich

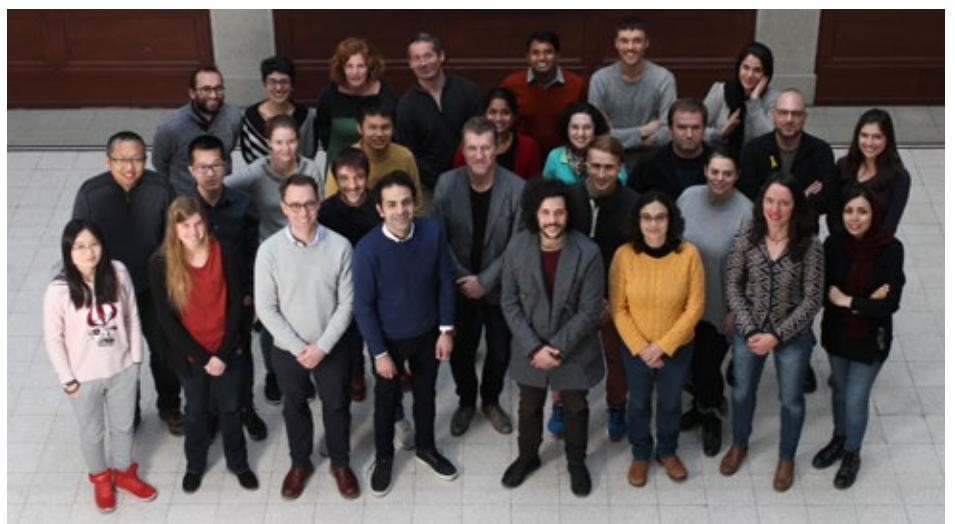
www.fsm.ethz.ch

Contribution to the WFSC

The group of Food and Soft Materials develops nanotechnology and material science concepts that can be exploited to improve structure and quality of processed and natural foods. Understanding the structure-properties relationship in complex food systems helps to develop healthy, functional foods. The study of model food systems originating from sustainable ingredients and affordable processes is closely aligned with the thematic focus areas of the WFSC.



Prof. Raffaele Mezzenga





CYBER (CanopY Exploration Robots) project where the science and technology of new multi-modal robots for comprehensive canopy exploration is studied.

ENVIRONMENTAL ROBOTICS

Using robotics to create sustainable agricultural production systems.



Research Areas

- Bioinspired design and fabrication methods for robots;
- Control and perception strategies for robot locomotion and interaction;
- Robotic tools for environmental monitoring;
- Robotics for sustainability.

Regions

Switzerland.

Partners

Institute for Forest, Snow and Landscape Research (WSL); and University of Zurich.

Contact

ETH Zurich
Environmental Robotics Lab
LFW C 55.3
Universitätstrasse 2
8092 Zurich

<https://erl.ethz.ch>

Contribution to the WFSC

The research of the Environmental Robotics Lab investigates the challenges and opportunities of robotics in the areas of climate change, environmental degradation, and sustainability. Taking inspiration from nature, we study novel design, manufacturing, perception, and control paradigms to create versatile and robust machines to explore complex and unpredictable natural environments. The purpose of these new robots is threefold: i) to mitigate the effects of climate disasters, ii) to collect data and samples for high spatial and temporal resolution environmental monitoring, iii) to enable efficient and sustainable agricultural production systems.



Prof. Stefano Mintchev





Terrace rice fields. In Yunnan Province, China (Photo: J. Gao)

COUPLED HUMAN-WATER SYSTEMS

Studying the relationships between social and hydrological systems.



Research Areas

- Coupled human-natural systems and Food-Energy-Water-Ecosystem nexus;
- Land acquisitions, land use change and dietary diversity;
- Forced migration, armed conflicts, virtual water flows and food insecurity.

Regions

South Asia, Middle East, Sub saharan Africa, and the Global South more broadly.

Partners

University of Notre Dame; UC Berkeley; Stanford; University of Vermont; University of Delaware; Politecnico de Milano; VU Amsterdam; and University of Berne.

Contact

Eawag
Coupled Human-Water Systems
FC D01
Überlandstrasse 133
8600 Dübendorf

<https://eawag.ch/en/department/siam/main-focus/coupled-human-water-systems/>

Contribution to the WFSC

The Coupled Human-Water Systems Group at Eawag studies the relationships between social and hydrological systems within the nexus of food, water, energy and environmental security. Using modeling and analysis tools from the environmental-, social- and data-sciences, the group examines the unintended consequences of water management or land-use decisions, especially when their impacts are externalized to distant regions, vulnerable populations, or future generations. At a global level, their research has investigated the effect of transnational land acquisitions and irrigation infrastructure expansion, on local food security, water competition and biodiversity losses. At a more regional level, their work has focused on the allocation of transboundary waters and on the ramifications of armed conflicts and forced migration on food security through virtual water fluxes.



Dr. Marc Müller



Cow feeding.

ANIMAL NUTRITION

Improving the sustainability of livestock systems by understanding the nutrition of animals.



Research Areas

- Nutritional physiology;
- Feeds, feeding, and food quality;
- Digestion, metabolism, and environment;
- Data science and smart livestock farming.

Regions

Europe, United States, and Canada.

Partners

Agroscope; Nestlé SA; University of Zurich (UZH); Bern University of Applied Sciences (BFH); University of Pennsylvania; and Deschambault Animal Science Research Center (CRSAD).

Contact

ETH Zurich
Animal Nutrition
LFW A 3
Universitätstrasse 2
8092 Zurich

<https://an.ias.ethz.ch>

Contribution to the WFSC

The Animal Nutrition Group focuses on feed and feeding, and nutritional physiology of animals, with the goal to improve the sustainability of livestock systems. We explore and develop strategies to mitigate methane emissions and nitrogen excretions, and we also try to understand how climate change and extreme weather conditions affect animals. Our research in smart farming with data science to have a better understanding on animal welfare and food quality. We aim to fill critical knowledge gaps in our research field and also develop practices that could be implemented in farm operations.



Prof. Mutian Niu





Research in the laboratory for food biochemistry.

FOOD BIOCHEMISTRY

Enhancing the nutritional value of plant-based foods and grains.



Research Areas

- Dietary fibres and associated minor phytochemicals in cereal grains;
- Molecular interactions between soluble fibres and small, nutritionally relevant ligands;
- Development of analytical methods to study weak interactions between polysaccharides and small molecules;
- Natural variability of health promoting substances and stability affecting factors in cereal grains.

Regions

Switzerland and Europe.

Partners

Various academic groups; Agroscope; ZHAW; and some companies.

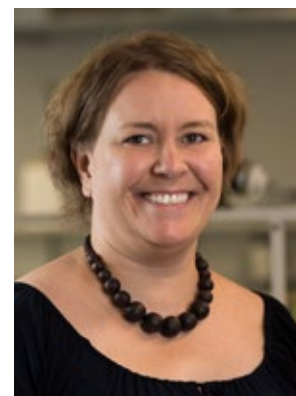
Contact

ETH Zurich
Food Biochemistry
LFO F 19
Schmelzbergstrasse 9
8092 Zurich

www.foodbiochem.ethz.ch

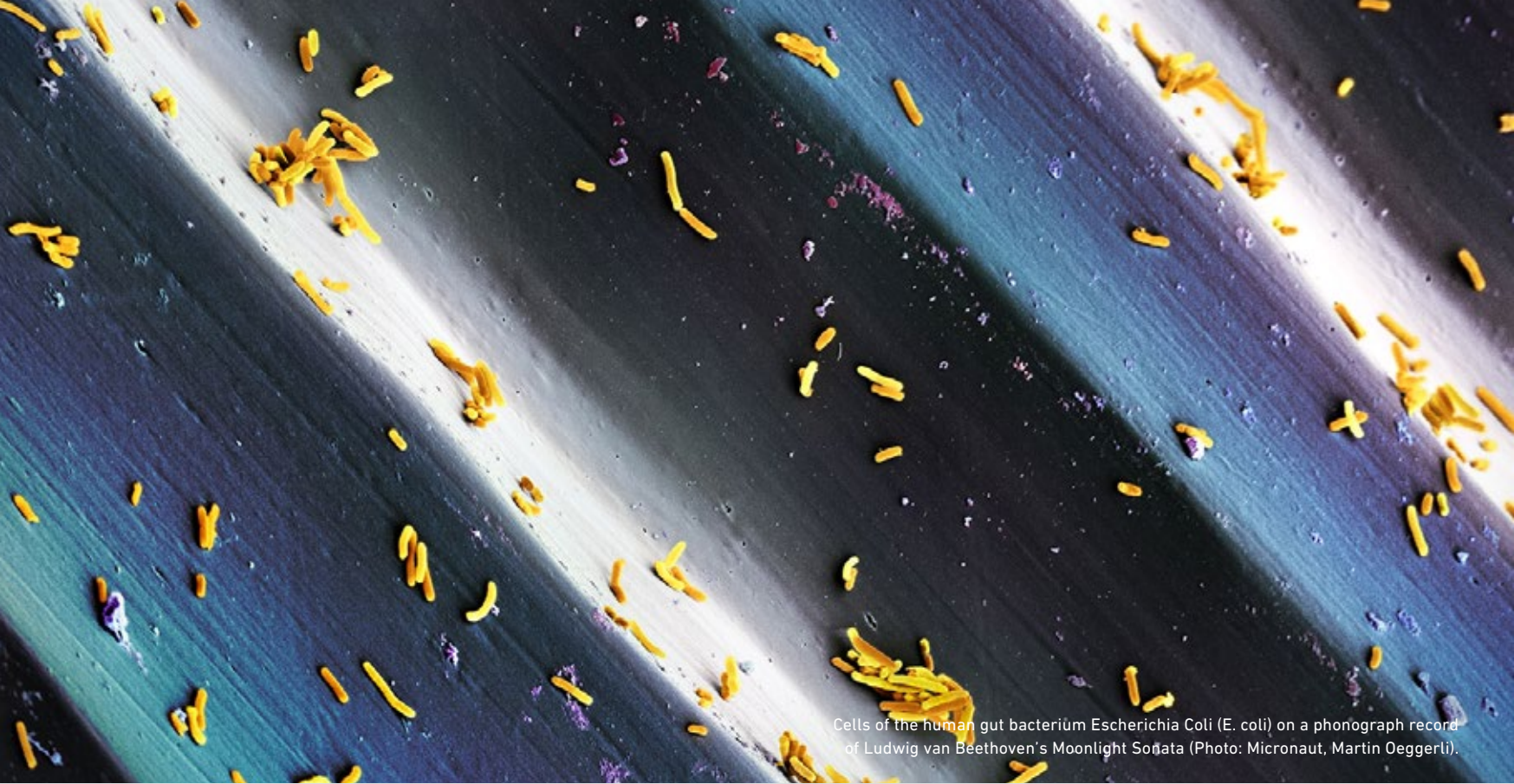
Contribution to the WFSC

The group of Food Biochemistry conducts research on plant-based foods, with a special focus on dietary fibres and associated health-promoting phytochemicals, thereby helping in optimizing the nutritional quality, processability and stability of staple foods. By optimizing the nutritional value of grain-based foods and other edible plants and seeds through selection of right varieties, health benefits can be achieved once consumed. The focus is mostly on plant based raw materials and ways to optimize their processing parameters to maximize nutritional quality and stability, through a detailed molecular-level understanding of mechanisms of action and biomolecular interactions between various food constituents.



Prof. Laura Nyström





Cells of the human gut bacterium Escherichia coli (E. coli) on a phonograph record of Ludwig van Beethoven's Moonlight Sonata (Photo: Micronaut, Martin Oeggerli).

BIOLOGICAL ENGINEERING



Characterizing how nutritional interventions affect probiotic bacteria in the gut to develop improved synbiotics.

Research Areas

- Gene editing;
- Microbial engineering;
- Living microbial diagnostics and therapeutics;
- Synthetic biology;
- Functional genomics.

Regions

Switzerland.

Partners

Nestlé.

Contact

ETH Zurich
D-BSSE
Biological Engineering
Mattenstrasse 26
4058 Basel

www.bsse.ethz.ch

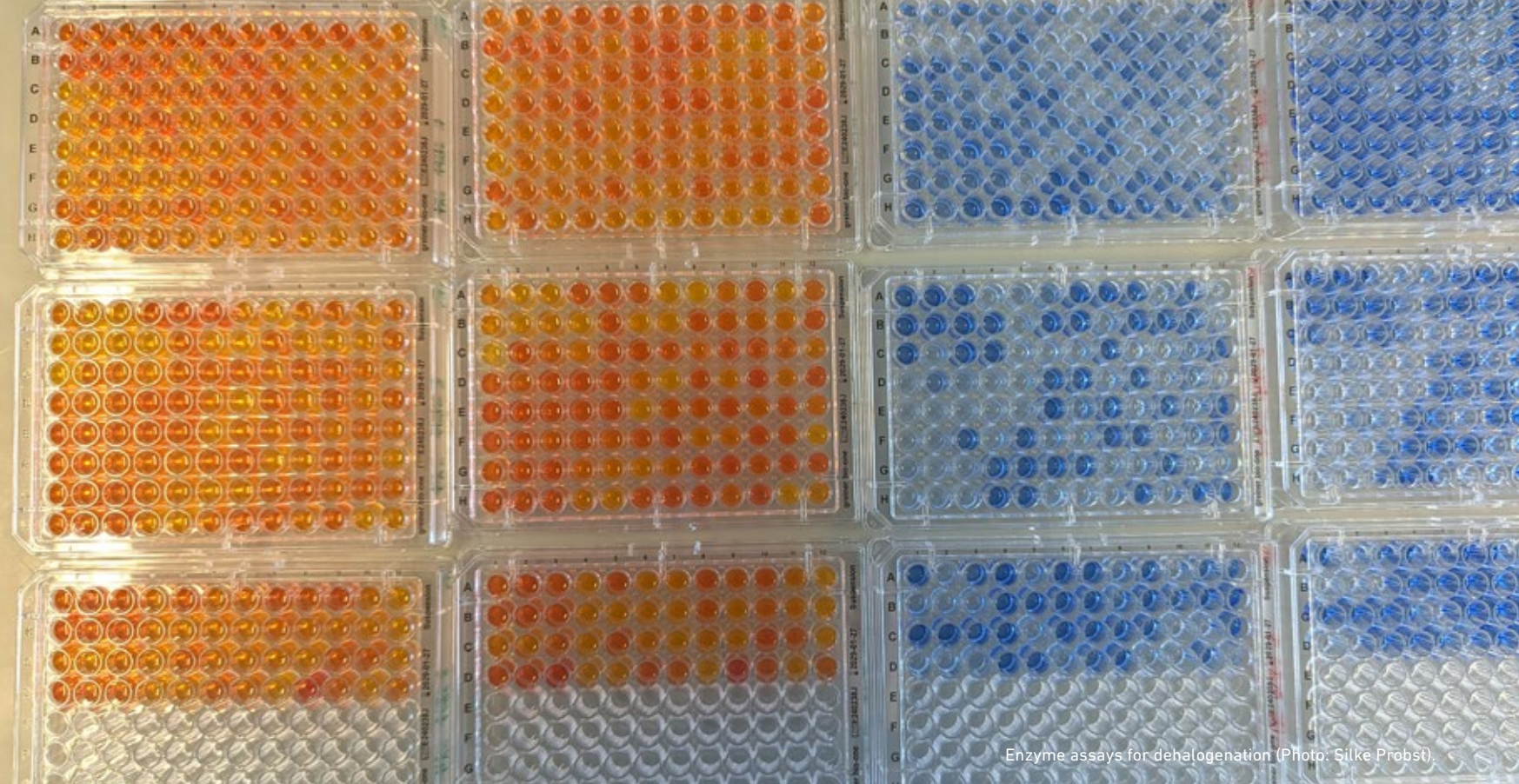
Contribution to the WFSC

The immense potential of the gut microbiome to modulate multiple aspects of health and disease has fueled an expanding global market for novel probiotics. However, the exact mechanisms by which probiotic microorganisms and prebiotic dietary compounds act to benefit host physiology remain widely unknown. With the support of the Future Food Initiative and the WFSC, the Laboratory of Biological Engineering is now working on characterizing mechanisms by which nutritional interventions influence the establishment and functional ability of probiotic bacteria in the gut with the long-term goal of engineering better synbiotics.



Prof. Randall Platt





Microbial Specialized Metabolism

Focusing on using multi-omic datasets to gain functional insights into microbial biotransformations.



Research Areas

- Microbes, enzymes and pathways involved in pollutant biotransformations e.g., pesticides, pharmaceuticals, and food contact materials including a broad range of per- and polyfluorinated [alkyl – alkenyl – aryl] substances (PFAS);
- Environmental biochemistry and enzyme activity assays;
- Mining metagenomic and metatranscriptomic datasets to identify and test the causality of mechanisms driving biotransformations in complex microbiomes.

Regions

Global, but with a main focus on Switzerland.

Partners

Canada; the Netherlands; Norway; Switzerland; USA.

Contact

Eawag
Environmental Microbiology
Überlandstrasse 133
Postfach 611
8600 Dübendorf

www.eawag.ch/en/department/umik

Contribution to the WFSC

The Microbial Specialized Metabolism group focuses on meta'omics-guided discovery of natural enzymes and pathways involved in biotransformations of agrochemicals, food contact materials, and food additives. We are interested in characterizing biomolecules for environmental and agricultural biotechnology and bioremediation applications. At a more fundamental level, we study the ecological roles of specialized enzymes and metabolites in microbial communities in terrestrial and aquatic systems. A key aim is to identify biomarkers for biotransformations, for example, with the potential to modify the efficacy and toxicity of plant protection products in the food supply chain. This has broader implications for the development of “benign-by-design” chemicals and precision agri-diagnostics.



Dr. Serina Robinson





Artificial apple fruit sensor device to measure core and surface temperatures throughout the entire supply chain.

BIOMIMETIC MEMBRANES AND TEXTILES



Aiming to develop of materials and systems for the protection and optimal performance of the human body.

Research Areas

- Soft materials;
- Food cold chain;
- Multiphysics simulations (heat and mass transfer, mechanics, fluid dynamics);
- Electrospinning of nano-fibrous functionalized membranes;
- Flexible, smart wearables;
- Transdermal drug delivery.

Regions

Canada, Europe, South Africa, South America, and Switzerland.

Partners

Agroscope; EPFL; St. Gallen Cantonal Hospital; University Hospital of Zurich; University of Stellenbosch; KU Leuven; Dalhousie University; Citrus Research International; and University of Haute-Alsace.

Contact

Empa
Biomimetic Membranes and Textiles
Lerchenfeldstrasse 5
9014 St. Gallen

www.empa.ch/web/s401/overview

Contribution to the WFSC

The Biomimetic Membranes and Textiles Group at Empa aims to develop materials and systems for the protection of the human body and its health. For foods, the lab applies this expertise to develop new packaging concepts for fresh fruits and vegetables, alternative cold-chain protocols, and improved food drying processes. The lab also develops membranes for functionalized delivery of active compounds and sensors. Such strategies to enhance postharvest life and quality of food support the WFSC in developing more resource-efficient, energy-smart food value chains.



Prof. René Rossi





Thermal processing, particularly extrusion, is a pivotal technique in food science known for transforming raw materials into structured food products (Photo: Patrick Rühls).

Food Structure Engineering

Advancing structuring processes and uncovering their nutritional and functional benefits.



Research Areas

- Nature-inspired food structuring;
- Dry and high moisture extrusion;
- Solid-state fungal fermentation;
- Nutrition-fermentation-processing relationships;
- Food processing for plant-based food products;
- Mycelium;
- Food processing with enhanced nutritional properties.

Regions

Switzerland.

Partners

Other department (D-MATL); startups; and various small and large companies.

Contact

ETH Zürich
D-HEST
Food Structure Engineering
Schmelzbergstrasse 7
8092 Zürich

www.fse.ethz.ch

Contribution to the WFSC

The Food Structure Engineering group is dedicated to transform food processing by developing simple and effective methods to convert raw materials into nutrient-rich food products. Our goal is to replace conventional food processing techniques with processes that enable us to use entire raw materials and to eliminate contradicting processing steps. To achieve this goal, we combine biological and physical approaches, such as solid-state fermentation, bioinspired structuring, forced alignment, and extrusion to enhance the texture, flavor, and nutrition of food. Fundamentally, we study the microbe-material-processing interface to understand the effects of processing on the nutritional quality of food to contribute to healthier diets and a more resilient global food system.

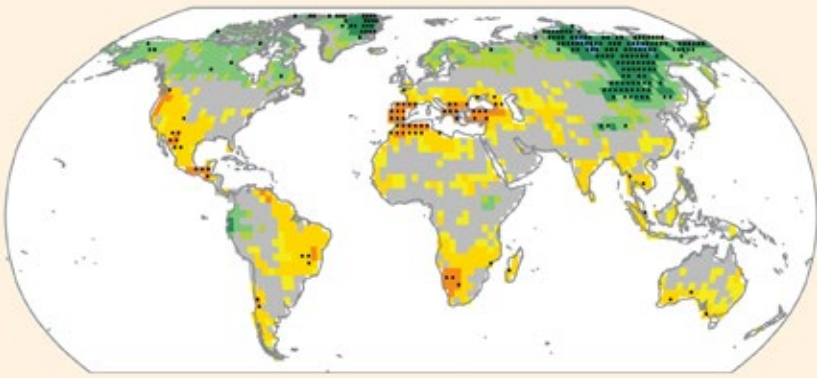


Prof. Patrick Rühls



Change in consecutive dry days (CDD)

2046 - 2065



Soil moisture anomalies (SMA)

2046 - 2065

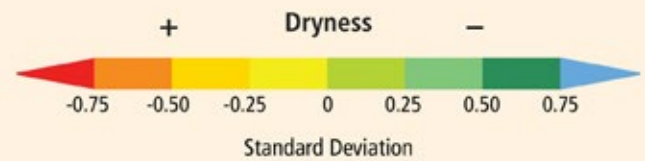
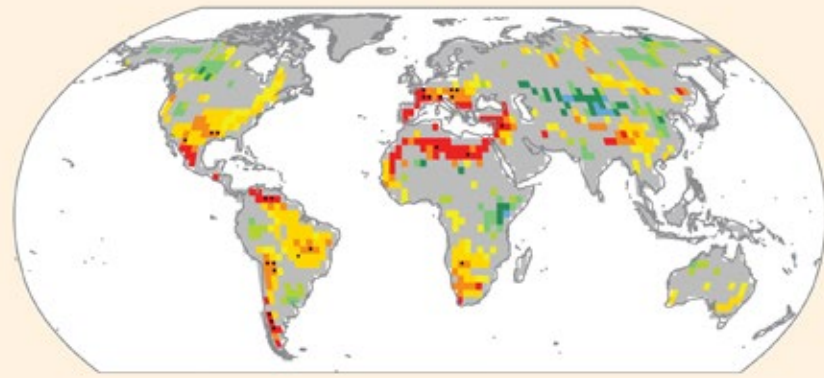


Figure of summary for policy makers of IPCC SREX (2012) report (adapted from Orłowsky and Seneviratne 2012, Clim. Change).

LAND-CLIMATE DYNAMICS

Investigating drought-related impacts on food systems.



Research Areas

- Climate change and extreme events;
- Drought dynamics;
- Land-climate interactions;
- Land use and land cover effects on climate;
- Agriculture-climate interactions.

Regions

Europe and global.

Partners

Center for Climate Systems Modeling (C2SM); MeteoSwiss; Agroscope; SwissRe; Research Institute for Forest, Snow and Landscape (WSL); LSCE/CEA; NASA/GSFC; Max Planck Institute (MPI) for Meteorology; Max Planck Institute (MPI) for Biogeochemistry, International Institute for Applied Systems Analysis (IIASA); and Columbia University.

Contact

ETH Zurich
Land-Climate Dynamics
CHN N 11
Universitätstrasse 16
8092 Zurich

www.iac.ethz.ch

Contribution to the WFSC

The group of Land-Climate Dynamics investigates climate extremes under a changing climate, including drought dynamics and climate related drought variability. In addition, it investigates the role of land use and land cover changes, including agricultural management, on regional climate and extremes. Understanding these dynamics and feedbacks is central for determining potential impacts on agricultural production systems, and the role of agriculture in climate change mitigation.



Prof. Sonia Seneviratne





Shopping in Virtual Reality.

CONSUMER BEHAVIOR

Understanding consumer behavior and decision-making processes in the food domain.



Research Areas

- Public acceptance of new food technologies;
- Modeling consumer behavior in the food domain;
- Risk and health communication;
- Virtual reality in consumer research;
- Sustainable food choices;
- Disgust as a protective system.

Regions

Switzerland.

Partners

Federal Office of Public Health (FOPH); and Federal Food Safety and Veterinary Office (FSVO).

Contact

ETH Zurich
 Consumer Behavior
 CHN J 76.3
 Universitätstrasse 16
 8092 Zurich

www.cb.ethz.ch

Contribution to the WFSC

The group of Consumer Behavior contributes to a better understanding of individual and organizational decision-making in the food domain. Research ranges from individual to social level decision-making processes, focussing on consumer decision-making in the domain of food products. A better understanding of consumers attitudes and risk perception towards emerging food technologies is crucial to understand the needs of a society.



Prof. Michael Siegrist





Integrated Soil Fertility Management trial for maize production in Embu, Kenya.

SUSTAINABLE AGROECOSYSTEMS

Elucidating and improving of sustainable agroecosystems across the world.



Research Areas

- The complex interactions between soil properties, plant traits and diversity, soil biota diversity and functioning, and biogeochemical cycling in terrestrial ecosystems, especially agroecosystems;
- Effects of land use change and management on ecosystem functioning and services;
- Socio-ecological analyses to holistically assess the sustainability and resilience of agriculture and food value chains.

Regions

Burkina Faso, Cameroon, DR Congo, Ethiopia, Hungary, Germany, Ghana, Ivory Coast, Kenya, Malawi, Mozambique, Nigeria, Rwanda, South Africa, Switzerland, Tanzania, and Uganda.

Partners

International Institute of Tropical Agriculture (IITA) in Nigeria, Kenya, DR Congo and Rwanda; Catholic University of Leuven; Wageningen University; University of Eldoret; and Arba Minch University.

Contact

Sustainable Agroecosystems
 LFH B1
 Universitätsstrasse 2
 8092 Zürich
www.sae.ethz.ch

Contribution to the WFSC

The Sustainable Agroecosystems Group works to illuminate feedbacks between ecosystem management options (e.g., tillage, cover cropping, green manuring, agroforestry, and intercropping), global change (e.g., elevated CO₂ and climate change), and biogeochemical cycling (carbon, nitrogen, phosphorus, and micronutrients) in agricultural, grassland and forest ecosystems. They Conduct experimental work from the micro- to landscape scale and subsequently integrate it with modeling to predict ecosystem functioning at the field, landscape, regional and global scale.



Prof. Johan Six





Left: Pesticide application in Uganda (Photo: Eawag/STPH).
Right: Maintenance of pesticide sampling devices in the field (Photo: Eawag).

ENVIRONMENTAL CHEMISTRY

Protecting surface water against diffuse pollution with agrochemicals.



Research Areas

- Quantification of exposure of water bodies with agrochemicals (main focus: pesticides);
- Studying transport pathways from fields to water bodies;
- Modelling exposure of water bodies due to diffuse pollution from agriculture;
- Inter- and transdisciplinary research on mitigating negative effects of pesticide use on human and environmental health.

Regions

Europe with a main focus on Switzerland, Costa Rica, South Africa, and Uganda.

Partners

Agroscope Reckenholz-Tänikon; Swiss Federal Office for the Environment (FOEN); University of Bern; Swiss Tropical and Public Health Institute; Instituto Regional de Estudios en Sustancias Tóxicas (IRET); Universidad Nacional, Heredia, Costa Rica; Ugandan Association for Community and Occupational Health (UNACOH); Makerere University; Department of Civil and Environmental Engineering, Kampala; and Institute for Risk Assessment Sciences, Utrecht University.

www.eawag.ch/forschung/uchem

Contribution to the WFSC

The group of Environmental Chemistry at Eawag works on understanding the exposure of the aquatic environment to anthropogenic organic pollutants and the fate of these pollutants in the water cycle. Food and water issues are closely related: food production relies on sufficient water of acceptable quality, on the other hand, food production may impair water resources. Poor practices of pesticide use may also impair human and environmental health at the same time. We contribute to solutions to these intertwined problems.



Dr. Christian Stamm

Contact

Eawag
Environmental Chemistry
Überlandstrasse 133
Postfach 611
8600 Dübendorf





Cross pollination of selected Italian ryegrass (*Lolium multiflorum*) genotypes in isolation fields.

MOLECULAR PLANT BREEDING



Using to molecular breeding tools to achieve the success of traditional crop breeding, but more efficiently.

Research Areas

- Molecular biology;
- Genetics and genomics;
- Molecular breeding;
- Reproduction biology.

Regions

Arable and grasslands in Switzerland, Europe, and temperate regions worldwide.

Partners

Agroscope and many other national and international institutions involved in plant breeding research.

Contact

ETH Zurich
Molecular Plant Breeding
LFW A 3
Universitätstrasse 2
8092 Zurich

www.mpb.ethz.ch

[www.twitter.com/MolecPlantBreed](https://twitter.com/MolecPlantBreed)

Contribution to the WFSC

The Molecular Plant Breeding Group aims at developing molecular methods and techniques to understand the genetic composition of complex traits and applying this knowledge to plant breeding, supporting the development of new cultivars with novel traits that can contribute to sustainable agriculture in Switzerland and worldwide. The group focuses on crop species, particularly forage and horticultural crops, and the use of various genotyping and sequencing technologies as well as bioinformatics approaches for genome analysis and breeding applications.



Prof. Bruno Studer





Isolation of chicken liver DNA (Photo: M. Kradolfer).

TOXICOLOGY

Contributing knowledge to improve human health and disease prevention strategies.



Research Areas

- Food mutagenesis;
- In vitro toxicity testing and biomarkers;
- Gut microbiota and toxicity;
- Mitochondrial toxicity.

Regions

Switzerland, Europe, USA, and global.

Partners

NTNU, Norway; University of Basel; University of Minnesota, Twin Cities; Netherlands National Institute for Public Health and the Environment (RIVM), Bilthoven; University of Guelph; United States Environmental Protection Agency (EPA), Washington DC; University of Lethbridge; Bundesinstitut für Risikobewertung (BfR), Berlin; Institute for Materials Science and Technology (Empa), Dübendorf; University of Kaiserslautern; University of Auckland; and University of New South Wales, Sydney.

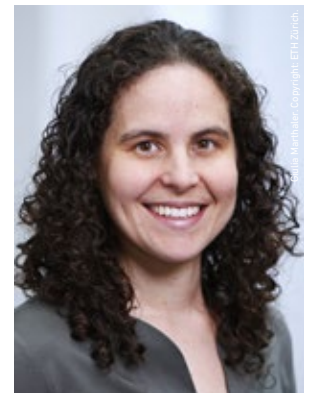
Contact

ETH Zurich
Toxicology
LFO D 15.1
Schmelzbergstrasse 9
8092 Zurich

www.toxicology.ethz.ch

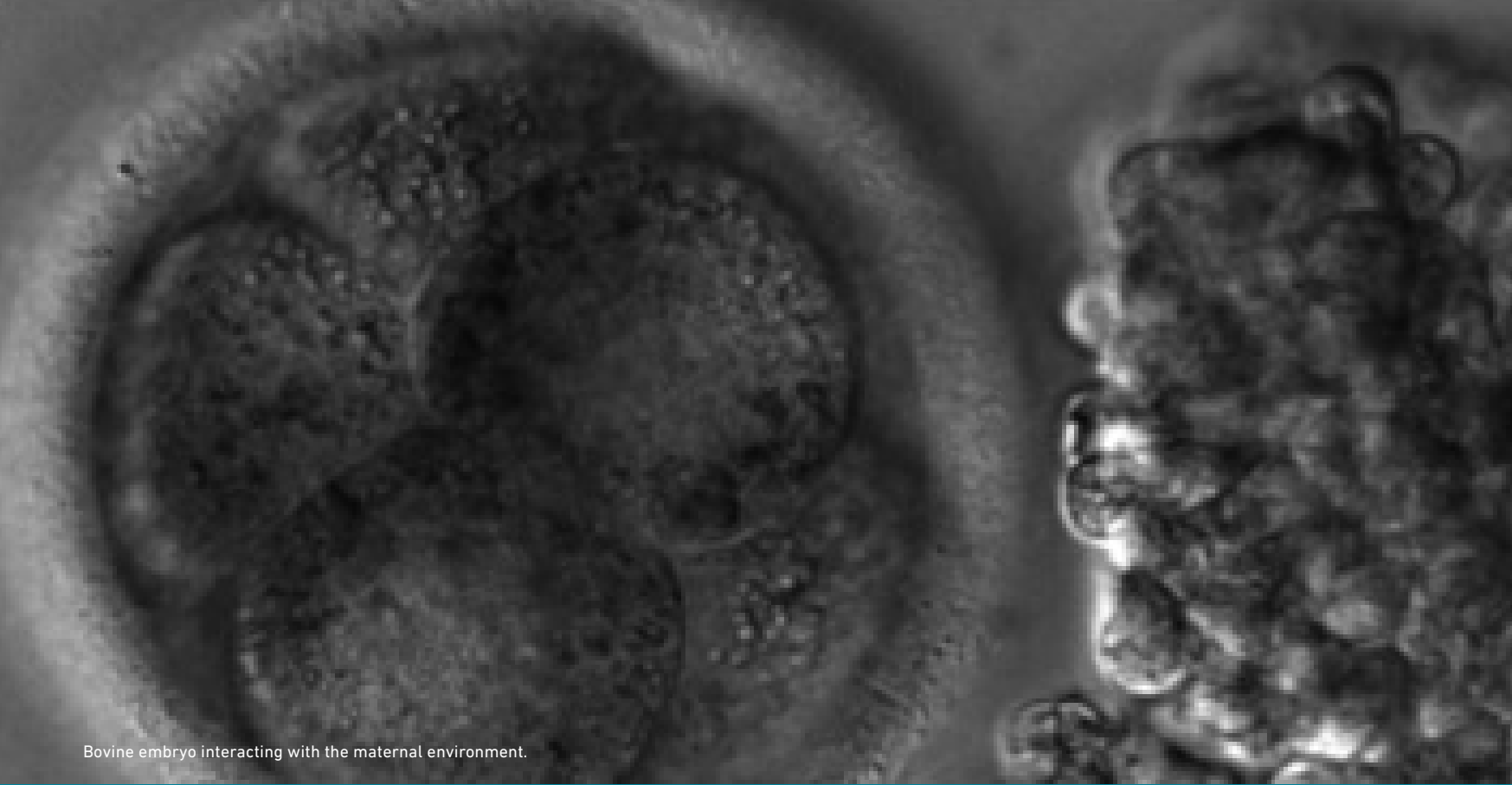
Contribution to the WFSC

The Laboratory of Toxicology contributes knowledge regarding how components of the human diet impact chronic disease risk and treatment. The modern chemical and biochemical analytical approaches developed in the lab, and the fundamental understanding of mechanisms of toxicity, may be linked with applications for promoting food safety.



Prof. Shana Sturla





Bovine embryo interacting with the maternal environment.

ANIMAL PHYSIOLOGY

Understanding the physiology of farm animals in order to provide healthy livestock for sustainable agriculture.



Research Areas

- Female reproductive biology;
- Maternal effects on postnatal development;
- Endocrine disrupting chemicals, epigenetics and reproduction;
- Extracellular vesicles in the mammary gland;
- Animal ethology, behavior and welfare.

Regions

Europe, Australia, and Canada.

Partners

Vetsuisse Zurich-Bern; TU München; Ludwig-Maximilians-Universität München, Institute for Zoo and Wildlife Research Berlin (IZW); National Institute for Agricultural Research (INRA); Polish Academy of Sciences (PAN); Universities of Adelaide and Melbourne; Université de Montreal; and The Hebrew University of Jerusalem.

Contact

ETH Zurich
Animal Physiology
LFW B 58.1
Universitätstrasse 2
8092 Zurich

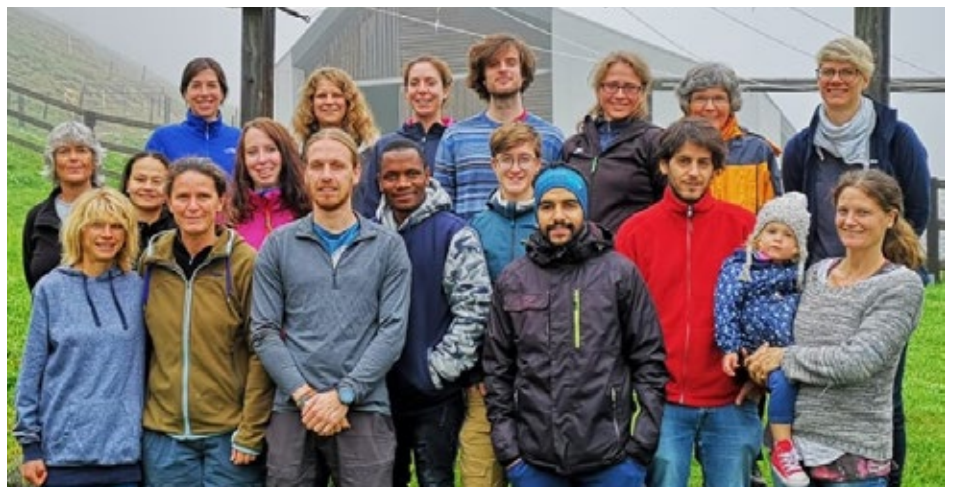
www.ap.ethz.ch

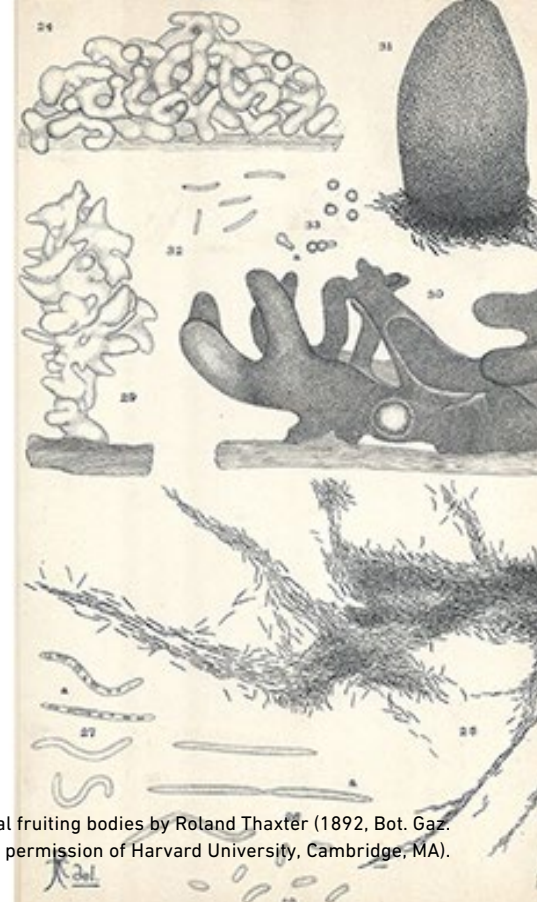
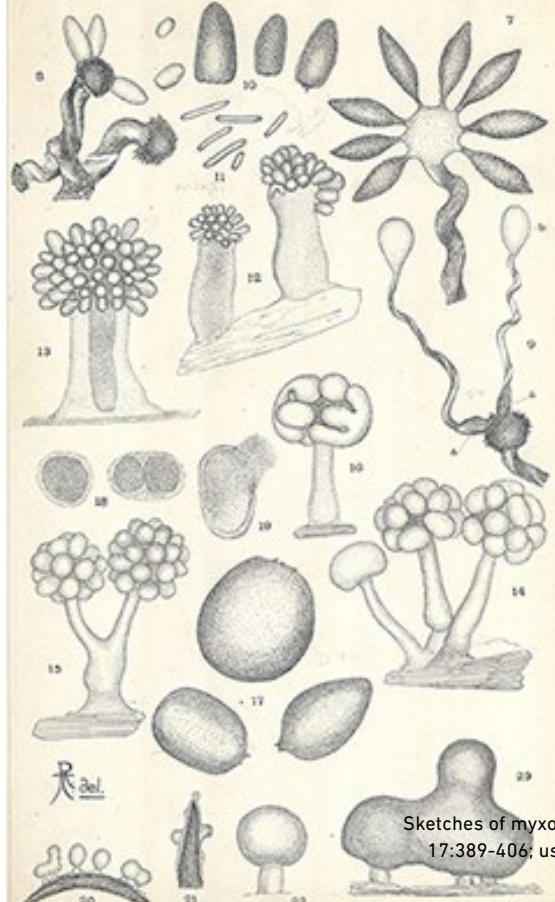
Contribution to the WFSC

How healthy are our farm animals and how do they stay healthy in the long term? The group of Animal Physiology investigates these questions by combining agricultural sciences, biology, medicine and veterinary medicine. Farm animals are an essential part of the food value chain. They make a major contribution to food security in Switzerland and around the world and secure the livelihood of the population, especially in rural areas. We want to better understand the physiology of the animals so that we can assign healthy livestock their adequate place in a sustainable agriculture.



Prof. Susanne E. Ulbrich





Sketches of myxobacterial fruiting bodies by Roland Thaxter (1892, Bot. Gaz. 17:389-406; used with permission of Harvard University, Cambridge, MA).

EVOLUTIONARY BIOLOGY

Investigating predation in microbial communities from ecological and evolutionary perspectives.



Research Areas

The ecology and evolution of:

- Microbial cooperation and conflict;
- Aggregative multicellular development;
- Predation in microbial communities;
- Pathogen biocontrol with predatory bacteria.

Regions

Primarily Switzerland.

Partners

Helmholtz Institute for Pharmaceutical Research Saarland.

Contact

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www.evo.ethz.ch

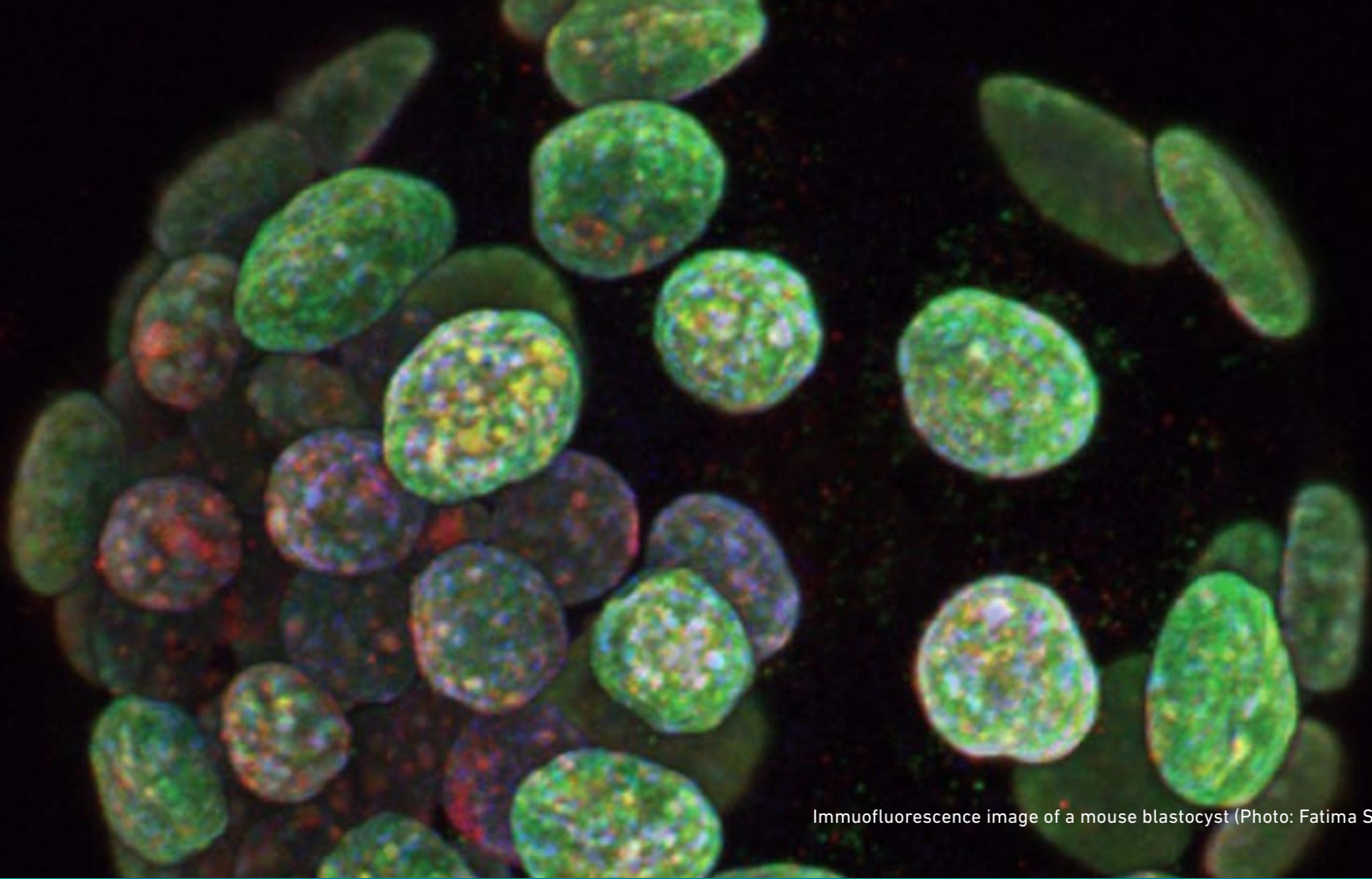
Contribution to the WFSC

The Evolutionary Biology Group studies cooperation and conflict in bacteria that engage in social motility, aggregative multicellular development and predation. In their predation research, they investigate fundamental questions about how predator-prey interactions shape the composition, ecology and evolution of microbial communities, which greatly influence the health and productivity of agricultural systems. In synergy with the WFSC goal of promoting sustainable agriculture, they also aim reduce use of synthetic chemicals such as fungicides in agriculture by developing predatory bacteria as biocontrol agents for limiting agricultural pathogens.



Prof. Gregory Velicer





Immunofluorescence image of a mouse blastocyst (Photo: Fatima Santos).

NUTRITION AND METABOLIC EPIGENETICS



Developing potential therapies for human metabolic diseases.

Research Areas

- Effects of nutrition on mammalian development,
- Nutritional memory in metabolic diseases, including obesity and Type 2 Diabetes,
- Natural compounds as epigenetic regulators,
- Linking nutrition to epigenetic changes.

Regions

Switzerland and rest of Europe, USA, New Zealand, Australia

Contact

ETH Zurich
Laboratory of Nutrition and Metabolic Epigenetics
SLA C 93
Schorenstrasse 16
8603 Schwerzenbach

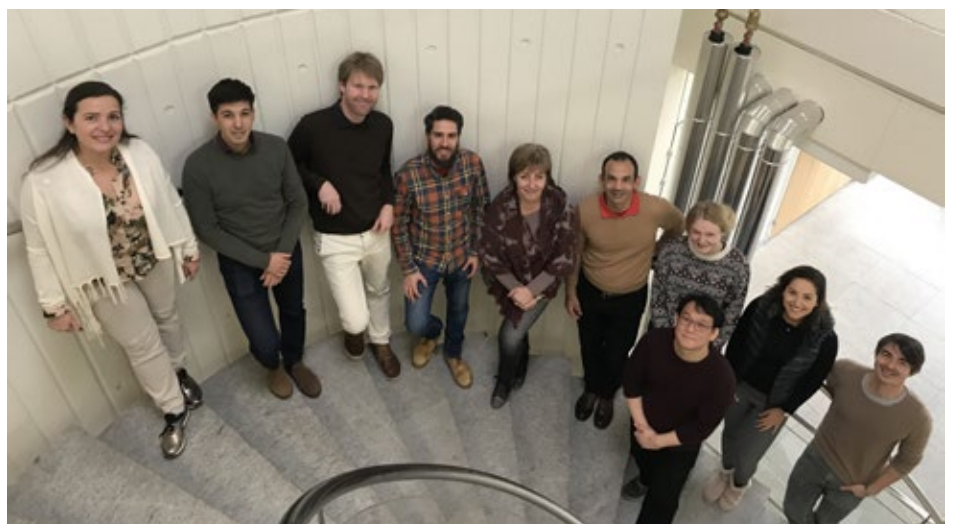
<https://epigenetics.ethz.ch/>

Contribution to the WFSC

The Laboratory of Nutrition and Metabolic Epigenetics aims to gain insights into the complex relationship between nutrition, metabolism, and the epigenome. They develop and use single cell and next-generation sequencing techniques as well as human and murine in vivo and in vitro studies and combine these with genome-wide computational and bioinformatic analysis. They are interested in both fundamental biological discovery and potential therapies for human metabolic diseases. In particular the impact of nutrition and food additives on (patho)physiology is an important aspect.



Prof. Ferdinand von Meyenn





Field Phenotyping Platform FIP in Eschikon.

CROP SCIENCE

Advancing crop phenotyping to improve efficient and sustainable plant production.



Research Areas

- Digitalization of agriculture;
- Crop phenotyping;
- Plant breeding;
- Agronomy.

Regions

Switzerland and Europe.

Partners

Several research groups of Agroscope and ETH and breeding companies such as Delley Semences et Plantes (DSP).

Contact

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 Crop Science
 LFW C 54.1
 Universitätstrasse 2
 8092 Zurich

www.kp.ethz.ch

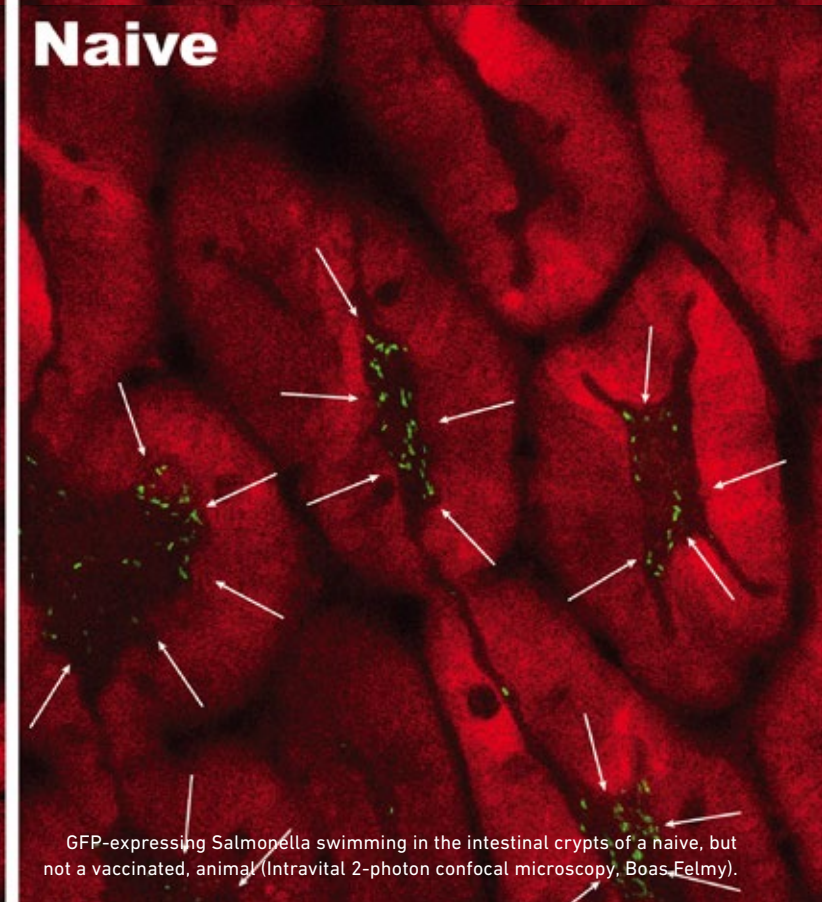
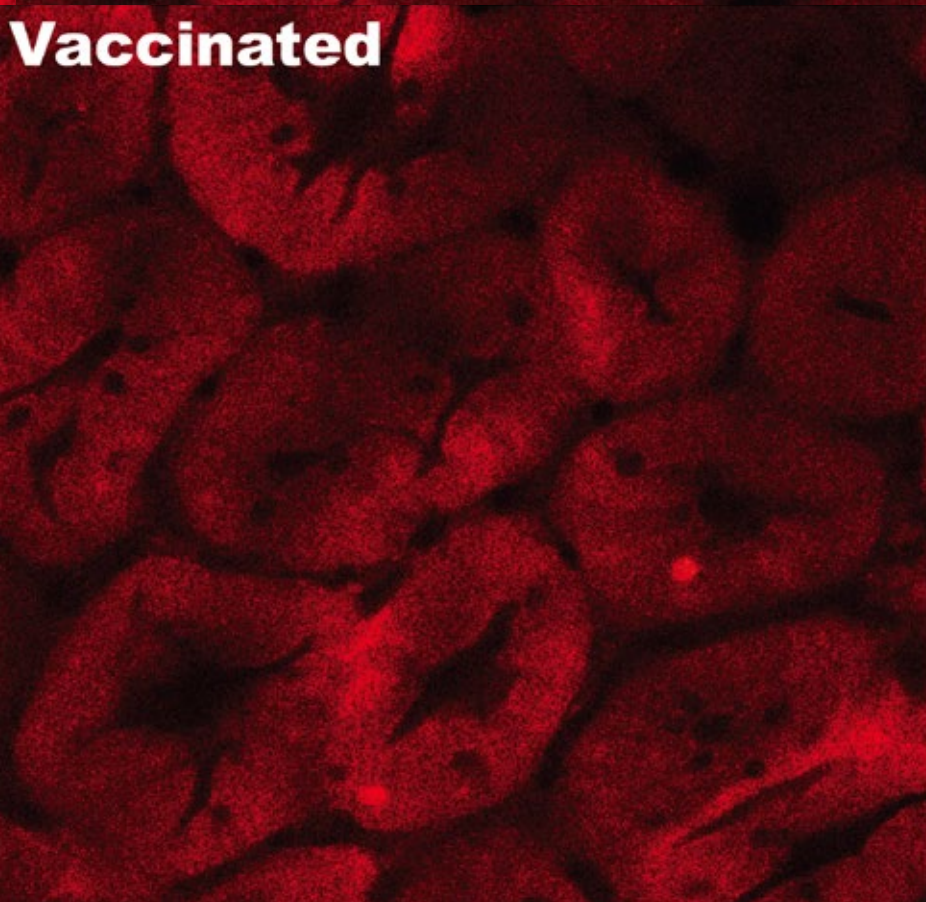
Contribution to the WFSC

The group of Crop Science creates novel ways to elucidate the performance of crops such as wheat and soybean via image-based analyses. This allows identifying optimal crops or cropping systems for different ecological niches or climate/soil situations thereby improving efficiency and sustainability of plant production – an important goal of the WFSC.



Prof. Achim Walter





GFP-expressing *Salmonella* swimming in the intestinal crypts of a naive, but not a vaccinated, animal (Intravital 2-photon confocal microscopy, Boas, Felmy).

MUSCOSAL IMMUNOLOGY



Aiming to understand the underlying mechanisms controlling interactions among the immune system, microbiota, host- and microbial metabolism and diet.

Research Areas

- Mucosal vaccine development for livestock;
- Direct elimination of antibiotic resistance;
- Host-microbiota cross-talk and gnotobiology;
- Mucosal immunology.

Regions

France, Germany, Switzerland, USA, and global.

Partners

Agrovet-Strickhof; UZH Animal Hospital, Department of Swine Medicine; University of Bern; Sorbonne University, Paris; and University of Illinois.

Contact

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 HCI E365.1
 Vladimir-Prelog-Weg 1-5
 8093 Zurich

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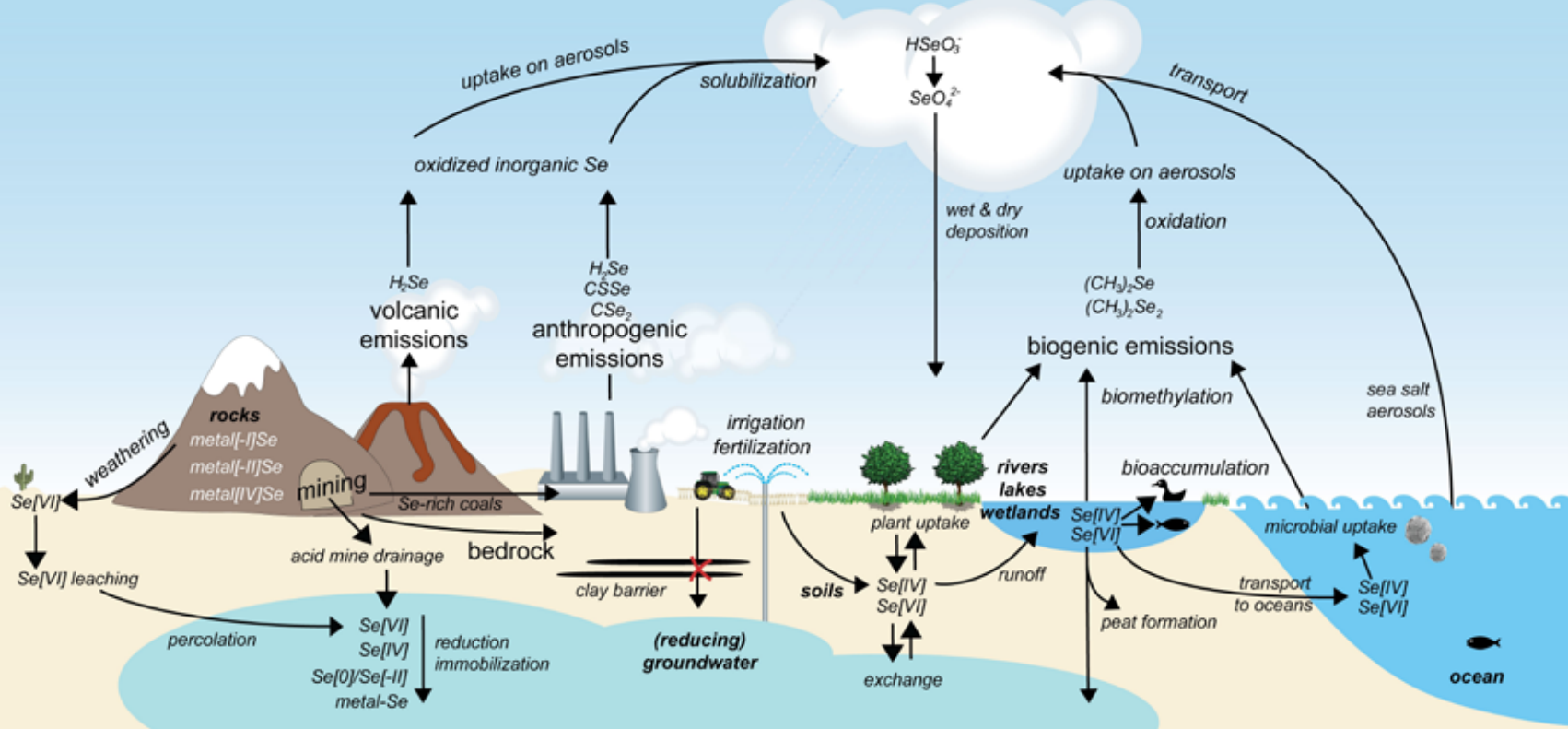
Contribution to the WFSC

The Laboratory for Mucosal Immunology carries out cutting edge research on crosstalk between diet, intestinal bacteria, and the host immune system. They then apply this knowledge in the development of cost-effective mucosal vaccines, targeting common animal pathogens and pathobionts. This approach not only decreases the requirement for antibiotic application in farm animal rearing, but could also drive extinction of antibiotic resistance carriage in animal herds.



Prof. Emma Wetter Slack





Schematic diagram of the global biogeochemical selenium cycle (adapted from Winkel et al. 2012, Environmental Science & Technology).

INORGANIC ENVIRONMENTAL GEOCHEMISTRY



Understanding global trace element cycling and predicting trace element distributions in the environment.

Research Areas

- Biogeochemistry of essential and toxic trace elements;
- Trace element cycling from the global to molecular scale;
- Trace element speciation in environmental matrices (water, soil, biological tissues);
- Geospatial modeling of broad-scale trace element distributions in groundwater and soils.

Regions

Switzerland, European countries, USA, and Vietnam.

Partners

Paul Scherrer Institute (PSI); University of Applied Sciences and Arts Northwestern Switzerland; Agroscope; NASA/LCLUC; University of Grenoble; and University College London.

Contact

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CHN E 21.2
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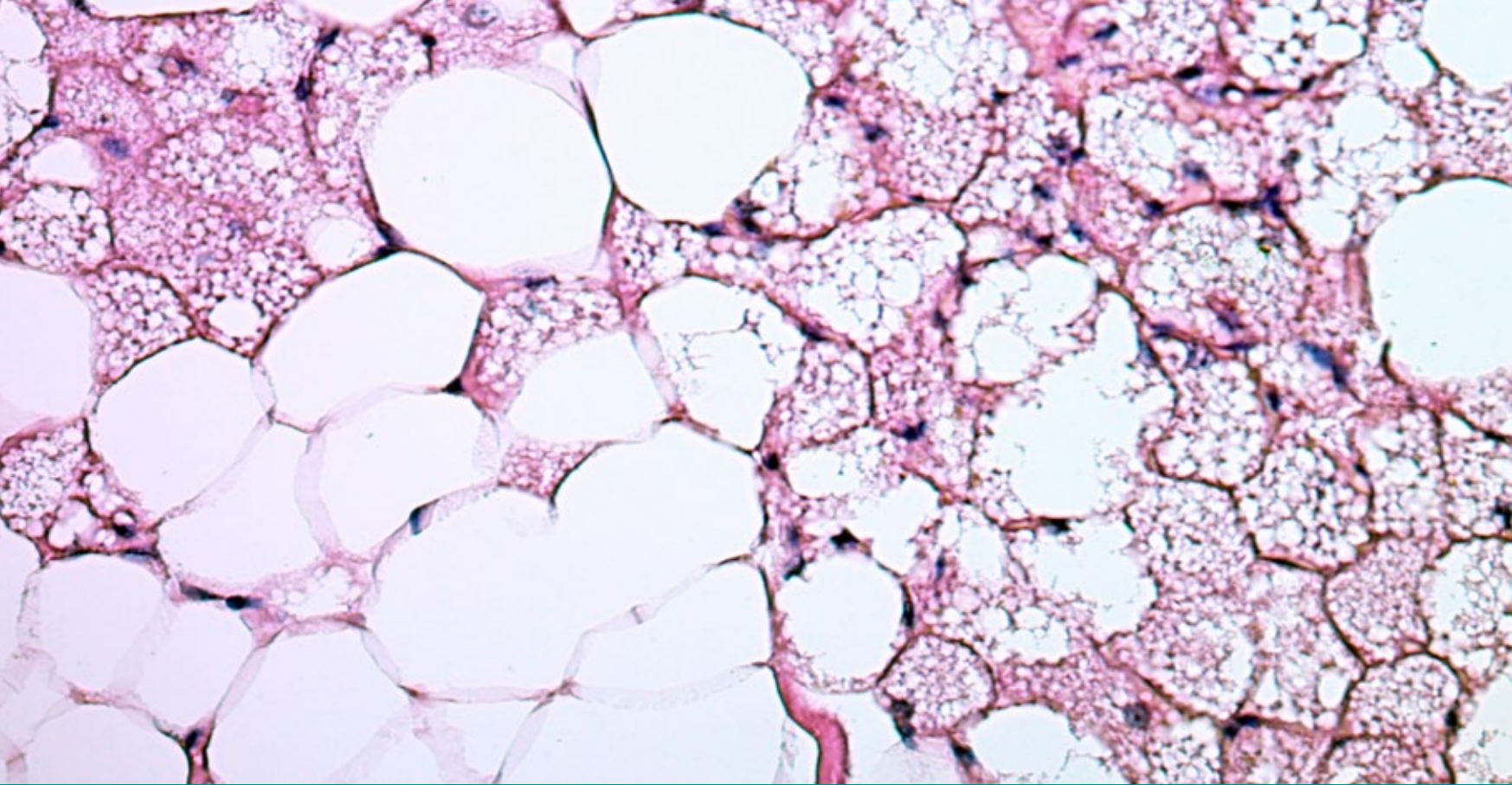
Contribution to the WFSC

The Inorganic Environmental Geochemistry Group studies biogeochemical cycles of trace elements with important health effects. Essential trace elements serve as micronutrients. Other trace elements are toxic over their entire intake ranges. The spatial distribution, chemical speciation and bioavailability of essential and toxic trace elements are governed by an array of environmental processes. The group aims to provide fundamental understanding of these processes and predict distributions and bioavailability of trace elements in agricultural and aquatic ecosystems.



Prof. Lenny Winkel





TRANSLATIONAL NUTRITION BIOLOGY

Identifying nutrition-based strategies to prevent and treat obesity-associated metabolic disorders.



Research Areas

- Development of Obesity and Type 2 Diabetes;
- Plant extracts and natural compounds to modulate adipose tissue function;
- Development of preventive strategies to improve metabolic diseases.

Regions

Switzerland, Singapore, China, Palau, and USA

Partners

Boehringer Ingelheim; Glycemicon AG; University of Geneva; National University of Singapore; Wilmar International; and Shanghai Institute of Materia Medica.

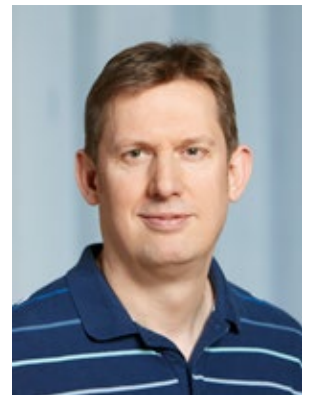
Contact

ETH Zurich
Laboratory of Translational Nutrition Biology
SLA C 94
Schorenstrasse 16
8603 Schwerzenbach

<https://tnb.ethz.ch/>

Contribution to the WFSC

The group of Translational Nutrition Biology aims to identify how adipose tissue proliferation and differentiation as well as function impacts the development of metabolic misbalance, such as obesity and diabetes. Therefore, the lab employs a translational approach from mice to men to elucidate the molecular mechanisms that govern these processes. Special emphasis is placed on identification of medicinal plant extracts and their bioactive components to identify nutrition-based strategies to prevent and treat obesity-associated metabolic disorders.



Prof. Christian Wolfrum





Laboratory experiments with cassava.

PLANT BIOCHEMISTRY

Developing higher-value crops through biotechnology and conventional breeding.



Research Areas

- Photosynthesis and carbohydrate metabolism;
- Sugar and starch biosynthesis;
- Metabolic regulation and cellular signalling.

Regions

Switzerland.

Partners

Australia, China, Germany, Italy, South Africa, Spain, Taiwan, UK, and USA.

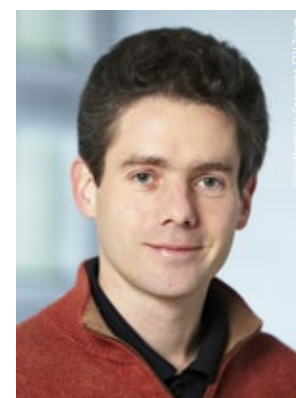
Contact

ETH Zurich
Plant Biochemistry
LFW E 53.1
Universitätstrasse 2
8092 Zurich

www.pbc.ethz.ch

Contribution to the WFSC

The group of Plant Biochemistry works on the metabolic pathways that lead to the production of key carbohydrate components of our food, most significant of which is starch. With the gained knowledge, it is possible to increase the produced amount of starch in potato or other crops. This can be done through biotechnological means or, in some cases, by conventional breeding. This can lead to increased yields and higher-value crops, contributing to improved production systems.



Prof. Sam Zeeman





Sample preparation for mass spectrometry in a scientific laboratory.

ANALYTICAL CHEMISTRY

Elucidating effects of nutrition on human health with human breath analytics.



Research Areas

- Real-time Breath Analysis;
- Nutrimetabolomics and NutriExhalomics;
- Nutrition Science;
- Microbiome;
- Quantification and Standardization in Mass Spectrometry;
- Chemical sensors.

Regions

Switzerland and Europe.

Partners

Agroscope; Agrovet-Strickhof; UZH Department of Gastroenterology and Hepatology; and aha! Swiss Allergy Centre.

Contact

ETH Zürich
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HCI E 329
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8093 Zürich

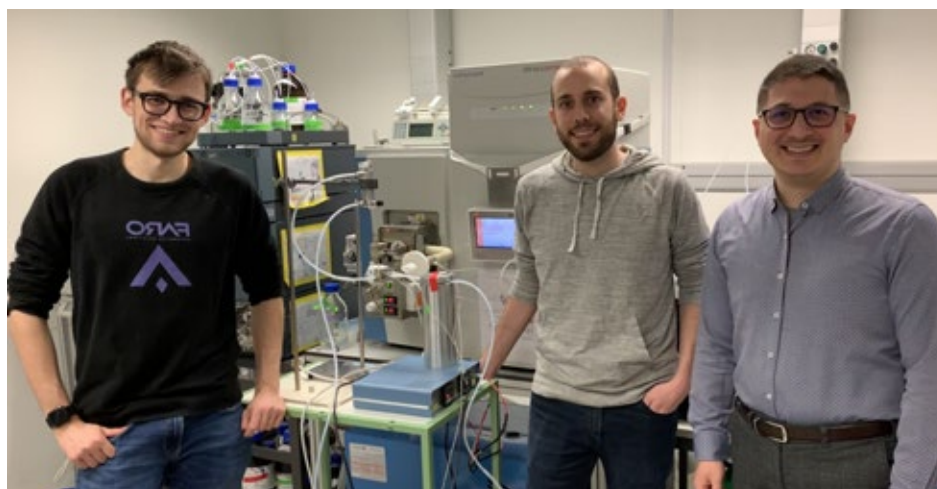
<https://zenobi.ethz.ch>

Contribution to the WFSC

The Analytical Chemistry Group focuses on the investigation of human exhaled breath in relation to nutrition and diet to understand the impact of nutrition on metabolism in real-time and in a non-invasive way. They carry out innovative research on nutrimetabolomics focusing on nutriexhalomics (e.g. determination of food intake biomarkers in human exhaled breath) facilitating the development of new, or improving the accuracy of existing, non-invasive medical diagnostic tests based on breath analysis. Studies provide multidimensional analytical insights into the effects of nutrition on human health.



Prof. Renato Zenobi





Drip irrigation system in Nepal using nitrogen rich supernatant after urine struvite precipitation.

WATER AND SANITATION

Developing efficient waste treatment solutions and reuse possibilities in agriculture.



Research Areas

- Sustainable water sanitation and solid waste concepts;
- Technologies for water supply, environmental sanitation, and solid waste management;
- Recovery of nutrients, energy and water from waste and reuse in agriculture.

Regions

Bangladesh, Bolivia, Ghana, Guatemala, India, Indonesia, Kenya, Malawi, Nepal, Peru, Senegal, South Africa, Tanzania, Thailand, Uganda, Vietnam, and Zambia.

Partners

In the above mentioned countries the group collaborates mostly with local universities; research organizations; NGOs; utilities; and development agencies.

Contact

Eawag
Water and Sanitation in Developing Countries
Überlandstrasse 133
Postfach 611
8600 Dübendorf

www.eawag.ch/forschung/sandec

Contribution to the WFSC

The group of Water and Sanitation in Developing Countries at Eawag uses applied research to find concepts and technologies for extracting value from waste products for reuse in agriculture or other food production systems. Strengthening the synergies between waste treatment and productive use is key to develop sustainable water and sanitation solutions. Sanitary engineering, waste management and agriculture need to interact strongly to develop better integrated approaches and solutions for the world food system.



Dr. Christian Zurbrugg



Contact

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