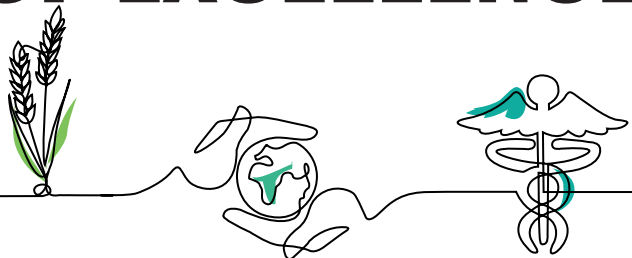


**ACTIVITY REPORT
2017-2019**



MONTPELLIER UNIVERSITY OF EXCELLENCE



MUSE

MONTPELLIER UNIVERSITY OF EXCELLENCE

BUILDING THE UNIVERSITY OF TOMORROW & ACTING TOGETHER TO CHANGE THE WORLD

MUSE, already 2 years and major changes

Launched in 2010 as part of France's Investments for the Future Program, the IDEX/I-SITE framework is intended to establish a limited number of Research Universities in France at sites benefiting from outstanding scientific potential, capable of creating synergy between universities, schools, research organizations and, where appropriate, healthcare institutions and companies.

Led by the University of Montpellier, nineteen institutions in Montpellier defined a joint project that fully integrates scientific institutions and communities, while offering a unique identity. The project focuses decisively on three of the greatest challenges facing our planet: food security, environmental protection, and human health.

Selected in early 2017, this major project has led to intense activity in all the major spheres of academic life, where major transformations are now underway.

Launched in late 2017, the first call-for-projects in research involved a numerous research teams drawn by MUSE's momentum. It was quickly followed, in early 2018, by a second call-for-projects based on a more strongly marked interdisciplinary orientation: the common desire to operate across diverse disciplines and issues is the hallmark of a project designed to address challenges that are themselves highly interconnected.

With respect to training and education, MUSE has empowered the University and its partners to introduce a structural system for transformation, the Innovative Learning Support Center, along with incentives to create and experiment with innovative teaching methods.

MUSE has also stimulated student life by offering a cross-functional vision of student actions that can reach beyond the limits of each individual campus and create meaningful connections.

I-SITE has also profoundly shifted the international relations landscape from isolated fragmented approaches to a common international policy based on a well-balanced concept of relations with a limited number of key partners, both in northern and southern hemisphere countries.

Our way of approaching our socio-economic environment is also evolving to evolve considerably, as we are giving ourselves the means to implement effective innovation marketing along with a proactive policy for hosting companies on our campuses.

Transforming our dynamics and policies goes hand-in-hand with changing the University. While the 2015 merger made the creation of "University of Montpellier" possible, selection as an I-SITE and the promulgation of the December 2018 ordinance enable to rethink the governance and structuring of the institution by integrating research organizations, schools, health facilities and economic stakeholders. These are the principles of the "target university" which have just been endorsed in a statutory roadmap and that will now be implemented.

Philippe Augé
President, University of Montpellier

50,000
STUDENTS

6,000
SCIENTISTS

130
10 RESEARCH ORGANIZATIONS

4,000
ADMINISTRATIVE
STAFF MEMBERS
AND TECHNICAL STAFF

**55 M€ capital
endowment**

1
UNIVERSITY

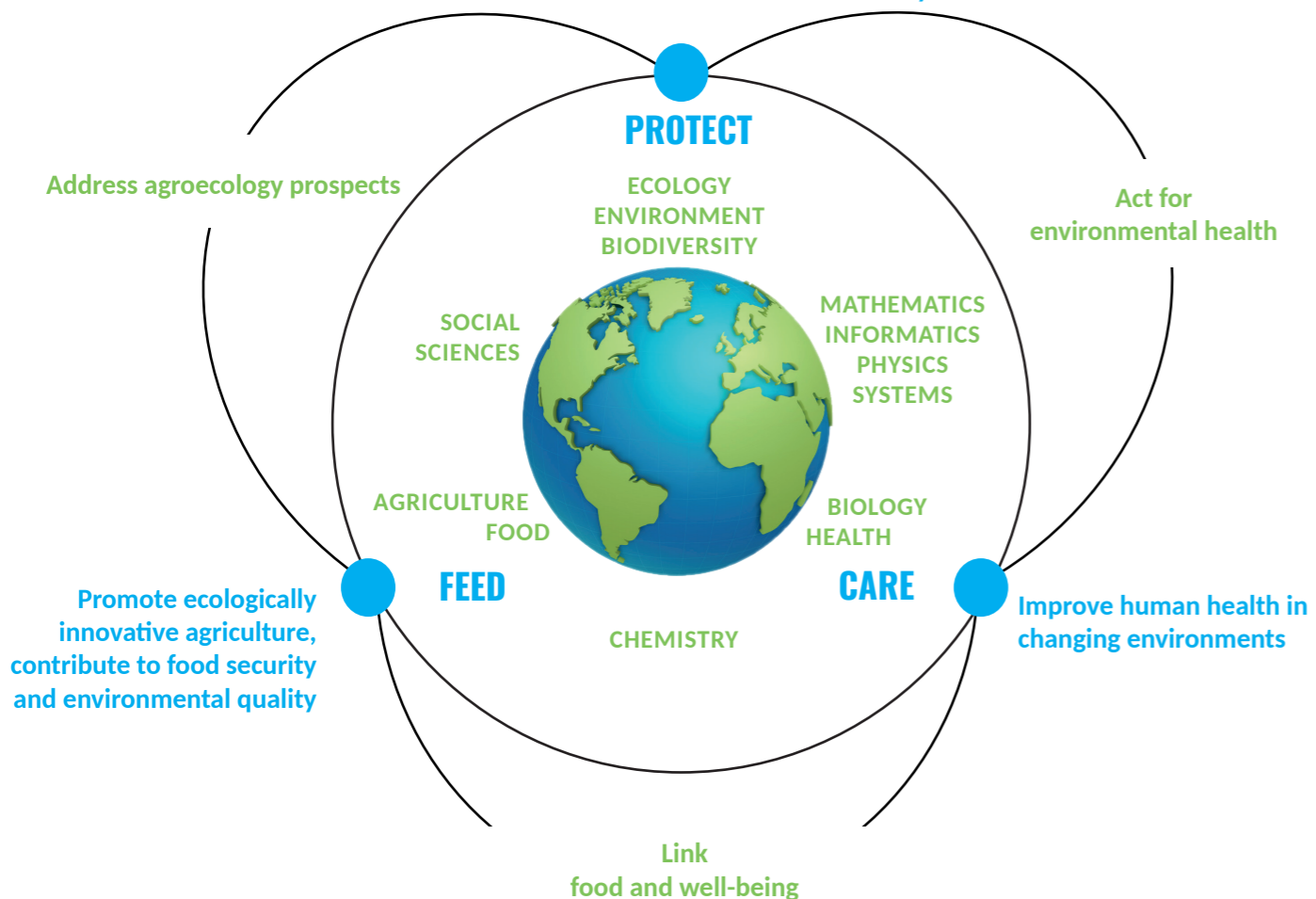
18
PARTNERS

5
FOUNDING
COMPANIES

MONTPELLIER UNIVERSITY OF EXCELLENCE

BUILDING THE UNIVERSITY OF TOMORROW & ACTING TOGETHER TO CHANGE THE WORLD

Encourage the transition towards a society that manages its environment and resources sustainably



The 2-year MUSE I-SITE (2017-2019) budget of 34 M€ over is distributed as follows:

- LabEX 13.0 M€
- Research and attractiveness 10.3 M€
- Education and student life 3.4 M€
- Key Initiatives 3.0 M€
- International 2.2 M€
- Partnerships 0.9 M€
- Management and communication 1.2 M€

2017-2019, A FIRST ACTION PHASE FOR UNIVERSITY OF MONTPELLIER AND ITS PARTNERS

4 higher education establishments

- IMT Mines Alès
- Montpellier National Superior School of Chemistry
- Montpellier National Superior School of Architecture
- Montpellier SupAgro

1 international organization

- International Center for Higher Studies in Agronomics - Montpellier Mediterranean Agronomics Institute

10 French public research organizations

- French Geological Survey Organization (BRGM)
- Alternative Energies and Atomic Energy Commission (CEA)
- Agricultural Research Centre for International Development (Cirad)
- French National Center for Scientific Research (CNRS)
- French Research Institute for Sea Exploration (IFREMER)
- French National Institute for Agronomic Research (INRA)
- French Research Institute for Digital Sciences (Inria)
- French National Institute for Health and Medical Research (Inserm)
- Development Research Institute (IRD)
- French National Science and Technology Institute for Environmental and Agricultural Research (Irstea)

3 health facilities

- University of Montpellier Hospital Center
- University of Nimes Hospital Center
- Montpellier Cancer Institute (ICM)

and 5 founding companies

- Banque Populaire du Sud
- Groupe BRL
- HORIBA ABX SAS
- InVivo Group
- Merck Sharp and Dohme France

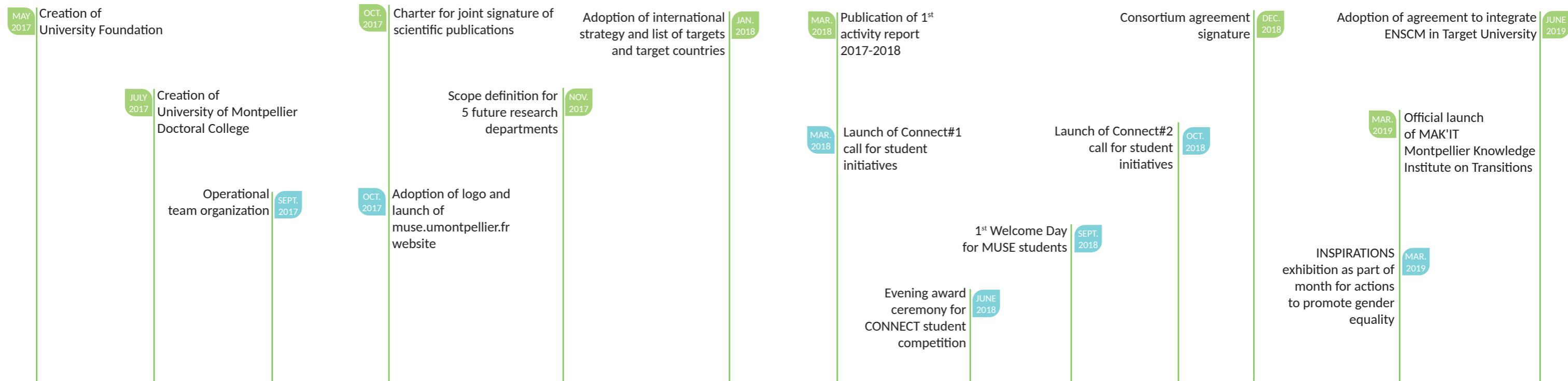
Bring disciplines together to incite scientific disruptions as well as collaborations

Drive innovation in teaching methods to reinforce excellence in university education

Encourage and promote industrial and societal innovations

Stimulate exchange and collaboration and establish ourselves as a real European portal to southern countries

Foster student involvement by connecting campuses and initiatives



GOVERNANCE AND A SENSE OF BELONGING

From the very outset of the project, I-SITE MUSE governance succeeded in taking two major steps: first, by setting up a University Foundation to implement actions at an extremely fast pace, and second, by creating a Doctoral College that has now become the symbol of unification. Above and beyond steering, governance has also been instrumental in fostering a sense of belonging among institutions, researchers, and students.

At the same time, discussions about governance have enabled us to define a profile for tomorrow's University of Montpellier, which will be further strengthened by integrating ENSCM and by opening our Board of Directors to major partners, and which will also transform the University's internal structure to bring all stakeholders together in synergy.

THE MUSE FOUNDATION IS THE OPERATIONAL TOOL FOR IMPLEMENTING THE PROJECT UP THROUGH THE CREATION OF THE TARGET UNIVERSITY



Set up when the foundation was created in May 2017, the **Board** is the steering body for MUSE

Meeting once a month, the MUSE Board comprises the President of UM, representatives from CEA, CIRAD, CNRS, Inra, Inserm, IRD, UM, and a representative from each partner pact: "MSA, ENSCM, ENSAM, IMT Mines Ales, and CIHEAM-IAMM", "CHU-M, CHU-N, and ICM", and "BRGM, Ifremer, Inria, and Irstea".

Board members also serve on the Foundation's management council, along with representatives from the five companies comprising the founders group:

- Banque Populaire du Sud
- Groupe BRL
- HORIBA ABX SAS
- InVivo Group
- Merck Sharp and Dohme France

Member dedication and the frequency of Board meetings ensure responsive decision-making across all the actions described in this report.

A streamlined executive team for greater agility

The executive team was appointed when the university Foundation was created, with the I-SITE MUSE (CNRS) Executive Director working closely with Research (UM), Education (UM), Partnerships (INRA), and International (CIRAD) directors.

The operational team took shape starting in September 2017, when the Managing Director, Communication Manager, and International Program Manager were hired.

The team was consolidated over the first half of 2018, with project managers hired for the Foundation's various programs, along with staff to handle support functions within University of Montpellier departments.

MUSE UNIVERSITY FOUNDATION

Created as early as May 2017, the governance mode for the university Foundation is simple and effective, uniting all project partners in decision-making activities.

The University Foundation lays the groundwork for creating the Target University by 2021.

TARGET UNIVERSITY

A Target University integrating MUSE project partners into its governing bodies and internal structures.

THE ENTIRE MUSE COMMUNITY IS MOBILIZED TO BUILD THE TARGET UNIVERSITY



The Target University will include an Administration Board open to I-SITE partners

While maintaining the name "University of Montpellier", the Target University will be a public scientific, cultural, and professional public institution (EPSCP) featuring an experimental dimension, with the aim of integrating a component establishment (ENSCM) and developing its governing bodies on the basis of possibilities allowed by French Ordinance no. 2018-1131 of 12 December, 2018.

The structure of the university's Administration Board is destined to change. Reorganization will provide a framework to involve the project's main partners with Target University governance.

After that time, the structure plans to include 12 qualified personalities alongside 24 elected members, including 6 representatives of the main organizations participating in the I-SITE and 4 companies that are already partners in our joint actions.

Research departments, Collegiums, and Graduate Division... Progressive deployment of mechanisms creating synergy with the Target University

The by-laws of the Target University will include intermediary organizations called Research departments (5) and Collegiums (8). These entities are designed as mechanisms for synergy and cooperation among research and educational establishments in order to both improve coordination and develop joint actions with partner establishments.

The Graduate Division will be in charge of the link between education and research, notably that between Master's and PhD levels.

Initially established as part of the MUSE Foundation, these Research departments, Collegiums, and the Graduate Division are destined to become statutory structures in the Target University when it is created in late 2021.

ENSCM approves the path for its integration into the Target University by the end of 2021

The Administration Board at the Montpellier National Superior School of Chemistry has approved its integration into the University of Montpellier as a component-establishment. The arrangement, which allows it to retain its legal and moral personality, is authorized under the Ordinance of December 12, 2018.

The association agreement detailing the roadmap notably provides for:

- The signature of publications and ENSCM inclusion in both general and thematic international rankings under the "University of Montpellier" name.
- PhD degrees granted by University of Montpellier and engineering degree co-signed by the ENSCM Director and University of Montpellier President.
- The implementation of a contract between ENSCM and University of Montpellier regarding objectives and resources.

BRAND IMAGE AND SHARING A COMMON IDENTITY REQUIRE SMOOTH AND TRANSPARENT INFORMATION CIRCULATION



Information circulation at the heart of the communication platform

MUSE has its own website in French and English, integrated with that of the University of Montpellier. Updated regularly, the site covers all MUSE domains and provides all the information needed to understand and keep up with the latest news about the project and its progression.

A monthly e-newsletter is sent to more than 50,000 people.

Active on social networks such as Twitter, MUSE also benefits from a strong relay through the various communication channels at member establishments, particularly those of University of Montpellier.

Several communication operations were carried as part of targeted partnerships to disseminate information about the project broadly in the press, both regionally (Midi Libre, L'Art-Vue) and nationally (La Recherche).

A shared brand image

The MUSE logo incorporates the Target University logo, unanimously adopted by all partners, along with a specific graphic charter for various physical and digital media.

The logo is always displayed on the websites of member institutions and the 120 research teams within the MUSE scope.

A corporate video, "MUSE: *let's change the world... together*" presents the I-SITE's actions and objectives.

Public relations actions are organized regularly at University of Montpellier.

BRAND IMAGE AND A SENSE OF BELONGING

STUDENT LIFE

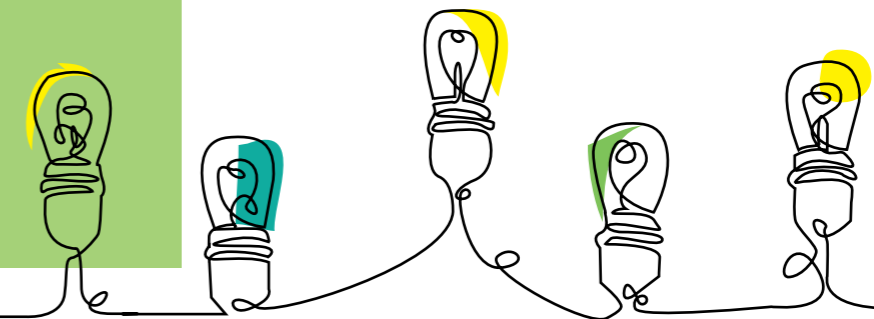
"Student life" actions seek to promote students' spirit for initiative and entrepreneurship, encouraging them to commit themselves as involved players in campus student life through a social- and solidarity-oriented approach.

50,000
STUDENTS

47
STUDENT INITIATIVES
FUNDED

350 K€
ALLOCATED FOR
STUDENT LIFE

CONNECTING CAMPUSES AND BUILDING A SENSE OF BELONGING



Support for solidarity, cultural, and societal actions to reinforce the sense of belonging

With the INSPIRATIONS exhibition by Laure Boin, MUSE supported a unifying action led by the directors for gender equality at all partner institutions to produce an event raising awareness about the role of women in science and university life through drawn and commented portraits illustrating their dreams and experiences.

Another example of the type of actions MUSE supports to increase a sense of belonging is the participation of a UM-MUSE team in the "La Montpellier-Reine a du Coeur" footrace, which helps fight breast cancer by donating its proceeds to organizations fighting the disease.

A call-for-projects to connect students with their campuses

The CONNECT call-for-projects supported 47 student initiatives presented by students, associations, and groups of associations in two waves.

Examples of these initiatives include **information campaigns about healthy and sustainable food for Montpellier students**, driven by students at the Montpellier Technical University Institute (UM) on all campuses (UM, ENSAM, MSA), and the solidarity campaign led by ENSCM students to **raise public awareness about Charcot arthropathy** and collect funds to help people living with the disease. With the **Artichoke festival**, students at Montpellier SupAgro organized an alternative eco-responsible student event open to the city.

A game contest promoting the collective MUSE project to the student community

MUSE organized a game contest, held in April 2018 following the publication of the CONNECT call-for-projects, to raise student awareness about the collective project.

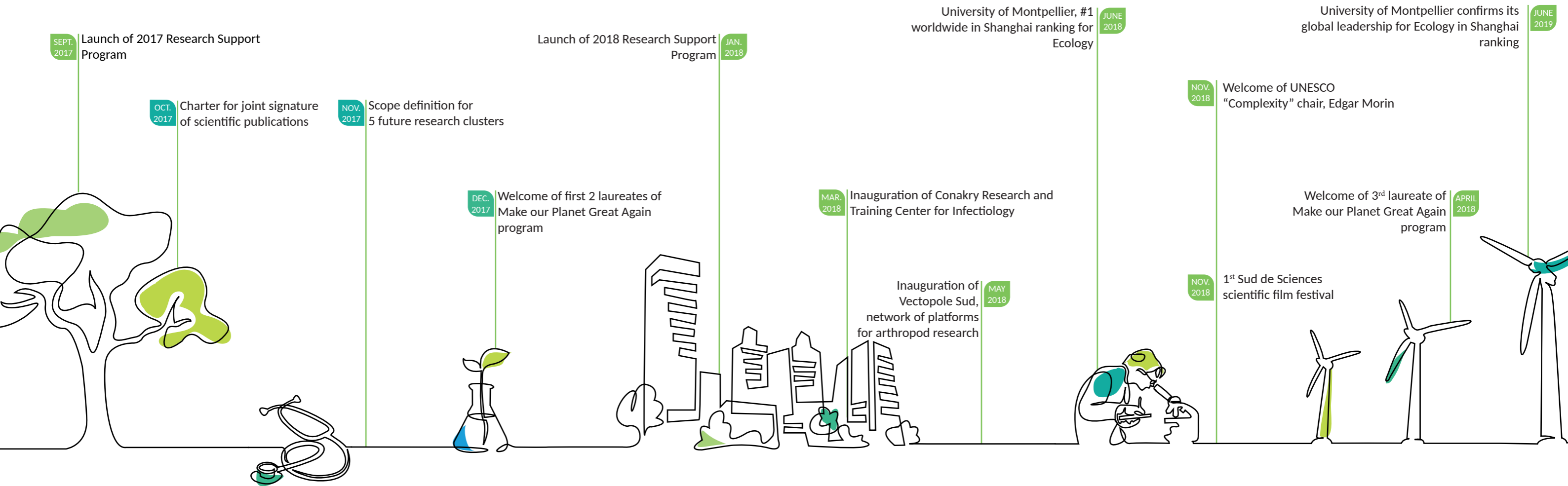
Testing their knowledge with about fifteen questions related to MUSE and supported projects, students were able to win trips to cities near MUSE's partner universities: San Francisco (UC Davis), Amsterdam (Wageningen U&R), Munich (U. Heidelberg), Barcelona (U. Barcelona), and Kyoto (U. Kyoto).

Winning students were given the opportunity to visit the partner university in question and report on their visit.

Welcome day for "Montpellier University of Excellence" students

All MUSE consortium students were invited to the University of Montpellier's big welcome day on 20 September 2018 at the Montpellier Botanical Garden. Named "Welcome Day - Montpellier University of Excellence", the event was organized by the UM Student Life Office.

The festive and friendly day was an opportunity for the 2,500 participating students to meet all the people involved in student, association, and university life.



RESEARCH & SCIENTIFIC ATTRACTIVENESS

130
RESEARCH DEPARTMENTS

> 5,500
SCIENTIFIC PUBLICATIONS
PER YEAR

6,000
SCIENTISTS

8.5 M€
IN SUPPORT FOR RESEARCH
(EXCL. LABEX)

1.8 M€
FOR ATTRACTIVENESS

As part of the MUSE project, partners share a common vision of research at the highest global level, promoting cross-disciplinarity and pursuing the dual objective of academic excellence at the frontiers of knowledge, and meeting society's needs, particularly with respect to the challenges on which MUSE focuses.

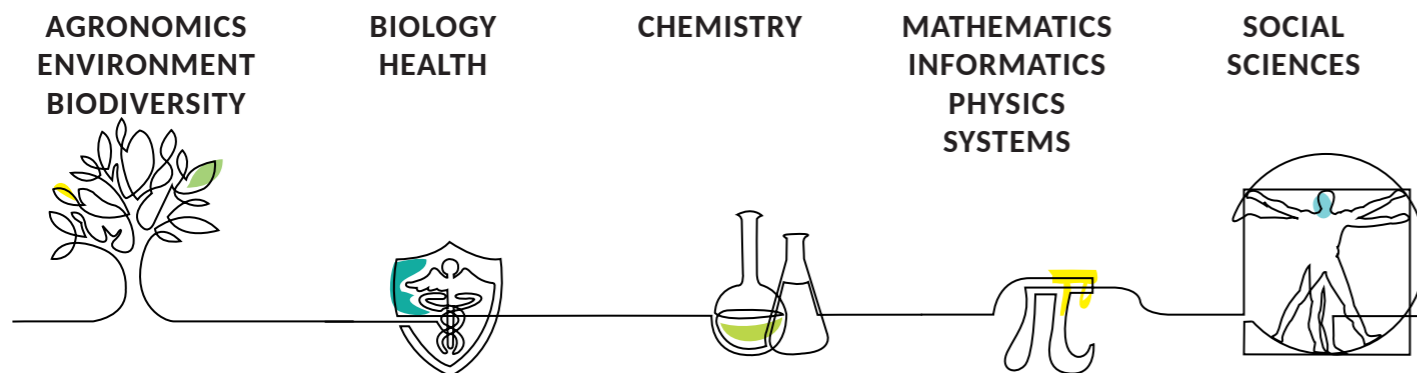
TARGET UNIVERSITY'S RESEARCH DEPARTEMENTS OFFICIALLY CREATED WITHIN MUSE FOUNDATION

Defined since November 2017, the departments' scientific scope comprises research and service units with a primary or secondary link to each research cluster, LABEX in the field, and, when applicable, University Hospital Federations. A precursor mission took a coordinated approach to establish the six major missions of the MUSE research departments.

Evaluated in early 2019, the AGRO, CEMEB, NUMEV, and ENTREPRENDRE LabEx structures were renewed by the French National Research Agency for 2020-2024.

Chemisyst and EpiGenMed LabEx will become internal Lab-MUSE structures and reorient their strategy. LabEx structures will continue to operate in project mode to respect their academic and scientific freedom.

EXCELLENCE LABORATORIES AT THE HEART OF THE MUSE INITIATIVE AND ITS SCIENTIFIC AMBITIONS



Organization, communication, strategy, and scientific outlook

This involves leading the community on thematic axes and fields to identify scientific foresight and develop high-potential, cross-disciplinary thematic actions.

Scientific governance

The departments will be involved in defining the scientific policy for MUSE and, in the long-term, for the Target University. Notably, they will participate actively in discussions on resource orientation.

Partnership collaboration and research organization

The departments will take a collective approach to encourage, promote, and coordinate responses to territorial, national, and international calls-for-projects and help foster the emergence of large-scale research projects. Directors will elaborate scientific roadmaps and participate in developing the main scientific axes for MUSE and subsequently for the Target University.

International outreach

The goal will be to increase international exposure and attractiveness by focusing on concerted actions within or between departments.

Education-research interface

The departments will recommend actions that consolidate the education-research link with future Collegiums, doctoral schools, doctoral colleges, scientific departments, training and research units, schools, and institutes.

Participation in prospects related to employment policy and career management

The departments will participate in joint reflection to employment policy, career and human resource management in a concerted manner.

AGRO

With recognized expertise in a wide range of plant species and agronomic, temperate, Mediterranean, and tropical interests, LabEx Agro combines multidisciplinary skills ranging from gene study to end-uses for plants.

40 research structures
1,200 scientists

ENTREPRENDRE

LabEx ENTREPRENDRE (for entrepreneurship) creates and shares knowledge at the intersection of legal, economic, and management sciences regarding launching a business. The LabEx contributes to dynamism in the entrepreneurial and innovation ecosystem by supporting companies with their sustainable growth strategy and by assisting public stakeholders with their public entrepreneurial policy.

5 research structures
200 scientists

CEMEB

The Mediterranean Center for the Environment and Biodiversity (LabEx CeMEB) focuses on the dynamics and function of biodiversity and ecosystems in a context of clear environmental changes induced by human activities in particular.

10 research structures
630 scientists

EPIGENMED

This LabEx seeks to improve fundamental and clinical research in biology-health and encourage interdisciplinary projects that cover three areas: cellular determinism, metabolism, and immune defenses.

30 research structures
500 scientists

NUMEV

Highly cross-functional regarding the scientific issues covered by MUSE, LabEx Numev promotes the emergence of new methods and innovative tools for life sciences, health, and the environment.

7 research structures
220 scientists

CHEMISYST

Specializing in chemistry for molecular and interfacial systems, LabEx Chemisyst is organized around three fields of expertise:

- Functional materials
- Biomolecule synthesis and assembly
- Processes in increasingly renewable nuclear power, as well as the strategic recycling of rare earth elements and other metals.

26 research structures
400 scientists

> **5,500**
PUBLICATIONS
IN 2018

77% OF ALL PUBLICATIONS
FOLLOWED THE JOINT SIGNATURE
CHARTER IN 2018, UP BY **10%**
FROM 2017 (67%)

WITH **15%**
CLASSIFIED IN
THE TOP 10%
MOST CITED

THE COMMON SIGNATURE FOR SCIENTIFIC PUBLICATIONS ADOPTED AS OF OCTOBER 2017 HAS RESULTED IN SIGNIFICANT PRELIMINARY RESULTS.

SCIENTIFIC PUBLICATIONS

The desire expressed by all stakeholders to create a world-class university and, to that end, strengthen notoriety and exposure for our scientific community around the "University of Montpellier" brand, is reflected in the adoption of a common charter for signing scientific publications.



SCIENTIFIC ATTRACTIVENESS

As part of the priority national research program on the fight against climate change - MOGPA, Make Our Planet Great Again - MUSE is welcoming three high-level researchers to develop their projects with support from MUSE partners, Occitanie Region, and the French government.



WITH ITS 1ST PLACE POSITION WORLDWIDE IN THE SHANGHAI RANKING, MUSE IS CENTRAL TO TRANSITIONS RELATED TO CLIMATE CHANGE



UM, #1 worldwide for ecology in 2018 and 2019 in the Shanghai Academic Ranking of World Universities

Ranked among the world's top 300 universities, University of Montpellier notably stands out for its global leadership in the field of ecology. UM is positioned ahead of Oxford University (United Kingdom), University of California Davis, and Wageningen University & Research (Netherlands).

This thematic ranking in ecology is the only one of the 52 Shanghai disciplines in which a French institution is ranked number one in the world.

In 2019, UM moved up in the National Taiwan Ranking (NTU) and entered the top 200 worldwide

This year, University of Montpellier again progressed in the NTU ranking for the performance of scientific publications, based on bibliometric indicators. UM joined the world's top 200 (189th position).

The University advances in all fields: natural sciences, agriculture, engineering, life sciences and medicine, and social sciences.

MUSE signs an agreement with CLARIVATE for consistent, more cost-effective access to Web of Science resources

Concluded for all MUSE members and providing greater visibility at an international scientific level, this agreement allows Montpellier University of Excellence to be better considered into account in international rankings. It also meets the need to monitor and measure the impact of scientific production within the MUSE scope.

Vincent Vadez ICRISAT, India > DIADE (UM, IRD)

Improving crops in arid regions with respect to climate change: studying hydraulic stress resistant plants, roots, and plant architecture to secure the food supply in the Sahel region.

Delphine Renard University of California, USA > CEFE (UM, CNRS)

Working to shine light on the contributions of agrobiodiversity to reduce the impact of climate instability and disruption on agricultural production.

Amandine Cadiau KAUST, Saudi Arabia > ICGM (UM, CNRS, ENSCM)

Working on air purification using new hybrid absorbents that selectively capture toxic gases to degrade and/or convert them through catalytic processes.

NOTEWORTHY INFORMATION

In 2018, seven researchers in MUSE's scope of action are included in the Clarivate Highly Cited Research listing, alongside other world-class researchers recognized for the exceptional quality of their work.

The University of Montpellier and the Occitanie Region have signed a very important memorandum of understanding. In 2 years, the support provided by the Region on the perimeter of MUSE is above 30M€, for doctoral funding, technological platforms, projects in partnership with companies, and more.

Assistance program for potential ERC candidates

This program seeks to support ERC (European Research Council) project submissions and increase the number of ERC projects at the site by providing assistance for scientific writing and communication training, and by exchanging best practices within an "ERC Network."

"ERC Breakfasts" are organized when a new ERC call-for-projects is launched.

Funding is also provided to help candidates benefit from support with their writing and preparing materials in English.

UNESCO sets up Edgar Morin "Complexity" chair at University of Montpellier

With joint support from MUSE and the Occitanie Pyrénées - Méditerranée Region, University of Montpellier welcomes Edgar Morin, French philosopher and anthropo-sociologist, considered as the father of complex thought, for a rich work program: a series of seminars at the Faculty of Education starting in early 2019; preparation of seminars; organization of specific debates; doctoral theses, and more.

ATTRACTIVENESS AND DISSEMINATION OF SCIENTIFIC CULTURE

Increasing the site's scientific attractiveness and national and international exposure involves deploying mechanisms to support promising future high scientific potential, welcoming the very finest national and international scientists, while also disseminating knowledge to a broad audience.

ATTRACTIVENESS AND SUPPORT FOR RESEARCH

In addition to the MOPGA program, and the selected projects of the 2017 and 2018 research support program, MUSE also encourages research teams to recruit among the most promising doctoral and post-doctoral candidates in their fields at the highest international level.

16

POST-DOC RESEARCHERS RECRUITED

30

PHD STUDENTS RECRUITED

PROMISING PHD STUDENTS AND POST-DOC RESEARCHERS JOIN RESEARCH TEAMS WITH MUSE SUPPORT

Supporting awareness actions regarding access to genetic resources and sharing the benefits

In partnership with the Foundation for Biodiversity Research, MUSE supported an action to raise awareness within the scientific community on the issue of access to genetic resources and benefit sharing (ABS) in the context of the Nagoya Protocol.

This one-day event took place on September 25, 2018 in the presence of representatives from the French Ministries of Agriculture, Higher Education, Research and Innovation, and Ecological and Solidarity Transition.

Confronting scientific issues with societal debates during open conferences

MUSE supported high-level conferences and debates open to the general public.

Topics included a conference organized by Cosciences on agro-ecology with the farmer-poet Pierre Rabhi as guest speaker, and a debate on the notion of collapse with Edgar Morin and Pablo Servigne.

The Be Curious conference series (MUSE - Banque Populaire du Sud) focused on marine biodiversity with scientist Laurent Ballesta, and the impacts of climate change with CNRS research director Anne Charmantier.

Sud de Sciences festival promoting scientific film production to the general public

MUSE participated in launching the first scientific film festival, featuring about ten scientific films on social topics produced and presented by IRD, CNRS, and INSERM. Scientists discussed the topics at each screening.

The 2018 edition of the festival focused on several themes, all related to MUSE pillars: mosquitoes, the origins of AIDS, the world of atoms, and plastic pollution in our oceans.

Alpha Kabinet KEITA (Guinea) studies the Ebola virus at the interface of humans and wildlife in Guinea

MUSE's first post-doctoral researcher, this recent graduate in medicine and infectious diseases, has already originated major advances in the fight against the Ebola virus.

He joined the TransVHIMI team (UM, IRD, Inserm, U. of Yaoundé, U. of Dakar) in February 2018 to help study Ebola virus presence at the interface between animals and humans in Guinea to assess the risk of virus transmission to humans and understand how it circulates between different epidemics.

Monica BRIENZA (Italy) applies environmental chemistry to food security

This researcher joined the G-EAU (CIRAD, IRD, IRSTEA, MSA, AgroParisTech) and LBE (INRA) teams in November 2018 to study the role of biofilms and the rhizosphere, and their impact on the biodegradation of pharmaceutical product residues when reusing treated wastewater for irrigation.

This project brings solutions to the societal challenge related to the growing demand for irrigation water to help meet the need for food security.

Antonio Alejandro VAZQUEZ-PERERA (Cuba) focuses on the intersection of MUSE pillars

This specialist in ecology and malacology joined the MIVEGEC team (IRD, CNRS, UM) to work at the intersection of MUSE's three pillars, Feed, Care and Protect. He works on epidemiological risks related to conservation biology and anthropogenic disturbances linked to mixed farming activities, notably the fasciolosis situation in France's Camargue area. The disease is transmitted by mollusks affected by environmental disturbances.

The results will include practical recommendations for local players and will be easily transferable to southern countries.

AN AMBITIOUS RESEARCH SUPPORT PROGRAM BASED ON MUSE'S THREE PILLARS: FEED - PROTECT - CARE



Calls-for-projects open to the consortium's entire scientific community (6,000 scientists)

Following the first call for research projects in 2017 (budget 5.8 M€), the second MUSE call for research projects (budget 3.6 M€) has selected 10 larger-scale projects.

These two calls-for-projects confirmed strategic priorities addressing the challenges of MUSE's transformational impact. Selected projects involve several disciplines and propose cross-functional approaches across the three MUSE pillars, as well as projects in the field of translational medical research, while giving priority to a more concrete integration of social science issues.

Projects with an international and/or economic dimension that span disciplines, including social sciences

While working to change how science develops around these pillars, our program emphasizes the way MUSE pillars interact and reinforce each other, particularly with respect to social science issues.

SUPPORT FOR RESEARCH

Technology platforms

MUSE and its scientific community benefit from a broad range of technological platforms.

MUSE support enables the development and organization of these shared technological platforms. Their influence is of interest to broader scientific communities and their activities are consistent with MUSE themes.

SUPPORT FOR RESEARCH

Examples of selected projects

PROMOTING ECOLOGICALLY INNOVATIVE AGRICULTURE, CONTRIBUTING TO FOOD SECURITY AND ENVIRONMENTAL QUALITY



Establishing an industrial partnership to develop cocoa crops in the Amazon to improve the standard of living for local populations

By taking a multidisciplinary approach involving genetics/genomics, palaeogenomics, bioinformatics, biochemistry, and social sciences, the **AMAZCACAO project** seeks to understand how domestication of the two ancient aromatic cocoa varieties originating in the Amazon took place. Genetic and biochemical studies on biodiversity, as well as sensory assessments carried out with the French company VALRHONA, will provide better understanding of determinism concerning flavor components as well as diagnostic tools to facilitate the selection of productive aromatic varieties adapted to the Amazon region.

Collaborating with the United States and China to study ecological mechanisms for managing rice farming

The **AMUSER project** seeks to test the manner in which rice varietal blends are more productive and/or more resistant to diseases when their genotypes are more or less complementary, both in terms of resource use and regarding their ability to emit signals that trigger immune responses in the others. As part of a partnership with the French Rice Center (CFR), University of California Davis (United States), and Yunnan University (China), this project poses questions that are based on concepts and theories in the fields of ecology, evolution, genetics, plant biology, functional ecology, and ecophysiology.

What tools are being implemented by public policy to address the challenge of adapting agriculture to climate change?

Many national and international declarations of intent have been made, but what concrete measures are being taken to address the challenge of adapting agriculture to climate change? The **TYOCLIM project** is working to establish an extensive typology of these tools and assess their governance along with their economic and environmental impacts. The project leverages a detailed mapping of tools for adapting agriculture to climate change, based on eight fields of study in countries in the Northern and Southern hemispheres and several agricultural sectors that are directly affected by various climate shocks.

MUSE participates in the acquisition of cutting-edge equipment that contributes to the technological breakthrough made by the IBISA-accredited Polyphenol analysis platform at IRU SPO (University of Montpellier - INRA - Montpellier SupAgro)

SUPPORT FOR RESEARCH

Examples of selected projects

ENCOURAGING THE TRANSITION TOWARDS A SOCIETY THAT MANAGES THE ENVIRONMENT AND ITS RESOURCES SUSTAINABLY



Robotics for exploring aquatic environments

Taking an interdisciplinary approach, the **BUBOT project** combines the expertise of marine biologists, roboticists, and computer scientists to design and develop innovative tools for exploring, observing, and monitoring marine biodiversity to assess human impact on the marine reef environment.

Particular attention will be paid to developing autonomous and reliable underwater robots, implementing specific stereoscopic systems, and identifying individual fish species automatically by using deep learning techniques. Environmental assessment will be coupled with data on human population densities and activities as well as an anthropological study on practices, culture, and knowledge related to fish resources.

A bee hive with instruments to track a bee colony in real-time

Building a macroscope for observing bee colonies will help to understand the pathophysiological mechanisms of chronic bee diseases induced by bees' long-term exposure to a combination of environmental stresses, such as chemical pollution, invasive predatory or parasitic species, and climate change that are leading to an undeniable worldwide decline in honey bee colonies.

The **SuperBeeLive project** will also monitor ecosystems and the nutritional quality of hive production, thus increasing our knowledge about the effects on a hive's "super-organism" functions and the quality alteration of ecosystem services provided by bees.

A multidisciplinary approach to understand the causes of changes in plant nutrient qualities

The continuously rising concentration of CO₂ in the atmosphere suggests that values close to 1,000 ppm could be reached by the end of this century, having a negative impact on the mineral properties of many plant species. The goal of the **eCO₂-THREATS project** is to pursue a multidisciplinary approach that includes plant physiology, soil sciences, and human nutrition to identify causes and characterize their consequences with respect to human nutrition.

The purpose is to determine whether the negative impact of CO₂ on the mineral composition of plants is related to changes in the physiological and developmental processes involved in the mineral nutrition of plants, or to changes in the biogeochemical processes of soil.

MUSE provided support for the Montpellier ECOTRON International Service Platform (CNRS), experimental research infrastructure dedicated to studying ecosystems, organisms, and biodiversity in a context of environmental change.

SUPPORT FOR RESEARCH

Examples of selected projects

IMPROVING HUMAN HEALTH IN CHANGING ENVIRONMENTS



A "One Health" model to understand and prevent the risk of emerging infectious diseases

The objective of the **EbolaHealth project** is to leverage the example of the recent Ebola epidemic in West Africa and take a global approach to better understand how such an infection can emerge following cross-species transmission from wildlife to humans and then spread within the human species.

The project also intends to produce information regarding the ecology of filovirus within these species and assess the health and social consequences of the epidemic both at individual and population levels.

This project will, for the first time, document the magnitude of asymptomatic Ebola virus infections and the immunity acquired in Guinea.

MUSE contributes to the deployment of structural mass spectrometry for the BIOCAMPUS Montpellier platform (UM, CNRS, Inserm), a joint structure initiated by Montpellier's Life Sciences research labs to share state-of-the-art tools.

A new therapeutic target for acute myeloid leukemia (cancer)

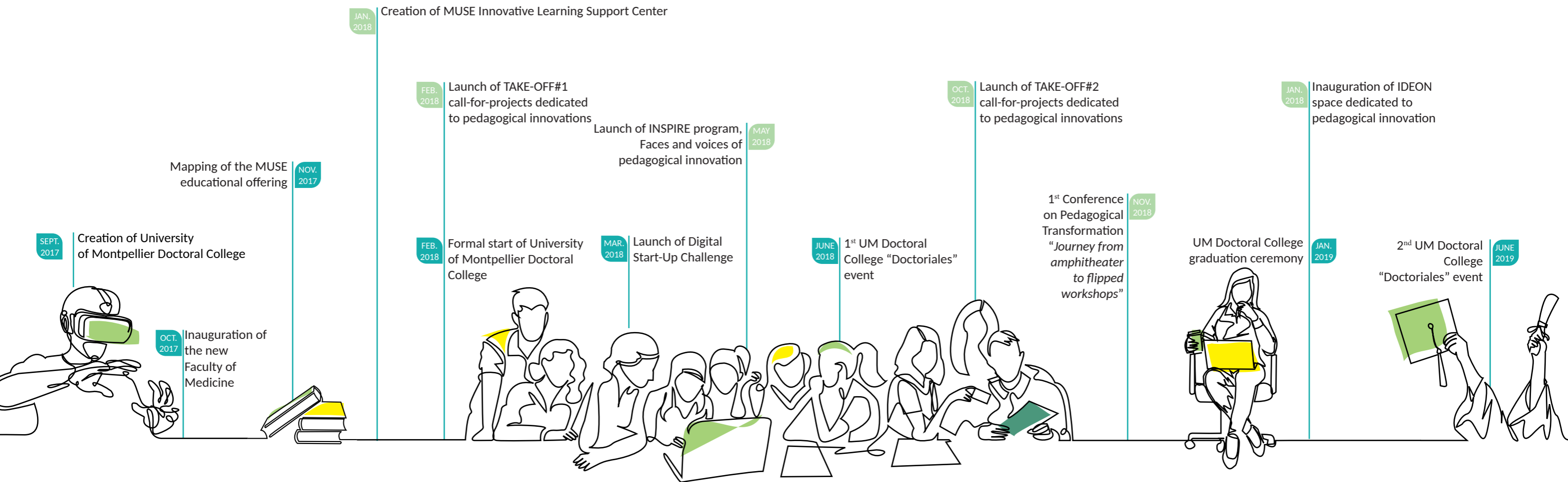
The **SUMO project** is working to develop a new therapeutic target for acute myeloid leukemia, the only hematological disease that has not benefited from major therapeutic progress over the past 40 years. A substantial proportion of patients (20-30%) do not respond to chemotherapy (anthracycline and cytarabine) and the rate of relapse is very high.

Teams from IBMM (CNRS, UM, ENSCM), IGMM (UM, CNRS), and the Montpellier University Hospital will work in partnership with the Universities of Barcelona and Heidelberg to characterize new peptide inhibitors of SUMOylation that are more specific and offer better bioavailability than existing molecules.

Vector-borne diseases and arbovirus epidemiological mechanisms in southern France and Burkina Faso

The **Arbosud project** seeks to predict future epidemic outbreaks involving arboviruses in the Montpellier/Nîmes area and the Upper Basins of Burkina Faso, by identifying environmental, human, pathogenic, and societal factors.

The project's purpose is to provide adequate health monitoring, prevention, and control measures to protect exposed populations in these two geographical contexts. Its goal is thus to integrate research, management, and decision-making processes involving various health and research stakeholders to better anticipate and prevent arboviral risk in the studied regions as the first step in providing an early and appropriate response.



50,000
STUDENTS

2.8 M€
DEDICATED TO EDUCATION

EDUCATION & PEDAGOGICAL INNOVATION

Pedagogical innovation and educational excellence require changes in attitudes and learning environments. Technologies and ties between students and the business world are also central to this process. The Innovative Learning Support Center activates these four levers to support the consortium's educational transformation.

WORKING TO ESTABLISH COLLEGIUMS, DETERMINING FACTORS FOR BUILDING EXCELLENCE CURRICULA

ORGANIZING ÉDUCATION

Currently being studied, the Collegiums are intended to promote synergies between institutions within the main educational fields and simplify access to information describing the education offerings of all MUSE partners.

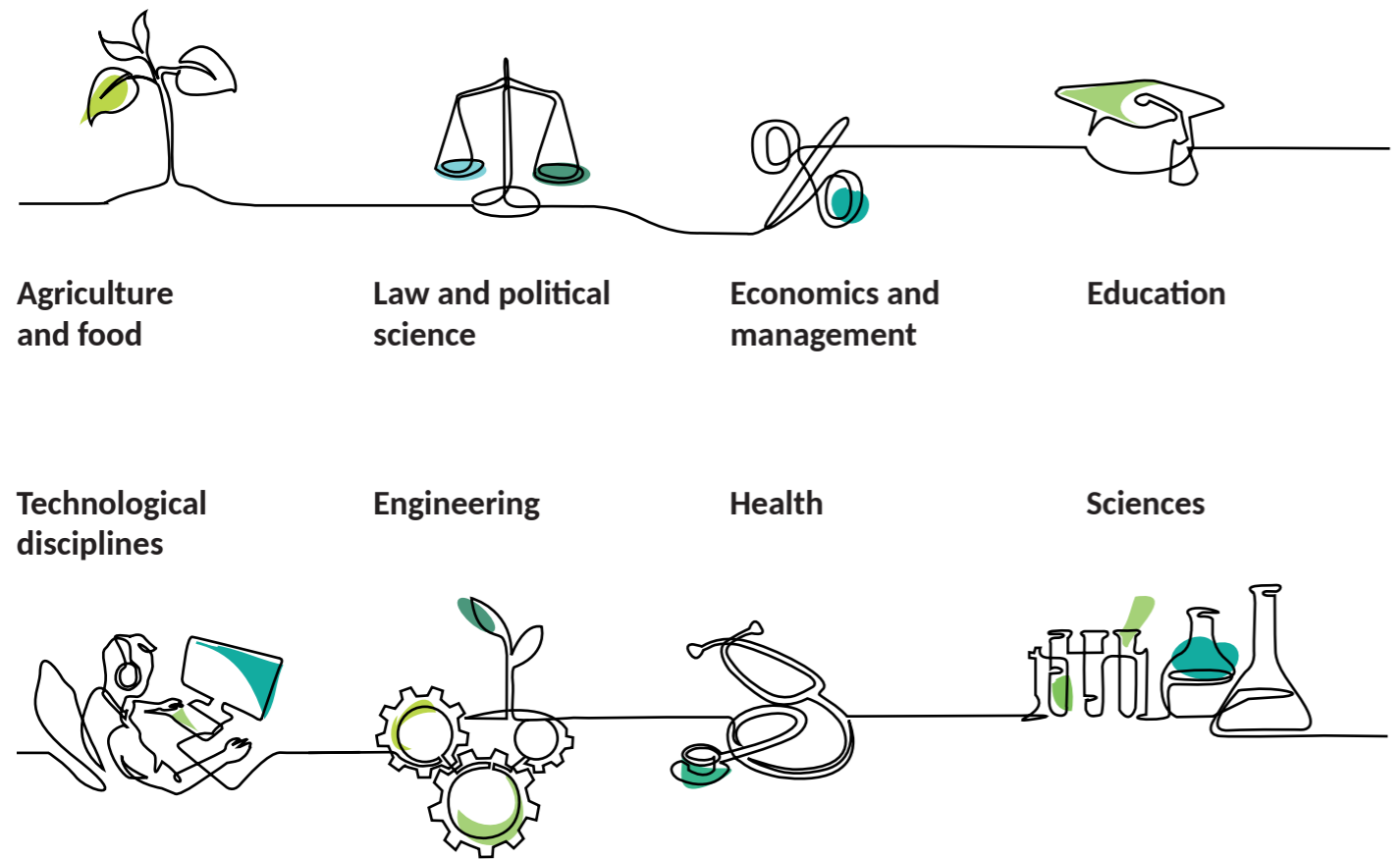
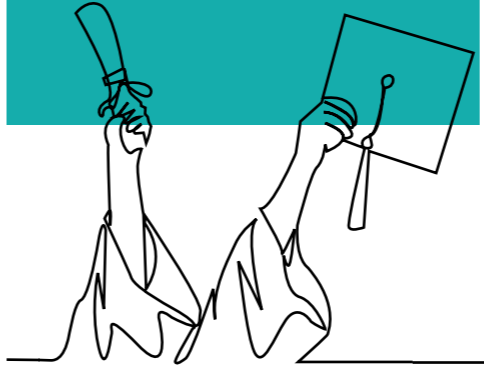
UNIVERSITY OF MONTPELLIER DOCTORAL COLLEGE

The University of Montpellier's Doctoral College is the first step towards building the Target University's graduate division. It has been coordinating the training opportunities offered to PhD students at all the University of Montpellier's doctoral schools since July 2017.

2,000
PHD STUDENTS

OVER **150** TRAINING DAYS
OPEN TO ALL DOCTORAL STUDENTS

THE UNIVERSITY OF MONTPELLIER DOCTORAL COLLEGE IS A KEY STRUCTURAL ELEMENT FOR THE TRAINING AND PROFESSIONAL INTEGRATION OF PHD STUDENTS



Over 150 transversal vocational training days open to all doctoral students

The main mission of the University of Montpellier Doctoral College is to define and implement transversal vocational training for PhD students over the course of their doctoral research activities. The Doctoral College also helps them manage their career plans locally, nationally, and/or internationally.

"Doctoriales" event to promote vocational integration of fresh PhDs outside the academic context

Open to PhD students in all disciplines, regardless of their career plans, the "Doctoriales" events offer specific training by a PhD from outside the academic world focusing on professional integration and leveraging acquired skills.

Organized in June 2019 for the second consecutive year, the UM Doctoral College "Doctoriales" seek to challenge PhD students in their professional plans by exploring the wealth and diversity of business life, based on their training through research.

The 1st joint graduation ceremony highlights a high-level diploma

On January 29, 2019, an unprecedented graduation ceremony was held in downtown Montpellier's prestigious Opéra Comédie opera house, made available for the occasion by Montpellier Méditerranée Métropole.

Nearly 200 PhD graduates from the class of 2018, accompanied by their families, were awarded their diplomas. The event was a way for the establishment to highlight the quality of the graduating PhDs' work and expertise in their field of specialization.

INNOVATIVE LEARNING SUPPORT CENTER (CSIP)

CSIP offers services for all stakeholders involved with the consortium's educational offering to help professors and research-professors generate new ideas and turn their existing ideas into reality.

Supervised by a professor recognized internationally for her expertise in the field, the team manages the TAKE-OFF call-for-projects on pedagogical innovation and helps implement the selected projects in the educational entities and schools.

TAKE-OFF PROGRAM TO SUPPORT PEDAGOGICAL INNOVATION

MUSE promotes high-quality teaching, reflecting the site's excellence in terms of education and supporting students in their acquisition of skills.

With this call-for-projects, MUSE supports pedagogical transformation in educational programs, as well as the development of interdisciplinarity using innovative teaching methods to raise current Master's programs to international standards in terms of excellence, attractiveness, and/or to create new Master's programs.

THE INNOVATIVE LEARNING SUPPORT CENTER HAS BEEN HELPING MUSE MEMBER INSTITUTIONS WITH THEIR PEDAGOGICAL TRANSFORMATION SINCE JANUARY 2018

THE FLAGSHIP PROGRAM IN MUSE'S EDUCATIONAL TRANSFORMATION STRATEGY, TAKE-OFF SUPPORTS INNOVATION THAT PROMOTES EXCELLENCE IN EDUCATION



IDEON, a space dedicated to innovation, creativity and pedagogical transformation

Inspired by the most renowned Learning Labs, such as Stanford University (USA), IDEON is an ever-changing space whose design is based on in-depth analysis of uses in order to support teaching teams with new teaching methods, including attitude changes, active teaching, and space co-design. IDEON is also intended to encourage exchanges between pedagogical and professional teams to bring about new ideas.

INSPIRE, the faces and voices of educational innovation, use video to share their experience

Producing and presenting short video clips, the professors and research-professors taking the risk of changing their behavior can express themselves and share their experience easily. 14 INSPIRE videos have already been published on the University of Montpellier YouTube channel since May 2018.

The 1st MUSE International Conference offers a journey from the amphitheater to flipped workshops

Discussion, feedback, and exchanging ideas with innovation experts are essential for the University's educational transformation. Organized by CSIP in November 2018 in Montpellier, this first international conference provided an opportunity to rethink teaching team innovations with respect to increasingly diversified student profiles, in a context of continually more intense national and international competition.

Innovative and transformational educational projects

TAKE-OFF supports projects that transform pedagogical practices, create new methodologies, and/or develop educational programs that will lead to the future Masters' of Excellence.

The program also supports projects that stimulate pedagogical creativity and encourage a shift in professor and research-professor positions towards student independence and internationalized education.

Support for developing flexible and collaborative digital and physical learning environments

TAKE-OFF supports the development of dedicated learning spaces that are flexible, collaborative, and innovative, as well as the production of digital resources (such as MOOC, SPOC, and other potentially useful tools to reach as many people as possible) to support the different types of teaching methods.

Theoretical and practical business knowledge

TAKE-OFF supports educational programs and modules designed to bring students closer to the business world by discovering and understanding the mechanisms and challenges of business and student initiatives.

MUSE ENCOURAGES CREATIVE PRACTICES AND PROMOTES COLLECTIVE INTELLIGENCE THROUGH THE DEVELOPMENT OF FLEXIBLE, COLLABORATIVE, AND INNOVATIVE LEARNING SPACES

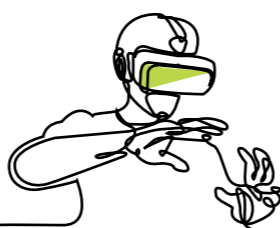
PEDAGOGICAL INNOVATION

Examples of selected projects

PEDAGOGICAL INNOVATION

Examples of selected projects

MUSE SUPPORTS EFFORTS TO CHANGE TEACHING HABITS IN ORDER TO STRENGTHEN STUDENT EMPOWERMENT AND INTERNATIONALIZE EDUCATION



A trading room providing professional simulation for students in risk management and finance

Unique in the French university system, this new educational space at the Faculty of Economics, where teaching will mainly be offered in English, has 30 spaces and is equipped with the latest digital equipment and industry reference trading software used by professionals, as well as a tele-presence robot for remote presentations. The space is also used for economics research.

Implementation: May 2019
MUSE funding: 69.5 Ke

Proactive and project-oriented learning adapted to different uses at the Pharmacy-Health Learning Lab

This 48 m² room is arranged to encourage the development of shared responsibilities between students and professors according to different uses, namely tutoring, collaborative work in groups, documentary research, and discussions. All the teaching teams at the Pharmaceutical and Biological Sciences education and research unit use this space to work together and engage students in active learning.

Implementation: June 2019
MUSE funding: 75 Ke

A collaborative virtual reality room at the cutting edge of technology enabling parallel work efforts

MuseVr (Multiple-Users Simulation Environment in Virtual Reality) is an educational space at ENSCM for collaborative virtual reality that enables several users to work and share the same experience simultaneously. Featuring virtual reality software and state-of-the-art computer equipment, including immersive headsets, this platform allows up to 120 people to participate simultaneously with optimal performance.

Implementation: March 2019
Funding: 71.5 Ke

A Serious Game (developed in English) to raise student awareness about environmental issues

"Down by the river" is a serious video game in environmental economics developed by MOMA, providing an opportunity for all students to become familiar with the social issues underlying the systems they are studying, and address issues related to managing natural resources.

The game is designed for students in social sciences as well as other disciplines such as agronomy, ecology, hydrology, biology, and more. It will be developed entirely in English to facilitate dissemination.

Implementation in progress - 32 Ke

International summer school focusing on major industrial challenges relating to MUSE topics

With a focus on studying the major industry challenges in France related to the themes "FEED - PROTECT - CARE" supported by MUSE, the Undergraduate Engineering Summer School 2019 at Polytech Montpellier welcomed 29 students from China, the United States, Brazil, and the United Kingdom.

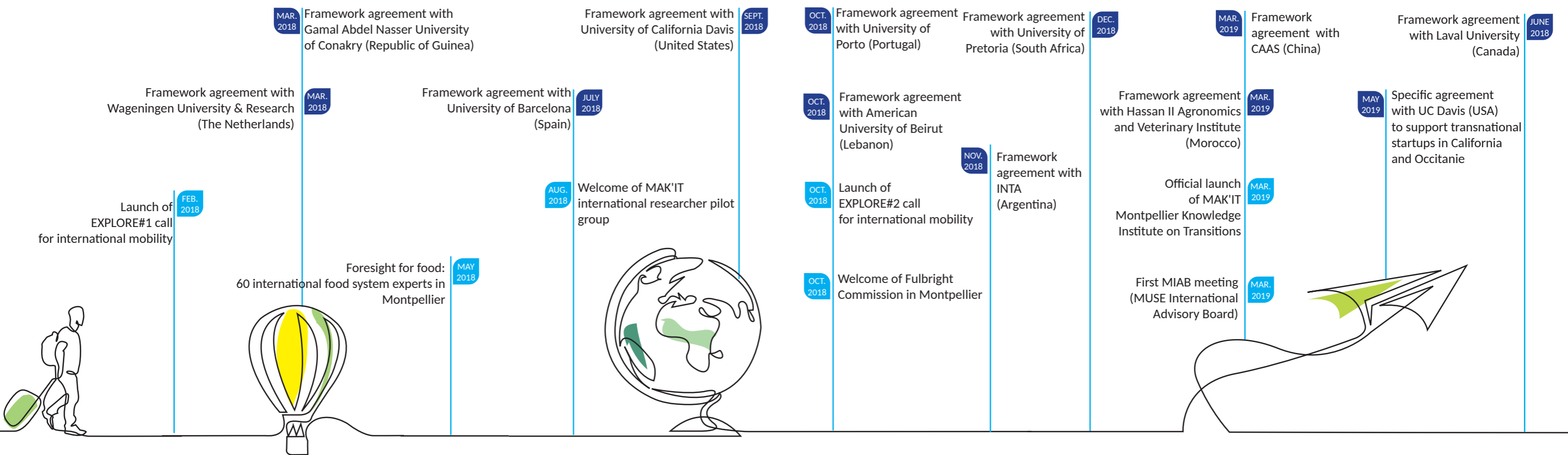
Divided into intensive courses over a period of 3 weeks, the program for this summer school, includes lectures, tutorials, cooperative laboratory experiments with PhD students, plus site, laboratory, and company visits.

Held from May 27 to June 14, 2019
MUSE funding: 12 Ke

Complementary actions for the benefit of student entrepreneurs

Articulated according to the complementarities of the three schools and expert partners on the topic: creative students and entrepreneurs can benefit from a MUSE ecosystem that spans and supports all phases leading from small ideas to large-scale professional projects.

The IAE management school and ITM Mines Alès engineering school are working on the "e-m@gine" project, a set of resources to stimulate and advise students attracted by an entrepreneurial approach. Polytech Montpellier's "Carré Numérique" will be a meeting hub with a co-working space, Junior-Enterprise association, and areas dedicated to one-to-one interviews. The UM-I-LAB MOMA incubator will offer a number of spaces at the university library dedicated to business creation in the university environment.



INTERNATIONAL

budget of
1.1 M€
for

40 countries
for

96 person-months
of scientific exchanges
(equivalent to 8 years of
collaboration)

MUSE's three major challenges (Feed, Protect, Care) shape a vision whose scientific and international dimensions are closely related. This prompts us to define an international strategy whose goals and methods are based on a partnership network and specific tools.

Closely linked with defined scientific policy, international ambitions are justified and built by:

- Montpellier's unique scientific strength in the fields of agriculture, environment, and health.
- The presence of many foreign and international establishments in Montpellier (CGIAR, EMBRAPA, INTA, CSIRO, University of Putra Malaysia, and more).
- MUSE member institutions' heritage, know-how, and potential dedicated to international development: CIRAD, CIHEAM, and IRD, whose teams are present worldwide and which welcome scientists from over one hundred countries.

MUSE leverages a network of international academic partners to formalize its international objectives and pave the way towards new opportunities for global initiatives at the crossroads of its scientific themes.

MUSE BUILDS TARGETED BILATERAL AND MULTILATERAL RELATIONS WITH INTERNATIONAL ACADEMIC PARTNERS



Nearly a dozen framework agreements signed with privileged partner universities around the world

These framework agreements, formalized with the universities of Conakry (Guinea), Wageningen U&R (The Netherlands), Barcelona (Spain), Porto (Portugal), Pretoria (South Africa), UC Davis (United States), American University of Beirut (Lebanon), Laval (Canada), INTA (Argentina), IAV Hassan II (Morocco), and CAAS (China), establish medium- and long-term commitments in various fields of cooperation and open the possibility to establish specific thematic conventions.

Guidance from the MUSE International Advisory Board (MIAB) helps the consortium reinforce its reach

Comprising representatives from MUSE's main academic and non-academic partners, MIAB plays an advisory role regarding the structure and strategic orientations of the MUSE project's international development. Set up in March 2018, MIAB took advantage of its first meeting to confirm MUSE's international strategic course and agree on a joint working method.

UniversiTREE planted in the Montpellier Botanical Garden, a symbol of ties with Wageningen U&R

To celebrate the centennial anniversary of Wageningen University & Research, its President Louise O. Fresco wanted to permanently demonstrate the strong bonds uniting the two universities by planting a "UniversiTREE." Planted in the heart of the Montpellier Botanical Garden on the day after the first MIAB meeting, the chosen Tartarian maple is a slow-growing tree that can live to a very old age.

MUSE and Gamal Abdel Nasser University of Conakry working together to fight the Ebola virus

Development of the Guinea Research and Training Center for Infectiology (CERFIG) was initiated by the TRANSVIHMI team from Montpellier, representing a perfect example of the extent to which French national research organizations (IRD, Inserm) and the University of Montpellier can work together on issues related to human health, environmental protection, and food security through international actions with countries in the southern hemisphere.

MUSE and UC Davis cooperating to support transnational startups in California and the Occitanie region

As the first action under the framework agreement signed with the University of California Davis, this specific agreement was signed during Chancellor Gary S. May's visit to Montpellier. Its goal is to foster greater cooperation to support transnational startups and help them settle on campuses in California and Occitanie. This international agreement is fully in line with MUSE's objectives for economic development through job creation to the mutual benefit of our territories.

Video highlights of a water resource project targeting southern countries

Following World Water Day in March 2018, MUSE retransmitted a video online about a project carried out in collaboration with Gadjah Mada University (Java, Indonesia) led by the Hydrosience research team concerning groundwater resources on the northern slope of the Bromo volcano in Indonesia. The project involved strong synergy with industry partner Danone Aqua. A perfect demonstration of the education-research-partnership links at the heart of the MUSE effort.

WITH ITS PROGRAM FOR SUPPORTING INTERNATIONAL MOBILITY, MUSE FOSTERS THE DEVELOPMENT OF HIGH-LEVEL SCIENTIFIC COLLABORATION

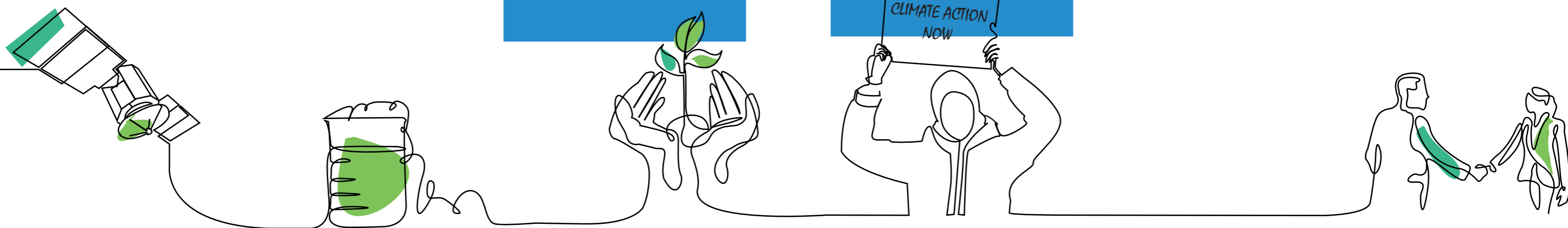
EXPLORE PROGRAM SUPPORTING INTERNATIONAL MOBILITY

The EXPLORE support program for international mobility promotes international exchanges and collaborations in order to increase the site's attractiveness and exposure. It also facilitates initiatives to build the university of tomorrow in accordance with MUSE's scientific program. These projects can leverage mechanisms already in place with MUSE members active internationally.

EXPLORE PROGRAM SUPPORTING INTERNATIONAL MOBILITY

EXPLORE supports incoming and outgoing mobility for individuals, and outbound mobility for collective projects, enabling people to explore new international collaborations. The program is notably for PhD students in preparation of their post-doctoral professional careers, as well as professors, research-professors, engineers, technicians, and administrative staff.

MUSE TAKES INSPIRATION FROM AROUND THE ENTIRE WORLD TO INFLUENCE THE UNIVERSITY'S SUSTAINABLE TRANSFORMATION



Publications about aerial phenotyping based on image capture and processing

Shawn Kefauver and Maria Luisa Buchailot (University of Barcelona, Spain) spent time at IRU DIADE (IRD, UM), leading to two scientific publications on technological progress in the field of genetic crop improvement applied to the use of autonomous vehicles and remote sensing.

Collaborating with Colombian universities on chemistry and health-biology

Leveraging the CIRAD network established in Colombia, outgoing mobility for Jean-Marc Campagne (ENSCM) and Marcia de Figueiredo (CNRS) enabled progress on scientific collaboration to develop chemistry that is more respectful of the environment and for health.

Transferring knowledge to help increase food security in Ethiopia

Sadik Muzemil, a doctoral student at the University of Hawassa (Ethiopia), came to Montpellier to expand his knowledge in microbiology, molecular diagnosis, and genotyping at IPME (IRD, CIRAD, UM), by pursuing his research on the resilience of Enset (Ethiopia's "tree against hunger") to soil-borne diseases.

Promoting the role of women in science to address climate change issues

CNRS Research Director Anne Charmantier participated in the Australian Homeward Bound program to take a one-year course on women's leadership to have a positive impact on public environmental policies and combat the effects of climate change. The training concluded with a multi-week expedition to Antarctica.

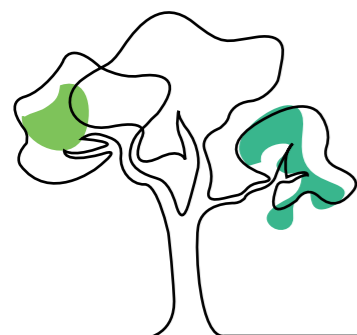
Benefiting from Swedish expertise in bioinformatics training

Erik Bongcam Rudloff, a researcher from University of Uppsala (Sweden) and EMBnet representative, delivered several high-level training courses to CBS2 doctoral school students, along with post-doctoral researchers, research professors, and researchers from IGH (UM, CNRS).

Discovering research management methods at Laval University in Canada

Anne Bancel, Director of Research and PhD Studies at UM, had the opportunity to observe the research organization and management at a North American university of similar size and disciplinary fields. She was also able to work towards establishing an agreement signed by the two institutions in June 2019.

MUSE SUPPORTS THE ORGANIZATION OF MAJOR INTERNATIONAL EVENTS TO PROMOTE THE WORK OF INTERNATIONAL RESEARCH TEAMS AND REINFORCE MONTPELLIER'S POSITION AS A WORLD-CLASS SCIENTIFIC CENTER



Montpellier, world agroforestry capital in May 2019

"Make our planet treed again!" That was the motto used by the 1,200 researchers and institutions gathered in Montpellier at the conclusion of the 4th World Agroforestry Congress, whose goal is to strengthen ties between science, society, and public policy.

At the end of the conference in Montpellier, more than a thousand experts from one hundred countries called for a profound change in the global food system to limit its negative impact on our planet. Agroforestry has a key role to play in that change.

Montpellier, European oncology capital in October 2018

European gastroenterologists, surgeons, and oncologists met in Montpellier in October 2018 for the *New Frontiers in GI Oncology* conference coordinated by ICM.

SUPPORT FOR SCIENTIFIC EVENTS

To highlight the vitality of scientific communities organizing many international scientific gatherings, MUSE accredits and supports events with an international dimension focusing on MUSE's three thematic pillars and/or situated in areas where they intersect.

Montpellier, world evolutionary biology capital in August 2018

With the 2nd *Joint Congress on Evolutionary Biology* and its 2,700 participants attending from nearly 60 countries, Montpellier welcomed the largest and most international evolutionary biology congress ever organized up to now.

The most recent advances in evolutionary biology were featured in 800 presentations, organized into 78 thematic symposiums, taking place in 13 parallel sessions. A wide range of topics and fields were covered, ranging from paleontology to molecular evolution.



MONTPELLIER
ADVANCED KNOWLEDGE
INSTITUTE ON TRANSITIONS

Welcoming world-renowned researchers and stakeholders

Organizing events with an international scope in Montpellier

Helping to refresh educational programs related to the three pillars: Feed, Protect, Care

Elaborating and coordinating international initiatives related to sustainable development objectives

WITH MAK'IT, MUSE CREATES ITS INSTITUTE OF ADVANCED STUDIES TO RALLY THE MONTPELLIER AND INTERNATIONAL SCIENTIFIC COMMUNITIES FOR SUSTAINABLE DEVELOPMENT OBJECTIVES



A meticulous benchmark to position MAK'IT as an institute for advanced studies

An extensive analysis of about thirty French, European, and international institutes for advanced studies, along with telephone conversations with their directors and visits of two of them, identified specific characteristics defining the new institute: the 2030 Agenda for Sustainable Development as a framework for action; a thematic focus on MUSE's three pillars; an innovative approach focused on addressing societal controversies; intensified dialogue with southern countries; and a role as an interface between science and society. Approved by the MUSE Board in May 2018, these characteristics contribute to the international attractiveness and exposure of MAK'IT.

Preliminary work by a pilot group of international researchers

MAK'IT welcomed five internationally renowned researchers from August to December 2018, helping them design and test collaborative working methods and innovative scientific approaches:

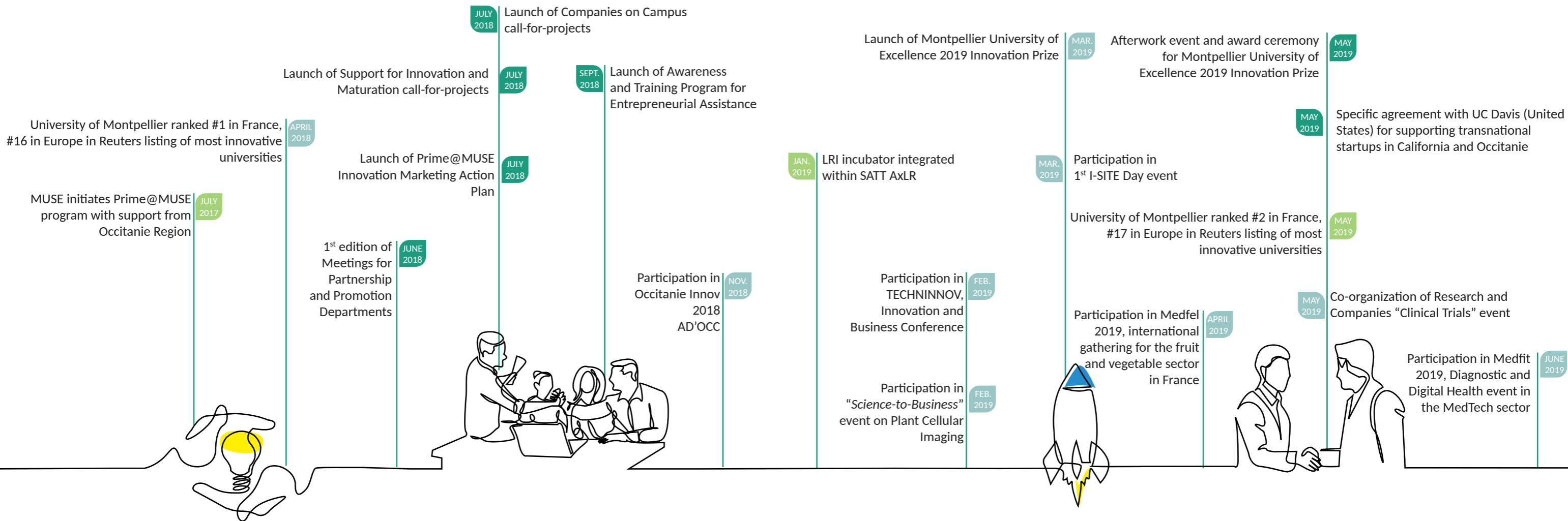
- Philippe Mayaud, Professor of Infectious Diseases and Reproductive Health, London School of Hygiene & Tropical Medicine
- John R. Porter, Professor Emeritus in Climate Change and Food Security, University of Copenhagen
- Habiba Bouhamed Chaabouni, Professor of Medical Genetics, University of Tunisia - El Manar
- Martin Van Ittersum, Professor of Food Production and Systems, Wageningen University and Research
- Neli Aparecida de Mello-Théry, Geographer and Professor of Sustainable Development, University of São Paulo

The pilot group addressed the question: "At what scale should the circularity of food systems be organized: local or global?"

An official launch worthy of international goals

At the MAK'IT launch on March 7, Frédérique Vidal, French Minister of Higher Education, Research, and Innovation, described MAK'IT as "an incubator for global intelligence... where knowledge and cultures resonate, dialog, and clash." She praised its innovative nature and potential for contributing to a "new global balance."

Also participating in the event were Abdoulaye Yéro Baldé, Minister of Higher Education and Scientific Research for the Republic of Guinea; David Nabarro, former Special Adviser to the United Nations Secretary-General on the 2030 Agenda for Sustainable Development; Carole Delga, President of France's Occitanie Region; and nearly 300 representatives from international academic and scientific communities.



PARTNERSHIPS & SUPPORT FOR INNOVATION

87
LICENSES GRANTED IN 2 YEARS

120
BUSINESS AND PROMOTION MANAGERS

100
HOSTED COMPANIES

for

for

MUSE brings the consortium's institutions together for a joint-partnership strategy that also involves socio-economic players to promote and stimulate economic, technological, and societal innovation. It creates interactions among stakeholders in the innovation ecosystem to help them work in synergy and complementarity.

MUSE DRIVES MOMENTUM TO SIMPLIFY PROCEDURES AND THEREBY FACILITATE ACCESS FOR SOCIO-ECONOMIC PARTNERS TO THE SKILLS, TECHNOLOGIES, AND KNOW-HOW OF RESEARCH LABORATORIES



First meeting day for all partnership and promotion professionals

With the involvement of innovation stakeholders, including the Occitanie Region, AD'OCC Regional Economic Development Agency, Montpellier Méditerranée Métropole technopole and BIC, and competitiveness clusters, this meeting was an opportunity to build synergy and complementarity, exchange ideas, and encourage the emergence of a collegial approach to the action programs launched by MUSE to support innovation.

Common tools to simplify procedures

A common tool has been developed to assess the comprehensive costs of research collaboration and service delivery contracts in order to converge methods and facilitate cost estimation.

A standard confidentiality agreement and research collaboration agreement were drafted collectively. University of Montpellier's digital clause was made available to all consortium institutions.

The CNRS PCRU platform for exchanging information about contracts signed between IRU supervising entities has been opened to University of Montpellier and ENSCM.

Other common tools have been initiated, such as business relationship management software and contract modeling software.

PARTNERSHIP PLATFORM

120 partnership and promotion professionals and many stakeholders in the local innovation ecosystem share best practices and build common tools to facilitate partnership research with socio-economic players, including SATT AxLR, competitiveness clusters, clusters, the Regional Economic Development Agency, and the Montpellier Méditerranée Métropole startup incubator.



COMPANIES ON CAMPUS

The proximity of MUSE partners facilitates the early stages of startup development and the emergence of new products and services for SMES, large groups, associations, public authorities, and more. MUSE also supports research units with a dedicated program to help make it easier for them to set up the human and material resources to welcome their partners.



Scientific expertise applied to bioinformatics to monitor marine biodiversity

Collaboration between SPYGEN and IRU MARBEC, together with two other consortium members, seeks to **create new indicators for marine biodiversity**, sustainable coastal fishing, and sustainable natural resource management.

The ADN-e project is entirely consistent with a promotion-oriented approach, including international scientific publications, knowledge transfer to students in the UM Master's degree in Ecosystems, and the involvement of SPYGEN's hosted employee. These indicators are confirmed by MEDTRIX, a network coordinated by the Water Agency that monitors the Mediterranean coastal marine environment.

13 NEW COMPANIES ON OUR CAMPUSES

614 K€ IN FUNDING

WITH ITS COMPANIES ON CAMPUS PROGRAM, MUSE ENCOURAGES INNOVATIVE COMPANIES TO SET UP THEIR OPERATIONS ON-CAMPUS



A partnership with strong regional job potential based on a cognitive monitoring system

EUROMOV is working with the start-up company SEMAXONE to develop and market an **augmented cognition software solution for monitoring psycho-physiological and cognitive states in real-time**. These information technologies for humans are designed to address safety and health issues by reducing accidents in the workplace.

DISUCOG, a project with high economic and societal impact, is first being developed for the military sector as part of a partnership with the Military Aircraft Expertise Center. It opens development opportunities in the aeronautics and space sector.



Development of precision medicine for managing multiple myeloma

Collaboration between the spin-off DIAG2TECH and the Institute of Human Genomics (IGH) focuses on developing biomarkers and therapeutic orientation tests to improve care for patients with multiple myeloma, a form of hematological cancer characterized by a high degree of molecular and clinical diversity.

Once validated clinically, these biomarkers may be licensed to pharmaceutical companies developing the target molecule or to biology laboratories. This project is part of SIRIC Montpellier and FHU EVOCAN's program on "Resistance to cancer treatment."

MUSE IDENTIFIES AND SUPPORTS RESEARCH RESULTS THAT CAN BE PROMOTED WITH SATT AXLR



A call for joint projects enables funding and/or support for 47 projects

The call-for-proposals launched in July 2018 identified and provided support for innovative and applied projects in order to steer those projects towards SATT AxLR funding for technology transfer, or other funding sources based on project maturity, and, as appropriate, provide them with methodological support to promote results.

Of the 47 projects presented, 12 are in their maturation or pre-maturation phase, and 32 are being assisted to help them continue with maturation (17 of them applied to the Occitanie Region Pre-maturation call-for-projects, with results published in July 2019).

Some examples of projects with SATT AxLR or LabEx funding

AUDIOLOGGER FOR BEHAVIORAL ECOLOGY

Originating at CEFE, the project involves developing an audiologger (on-board acoustic recorder) to expand the range of tools available in behavioral ecology and to open up new opportunities for studying animal behavior. The project was co-funded by SATT AxLR and the CEMEB and NUMEV LabEx structures.

BACTERIAL RESISTANCE TO ANTIBIOTICS

This project, which was started at IBMM, intends to develop Metallo- β -lactamase inhibitors to restore the sensitivity of Gram-negative bacteria to β -lactam antibiotics (penicillin, cephalosporin, carbapenem). It received maturation funding to prepare transfer to pharmaceutical companies.

SUPPORT FOR INNOVATION AND MATURATION

A clear sign of the vitality of networking at the Montpellier site, this funding was the focus of a joint call-for-proposals involving MUSE, its six LabEx structures, and SATT AxLR seeking to provide methodological support for promoting results.

INNOVATION PRIZE

Launched in March 2019, the "Montpellier University of Excellence Innovation Prize" highlights researchers, research-professors, and administrative staff in the institutions driving innovation initiatives in each of MUSE's five research departments for particularly innovative projects, notably in terms of expected impact.

MUSE SHOWCASES RESEARCHERS AT THE HEART OF INNOVATIVE ACTIONS PAVING THE WAY FOR NEW ECONOMIC, TECHNOLOGICAL, AND SOCIETAL PATHS



An original action made possible thanks to support from Banque Populaire du Sud and the InVivo Group

Banque Populaire du Sud and the InVivo group joined forces with MUSE to provide equal funding for the first edition of this prize.

The prize for Human and Social Sciences was awarded by Sébastien BAGGIO, Director of Banque Populaire du Sud, Montpellier Métropole Region.

The Agriculture-Environment-Biodiversity Prize was awarded by Nicolas FERRAS, Director of Partner Relations at SMAG-InVivo.

The five winners of the Montpellier University of Excellence 2019 Innovation Prize

- Camille CLEMENT, Research Engineer at INRA/ Innovation in Social Sciences IRU
- Xavier GARRIC, Research-Professor in Chemistry at UM/UMR IBMM
- David ADREU, Research-Professor in MIPS at UM/IRU LIRMM
- Jean-Christophe, AVARRE, Researcher in AEB at IRD/IRU ISEM
- Saïd ASSOUL, Research engineer Biology-Health at UM/IRU IRMB

Winners were selected by a jury, with half of its members being research departments directors and the other half being representatives of the regional innovation ecosystem. The jury was presided by Christophe Derail, Deputy Vice-President for Research Promotion and Technology Transfer at the University of Pau and Pays de l'Adour (UPPA).

Innovation Awards highlight the 1st MUSE Afterwork event dedicated to Innovation

A privileged occasion for interaction and encounters to boost contact and networking among researchers and local innovation ecosystem stakeholders, the 1st MUSE Afterwork event dedicated to innovation was also a great opportunity for the five winners of the Montpellier University of Excellence Innovation Prize to present their projects.

This first event also highlighted success stories demonstrating the site's innovation dynamics, for example that of ABIVAX, as well as those resulting from the 13 "Companies on Campus" research collaborations.

WITH SUPPORT FROM OCCITANIE REGION, MUSE IS ORGANIZING ITS STRATEGY TO DETECT NEEDS AND DEVELOP BUSINESS INTEREST...

INNOVATION MARKETING

Better understanding of the market helps understand companies' needs.

That will make enable MUSE to develop a clearer offering of skills, technologies, and services from all the consortium's research structures.



INNOVATION MARKETING

Several tools are currently being deployed to define and implement an innovation marketing plan based on a shared common identity. This includes market research, prospecting for potential partnerships, and mapping laboratories' skills, know-how and technology platforms.

... AND DEFINING AN INNOVATION MARKETING PLAN



Providing unprecedented funding of 2.4 M€ over 2 years, Occitanie Region supports MUSE in developing its innovative research

In order to provide better visibility for the skills, technologies, and services offered by the consortium's research structures, MUSE receives significant support from the Occitanie Pyrénées-Méditerranée Region through PRIME, its Grant for Innovative Research in Collaboration with Companies. PRIME supports research partnerships with regional companies and encourages projects to develop new industry partnerships, thereby increasing the region's economic appeal by promoting scientific and technical offerings from public research laboratories.

Preliminary market studies for a joint marketing plan

Five market studies were carried out on the thematic areas identified as partnership opportunities by the working group, consisting of professionals from each MUSE member's partnerships and promotion department. This includes the following industry topics:

- Sensors
- Precision agriculture
- Therapeutic molecules
- Biomarkers
- Substitution materials

Five business developers facilitating the link between companies, research units, and partnership and promotion departments

Covering the 5 themes of Agriculture-Agronomy, Biology-Health, Chemistry, Environment-Ecology, and MIPS, the five business developers are tasked with identifying the needs of companies and projects with the potential to generate value in the consortium's laboratories and to establish a relationship between laboratories and companies.

Leveraging market studies, business developers' role is to determine the skills and availability of laboratories, map them, and develop a partnership offering by conducting market studies, while guiding companies towards new collaborations.

Mobilizing networks requires active participation in a variety of national and international professional meetings as well as the organization of professional events.

Business developers reach out directly to companies, in particular by targeting trade shows at which they are present, to promote the wide range of skills MUSE has to offer. This includes Tech Innov, the business and innovation event, as well as Medfel, Medfit, and more. They co-organize events with competitiveness clusters and AD'OCC, the regional economic development agency, on targeted themes and mobilize research teams for BtoB meetings: Clinical Trials Day on May 7, 2019, Plant Imaging, and more.

The innovation marketing plan includes communication tools adapted to companies' expectations

The purpose of communication actions is to increase exposure for skills and know-how, in particular through promotional laboratory videos and the creation of demonstrators and showrooms: examples include the PEPPER robot at LIRMM, interactive kiosk at the Genopolys site, signage for the Pech Rouge Experimental Unit, and more.

Network mobilization requires active participation in a variety of national and international professional meetings as well as the organization of professional events.

Pilot site renovation to expand partnership activities

This involves facilitating company access to pilot sites for which high-potential markets exist and which make it possible to handle medium-scale production of a product or technology. For example, CHIMECO and L2C (Terahertz) will receive funding from Occitanie Region to support their renovation effort.

Similarly, financial support is being provided to renovate the ReducPol platform, which enables companies, particularly those involved with agriculture spraying, to run tests on the anti-drift effectiveness of additives and new bio-control products.



KEY INITIATIVES

EDUCATION - RESEARCH - PARTNERSHIPS

Inspired by interdisciplinary actions carried out by University of California Davis (UC Davis) – a strategic MUSE partner – these thematic and transversal programs assert MUSE’s unique identity in its area of activity both locally and internationally, and promote synergy between research, education, and economics.

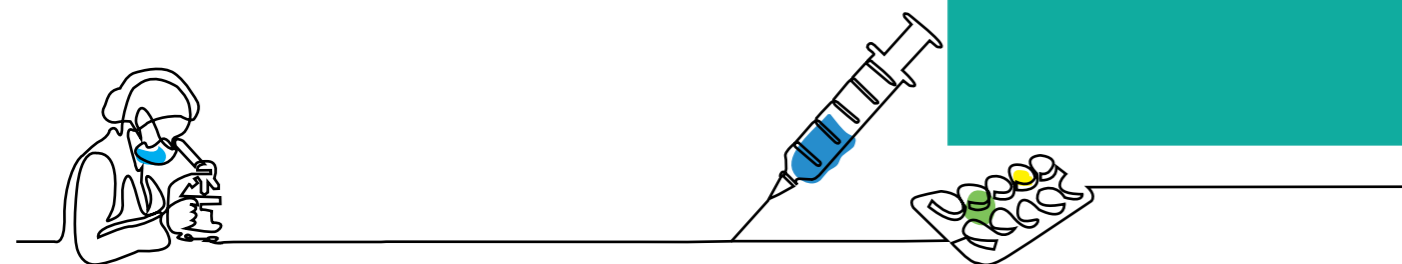
Located near the coast, in the heart of one of the world’s largest wine-producing regions, and in zones confronted by water resource challenges and the ongoing pressure of substantial population growth, MUSE research teams have been created to address research, education, and innovation issues related to the territorial context, focusing on five themes: Biomarkers & Therapy, Data for Life Sciences, Sea & Coast, Vine & Wine Sciences, and Waters.

BIOMARKERS & THERAPY

The objective of this Muse Key Initiative is to promote translational research based on a Research-Training-Companies continuum to build and attract the most effective projects for developing tomorrow's health and medicine locally.

MAKING MONTPELLIER A CENTER FOR EXCELLENCE AND EXPERTISE RECOGNIZED IN THE FIELD OF BIOMARKERS AND "6P" MEDICINE

(PERSONALIZED, PREVENTIVE, PREDICTIVE, PARTICIPATIVE, PATIENT-FOCUSED, AND PRECISE)



Accreditation and assistance for researchers on the road to economic development

The MUSE Key Initiative is launching a call-for-candidates for the accreditation of emerging projects to facilitate new actions in the field of biomarkers, diagnostics, and targeted therapy, and advance them to a pre-maturation stage. Recognized by promotion organizations, SATT AxLR, and the Occitanie Pyrénées-Méditerranée Region, this MUSE accreditation facilitates further steps to identify partners and provide funding for project leaders.

These project leaders are assisted by an Interdisciplinary Committee made up of 29 experts from the biomarker, diagnostic, and therapy sector covering research, clinics, platforms, promotion, industry, and institutions. They represent the entire value chain for diagnostic biomarkers and targeted therapy.

Extracting patient data, necessary for university-hospital research

A fundamental aspect of translational research, this action involves extracting patient data in interaction with MUSE's three healthcare facilities implementing a consistent format that enables optimal use.

Clinical and biological data from patients and biomarkers are vital for confirming diagnoses, as well as for defining pathology subtypes and correlating them with treatment progression or response.

This action is based on: (1) assessment of the current situation and needs in terms of clinical-biological data; (2) preparation of specifications for implementing a computer-based solution; (3) determining the most widely used data collection; (4) technical implementation and validation.

Support for training students in the field of translational research

The "Biomarkers & Therapy" MUSE Key Initiative offers a grant program to support student training in translational research for Master's and early thesis students, as well as interns in medicine, and fund their research year. These students' research topics must focus on projects that have a diagnostic or therapeutic and interdisciplinary scope.

Biomarker Days, an annual event not to be missed

Every year, the MUSE Key Initiative works with the AD'OCC Regional Economic Development Agency and Eurobiomed Competitiveness Cluster to organize two days of meetings for researchers, clinical practitioners, and industry players to focus on biomarkers.

DATA & LIFE SCIENCES

Data relating to health, the environment, and agriculture is skyrocketing. Consortium-level organization is needed for storage, Big Data management, artificial intelligence, and results analysis.

By fostering interdisciplinary collaboration, the MUSE Key Initiative is expected to become a platform where researchers and engineers can meet to exchange ideas and develop methods and software for large-scale data analysis.

AN INTERDISCIPLINARY AND CROSS-FUNCTIONAL COMMUNITY IS EMERGING AROUND THE QUESTION OF BIG DATA FOR LIFE SCIENCES



Training for researchers

Three doctoral programs in data management and processing at the GAIA and CBS2 doctoral schools will enable students to earn a certificate of doctoral studies in Data Science.

A doctoral program for students in the Biostatistics, Computer Science, Mathematics, and Modeling specialties at the I2S doctoral school places doctoral students in a consulting position in the fields of data management and processing for researchers in life and environmental sciences.

Ten second-year internships will be offered to Master's students in Mathematics, Computer Science, Science, and Digital Health in the Fall of 2019.

Scientific attractiveness involves recruiting high-level researchers

The Data & Life Sciences MUSE Key Initiative funds post-doctoral fellowships on pre-defined topics related to three themes:

- Health data structure and storage
- Artificial intelligence and automatic learning for personalized medicine
- Statistical methods for inference on pan-genomic data

A cross-functional tool to support the entire MUSE community

Tightly linked with the needs expressed by the Biomarkers & Therapy MUSE Key Initiative for data extraction and analysis, the Data & Life Sciences MUSE Key Initiative supports the creation of an automated tool for extracting patient data from databases distributed across IT systems at different healthcare facilities (Montpellier University Hospital, Nîmes University Hospital, and Montpellier Cancer Institute). This includes hiring a bioinformatician, a biostatistician, and a specialist in data management and storage.

Monthly meetings for research and design engineers in the fields of data processing and storage will also be held to discuss methodologies and algorithms.

VINE & WINE SCIENCES

In the heart of the largest wine-growing region in France, with 270,000 hectares of vineyards, the Vine & Wine Sciences MUSE Key Initiative brings together all the stakeholders involved in the Montpellier site's research, education, and transfer actions. It enables them to work together on shared projects and better meet challenges facing the sector, facilitate interactions with economic players, and confirm the site's appeal and exposure.

AN INTERNATIONAL NETWORK FOR INTERDISCIPLINARY RESEARCH IN VINE AND WINE SCIENCES TO MEET SECTOR CHALLENGES



Moving towards creating an observatory of production of production competitiveness

Particularly in France's southern region, viticulture faces challenges due to prevailing quality models that limit wine production, whereas changes in natural and climate conditions accentuate declining yields.

This directly affects competitiveness. A partnership with the regional interprofessional organization Inter Oc is thus being created to set up an observatory of situational disparities, changes, and determining factors for competitiveness, along with action levers to face these difficulties.

Reinforcing the Vine & Wine MOOC to understand viticulture and oenological practices

The first component of the Initiative's digital resources, the Vine & Wine MOOC developed by Montpellier SupAgro offers a 5-week introduction to the sciences and techniques that drive wine-making and oenological practices and the way the wine market works.

Divided into four thematic chapters – vine biology, viticulture, oenology, and sector economic sectors – the first edition of the MOOC was attended by 10,000 people in 2018. By exploring the many facets of the wine world, students can gain better insight into the sector before undertaking longer courses. Offered in French and English, the MOOC will be available soon in Mandarin.

A panel of 279 representative grape varieties planted to improve knowledge of vine genetics

Major challenges for the wine industry include selecting grape varieties and creating varieties that consume less resources, adapted to challenging climates, while also meeting consumer demand for high quality wines. To address this situation, the MUSE Key Initiative provides support for setting up a "panel of 279", which is intended to provide necessary knowledge on vine genetics with respect to these issues.

A unifying force for Montpellier institutions and a platform for multidisciplinary solutions, this tool places Montpellier Vine & Wine Sciences in a strong position internationally to address these concerns. The site's regional location will be at the INRA Experimental Unit in Pech-Rouge starting in 2020.

SEA & COAST

Anchored in an area where the sea and coastline are priorities for the Occitanie Region, with a clear international focus, the MUSE Key Initiative is a tool to support scientists and stakeholders in blue growth whose goal is to create a strong scientific and societal community for these two current issues.



A MULTIDISCIPLINARY SCIENTIFIC COMMUNITY GATHERED TO ADDRESS SEA AND COASTAL ISSUES

Reinforcing international exposure for the Montpellier community

The Initiative's first international call-for-projects (September 2018) was open to MUSE researchers to pursue research projects with new university partners around the world. Eight projects are supported.

The projects open new opportunities for collaboration between our research organizations, such as Badji Moktar University in Annaba (Algeria), Passive Acoustic Research Group NOAA Northeast (United States), Institute of Biotechnology (Vietnam), and Abidjan Oceanographic Research Center in Abidjan (Côte d'Ivoire).

A thematic multidisciplinary summer school

Open to French and international PhD students and young researchers, this thematic multidisciplinary summer school offers early-stage scientists a gateway to disciplines directly or indirectly related to their subject of study, but for which they may not have received any training, such as biology, human sciences, engineering, oceanography, modeling, etc...

This open-minded approach is expected to lead to multidisciplinary collaborations between MUSE scientists and scientists from foreign universities.

Conferences for the general public

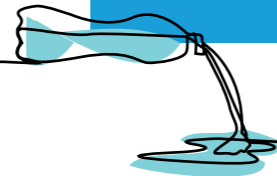
A particular focus of the Sea & Coast Key Initiative's development is to disseminate scientific culture to both students and the general public. The following are examples of some of the conferences that were organized:

- Laurent Ballesta, "Man and sharks" in partnership with the University of Montpellier Doctoral College
- Marc Chaumont, "Artificial intelligence applied to the marine environment"
- David Mouillot, "Coral reefs: a future in warm water" with Planet Ocean Montpellier
- Jean Marc Fromentin, "Is sustainable fishing possible in the Mediterranean?" with Planet Ocean Montpellier

WATERS

THE WATERS KEY INITIATIVE INTENDS TO MAKE MONTPELLIER A GLOBAL CENTER FOR EXCELLENCE IN WATER SCIENCES

WATERS builds on a jointly developed scientific project to address the challenges of global changes in the water cycle (such as climate, environment, population growth, as well as political, social and economic instability) that our societies will have to face, particularly the most vulnerable regions.



Creating a development area in Mediterranean coastal watersheds

The WATERS Key Initiative is working to create a "Mediterranean Coastal Watersheds" development area (BVC-Med) to coordinate, promote, and enhance multidisciplinary research involving water, biodiversity, agriculture, and health, and to pursue observation work on the functioning of typical socio-ecosystems.

The project scope includes observation and experimentation sites covering part of the French Mediterranean region, from the Pyrénées mountains to the Rhône River delta, and from the coast to the Cévennes foothills.

This development area will provide a platform for dialog between scientific and socio-economic stakeholders to converge efforts on adaptive and integrated water and land management.

Candidacy to become a UNESCO Category 2 Center

The WATERS MUSE Key Initiative is sponsoring the candidacy of a UNESCO International Center to enhance its interdisciplinary research and training activities relating to "Water Resources, Hydrological Risks, and Human Societies in the Face of Global Change."

The center will increase the international impact of the "WATER" community, and strengthen existing ties with international networks, notably with countries in the Mediterranean basin and on the African continent. It will help to provide appropriate solutions to the critical challenges posed by sustainable development objectives and the need to take global changes into account.

Already two international field schools in Tunisia and Spain

The WATERS Key Initiative co-organized two international field schools, in Tunisia and Spain, in February 2019. Nearly 90 students in training programs related to Water and the Environment attended from University of Montpellier and its local and international partners (Tunisia, Côte d'Ivoire, Spain, Netherlands).

Their mission was to work with local stakeholders to analyze societal issues associated with water resource management in the Mediterranean region in a context of global change (climate, uses, etc.).

Faced with reality in the field, these future graduates learn the scientific approach, how to work in multidisciplinary teams, and ways to promote the results of their work.



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