MSCA Postdoctoral Fellowships at Sorbonne University
Call for expression of interest 2023

HUMANITIES	
Code	**Topics and supervisors / research units**
LITT1	**Health and the Environment in the Nineteenth-Century United States** Thomas Constantinesco – Voix anglophones : littérature et esthétique (VALE)
	This project aims to investigate the tangled histories of health and ecological crises as they are represented in a range of literary and cultural productions of the nineteenth-century United States. To do so, we intend to focus on the notion of the environment as a complex nexus of contradictory theorizations and pressures, beween a natural resource for obtaining or preserving health and a human-made site where toxic forces have pushed many species on the verge of extinction.
LITT2	**19th-century colour** Charlotte Ribeyrol - Voix anglophones : littérature et esthétique (VALE)
	Charlotte Ribeyrol welcomes interdisciplinary projects exploring any aspect of colour in the 19th century. Priority will be given to projects focusing on chromatic materialities in Victorian art, literature, fashion and/or design. Possible topics include preserving and 'reviving' colour; colour naming; the use of colour in 19th-century pedagogical practice; the geography, circulation and geopolitics of colour; the economics and labour of colour; colour ecologies; colour and the racialised and/or gendered body; chromotherapy, colour toxicity
LITT3	**Pasolini Persists: Pier Paolo Pasolini's Transnational Presence in Contemporary Culture** Manuele Gragnolati - Littérature et Culture Italiennes (ELCI)
	The research project is the first study of the worldwide reception of Pier Paolo Pasolini (1922-75), one of the most provocative and influential twentieth-century Italian authors, filmmakers, and intellectuals. Mapping and investigating the variety of commemorative events – including conferences, exhibitions, film shows, and live performances – that were held globally during the centenary anniversary of his birth in 2022, this project aims to understand the reasons for the pervasiveness of Pasolini's transnational presence in contemporary culture.
LITT4	**Grammaticalization and Language Diversification in the Romance Language Family** Carlier Anne – Sens, Texte, Informatique, Histoire
	Romance languages underwent –at different rates and to different degrees– a thorough transformation of their morphosyntactic make-up. This project will investigate internal correlations and external factors (e.g. geographical, socio-political) at work in this diversification process (13th-18th C), combining a philological approach with state-of-the-art techniques of digital humanities and taking advantage of expertise in Romance historical linguistics and in computational linguistics in our lab

PHYSICS	
Code	**Topics and supervisors / research units**
PHY1	**Taking pictures of entanglement** Hugo Defienne - Institut des NanoSciences de Paris (INSP)
	High-dimensional entanglement is a promising resource for quantum technologies. Being able to quantify it for a given quantum state is essential. However, to date, all experimental methods are either too slow to be practical or inaccurate. Combining wavefront shaping techniques and single-photon camera, this project aims at developping new approaches for fast and precise high-dimensional entanglement certification between photon pairs.
PHY2	**Plasmonic nanocavities confined in liquid crystal topological defects** Emmanuelle Lacaze - Hugo Defienne - Institut des NanoSciences de Paris (INSP)
	Liquid crystal topological defects can confine NPs and organise them into strictly oriented 1D chains. Gold nanorods and bipyramids allow the creation of plasmonic cavities with a tip-to-tip geometry still difficult to achieve at the nanoscale. With single photon emitters covalently linked to the tip of the NPs, the strong coupling regime may be achieved in the cavities at room temperature. Formation of hybrid states, where the fluorescence is strongly exalted, is expected and will be studied.
PHY3	**Acoustics for antiferromagnets** Laura Thevenard - Institut des NanoSciences de Paris (INSP)
	This experimental project aims to use dynamic strain (surface acoustic waves) to control antiferromagnetic (AF) states using magnetoelasticity. The main objective will be to gauge the possibilities SAWs offer as opposed to the traditional excitation of AF dynamics with radio-frequency fields. We're looking for a highly motivated candidate with either an acoustics or a magnetism background to work in an exciting environment in the center of Paris.
PHY4	**Manipulating magnetic domains through femtosecond pulses of magnetic field** Mathieu Mivelle - Institut des NanoSciences de Paris (INSP)
	This project aims to develop an entirely new approach to manipulating magnetic domains based on the engineering of plasmonic nanodevices. For that, these devices will optically generate ultra- short, intense, and reversible pulses of magnetic field at the nanoscale, a challenge that no other technique can achieve so far.
PHY5	**Selective oxidation of Fe-alloys beyond the pressure gap: a surface science approach** Rémi Lazzari - Institut des NanoSciences de Paris (INSP)
	Modern Al-based light-alloy steels used by car industry to comply with environmental constraints challenge galvanization due to selective segregation and oxidation induced by recrystallization. This industrial issue will be tackled with a fundamental surface science approach by combining near-field microscopy and photoemission. Using single crystals, the idea is to explore crystalline orientation and environment effects on the epitaxial alumina film structures by going beyond the pressure gap.
PHY6	**Electron Spin Resonance for Quantum Technology** Jean-Louis Cantin - Institut des NanoSciences de Paris (INSP)

	Formation of large-scale galactic winds is a complex phenomenon powered by massive stars and active galactic nuclei. These feedback processes involve mechanical feedback from shocks, but also radiation coupling to the gas by photionisation and momentum input to dust particles, and feedback from cosmic rays accelerated at shocks. Using MHD simulations of galaxies, we will study how the various feedback mechanisms affect the formation and observational signatures of galactic winds.
PHY7	**Formation of galactic winds** Yohan Dubois - Institut d'Astrophysique de Paris (IAP)
	Formation of large-scale galactic winds is a complex phenomenon powered by massive stars and active galactic nuclei. These feedback processes involve mechanical feedback from shocks, but also radiation coupling to the gas by photionisation and momentum input to dust particles, and feedback from cosmic rays accelerated at shocks. Using MHD simulations of galaxies, we will study how the various feedback mechanisms affect the formation and observational signatures of galactic winds.

ENGINEERING	
Code	**Topics and supervisors / research units**
ENG1	**Algorithms with Untrusted Predictions** Evripidis Bampis - LIP6
	Worst-case analysis often fails to predict the performance of algorithms in practice. Our project aims at leveraging data for dealing with input uncertainty in order to design algorithms that, when the prediction's accuracy is good, offer a performance close to the one of an algorithm that has full access to the input, and, and at the same time, when the predictions are wrong, offer a performance that is not much worse than the one of an algorithm without access to the predictions.
ENG2	**Gaze-based personalized feedback in serious games to foster programming** Sébastien Lallé - LIP6
	Serious games are increasingly used to teach programming. Learning with these games can be improved with personalized feedback, especially when the teacher is not able provide it. Here, we aim to study the possibility of designing eye-tracking-based feedback that leverages the learners' attention patterns to the learning material and game resources at hand. This would provide novel insights on the possibility of gaze-aware feedback for gamified learning activities, and on how to design it.
ENG3	**Learning Analytics to investigate student's self-regulation in blended learning** Yves Noël - LIP6
	The student's ability to regulate their learning is key in blended courses where substantial learning resources are left for the students to access on their own. In this project we aim at developing Learning Analytics (LA) tools and models to investigate from the student's data (e.g., Moodle's logs), their self-regulated learning strategies. The goal is to gain insights on their strategies, so as to provide students with reports on their regulation effectiveness and support on how to improve it.
ENG4	**Learning-enhanced algorithms: theory and practice** Spyros Angelopoulos - LIP6

	In this line of research, we are instead in new approaches in the design and analysis of algorithms that incorporate learning aspects concerning the input and the environment. For example, the algorithm may leverage some prediction concerning the input it will have to process, or may query parts of the environment in order to acquire additional information. This project is in the intersection of TCS and AI, and addresses all issues of design, analysis and performance evaluation.
ENG5	**Physiological modeling of the interactions underlying multisensory processing** Malika Auvray - Institut des systèmes intelligents et robotiques (ISIR)
	Large-scale co-occurrences of neural activity characterize numerous aspects of cognition. But the complex interdependencies between neural systems and consciousness remain unknown. This project aims to describe multisystem interplay (e.g., brain-heart axis) by exploiting physiological modeling. This research will uncover some mechanisms of conscious perception and encourage multisystem monitoring in several clinical conditions.

CHEMISTRY	
Code	**Topics and supervisors / research units**
CHEM1	**Novel theoretical approaches for chemical reaction dynamics** Riccardo Spezia - Laboratoire de Chimie Théorique (LCT)
	The group is expert in theoretical description of chemical reactions. In future projects, we will consider to couple ring polymer MD, free energy calculations and surface hopping. Typical applications are in mass spectrometry, organic reactions and astrochemistry. Actually we use electronic structure methods (like DFT, DFTB or semi-empirical Hamiltonians) but we want to move to novel techniques like those based on Artificial Intelligence to speed-up the convergence.
CHEM2	**Catalytic Conversion of Furfural Derivatives to Dimers for the Synthesis of Biobased Polymers** Julie Oble - Institut parisien de chimie moléculaire (IPCM)
	This project aims at synthesizing bifurfurals from furfural, a renewable product derived from lignocellulosic biomass of great industrial interest as an alternative to oil. To this end, selective C–H functionalization strategies will be studied to obtain 3,3-, 4,4 and 5,5-diformyl-2,2-difurans. These strategies will give access to versatile multifunctional monomers. These will be evaluated for the synthesis of dynamic polyimine polymers, i.e. biosourced and potentially biodegradable polymers.
CHEM3	**Merging Radical and Organometallic Chemistry for the Synthesis of Organogermanes** Alejandro Perez Luna - Institut parisien de chimie moléculaire (IPCM)
	Germanium-containing molecules are increasingly important in several fields and the discovery of new methods to prepare original organogermanes is a current major issue in synthetic chemistry. In this area, we aim to exploit the radical chemistry of germanium derivatives in combination with the most recent advances in catalytic radical-based chemistry using sustainable transition metals. This merger will introduce fundamentally different approaches allowing to overcome existing shortcomings.
CHEM4	**Access to polycyclic scaffolds by photoinduced palladium catalysis** Alexandre Pradal - Institut parisien de chimie moléculaire (IPCM)
	Recent work showed that Pd(0) complexes could be photoexcited and interact with alkyl halides when they are irradiated under monochromatic light. This reaction would lead to an alkylPd(II) salt obtained through a hybrid alkylradical/Pd(I) complex after two single electron transfer steps. This project would

	take profit of the hybrid alkylradical/Pd(I) complex intermediate formed to initiate radical polycyclization reactions on non-conjugated polyenes to prepare complex molecules in a single step.
CHEM5	**Tip-enhanced Raman Spectroscopy** Emmanuel Maisonhaute - Laboratoire Interfaces et Systèmes Electrochimiques (LISE)
	We aim at implementing electrochemical tip-enhanced Raman spectroscopy to study electrocatalytic reactions. The substrates may be either organic/organometallic molecules deposited onto gold, or inorganic active substrates. Depending on the candidate background and interest, the project may focus more precisely on one of the following points: 1) which spatial resolution can we get for EC-TERS ? 2) Mechanistic study of a specific system 3) Plasmonics and electrochemistry

BIOLOGY	
Code	**Topics and supervisors / research units**
BIO1	**Biophysical guidance of in-vivo like microvessels for organ-on-chip development** Mathieu Hautefeuille – Biologie du Développement Paris Seine (LBD)
	Recently, we managed to externally guide a self-organization of in vivo-like tubular microvessels using liver endothelial cells from capillaries and an ECM-glass physical barrier orienting collective orientation. We aim to precisely describe the underlying biophysical processes responsible for these tension-oriented development-like constructs, and from which long lumenized tubes with high structural stability emerge. This should help generalize the method with primary cells for better models.
BIO2	**Role of membrane-less organelles in RNA fate** Dominique Weil - Biologie du Développement Paris Seine (LBD)
	Our aims is to elucidate the role of membrane-less organelles in RNA metabolism. How do they assemble? What is their dynamics? How do they contribute to RNA fate and cell physiology? We focus on human P-bodies, using a combination of biochemical, cell imaging, proteomic and transcriptomic approaches, as well as our unique capacity to purify P-bodies by Fluorescence Activated Particle Sorting and our access to patients with neurodevelopmental delay associated with P-body defects.
BIO3	**Resolving complex karyotypes and deciphering their roles in cellular adaptation to environmental changes** Gilles Fischer – Laboratoire de Biologie Computationnelle et Quantitative (LCQB)
	Complex karyotypes (CK) result from massive chromosome reorganization and are a hallmark of cancer progression, suggesting that the rapid accumulation of mutations could provide a unique fitness advantage. CK are also observed in natural yeast isolates, indicating that they contribute to genome evolution. Using S. cerevisiae as a model, we propose to resolve their complex genome structures using Nanopore long-read sequencing and assess their adaptive potential in stressful environments.
BIO4	**Tackling Off-target Side Effects of oxaliplatin** Hélène Bertrand - Laboratoire des Biomolécules (LBM)
	Oxaliplatin (Ox) is widely used in clinic, despite severe side effects. The Ox-induced peripheral neuropathy (OIPN) is a major hurdle limiting its clinical use and a major societal issue. Its underlying molecular mechanisms are complex and no clinically effective treatment or prevention therapy exists. We wish to

	develop a new in vivo model of neuropathy in the zebrafish to screen for molecular approaches to enhance the efficacy over toxicity ratio of Ox-based treatments.
BIO5	**Role of the matricellular protein hevin in the neuroplasticity of resilience to stress-related disorders** Vincent Vialou - Neurosciences Paris Seine (NPS)
	The proposed research focuses on the neurobiology of resilience in rodents in the context of mood-related psychiatric disorders, more specifically depression. Using animal models of stress-related disorders, we identified the astrocytic protein hevin in resilient animals. Increasing evidence shows that hevin regulate the architecture and function of synapses. We propose to use complementary approaches to characterize hevin mode of action at a molecular, cellular and behavioral level.
BIO6	**Cellular and molecular mechanisms of the exposure to real life mixtures in hippocampal and hypothalamic neurones derived from human iPS cells** Sakina Mhaouty-kod - Neurosciences Paris Seine (NPS)
	Exposure to endocrine disrupting compounds represents environmental and health concerns. The project aims to use the newly developed technology of human induced pluripotent stem cells to address in hypothalamic and hippocampal neurons the cellular and molecular mechanisms underlying the exposure to real-life mixtures of chemical substances with endocrine disrupting activity. The final goal is to identify relevant biomarkers that can be used for risk assessment for human health.

MEDICINE	
Code	**Topics and supervisors / research units**
MED1	**Social inequalities with regard to children's mental health - a lifecourse approach** Maria Melchior - Institut Pierre Louis d'Epidémiologie et de Santé Publique (IPLESP)
	Social inequalities in mental health start early in life, however the underlying mechanisms are not yet well known. Based on data from longitudinal cohort studies following prospectively children (EDEN, ELFE, TEMPO), the aim s of this project are to bring new knowledge on this topic, focusing on the role of parental psychopathology and parenting behaviors.
MED2	**Regulatory checkpoints during anti-cancer immune response in humanized mice** Gilles Marodon - Centre d'immunologie et des maladies infectieuses (CIMI)
	To investigate the role of several genes characterizing regulatory T cells in the immune response to cancer in humanized mice model. Advanced cellular (multiparameter spectral flow cytometry) and molecular (scRNA sequencing) analyses of tumor-infiltrating leukocytes will be performed. Advanced bioinformatics analyses and data mining will be necessary as well. The overall aim of the project is to improve knowledge on immunosuppression and advance therapy for the benefit of patients.
MED3	**Integrating Transcriptomics, Genomics, and Whole Slide Imaging in Alzheimer's Disease: A Federated Model** Daniel Racoceanu - Institut du Cerveau (ICM)
	This study is dedicated to understanding and designing a novel federated model, genotype-expression-whole slide image (WSI) data Integration, to identify genetic and transcriptomic influences on brain WSI measures using Computational Pathology. We will perform extensive experiments on the French Neuro-CEB Biobank (Paris, France) database, consolidated by the RADC Research Resource Sharing Hub and the University of Kentucky (US) databases.

MED4	**Innovative bio-inspired cell and tissue models of genetic dilated cardiomyopathy for disease modelling and drug discovery** Onnik Agbulut - Biological Adaptation and Ageing (B2A)
	The main goal of this proposal is to develop innovative bio-inspired cell and/or tissue models and their associated analysis tools in the perspective of high-throughput and high-content drug screening for genetic dilated cardiomyopathy. To achieve these, we generated induced pluripotent stem cells from different healthy and dilated cardiomyopathy patients and a multidisciplinary consortium which involve academic partners and companies.
MED5	**Role of cardiomyocyte mitochondria transfer in heart homeostasis, remodeling and diseases** Onnik Agbulut - Biological Adaptation and Ageing (B2A)
	This project aims to prove that cardiomyocyte crosstalk with neighbouring cells, through the release of their mitochondria, is an important mechanism by which recipient cells sense the state of cardiac organelles and thereby adapt their behaviour to the physiological/pathological conditions of the heart.
MED6	**Combined use of novel MRI sequences, image processing and computational fluid dynamics in the characterization of human aorta and its changes with aneurysmal disease** Nadja Kachenoura - Laboratoire d'Imagerie Biomédicale (LIB)
	MRI is a leading multiparametric and radiation free modality for aortic disease assessment. However, wide application remains hindered by time consuming acquisitions and post processing. Applicant aims are to: 1) tune new accelerated MRI acquisition strategies, 2) develop processing techniques while combining AI and CFD. This will offer reliable and precise aortic biomarkers, that can be added to the hosting team renown expertise in the field, to ultimately improve management of aortic disease.
MED7	**Added value of fully automated 4D flow MRI hemodynamic quantitative analysis in phenotyping patients with hypertrophic cardiomyopathy (HCM)** Nadja Kachenoura - Laboratoire d'Imagerie Biomédicale (LIB)
	HCM is a major cause of sudden cardiac death in young. Applicant aim is to enrich MRI (leading modality in HCM) tissue and morphology biomarkers by developing novel tools to: 1) extract pressure gradients and vortex patterns in the heart from 4D flow MRI, 2) quantify intra-ventricular obstruction (known as predictor of sudden death in ultrasound), 3) use hosting team OPTIM (>1000 HCM pts) project MRI data to evaluate added value of the proposed biomarkers against existing parameters.
MED8	**Linking cellular and functional changes in age-related macular degeneration** Denis Sheynikhovih – Institut de la Vision (IDV)
	The objective of this project is to develop predictive statistical models for early diagnosis of age-related macular degeneration - a main cause of central blindness among the working-aged population worldwide. The statistical models will link the data from state-of-the-art high-resolution retinal imaging with fine psychometrics of AMD-related visual losses in a cohort study of deeply profiled individuals with the risk of developing AMD.
MED9	**Involvement of Autoantibodies and Memory B-cell subsets in anti-checkpoint-induced Immune-Related Adverse Events** Sophie Siberil - Centre de Recherche des Cordeliers
	The project aims to characterize phenotypic, transcriptomic and functional profiles of B-cell subsets dysregulated in immune checkpoints inhibitors-treated cancer patients who develop autoimmune adverse events. Moreover, single B-cell sorting and immunoglobulins genes cloning technologies will be applied for in vitro production of autoantibodies derived from these patients. The pathogenic role of these autoantibodies will be investigated in 2D and 3D models.

MARINE SCIENCES	
Code	**Topics and supervisors / research units**
MAR1	**Assessment of the drivers of the ocean carbon flux attenuation** Matthieu Bressac - Laboratoire d'Océanographie de Villefranche (LOV)
	The biological carbon pump annually supplies 5-10 Gt of C to the oceans' interior, driving long-term C sequestration. The vast majority of sinking particulate organic carbon (POC) entering the mesopelagic zone is remineralized by zooplankton and microbes. Despite multi-decadal research, there is no consensus on the controls and latitudinal trends in POC flux attenuation. Thus, we aim at separating and quantifying independently the processes that jointly set POC flux attenuation.
MAR2	**Functional diversity and niche partitioning of alpha-cyanobacteria, a major component of aquatic microbial communities** Laurence Garzareck - Adaptation et diversité en milieu marin (AD2M)
	Alpha-cyanobacteria, encompassing Prochlorococcus and 3 Synechococcus-like lineages, are the most abundant and ubiquitous photosynthetic prokaryotes in aquatic ecosystems. This ecological success as well as the numerous genomes, omic data, cultures and the availability of genetic tools make them highly pertinent models in microbial ecology. In this context, the postdoctoral fellow will work on the links between phylogenomic diversification and colonization of specific environmental niches.
MAR3	**Interactions between material from melting ice-sheets and marine microbes** Ingrid Obernosterer - Laboratoire d'Océanographie Microbienne (LOMIC)
	The accelerated melting of the Antarctic ice sheet due to global warming potentially represents a new source of key nutrients, including iron, a micronutrient known to limit phytoplankton primary production and the biological pump of CO2 in the Southern Ocean. But the bioavailability of Fe provided by glacial ice is poorly understood. The main objective is to elucidate the role of marine prokaryotes in the transformation of glacial Fe and its consequences on the microbial food web.
MAR4	**Corals face to alternative solutions to conventional plastics – a toxicological survey** Franck Lartaud - Laboratoire d'Ecogeochimie des environnements benthiques (LECOB)
	Plastics are an additional threat to marine ecosystems. Particularly, engineer species as corals are severely exposed to the microplastics pollution, limiting their potential to support biodiversity. While solutions to conventional plastics are emerging, their effects on marine organisms are still unknown. *This project aims to study the response of coral holobionts to biodegradable polymers of new generation (e.g., PHA) and recycled plastics compared to conventional polymers (PP, PS, PE).*