Alternative proteins across STEM fields:

A disciplinary guide

Introduction

Alternative proteins represent one of the most dynamic and interdisciplinary areas in modern science and technology. From engineering bioreactors that grow animal cells to decoding plant protein functionality to designing microbial strains that can produce key ingredients, this field requires expertise across the STEM spectrum.

This guide is created to help students, educators, advisors, and researchers understand how traditional academic disciplines map onto the innovation needs of the alternative protein ecosystem. Whether you're choosing a major, building a curriculum, advising students, or designing research projects, this resource provides a structured way to explore:

- How each STEM field contributes to plant-based, fermentation, and cultivated meat technologies
- The scientific concepts that form the foundation of each discipline
- Career archetypes with direct links to detailed profiles on GFI's Career Pathways platform, where available
- Exploration questions that can inspire undergraduate projects, research questions, and graduate applications

By connecting academic learning to real-world scientific challenges, this guide serves as a bridge between STEM education and the future of sustainable food systems.



This guide maps collegiate majors to careers, research questions, and experts in the alternative protein field.

Table of contents

Biological sciences **5**

- Cell biology 6
- Molecular biology 7
- Microbiology 8
- Biotechnology 9
- Genetics and genomics 10
- Ecology and environmental biology 11
- Computational biology 12
- Bioinformatics 13

Chemistry **14**

- Organic chemistry 15
- Biochemistry 16
- Analytical chemistry 17
- Physical chemistry 18
- Chemical engineering 19
- Food chemistry 20

Engineering **21**

- Chemical engineering 22
- Mechanical engineering 23
- Biomedical engineering 24
- Food engineering 25
- Materials science 26

Food science **27**

- Food science 28
- Food engineering 29
- Sensory science 30
- Food chemistry 31
- Food safety and regulatory science 32

Key

- Plant-based meat related career
- Fermentation related career
- Cultivated meat related career

Discipline guide

How STEM disciplines translate into careers shaping the future of food

Discipline	Connection to alternative proteins	Key concepts
Biological sciences	Biology explores the cellular, genetic, and ecological foundations of alternative protein production, from optimizing and processing plant-based meat crops to understanding muscle cell growth in cultivated meat to harnessing microbial systems across precision and biomass fermentation. Biological research also addresses questions such as microbial community interactions, fungal growth and morphology, and methods to improve food safety and processing, ultimately enabling more efficient, sustainable, and scalable ways to produce animal-free proteins.	Cell culture techniques, microbial fermentation, media development, enzyme development, crop development and plant genetics, protein expression, cell differentiation, strain optimization
Chemistry	Chemistry provides the foundation for understanding protein composition, sensory properties, and food safety in alternative proteins. For plant-based products, it links protein and lipid interactions to flavor development, browning, structure, stability, and safety. In fermentation, it analyzes and purifies microbe-derived molecules and verifies quality. In cultivated meat, it informs media composition and studies how nutrients and scaffolds support robust cell growth.	Flavor chemistry, Maillard reaction, protein structures, lipid science, chemical synthesis of plant ingredients, enzymatic reactions, emulsifiers and binders, analytical techniques and sensing

Discipline	Connection to alternative proteins	Key concepts
Engineering	Engineering translates science into scalable systems, from shaping plant-based structure through extrusion, shear, and thermal processes to configuring fermentation trains and downstream recovery for consistent, cost-effective ingredients to designing cultivated meat bioreactors, perfusion and harvest strategies, and automation that maintain cell health and quality at food-relevant volumes.	Bioprocessing, food engineering, 3D Bioprinting, bioreactor design, fermentation system optimization, food processing technologies, scale-up strategies, automation, genetic engineering, strain engineering
Food science	Food science integrates formulation, processing, and sensory evaluation across all pillars. For plant-based products, it selects proteins and fats to achieve target texture and flavor while meeting safety and shelf-life goals. In fermentation, microbial ingredients are incorporated to enhance nutrition, stability, and taste. In cultivated meat, it converts tissues into consumer-ready foods with appropriate seasoning, structure, quality assurance, and regulatory compliance.	Sensory science, flavor optimization, texture development, product shelf-life, food safety, fortification

Biological sciences

Biology explores the cellular, genetic, and ecological foundations of alternative protein production, from optimizing plant-based meat crops and processing to understanding muscle cell growth in cultivated meat to harnessing microbial systems across precision and biomass fermentation. Biological research also addresses questions such as microbial community interactions, fungal growth and morphology, and methods to improve food safety and processing, ultimately enabling more efficient, sustainable, and scalable ways to produce animal-free proteins



Cell biology

Cell biology plays a central role in cultivated meat and fermented food production. Cell biologists investigate how cells grow, divide, and differentiate, which is essential for producing muscle, fat, and connective tissue in a controlled environment. Their work helps develop cell lines and culture methods that support scalable, cost-effective cultivated meat.

Key research areas | *learn more*

Metabolic engineering for higher production of desirable endogenous proteins, lipids, or nutrients.

Engineering recombinant expression platforms for higher efficiency of producing animal proteins through cellular agriculture.

Investigate how changes in shear stress, environmental conditions, dissolved oxygen, or carbon/nitrogen ratios trigger morphological shifts. Determine if we can encourage a single organism to produce both protein and fat with different nutrient or temperature profiles, or at different times. Determine the bioprocess parameters that enable cell switching, enzyme production, and secondary metabolite formation.

Career opportunities

- Cell biologist
- Strain engineer

Learn from the experts



Reimagining meat: Pathways for cell biologists in the cultivated meat field

Molecular biology

Molecular biologists study how genes, proteins, and cellular pathways function and interact. In alternative proteins, they investigate the molecular mechanisms that drive plant traits, microbial metabolism, and animal cell growth to better understand and improve protein production. Their work helps identify biological pathways that can enhance nutrition, optimize protein expression, and support more efficient production across plant-based, fermentation-derived, and cultivated foods.

Key research areas | *learn more*

Understand the impact of environmental stressors on the protein quality of food crops.

Identify genetic traits that contribute to improved textural performance (like gelling or binding properties) of proteins.

Optimize microbial cell growth and/or protein production using genomic engineering and lab evolution strategies.

Career opportunities

- Tissue engineer
- Cell biologist
- Strain engineer
- Plant geneticist
- Molecular biologist
- Plant pathology, horticulture

Learn from the experts



Building Your Alt Protein Career: Shaping the future of food as a plant protein scientist

Microbiology

Microbiologists study microorganisms, such as yeast, fungi, and bacteria, that are commonly used to produce proteins through fermentation, which can mimic the texture and taste of traditional meat. They identify and improve microbial strains to optimize protein production, ensuring that bioprocessing and manufacturing systems operate safely and efficiently. Their expertise supports both large-scale ingredient production and quality control.

Key research areas | *learn more*

Engineer strains to effectively convert waste-derived feedstocks into proteins with desirable sensory and functional properties.

Investigations should expand to underexplored protein sources such as underutilized crop varieties, fungal mycoproteins, microalgae, or Rubisco, which possess intrinsic self-assembling mechanisms or distinct molecular architectures. These candidates may offer superior fibrillation potential compared to standard seed storage proteins, which are biologically designed for stability rather than structure.

Career opportunities

- QA/QC specialist
- QA/QC specialist
- Fermentation scientist
- Strain engineer
- Toxicologist (food safety / microbial)

Learn from the experts



Dr. Leonie Jahn: Microbial biodiversity in the green transition — from discovery to application

Biotechnology

Biotechnology specialists apply biological knowledge to develop scalable production processes for alternative proteins. They integrate tools such as fermentation, bioprocess engineering, cell culture, and, where appropriate, genetic engineering to improve the efficiency, yield, and consistency of protein production. Their work bridges scientific discovery and commercial manufacturing, helping bring plant-based, fermentation-derived, and cultivated products to market.

Key research areas | *learn more*

Design bioreactors and processes to optimize growth and yield for protein-rich products.

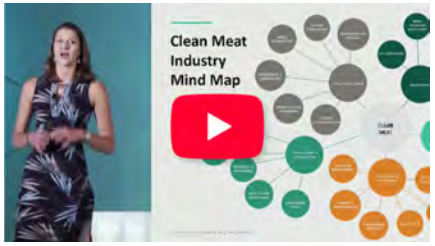
Optimize microbial strains and bioprocess strategies to be resilient to environmental conditions in a variety of bioreactors and growth types.

Leverage physical conditions or bioprocess parameters (shear, flow dynamics) for alignment and texturization, in place of extrusion.

Career opportunities

- Plant geneticist
- Plant pathology, horticulture
- Bioprocess engineer
- Cell biologist
- Strain engineer
- Purification scientist
- Bioprocess engineer

Learn from the experts



Clean Meat 101 with Dr. Liz Specht



Careers in the Alternative Protein Industry featuring Joshman Villa Macas, M.Sc.

Genetics and genomics

Genetics and genomics specialists study DNA, genes, and entire genomes to understand the traits that influence alternative protein production. They identify genetic variation associated with desirable characteristics, such as improved crop protein content, robust microbial strains, or high-performing cultivated meat cell lines. This knowledge informs breeding, strain selection, and, when appropriate, genetic engineering approaches that improve the performance of plants, microbes, and animal cells.

Key research areas | *learn more*

Engineer clean meat cell lines for desirable traits: immortalization, tolerance of suspension growth, reduced requirements for exogenous growth factors.

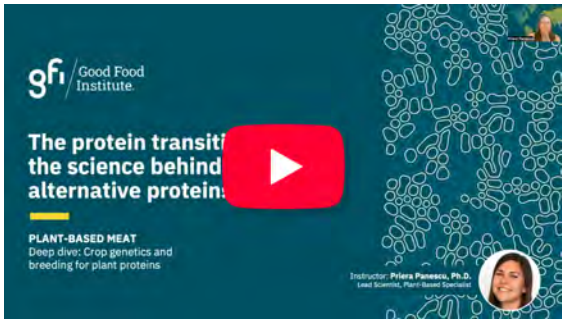
Use functional genomics (i.e., CRISPR screens) to discover genes relevant to composition, flavor, and yield of fermentation-derived and plant protein sources.

Research should correlate biological composition and biomarkers with rheological and other functional outcomes. This involves screening cultivars not just for total protein content, but for subunit profiles that govern functional properties such as cross-linking and elasticity.

Career opportunities

- Strain engineer
- Plant geneticist
- Cell biologist
- Plant pathology

Learn from the experts



Diving deep into the science of plant-based meat: Crop genetics and breeding

Ecology and environmental biology

Environmental biologists assess the impact of alternative proteins on ecosystems, climate, and natural resources. They compare plant-based, cultivated, and fermentation-derived products to conventional animal agriculture in terms of land use, greenhouse gas emissions, and water consumption. Their research informs strategies to scale alt proteins with lower environmental footprints.

Key research areas | *learn more*

Quantify the biodiversity impacts of shifting land from livestock grazing to crop production for alternative proteins

Model the resilience of fermentation or plant-based protein systems to environmental stressors like drought or supply chain disruptions.

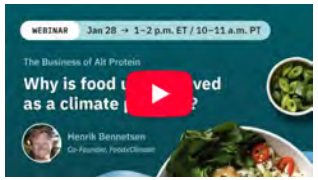
Study ecologically adapted crops (e.g., millets, cowpea, amaranth) that are underexplored for their potential in climate-resilient protein production.

Create a global atlas of agricultural waste streams (cassava peels in Africa, corn stover in the US) mapped against microbial strain performance.

Career opportunities

- Life cycle assessment scientist
- Land protection specialist
- Ecologist
- Environmental scientist
- Crop and soil specialist

Learn from the experts



The Business of Alternative Protein: Why is food so underserved as a climate issue?



The costs and environmental impacts of cultivated meat

Plant-based Fermentation Cultivated

Computational biology

Computational biologists use computer modeling and simulations to model cell growth in cultivated meat, optimize fermentation conditions, and predict how proteins may interact with other food ingredients. Computational tools reduce the time and cost of lab experiments.

Key research areas | *learn more*

Develop “digital twins” to gather insights on cell growth, fluid dynamics, and nutrient uptake of organisms based on bioreactor variables to circumvent costly processing runs.

Use protein structure prediction tools to design novel proteins that mimic muscle proteins, predicting metabolic outcomes and “flavorome” interactions.

Leverage Molecular Dynamics (MD) at the nanoscale to predict protein unfolding and ligand binding, alongside Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD) to bridge the micro- and mesoscale mechanics of fiber bundles and fluid flow. By linking these scales and validating model outputs against analytical benchmarks, researchers can understand how molecular interactions govern the macroscopic release of juices and the mechanical breakdown of the matrix, creating a predictive map of functional sensory properties.

Career opportunities

- Biophysicist
- Computer scientist
- AI research scientist
- Bioengineer
- Data analyst
- Computational biologist
- Automation engineer
- Bioprocess engineer

Learn from the experts



Dr. Simon Hubbard: Computational modeling workflows for cultivated meat yield prediction

Bioinformatics

Bioinformatics specialists analyze genetic and protein sequencing data to improve strain selection for precision fermentation, optimize microbial hosts, and enhance protein expression efficiency. Computational biology tools help accelerate research in cultivated meat and microbial fermentation.

Key research areas | *learn more*

Build predictive models to link genome data with protein functionality (like solubility, emulsification) and yield.

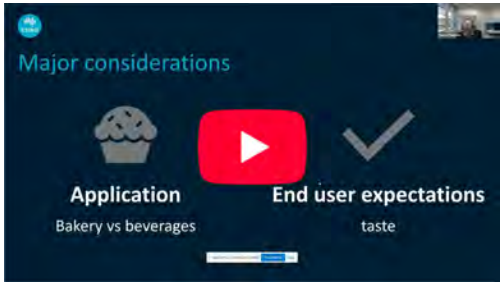
Create open-source databases to link alternative protein ingredient properties (amino acid profiles, extraction processes) to performance.

Analyze online and offline sensor and assay data to model fermentation strain and performance correlation.

Career opportunities

- Bioengineer
- Biological scientist
- BioInformatics specialist
- Molecular biologist
- Strain engineer

Learn from the experts



Part 1: AI Technologies in Alternative Protein Development feat. CSIRO

Chemistry

Chemistry provides the foundation for understanding protein composition, sensory properties, and food safety in alternative proteins. For plant-based products, it links protein and lipid interactions to flavor development, browning, structure, stability, and safety. In fermentation, it analyzes and purifies microbe-derived molecules and verifies quality. In cultivated meat, it informs media composition and studies how nutrients and scaffolds support robust cell growth.



Organic chemistry

Organic chemists examine the molecular structures that make up fats, proteins, and carbohydrates in alternative proteins. In plant-based meat, they study how plant-derived molecules can be reassembled to mimic animal products, and how lipids can be synthesized or modified to replicate animal fat. They also design and test food-safe binders, emulsifiers, and flavor compounds to improve sensory performance.

Key research areas | *learn more*

Synthesize lipids to replicate animal fat in plant-based meat.

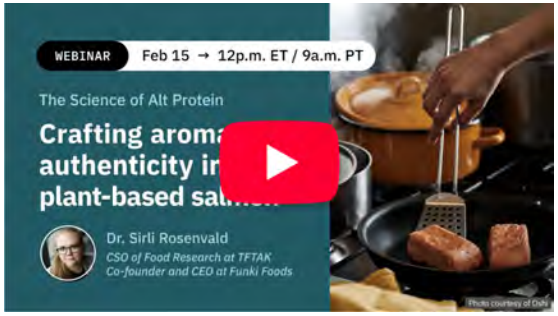
Develop or restructuring plant-derived molecules to mimic the sensory experience of meat.

Design systems to encapsulate or ensure release of volatile flavor compounds under heat or mechanical triggers.

Career opportunities

- Flavor chemist
- Product development scientist
- Food chemist
- Sensory scientist
- Formulation scientist

Learn from the experts



Dr. Sirli Rosenvald: Crafting aroma authenticity in plant-based salmon

Biochemistry

Biochemists explore how enzymes and cellular processes can be harnessed or reengineered to produce alternative proteins more efficiently. In precision fermentation and cultivated meat, they optimize metabolic pathways to increase the production of key proteins, fats, or nutrients. Their work includes protein folding, post-translational modifications, and the purification of target molecules for food applications.

Key research areas | *learn more*

Engineer enzyme pathways to boost protein or lipid yield in fermentation.

Understand the impact of post-translational modifications on the functionality or allergenicity of ingredients.

Metabolic engineering for higher production of desirable endogenous proteins, lipids, or nutrients.

Understand protein structure/biochemistry and how they relate to protein purification and isolation.

Career opportunities

- Application scientist
- Biochemist
- Food engineer
- Nutritionist
- Fermentation scientist
- Purification scientist

Learn from the experts



Reimagining meat: Alternative protein careers for biochemists

Analytical chemistry

Analytical chemists ensure the nutritional quality, consistency, and safety of alternative proteins. They use and develop assay techniques like mass spectrometry, HPLC, and NMR to analyze protein content, detect contaminants, and verify labeling claims. Their expertise is critical to regulatory approval and commercial scale-up across all alternative protein platforms.

Key research areas | *learn more*

Use mass spectrometry or HPLC to quantify nutrient content in alt proteins

Characterize products under cooking conditions to understand flavor development and volatile precursors

Assay fermentations and bioreactors for metabolites, toxicology, and contamination.

Career opportunities

- QA/QC Specialist
- QA/QC Specialist
- Plant QA/QC specialist
- Food chemist
- Flavor chemist

Learn from the experts



Panome Bio: Next-generation 'omics analysis

Physical chemistry

Physical chemists study how alternative protein molecules behave under different processing and cooking conditions. They investigate protein-protein and protein-fat interactions, emulsification behavior, and thermal stability to improve texture, meltability, and mouthfeel. Their insights help develop plant-based cheeses that stretch or cultivated meat that sears like the real thing.

Key research areas | *learn more*

Understand ways in which protein-protein and protein-fat interactions affect mouthfeel.

Improve thermal stability and emulsification behavior of plant-based dairy and meat products.

Understand the chemical changes that ingredients undergo under high temperatures and pressures in processing conditions such as extrusion. Modeling how protein structures unfold, aggregate, and crosslink in real-time under specific combinations of temperature, pressure, pH, and shear.

Model fat-protein interactions to develop a mechanistic understanding. Develop validated molecular-mesoscale models of protein, fat, and water interactions under heat and shear.

Career opportunities

- Biophysicist
- Sensory scientist
- Product development/ application specialist

Learn from the experts



Dr. Alejandro Marangoni: The science, technology and art of high protein plant-based cheese

Chemical engineering

Chemical engineers design and optimize bioprocesses that produce alternative proteins. Their work includes developing streamlined plant protein manufacturing, scalable bioreactors, optimizing feedstock formulations, and designing downstream purification processes. Whether improving yield in fermentation-derived proteins or minimizing waste during lipid extraction, chemical engineers translate lab-based workflows into viable commercial systems.

Key research areas | *learn more*

Optimize bioreactor design for high-yield, low-cost fermentation or cell culture.

Develop scalable downstream purification strategies suited for food-grade protein extraction.

Design interfaces and surface modification techniques to create mimetic structures with desirable mechanical tear properties.

Surface modification techniques must be developed to tune this interface, enabling precise control over energy dissipation and fiber "pull-out" forces during mastication. Such interfacial engineering ensures that the material fails or tears along specific pathways, mimicking the natural shredding of muscle bundles rather than snapping like a monolithic gel.

Career opportunities

- Food technologist
- Application scientist
- Extrusion operator
- Process engineer
- Food chemist
- Chemical engineer
- Bioprocess engineer
- Fermentation scientist
- Purification scientist
- Bioprocess engineer
- Strain engineer

Learn from the experts



Reimagining meat: Pathways for scientists focused on fats and oils in the alternative protein field

This guide maps collegiate majors to careers, research questions, and experts in the alternative protein field.

Food chemistry

Food chemists investigate the molecular structure of proteins, fats, and other components in alternative protein products. They develop solutions to improve stability, binding, emulsification, and nutrient retention.

Key research areas | *learn more*

Develop novel formulation strategies to improve nutritional content and functional properties.

Test combinations of ingredients maximize shelf-life, fortification, and binding properties.

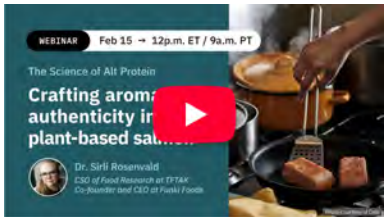
Understand how Maillard reactions and other browning chemistries influence flavor and visual cues in plant-based meat.

Model fat-protein interactions to develop a mechanistic understanding. Develop validated molecular-mesoscale models of protein, fat, and water interactions under heat and shear.

Career opportunities

- Cell biologist
- QA/QC specialist
- Food chemist
- Formulation scientist
- Molecular biologist
- R&D scientist
- Sensory scientist

Learn from the experts



Dr. Sirli Rosenvald: Crafting aroma authenticity in plant-based salmon

Engineering

Engineering translates science into scalable systems, from shaping plant-based structure through extrusion, shear, and thermal processes to configuring fermentation trains and downstream recovery for consistent, cost-effective ingredients to designing cultivated meat bioreactors, perfusion and harvest strategies, and automation that maintain cell health and quality at food-relevant volumes.



Chemical engineering

Chemical engineers design and optimize bioprocesses that produce alternative proteins. Their work includes developing streamlined plant protein manufacturing, scalable bioreactors, optimizing feedstock formulations, and designing downstream purification processes. Whether improving yield in fermentation-derived proteins or minimizing waste during lipid extraction, chemical engineers translate lab-based workflows into viable commercial systems.

Key research areas | *learn more*

Optimize bioreactor design for high-yield, low-cost fermentation or cell culture.

Develop scalable downstream purification strategies suited for food-grade protein extraction.

Design interfaces and surface modification techniques to create mimetic structures with desirable mechanical tear properties.

Surface modification techniques must be developed to tune this interface, enabling precise control over energy dissipation and fiber "pull-out" forces during mastication. Such interfacial engineering ensures that the material fails or tears along specific pathways, mimicking the natural shredding of muscle bundles rather than snapping like a monolithic gel.

Career opportunities

- Food technologist
- Application scientist
- Extrusion operator
- Process engineer
- Food chemist
- Chemical engineer
- Bioprocess engineer
- Fermentation scientist
- Purification scientist
- Bioprocess engineer
- Strain engineer

Learn from the experts



Reimagining meat: Pathways for scientists focused on fats and oils in the alternative protein field

Mechanical engineering

Mechanical engineers support the design and operation of equipment critical to plant-based protein extrusion, fermentation, and bioreactor-based meat cultivation. They focus on ensuring machinery can maintain consistent pressure, shear forces, and temperature across large-scale runs—key factors in replicating the structure and mouthfeel of meat. They also help develop mechanical harvesting systems and in-line monitoring technologies to improve throughput and reduce production variability.

Key research areas | *learn more*

Design sensors for in-line monitoring of plant-based meat structure and texture.

Understand the impacts of heat, pressure, and shear forces during large-scale runs.

Integrate different processing approaches across length scales (i.e., microscale fiber alignment and macroscale bulk matrix formation). Define the boundaries of each process (i.e., what can extrusion do best, what can shear cell do best, etc).

Career opportunities

- Extrusion operator
- Rheologist
- Formulation scientist
- Texture analyzer/characterization expert
- Hardware engineer
- Sensor scientist
- Application engineer
- Application scientist

Learn from the experts



Dr. Ellen Kuhl: The mechanical signature of plant-based meat

Biomedical engineering

Biomedical engineers apply tissue engineering techniques to cultivated meat, including the design of biocompatible scaffolds, perfusion bioreactors, and bioprinting platforms. They explore how scaffold geometry, biomechanical properties, and paracrine signaling affect differentiation into muscle, fat, or connective tissue. Their work enables the formation of structured products that better replicate whole cuts of meat and supports innovation in suspension culture and cell-harvesting strategies.

Key research areas | *learn more*

Determine the biomechanical properties of a scaffold that are suitable for directing differentiation to fat, muscle, endothelial, and fibroblast cells.

Adapt bioprinting techniques for food development.

Career opportunities

- Bioprocess engineer
- Tissue engineer
- Cell biologist
- Computational biologist

Learn from the experts



The Science of Alt Protein: Deploying alternative feedstocks for biomanufacturing of food

Food engineering

Food engineers develop novel methods to formulate, texturize, and scale alternative proteins into consumer-ready products. They integrate sensory science with process engineering to ensure consistent flavor, mouthfeel, and nutrition. Their work often involves optimizing extrusion processes, developing hybrid formulations, and incorporating functional ingredients for improved product stability during storage and transport.

Key research areas | *learn more*

Test the viscosity and rheology of product formulations at different batch sizes (i.e., moving from bench scale to manufacturing scale).

Refinement of dry fractionation or mild aqueous separation techniques (e.g., membrane filtration) designed to produce functional feedstocks that retain the protein's native tertiary structure and associated oil bodies.

Extend the shelf-life and stability of a product under different storage and temperature conditions.

Understand the effects of various heating, drying, and cooling methods on protein structure and sensory outcomes.

Career opportunities

- Extrusion scientist
- Application scientist
- Sensory scientist
- Process engineer
- R&D food scientist

Learn from the experts



The Science of Alt Protein: Deploying alternative feedstocks for biomanufacturing of food

Plant-based Fermentation Cultivated

Materials science

Materials scientists investigate the structure–function relationship of plant-based and cultured proteins, focusing on how proteins behave under different physical, thermal, and chemical conditions. They design scaffolds that mimic the elasticity and texture of animal tissues and contribute to the development of food-safe packaging materials that extend shelf life without compromising sustainability. They also explore reversible coatings and bioinspired materials to aid in cell adherence and tissue structuring.

Key research areas | *learn more*

Develop reversible aggregate-nucleating molecules for suspension cell culture, or reversible cell-adherence coatings for solid surfaces to improve cell harvesting.

Create dynamic binders, i.e., bioactive cross-linkers (enzymatic or mycelial) that activate at cooking temperatures (60-80°C) to mimic the setting of animal protein meat.

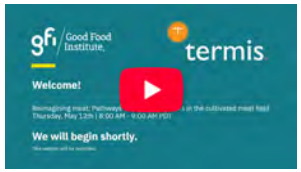
Understand the relationship between the structure, processing, and functionality of primary ingredients in meat products (i.e., the ways in which extruding a specific protein at a specific temperature impacts its fibrousness).

Examine composites and integrate fats into structured networks with tunable melt curves. For instance, create a composite material where fungal fibers (muscle) are interspersed with yeast colonies (fat), held together by a bacterial cellulose mesh (connective tissue), and design lamination strategies for mixed fat–connective tissue architectures in a scalable, cost-efficient way. Explore multi-material systems.

Career opportunities

- Tissue engineer
- Application scientist
- Formulation scientist
- Food material scientist
- Process engineer

Learn from the experts



Reimagining meat: Pathways for tissue engineers in the cultivated meat field



Dr. Davidovich-Pinhas: Harnessing molecular assemblies to design novel and nutritional food products

Food science

Food science integrates formulation, processing, and sensory evaluation across all pillars. For plant-based products, it selects proteins and fats to achieve target texture and flavor while meeting safety and shelf-life goals. In fermentation, microbial ingredients are incorporated to enhance nutrition, stability, and taste. In cultivated meat, it converts tissues into consumer-ready foods with appropriate seasoning, structure, quality assurance, and regulatory compliance.



This guide maps collegiate majors to careers, research questions, and experts in the alternative protein field.

Food science

Food scientists develop and improve alternative protein formulations by enhancing their nutrition, texture, and taste. They focus on fortifying products with key vitamins, minerals, and functional ingredients while optimizing processing methods to retain flavor and shelf life.

Key research areas | *learn more*

Develop novel formulation strategies to improve nutritional content and functional properties.

Test which ingredients best mimic the fibrous or elastic properties of meat when used in scaffolds or gels.

Career opportunities

- Food technologist
- Application scientist
- Nutrition scientist
- Nutritionist
- Food scientist
- Sensory scientist
- Meat scientist

Learn from the experts



Building Your Alt Protein Career: Food science & entrepreneurship



Building Your Alt Protein Career: Food science, consulting, and science communication

Plant-based Fermentation Cultivated

Food engineering

Food engineers develop novel methods to formulate, texturize, and scale alternative proteins into consumer-ready products. They integrate sensory science with process engineering to ensure consistent flavor, mouthfeel, and nutrition. Their work often involves optimizing extrusion processes, developing hybrid formulations, and incorporating functional ingredients for improved product stability during storage and transport.

Key research areas | *learn more*

Test the viscosity and rheology of product formulations at different batch sizes (i.e., moving from bench scale to manufacturing scale).

Refinement of dry fractionation or mild aqueous separation techniques (e.g., membrane filtration) designed to produce functional feedstocks that retain the protein's native tertiary structure and associated oil bodies.

Extend the shelf-life and stability of a product under different storage and temperature conditions.

Understand the effects of various heating, drying, and cooling methods on protein structure and sensory outcomes.

Career opportunities

- Extrusion scientist
- Application scientist
- Sensory scientist
- Process engineer
- R&D food scientist

Learn from the experts



The Science of Alt Protein: Deploying alternative feedstocks for biomanufacturing of food

Plant-based Fermentation Cultivated

Sensory science

Sensory scientists evaluate how consumers perceive taste, smell, appearance, and mouthfeel in alternative protein products. Their work helps match or exceed expectations set by conventional animal products.

Key research areas | *learn more*

Optimize sensory attributes to enhance consumer acceptance of alternative protein products.

Understand the palatability of products under different storage conditions.

Correlate flavor compound release mechanisms and timing with perception of meaty flavors.

Career opportunities

- Sensory scientist
- Product developer
- Flavor chemist

Learn from the experts



The Business of Alt Protein: Leveraging sensory research to improve plant-based meat

Plant-based Fermentation Cultivated

Food chemistry

Food chemists investigate the molecular structure of proteins, fats, and other components in alternative protein products. They develop solutions to improve stability, binding, emulsification, and nutrient retention.

Key research areas | *learn more*

Develop novel formulation strategies to improve nutritional content and functional properties.

Test combinations of ingredients maximize shelf-life, fortification, and binding properties.

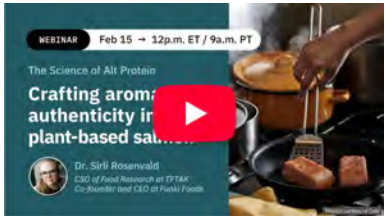
Understand how Maillard reactions and other browning chemistries influence flavor and visual cues in plant-based meat.

Model fat-protein interactions to develop a mechanistic understanding. Develop validated molecular-mesoscale models of protein, fat, and water interactions under heat and shear.

Career opportunities

- Cell biologist
- QA/QC specialist
- Food chemist
- Formulation scientist
- Molecular biologist
- R&D scientist
- Sensory scientist

Learn from the experts



Dr. Sirli Rosenvald: Crafting aroma authenticity in plant-based salmon

Food safety and regulatory science

Experts in this area ensure that alternative protein products comply with local and international food regulations. They manage risk assessments, implement quality assurance protocols, and support the development of new testing methods to verify safety.

Key research areas | *learn more*

Ensures safety and compliance through innovative testing methods and protocols.

Study foodborne pathogens, tracking microbial ecology and epidemiology, and finding technologies to reduce pathogen contamination.

Assess the safety and nutritional profiles of novel food ingredients.

Career opportunities

- Food safety specialist
- Regulatory affairs specialist
- QA/QC specialist
- QA/QC specialist

Learn from the experts



The Business of Alt Protein: Unlocking food safety in plant-based meat