15 PhD positions available for the Marie Skłodowska Curie European Innovative Training Network- INEXTVIR

INEXTVIR – Innovative Network for Next Generation Training and Sequencing of Virome - is funded by the European Commission under the Horizon 2020 programme (https://ec.europa.eu/research/mariecurieactions/) and offers 15, fully funded PhD positions with an attractive stipend, complementary training activities and generous travel and laboratory and research budgets. The successful candidates will be hosted by a member of a European Consortium of universities, research institutions and companies in Belgium, France, Spain, Slovenia and the UK. Successful candidates will ***have natural*** or ***social-science based research interests*** and will participate in a transdisciplinary network of research and training aimed at accelerating the start of the applicants' scientific career.

Plant viruses cause 50% of the emerging plant diseases globally and pose an important threat to many agricultural crops. Losses are estimated at €15 to 45 billion per year through lower yields and reduced product quality. The project seeks to generate a better understanding of viral communities and their role in agricultural ecosystems by using the latest advances in high throughput sequencing (HTS) technologies coupled with modern big data analytical approaches and socioeconomic analysis and communication based on societal requirements and concerns. The project provides a timely opportunity to change our approach to plant health and improve our ability to overcome global agricultural, food security and environmental challenges. The main objectives are:

- To define the virome present in selected agricultural crops across Europe using cutting-edge High-throughput sequencing (HTS) technologies.
- To understand the biological impact virus communities, have on the biology and ecology of farming systems.
- To improve virus detection capabilities in plant health and certification settings thorough the development and validation of HTS methods including the use of novel sequencing technologies (e.g. Nanopore sequencing) and development of bioinformatics approaches based on AI and machine learning.
- To assess the agronomic and socio-economic impact of the virome and translate it into practical decision tools for different stakeholders including policy makers, plant health bodies, diagnostics industry, agricultural sector and society.

INEXTVIR will offer early stage researchers (ESR) world class technical training in their host institute, through research secondments and short-term scientific visits. ESRs will have a unique opportunity to obtain complementary skills in effective dissemination and communication, quality management, intellectual property management, technology transfer and commercial exploitation of research results, managing research projects, entrepreneurship and company start up, organization of R&D and product development in industry, formulation of effective research bids and development of impact from research, all delivered through a bespoke series of workshops and schools.

We are looking for **15 Early Stage Researchers** (ESR), with a background in either life sciences and related studies (biology, agronomy, biotechnology, bioinformatics) or social sciences (e.g. Psychology, economics, communication sciences, geography, decision-sciences). Successful candidates will have a strong interest in one of the following fields: plant virology, bioinformatics, virus ecology and epidemiology, agriculture, socio-economics, societal communication, policy and regulation.
The position is offered for **3 years** for the following individual research projects: All hired researchers must enroll in Doctoral Programmes, undertake **mobility** in order to implement their individual Research Project, as well as to participate in complementary training activities.

	TITLE OF INDIVIDUAL RESEARCH PROJECT	HOST INSTITUTION	PHD AWARDING INSTITUTION
1	Investigating the European field vegetable virome	University of Newcastle Upon Tyne, (UNEW), United Kingdom	University of Newcastle Upon Tyne, (UNEW), United Kingdom
2	Virome characterization of European germplasm resources of pome fruits for future breeding and risk analysis	University of Liege (ULIEGE), Belgium	University of Liege (ULIEGE), Belgium
3	Survey and evaluation of the cultural practices impact on the virome of vegetable production systems and effect on sustainability	University of Liege (ULIEGE), Belgium	University of Liege (ULIEGE), Belgium
4	Characterisation of tomato virome	National Institute of Biology (NIB), Slovenia	Jožef Stefan International Postgraduate School (IPS), Slovenia
5	Water as an important indicator of circulating plant viruses	National Institute of Biology (NIB), Slovenia	Jožef Stefan International Postgraduate School (IPS), Slovenia
6	HTS-based viral indexing in *Prunus* species: virome characterization and validation of diagnostic approaches	Institut National de la Recherche Agronomique (INRA), France	University of Bordeaux (UBx), France
7	Ecological analysis of the plant virome structure and of reciprocal transfers between cultivated and wild host populations	Institut National de la Recherche Agronomique (INRA), France	University of Bordeaux (UBx), France
8	Effect of habitat biodiversity on the virome of wild plants and crops	Universidad Politecnica de Madrid (UPM), Spain	Universidad Politecnica de Madrid (UPM), Spain
9	Effect of habitat biodiversity on virus host range evolution	Universidad Politecnica de Madrid (UPM), Spain	Universidad Politecnica de Madrid (UPM), Spain
10	The cucurbits and lettuce viromes	ABIOPEP SL (ABP), Spain	University of Murcia (UMU), Spain
11	Development and validation of innovative HTS tools for the fast and efficient detection of virus and virus-like agents in the selected crops	DNAVision (DNAV), Belgium	University of Liege (ULIEGE), Belgium
12	Bioinformatics pipelines development for virome classification	University of Bordeaux (UBx), France	University of Bordeaux (UBx), France
13	Development and integration of decision-making tools in data analysis procedures for HTS-based plant virus diagnostics	BIOSISTEMIKA d.o.o. (BSK), Slovenia	Jožef Stefan International Postgraduate School (IPS), Slovenia
14	Agronomic and socio-economic impact of virome	FERA Science Limited (FERA), United Kingdom	University of Newcastle Upon Tyne (UNEW), United Kingdom
15	Risk-benefit communication and Knowledge exchange platform	University of Newcastle Upon Tyne (UNEW), United Kingdom	University of Newcastle Upon Tyne (UNEW), United Kingdom

Remuneration is according to MSCA ITN rules. Stipend per month depends on the host country correction coefficient following the EC rules (Table 2 of the MSCA Work Programme 2018-2020, http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-msca_en.pdf, page 82). Net salary results from deducting all compulsory (**employer /employee**) social security contributions as well as direct taxes (e.g. income tax) from the gross amounts.

In addition to the stipend, mobility allowance (600€ per month) will be paid as part of the salary or as other benefits depending on the organization. Family allowance*(500€ per month) will be paid as part of salary where the researcher has a family by the time of recruitment.

PhD tuition fees will be covered by the host organisation.

All hired researchers are obliged to submit two questionnaires: 1) Evaluation questionnaire, at the end of the fellowship, and 2) Follow-up questionnaire, 2 years after the fellowship (https://ec.europa.eu/eusurvey/runner/Evaluation_for_MSC_fellows).

The hosting institutions will follow gender equal opportunities/policies during the recruitment process.

Further information relevant links:

http://ec.europa.eu/research/participants/data/ref/h2020/other/guides_for_applicants/h2020-guide-appl-msca-itn_en.pdf

https://ec.europa.eu/research/mariecurieactions/resources/document-libraries/information-note-fellows-innovative-training-networks-itn_en (version 2)

https://euraxess.ec.europa.eu/sites/default/files/am509774cee_en_e4.pdf

ELIGIBILITY CRITERIA

The Marie Curie funding is available for researchers that move, both within Europe and globally. The following criteria apply:

- Nationals from **any country** may apply.
- **Mobility**: at the time of the recruitment, the researcher must not have resided or carried out his/her main activity (work, studies, etc.), in the country of the chosen host institution (recruiting beneficiary) for more than 12 months in the 3 years immediately prior to the date of the recruitment.
- **Research category** of *Early Stage Researcher (ESR):* researchers who, at the time of the recruitment, have not yet been awarded a doctorate degree and are in the first 4 years (full-time equivalent) of their research careers, including the research training period that would entitle them to a doctorate.

GENERAL EVALUATION CRITERIA

- Educational background relevant for the chosen position (individual research project)
- High proficiency in spoken and written English
- Networking and communication skills (to be evaluated in the interview).
- Previous research experience, relevant to the chosen position is desirable.

SELECTION PROCESS

Pre-selection: will be based on CV, experience, skills, motivation letter, and recommendation letters.

Interviews: Short-listed candidates will be interviewed.

Start of contract: October 2019

HOW TO APPLY

Applicants should send full application consisting of:

- **Curriculum Vitae** (Europass format recommended; Please specify your residence/work place in the last 3 years).
- **University transcripts** (grades)
- **A motivation letter** addressing his/her research interests in relationship to the selected individual research project.
- Applicants **should specify first, second and third priority for individual research projects** in order of preference (1st, 2nd and 3rd choice) following the mobility rule of Marie Skłodowska-Curie Actions.
- **Recommendation letters**

To be emailed to the corresponding project supervisor (indicated in the tables bellow) and in copy to Antonia.LorenzoLopez@nib.si indicating ref. "INEXTVIR call for ESRs" in the subject of the email. The deadline to submit the required documentation is 14th May 2019.

ADDITIONAL INFORMATION: The INEXTVIR consortium will process data collected from the applicants for recruitment purposes only, and their rights in relation to the processing of personal will be preserved according to principles of the GDPR EC current regulations. No CVs, neither cover letters, or other data will be shared outside the network or for other purposes than those described in the selection process below, unless upon authorisation from the interested applicant. The data will be kept for a period of five years after the end of the project for the purpose of an audit by the EU.

LIST OF INDIVIDUAL RESEARCH PROJECTS

Fellow code: ESR 1	
Title of individual research project	**Investigating the European field vegetable virome**
Host institution	University of Newcastle Upon Tyne (UNEW), United Kingdom
Location	Newcastle Upon Tyne
Brief description of individual research project	The project seeks to build on our work on understanding the diversity of viruses within key vegetable crops (carrots/lettuce), including assessment of baseline data across Europe, understanding the relationship between virus infection and crop damage leading to wastage. In addition, we seek to understand the relationships between the virus community, vectors, crop plants and weeds in the cropping ecosystem and will take a network ecology approach to understand the function of the communities and how they interface with agriculture systems.
Relevance for the ESR career development	The ESR will learn and become autonomous in the use of a wide array of concepts, tools and techniques of classical and molecular plant virology, in particular concerning the development and validation of HTS-based approaches for viral diagnostics and characterization, a highly dynamic field in Virology.
Tentative Secondments and short visits	UBx (academic): 3 months to develop and evaluate alternative methods to homology searching for virus discovery ULIEGE (academic): 4 weeks to standardize the sample preparation protocols DNAV (non-academic): 4 weeks for protocol standardisation and validation of the virome sequencing methodology Delphy (non-academic): 3-4 weeks to establish contacts with agricultural sector and for sampling of vegetable crops on the field
Supervisory team	Professor Neil Boonham (Neil.Boonham@newcastle.ac.uk) Plant Virologist and molecular biologist, interested in how virus communities' impact ecological networks and diagnostics applied to farming and plant health. Adrian Fox (Fera Science Ltd) Plant Virologist with an interest in how plant virus ecology is impacted by agricultural practice. Dr Ian Adams (Fera Science Ltd) a molecular biologist and plant virologist. specializing in HTS, diagnostic development and virus discovery.
Working conditions	The ESR will join the Agricultural Production Systems Group at Newcastle University and the Plant Health laboratory at Fera Science Ltd. They will have access to a wide range of world class molecular biology and plant science equipment at two sites in the north of England.
Educational requirements	Essential - Degree in Life Sciences preferably including plant virology, plant pathology and bioinformatics/modelling. Desirable - Masters in Life Science or related subjects,
Other specific requirements	Excellent written and spoken English, good attention to detail, great team working skills and dynamism

Fellow code: ESR 2	
Title of individual research project	**Virome characterization of European germplasm resources of pome fruits for future breeding and risk analysis**
Host institution	University of Liege (ULIEGE), Belgium
Location	Gembloux
Brief description of individual research project	The project aims (1) to use HTS technologies to scan the virome of European pome fruit trees (apple and pear) along diverse cultivars (conservation, pre-breeding…); (2) to characterize newly identified viruses (in particular the most prevalent and associated with symptomatology) by epidemiological study based on developed detection protocols (3) To analyse the observed results in the frame of "pest risk analyses" to be delivered to regulatory authorities.
Relevance for the ESR career development	The ESR will learn to adapt and apply HTS technologies from field samples and to analyse the obtained results. (S)he will acquire expertise in cutting-edge biotechnologies, field sampling and epidemiological studies, data mining and in the biological interpretation of the observed results for pest risk analysis.
Tentative Secondments and short visits	FERA (non-academic): 3 months for designing specific diagnostic tools INRA (academic): 4 weeks to standardize the sample preparation protocol NIB (academic): 4 weeks to sample apple and pear germplasm collection in Slovenia and extracting RNA in the lab
Supervisory team	Prof. Sebastien Massart (sebastien.massart@uliege.be). He is a plant pathologist working from 10 years in HTS technologies (first in a private company and now at ULiege) and interested in diagnostics improvement and plant virology.
Working conditions	The ESR will join the plant virus team (10 virologists) of the Laboratory of Plant Pathology (LPP) from Gembloux Agro-Bio Tech (Liège University, Belgium - https://www.gembloux.uliege.be/cms/c_4039827/en/). This international team is currently focusing its research on plant virus diagnostic and surveillance, plant virus ecology, and population genetics. The LPP has developed a large network of international collaborations and is also the official virus diagnostic laboratory for international germplasm collection of banana held by Bioversity International.
Educational requirements	Masters or equivalent, preferably in plant virology or plant pathology
Other specific requirements	The ESR should have strong communication skills and teamwork ability within and outside the laboratory team. Curiosity, rigor and autonomy are also key assets.

Fellow code: ESR 3	
Title of individual research project	**Survey and evaluation of the impact of cultural practices on the virome of vegetable production systems and effect on sustainability**
Host institution	University of Liege (ULIEGE), Belgium
Location	Gembloux
Brief description of individual research project	This project aims: (1) to compare the presence of viruses in agronomic ecosystem with different cultural practices (conventional, organic and/or permaculture conditions) through field sampling and application of HTS technologies; (2) To undertake a grower survey on viral disease and spread in the different systems; (3) to make preliminary biological characterisation of the new identified viruses; (4) To evaluate the socio-economic impact of virus prevalence and impact on sustainability of production;
Relevance for the ESR career development	The ESR will learn to adapt and apply HTS technologies from field samples and to analyse the obtained results. (S)he will acquire expertise in cutting-edge biotechnologies, both at laboratory and bioinformatics levels. He will have numerous interactions with growers and grower association through initial survey, field sampling and dissemination activity. (S)he will be able to link biological observation from HTS, response to the survey and the evaluation of agronomic and socio-economic impacts of the findings.
Tentative Secondments and short visits	DNAV (non-academic): 4 weeks for protocol standardisation and validation of the virome sequencing methodology. BSK (non-academic): 3 months to to obtain knowledge about modular laboratory documentation system. UPM (academic): 4 weeks for ecological interpretation of virome in ecosystems. UNEW (academic): 2 months to evaluate the impact of virome at agronomical and socio-economic levels.
Supervisory team	Prof. Sebastien Massart (sebastien.massart@uliege.be). He is a plant pathologist working from 10 years in HTS technologies (first in a private company and now at ULiege) and interested in diagnostics improvement and plant virology.
Working conditions	The ESR will join the plant virus team (10 virologists) of the Laboratory of Plant Pathology (LPP) from Gembloux Agro-Bio Tech (Liège University, Belgium - https://www.gembloux.uliege.be/cms/c_4039827/en/). This international team is currently focusing its research on plant virus diagnostic and surveillance, plant virus ecology, and population genetics. The LPP has developed a large network of international collaborations and is also the official virus diagnostic laboratory for international germplasm collection of banana held by Bioversity International.
Educational requirements	Masters or equivalent, preferably in plant virology or plant pathology
Other specific requirements	The ESR should have basic knowledge of French and a driving licence to visit the growers for sampling and for the survey. The ESR should have strong communication skills and teamwork ability within the laboratory team but also with other stakeholders (grower association, growers, regulatory agency). Curiosity, rigor and autonomy are also key assets.

Fellow code: ESR 4	
Title of individual research project	**Characterisation of tomato virome**
Host institution	National Institute of Biology (NIB), Slovenia
Location	Ljubliana
Brief description of individual research project	**The main goal of the ESR will be** to explore the virome of tomato plants extensively within Slovenia and other EU countries (including careful sampling design, screening and characterisation using HTS and classical virology methods (e.g., test plants, electron microscopy, ELISA or PCR). The ESR will also assess the role of biological protection agents currently used in tomato production, such as, e.g., mild strain of PepMV, on the virome, microbiome and fitness of the tomato plants. **We expect to** obtain a comprehensive map of viruses infecting tomato crops and circulating across Europe, including their description and characterisation and to advance in the elucidation of the effects of emerging biological protection agents on the microbiome and fitness of the tomato plants.
Relevance for the ESR career development	The ESR will be employed at the Department of Biotechnology and Systems Biology at NIB, joining a group composed of highly competent, enthusiastic and motivated scientists. The department is a worldwide reference in plant virology, molecular diagnostics and HTS. The ESR will learn to master novel molecular detection methods in virology, including HTS (with appropriate bioinformatics pipelines) and targeted (PCR) methods, to detect, confirm and characterise new viruses and study plants' fitness and microbiome. He/she will obtain complementary knowledge from both wet- and dry-lab practices. He/she will also get formation in other aspects of scientific carrier, such as, team working, problem solving and group leadership through regular workshops organized by the department. He/she will be enroled in the Jožef Stefan International Postgraduate School.
Tentative Secondments and short visits	INRA (academic): 3 moths to compare the tomato viruses' incidence in different countries and NGS analysis procedures in both labs. ABP (non-academic): 3 months working on the effect of cross-protection agent on the microbiome of tomato plants.
Supervisory team	**Prof. Maja Ravnikar**, (Maja.ravnikar@nib.si)is the Head of the Department of Biotechnology and Systems Biology at NIB, Slovenia and is specialist on biology of plant pathogens, development of novel diagnostic methods for detection of viruses and bacteria and innovative approaches to concentration and purification of viruses. She has coordinated and participated in a number of EU funded projects and has published more than 150 research papers in peer reviewed journals. **Dr. Denis Kutnjak (M),** (denis.kutnjak@nib.si). Expert on high-throughput sequencing (HTS), metagenomics, virus discovery, diversity and evolution studies. **Dr. Ion Gutierrez Aguirre (M)**, (ion.gutierrez@nib.si) Expert on designing and implementation of new molecular methods for the detection, quantification and concentration of human and/or plant viruses.
Working conditions	Excellent equipment, and facilities with a multidisciplinary research environment composed of highly motivated group of virologists, biotechnologists and bioinformaticians
Educational requirements	Masters or equivalent on Natural sciences: e.g. biology, microbiology, biotechnology, biochemistry, plant pathology.
Other specific requirements	Passion for bioinformatics and microbiology/virology. Good team work abilities. Good English communication and writing.

Fellow code: ESR 5	
Title of individual research project	**Water as an important indicator of circulating plant viruses**
Host institution	National Institute of Biology (NIB), Slovenia
Location	Ljubliana
Brief description of individual research project	**The main goal of the ESR will be** to assess the role of water as an epidemiological pathway by scanning/characterizing plant viruses present in environmental waters near agricultural fields using a metagenomic shotgun HTS approach and state-of-the-art techniques for virus concentration; He/she will define the ecological role of the discovered viruses by sampling agricultural plants and weeds in the vicinity of water sampling sites and comparing the viromes. **We expect to obtain** a wide picture of viruses circulating in the environment by establishing a new protocol for screening the presence of plant viruses in the environment. The comparison between the occurrence of viruses in water samples and plant samples will provide insight into role of water as a vector between different habitats.
Relevance for the ESR career development	The ESR will be employed at the Department of Biotechnology and Systems Biology at NIB, joining a group composed of highly competent, enthusiastic and motivated scientists. The department is a worldwide reference in plant virology, molecular diagnostics and HTS. The ESR will learn to master novel molecular detection methods in virology, including HTS and PCR methods, to detect, confirm and characterise new viruses. He/she will obtain knowledge from both wet- and dry-lab practices. He/she will also get formation in other aspects of scientific carrier, such as, team working, problem solving and group leadership through regular workshops. He/she will be enrolled in the Jožef Stefan International Postgraduate School.
Tentative Secondments and short visits	**FERA (non-academic)**: 3 months to perform sampling of environmental waters in the vicinity of sites where important vegetable viruses were found and to assess the incidence of those viruses in waters. **UPM, INRA (academic)**: 3-6 weeks for further water sampling purposes in different countries. **Delphy (non-academic)**: 3-4 weeks for connection with growers and collection of water samples from selected irrigation or hydroponic systems (M38).
Supervisory team	**Prof. Maja Ravnikar**, (Maja.ravnikar@nib.si) is the Head of the Department of Biotechnology and Systems Biology at NIB, Slovenia and is specialist on biology of plant pathogens, development of novel diagnostic methods for detection of viruses and bacteria and innovative approaches to concentration and purification of viruses. She has published more than 150 research papers in peer reviewed journals. **Dr. Denis Kutnjak (M), (**denis.kutnjak@nib.sib**)**. Expert on high-throughput sequencing (HTS), metagenomics, virus discovery, diversity and evolution studies. **Dr. Ion Gutierrez Aguirre (M)**, (ion.gutierrez@nib.si) Expert on designing and implementation of new molecular methods for the detection, quantification and concentration of human and/or plant viruses.
Working conditions	Excellent equipment, and facilities with a multidisciplinary research environment composed of highly motivated group of virologists, biotechnologists and bioinformaticians
Educational requirements	Masters or equivalent on Natural sciences: e.g. biology, microbiology, biotechnology, biochemistry, plant pathology.
Other specific requirements	Passion for bioinformatics and microbiology/virology. Good team work abilities. Good English communication and writing.

Fellow code: ESR 6	
Title of individual research project	**HTS-based viral indexing in Prunus species: virome characterization and validation of diagnostic approaches**
Host institution	Institut National de la Recherche Agronomique (INRA), France
Location	Bordeaux
Brief description of individual research project	Using HTS-based approaches the project will (1) describe the virome of *Prunus* crops (peach, apricot, plum, cherries, etc), (2) characterize in detail two or three newly identified *Prunus*-infecting viruses, (3) develop specific detection assays targeting them and (4) validate HTS-based approaches for viral diagnostics in *Prunus* through a comparison of their performance with those of existing biological, serological or molecular detection assays
Relevance for the ESR career development	The ESR will learn and become autonomous in the use of a wide array of concepts, tools and techniques of classical and molecular plant virology, in particular concerning the development and validation of HTS-based approaches for viral diagnostics and characterization, a highly dynamic field in Virology.
Tentative Secondments and short visits	DNAV (non-academic): 3 months for learning to prepare HTS sequencing libraries and for comparing diagnostics efficiency of HTS virome scanning approaches. UNEW (academic): 3 months for analysing the socio-economic data related to the scale of the impacts in the process of new diagnostic method development.
Supervisory team	Dr Armelle Marais (armelle.marais@inra.fr, https://www6.bordeaux-aquitaine.inra.fr/bfp_eng/Staff/K-M/Marais-Armelle). Member of the Plant Virus team with a long experience in plant virology and in particular in the use of HTS-approaches for plant virus characterization and metagenomics. Dr Thierry Candresse (thierry.candresse@inra.fr https://www6.bordeaux-aquitaine.inra.fr/bfp/Personnel/A-C/Candresse-Thierry)
Working conditions	The ESR will join Plant Virology team of the "Fruit biology and Pathology" joint laboratory between INRA and the University of Bordeaux (https://www6.bordeaux-aquitaine.inra.fr/bfp_eng/), a dynamic and multidisciplinary research environment offering state of the art facilities. INRA is the first French research organisation to have received the "HR Excellence in Research" label, awarded by the European Commission in recognition for its human resources policy.
Educational requirements	Masters or equivalent, preferably in plant virology or plant pathology
Other specific requirements	A good mastering of English, team spirit, dynamism, thoroughness and curiosity

Fellow code: ESR 7	
Title of individual research project	**Ecological analysis of the plant virome structure and of reciprocal transfers between cultivated and wild host populations**
Host institution	Institut National de la Recherche Agronomique (INRA), France
Location	Bordeaux
Brief description of individual research project	Using HTS-based approaches the project will (1) characterize the virome of one or two selected weed or wild plant species under a wide range of growth conditions (wild populations, within crops-populations), (2) estimate how this virome is affected by plant cover diversity and by the closeness with particular crops and (3) symmetrically evaluate how the virome of neighbouring crops is affected by that of weeds or wild plants, providing a first evaluation of viral fluxes between the wild and cultivated compartments.
Relevance for the ESR career development	The ESR will acquire a wide range of skills, in particular concerning the development and use of HTS-based virome scanning techniques and the analysis of virus population genetics, epidemiology and ecology. In addition, the ESR will gain a general practical training in molecular and classical plant virology.
Tentative Secondments and short visits	FERA (non-academic): 3 months for developing specific assays for the detection and population genetics characterization of selected newly identified viruses and evaluation of their prevalence in weeds and crops under the UK agro-ecological conditions. UPM (academic): 1-2 months for performing population genetics and ecological network analyses on the accumulated virome data.
Supervisory team	Dr Thierry Candresse (thierry.candresse@inra.fr https://www6.bordeaux-aquitaine.inra.fr/bfp/Personnel/A-C/Candresse-Thierry). Senior INRA scientist and team leader for Plant Virology with a long experience in plant virology and in particular in the use of HTS-approaches for plant virus characterization and metagenomics Dr Armelle Marais (armelle.marais@inra.fr https://www6.bordeaux-aquitaine.inra.fr/bfp_eng/Staff/K-M/Marais-Armelle)
Working conditions	The ESR will join Plant Virology team of the "Fruit biology and Pathology" joint laboratory between INRA and the University of Bordeaux (https://www6.bordeaux-aquitaine.inra.fr/bfp_eng/), a dynamic and multidisciplinary research environment offering state of the art facilities. INRA is the first French research organisation to have received the "HR Excellence in Research" label, awarded by the European Commission in recognition for its human resources policy.
Educational requirements	Masters or equivalent, preferably in plant virology, plant pathology or ecology
Other specific requirements	A good mastering of English, team spirit, dynamism, thoroughness and curiosity

Fellow code: ESR 8	
Title of individual research project	**Effect of habitat biodiversity on the virome of wild plants and crops**
Host institution	Universidad Politécnica de Madrid (UPM), Spain
Location	Madrid
Brief description of individual research project	Using HTS approaches the project will define the virome of about 20 plant species, including wild, weed and crop species growing in habitats with different degrees of anthropisation. Network analysis will define the interactions between hosts and viruses in the different plant communities. Infection networks will be used to identify which plants are preferred hosts for specific viruses, and plant species that are hubs in infection networks will be evaluated for their role in network structure and as reservoirs for virus emergence in crops.
Relevance for the ESR career development	The ESR will acquire the conceptual framework and learn the state-of-the-art technologies related to virus ecology. Specifically: 1) Design of field experiments, 2) Procedures to obtain and analyse sequencing data and 3) Computational biology tools for the analysis of infection network and of virus epidemiology and inoculum fluxes across hosts and habitats.
Tentative Secondments and short visits	DNAV (non-academic): 3 months for training in HTS data pipeline analyses. INRA (academic) 3 month visit to compare data from environmentally diverse habitats from France and Spain and homogenise the strategy for data analyses. ULIEGE (academic): 3-4 week visit to compare data on the virome of common crops.
Supervisory team	Prof. Fernando García-Arenal (fernando.garciaarenal@upm.es). Professor at UPM, with a long experience in virus evolution, virus epidemiology and plan-virus co-evolution. Dr. Michael McLeish (michael.mcleish@upm.es). Associate scientist at UPM, specialising in community ecology and organismal interactions.
Working conditions	The ESR will join the "Plant-Virus Interaction and Co-evolution" research group (http://www.cbgp.upm.es/index.php/es/informacion-cientifica/interaccion-de-las-plantas-con-el-medio-ipm/plant-virus) at Centro de Biotecnología y Genómica de Plantas UPM-INIA (CBGP) (http://www.cbgp.upm.es/index.php/es/). CBGP is a leading institutions for plant research in Spain, and has been recognized as Centro de Excelencia "Severo Ochoa" by the Spanish Ministry of Science. CBGP will provide Ph D students with a stimulating scientific and social environment, within with state-of-the-art facilities. Ph. D. student contracts at UPM follow the legal regulations of the Spanish Science Law (Ley de la Ciencia).
Educational requirements	A Master of Science degree in Plant Science, Biotechnology, Virology, Evolutionary Biology, Computational Biology, or other topics related to the project.
Other specific requirements	A good knowledge of English, official language at CBGP. Enthusiasm and capacity for team work.

Fellow code: ESR 9	
Title of individual research project	**Effect of habitat biodiversity on virus host range evolution**
Host institution	Universidad Politecnica de Madrid (UPM), Spain
Location	Madrid
Brief description of individual research project	Based on HTS data, plant-virus interactions will be analysed in a set of about 30 plant species and about 10 viruses, to identify preferred hosts for specific viruses (the first sign of potential adaptation to different hosts). Sequence analyses of the genomes of specific viruses infecting different hosts in different habitats will inform on the degree of virus genetic structure according to host (indicating adaptation or lack of adaptation to the different hosts) and how inoculum fluxes promote or hinder virus adaptation to hosts. Across-host trade-offs will be analysed. On these data predictions will be made on the potential of each virus species to evolve as an emergent pathogen.
Relevance for the ESR career development	The ESR will acquire the conceptual framework and learn the state-of-the-art technologies related to virus host range evolution. Specifically: 1) Methods for the comparison of nucleic acid sequences and for the quantification of genetic variation of viruses according to ecological factors; 2) Population genetics methods to describe the genetic structure of virus populations according to host plant and habitat; 3) Advanced phylogenetic methods to characterise the specialisation of viruses according to host plant species and the migration (inoculums fluxes) among hosts and habitats.
Tentative Secondments and short visits	DNAV (non-academic), 3 months to acquire the tools for HTS data analysis pipelines. INRA (academic) 3-4 week visit to acquire experience in advanced statistical analyses of HTS data. ULIEGE (academic) 4 weeks to jointly analyze virome data for crops from different habitats in Spain and Belgium.
Supervisory team	Prof. Fernando García-Arenal (fernando.garciaarenal@upm.es). Professor at UPM, with a long experience in virus evolution, virus epidemiology and plan-virus co-evolution. Prof. Aurora Fraile (aurora.fraile@upm.es). Professor at UPM, has a long experience in virus epidemiology and host range evolution.
Working conditions	The ESR will join the "Plant-Virus Interaction and Co-evolution" research group (http://www.cbgp.upm.es/index.php/es/informacion-cientifica/interaccion-de-las-plantas-con-el-medio-ipm/plant-virus) at Centro de Biotecnología y Genómica de Plantas UPM-INIA (CBGP) (http://www.cbgp.upm.es/index.php/es/). CBGP is a leading institution for plant research in Spain and has been recognized as Centro de Excelencia "Severo Ochoa" by the Spanish Ministry of Science. CBGP will provide Ph D students with a stimulating scientific and social environment, within with state-of-the-art facilities. Ph.D. contracts at UPM follow the legal regulations of the Spanish Science Law (Ley de la Ciencia).
Educational requirements	A Master of Science degree in Plant Science, Biotechnology, Virology, Evolutionary Biology, or other topics related to the project.
Other specific requirements	A good knowledge of English, official language at CBGP. Enthusiasm and capacity for team work.

Fellow code: ESR 10	
Title of individual research project	**The cucurbits and lettuce viromes**
Host institution	ABIOPEP SL (ABP), Spain
Location	Murcia
Brief description of individual research project	Surveys will take place during the first and second year of the project on cucurbit (melon, watermelon, cucumber and squash) and lettuce crops. In both cases weeds and potential alternative hosts will also be surveyed. In the lettuce case, conventional and ecological production will be considered separately for further comparisons. HTS-based approaches will then be used to (1) describe the viromes of cucurbit and lettuce crops, (2) characterize in detail two or three newly identified (if any) cucurbit- and lettuce-infecting viruses, (3) develop specific detection assays for them and (4) compare the virome of lettuce under two different production schemes.
Relevance for the ESR career development	The ESR will learn and become autonomous in the use of a wide array of concepts, tools and techniques of classical and molecular plant virology, including crop sampling and surveying methods, sample preparation for virus diagnosis, HTS data handling for virus discovery, analysis of genetic variation within virus populations, epidemiology of plant viruses and socio-economics impact of virus infections in crops. She/he will also become familiar with different strategies to transfer the knowledge acquired into tools and/or services for producers.
Tentative Secondments and short visits	UBx (academic) 3 months dedicated to specific training in bioinformatics methods to analyse HTS data. NIB (academic) 2 months that will enable to homogenize sampling and processing protocols, and acquiring skills for virus detection in irrigation water samples.
Supervisory team	Dr. Miguel A. Aranda (m.aranda@cebas.csic.es). Research Professor and head of the Plant Pathology research group at CEBAS-CSIC. Chief scientific advisor of Abiopep. He has directed 14 PhD students (5 current) and mentored 8 postdocs (2 current). Dr. Yolanda Hernando (yh.saiz@abiopep.com). PhD in Microbiology, expert in technology transfer. Since 2018 she is the CEO of Abiopep. Dr. Livia Donaire (ldonaire@cebas.csic.es). PhD in Plant Virology, expert in bioinformatics analysis of HTS data. Since 2017 she is postdoctoral researcher at CEBAS-CSIC (Murcia).
Working conditions	The ESR will join the R&D team of Abiopep (ww.abiopep.com) at Parque Científico de Murcia, which has privileged access to the Universidad de Murcia research shared facilities. Abiopep on its own has a fully-equipped state of the art molecular biology laboratory, and offers a dynamic and multidisciplinary research environment.
Educational requirements	Masters or equivalent, preferably in plant virology or plant pathology. Basic bioinformatics skills are also advisable.
Other specific requirements	A good mastering of English, team spirit, dynamism, thoroughness and curiosity. Driving license is also advisable.

Fellow code: ESR 11	
Title of individual research project	**Development and validation of innovative HTS tools for the fast and efficient detection of virus and virus-like agents in the selected crops**
Host institution	DNAVision (DNAV), Belgium
Location	Charleroi
Brief description of individual research project	The project aims to validate properly the use of novel technologies for diagnostic use with a strong component of bioinformatics and statistics. More precisely, the ESR will (1) Adapt and apply validation protocols for existing bioinformatic pipelines to detect viruses from HTS datasets (2) Evaluate the ability to identify Single Nucleotide Polymorphisms in virus genomes from HTS datasets and propose relevant guidelines (3) Develop new diagnostic tests for important virus based on in silico analysis of HTS results from the ITN and organise an inter-laboratory evaluation of at least one test (for the virus with highest socio-economic importance)
Relevance for the ESR career development	The ESR will develop an expertise in big data analysis, including the statistical component and in the validation of diagnostic protocols based on HTS, including the bioinformatic analysis of huge datasets. (S)he will develop an expertise in the SNP detection and analysis. In addition, the ESR will be able to integrate the socio-economic component of the use of new technologies
Tentative Secondments and short visits	UNEW (academic): 3 months for analysing the socio-economic data related to the scale of the impacts in the process of new diagnostic method development and validation. NIB (academic) and ABP (non-academic): 3-4 weeks for HTS-based virome analysis protocol optimization.
Supervisory team	Dr. Maxime Devos (maximedevos@dnavision.be), quality assurance and project manager at DNAVision. He has expertise in validation of technologies compatible with high quality standards. The academic supervision will be ensured by Prof. Yves Brostaux (with a large expertise in statistics and method validation) and Prof. Sebastien Massart (expert in plant virology)
Working conditions	The ESR will work in a private company (SME) active in biotechnology and will benefit from the scientific expertise of renamed researchers in statistics and plant virology through regular interactions and academic mentorship.
Educational requirements	Master or equivalent in plant science or in computational sciences/statistics
Other specific requirements	Interest and basic knowledge in Statistics and/or bioinformatics. Curious, rigorous, autonomous.

Fellow code: ESR 12	
Title of individual research project	**Bioinformatics pipelines development for virome classification**
Host institution	University of Bordeaux (UBx), France
Location	Bordeaux
Brief description of individual research project	The project aims to develop bioinformaric computational methods for the analysis of HTS data in the context of plant virome studies. More precisely, the ESR will 1) Define and apply bioinformatic pipelines to detect viruses from HTS datasets in a computationally efficient manner. 2) Define rules and implement a method for the inter-sample contamination detection. 3) Design and develop new methods for homology free machine-learning specifically tailored for virome classification and for virome / microbiome interaction analysis; 4) Integrate the resulting pipeline within a user-friendly graphical system (such as Galaxy) providing a complete bioinformatics analysis workflow from raw sequencing reads.
Relevance for the ESR career development	The ESR will learn and become autonomous in the use and development of bioinformatic algorithms, tools and classification methods for virome high-throughput data, in particular concerning the development and validation of efficient computational methods for viral diagnostics and characterization.
Tentative Secondments and short visits	ULIEGE (academic) 2 months to learn how machine learning approaches can be used for plant virome data. Biosistemika (non-academic) 2 months for the aspect of delivery of bioinformatics pipelines (docker development, interface etc). UPM (academic): 4 weeks to learn about how environmental diversity considerations should impact the design of an alignment-free virome analysis pipeline.
Supervisory team	Dr Macha Nikolski (macha.nikolski@u-bordeaux.fr, http://www.labri.fr/perso/macha/). Senior CNRS scientist and team leader for Bioinformatics with a extensive experience in sequence analysis and in particular in the use of HTS-approaches for virus characterization and metagenomics. Dr Katarzyna Hooks (katarzyna.hooks@u-bordeaux.fr, https://kbhooks.wordpress.com)
Working conditions	The ESR will join the Bordeaux Bioinformatics Center team at the University of Bordeaux (https://www.cbib.u-bordeaux.fr/en), a dynamic and multidisciplinary research environment offering state of the art facilities.
Educational requirements	Masters or equivalent, preferably in bioinformatics, computer science or data science
Other specific requirements	Good mastery of English, strong communication skills and teamwork ability, dynamism, thoroughness and curiosity, basic French is a plus

Fellow code: ESR 13	
Title of individual research project	**Development and integration of decision making tools in data analysis procedures for HTS-based plant virus diagnostics**
Host institution	BIOSISTEMIKA d.o.o. (BSK), Slovenia
Location	Ljuibliana
Brief description of individual research project	You will be contributing to the bioinformatics and software development segments of the project. **Your main areas of work will include**: 1. Development of machine learning approach for decision support in detection and classification of plant viruses based on High Throughput Sequencing (HTS) data. 2. Development of computational approach for evaluation of performance of bioinformatics pipelines for analysis of HTS data. 3. Simplification and automation of bioinformatics pipelines to be more user friendly and their integration with laboratory data management systems and workflow tools.
Relevance for the ESR career development	You will learn state of the art machine learning approaches for analysis of HTS sequencing data and integration of public datasets (data fusion). You will gain experience in transferring the developed pipelines into user friendly software interface, integration with laboratory data management systems and thus contribute to digitisation of laboratories. Through this you will gain experience with good software development practices and software development lifecycle management. In addition, you will get experience with working in an interdisciplinary team and working in a company setting.
Tentative Secondments and short visits	UBx (academic): 3 months dedicated to the usage of existing HTS data analysis pipelines and their integration into electronic laboratory information system. FERA: (non-academic): 2 months dedicated to practical employment of bioinformatics pipelines in the research lab.
Supervisory team	**Assist. Prof dr. Tomaž Curk** (tomaz.curk@fri.uni-lj.si) will be the academic supervisor. His main focus is bioinformatics, where he uses data mining and machine learning for sequence analysis and data fusion of biological data. He is co-author of the Orange Data Mining tool (https://orange.biolab.si) and iCount (https://github.com/tomazc/iCount) for protein-RNA interaction analysis. **Dr. Matjaž Hren** (mhren@biosistemika.com) has experience in managing software development projects with emphasis on user interfaces, digitization of laboratories and bioinformatics. **Luka Murn** (lmurn@biosistemika.com) is a senior software engineer and a team lead with experience in designing software architecture, developing integrations between software platforms and is generally involved in delivery of software solutions to the market.
Working conditions	You will be joining an interdisciplinary and international team of life-scientists, UX/UI designers, software developers and digitalization enthusiasts that develop custom software solutions for life scientists. In the scope of project you will also be closely collaborating with the rest of the ESR students.
Educational requirements	Master or equivalent in computational sciences.
Other specific requirements	What we are looking for in you: • Experience with Git version control • Programming experience, e.g. with scripting languages (Python, R, etc.) and command line • Good knowledge of English – you will be using it every day • Used to work with good development practices such as code review

	and awareness of importance of QA/QC in software development • Self-initiative and eagerness for learning new things and self-improvement • Positive, make-it-happen, lead-by-example attitude • Knack for automating things & seeking ways to improve the work process • Nice-to-have: experience with machine learning algorithms • Nice-to-have: experience with modern web languages such as Ruby on Rails, React.js, Angular.js, Vue.js, Python, Golang, Scala, Elixir • Nice-to-have: experience with databases (relational, NoSQL, etc.)

Fellow code: ESR 14	
Title of individual research project	**Agronomic and socio-economic impact of virome**
Host institution	FERA Science Limited (FERA), United Kingdom
Location	York
Brief description of individual research project	The objectives are: • To assess the potential impacts of improved knowledge on virome in agriculture and based on this define what stakeholders/ markets are vulnerable, and to identify what policy options are available to mitigate identified risks and optimise the impacts of any associated benefits associated • To define how decision-makers interpret and prioritise the potential impacts in terms of vulnerabilities/ opportunities when making decisions • To establish a typology of risks and benefits, and risk/benefit perceptions. • The results will include the identification of risks and benefits (linked to emerging risks and benefits of the virome in agriculture) and societal concerns and priorities for policy response. It will also deliver a flexible decision tool-kit that can incorporate a range of criteria and weighting/scoring from different stakeholders, including scientists/experts, policy makers, industry, and other stakeholders
Relevance for the ESR career development	The ESR will gain experience across a wide range of policy and industry relevant disciplines, including • Systematic review methodology to develop predictive models of acceptability which incorporate risk/benefit perceptions, • Decision-making sciences, • Design of expert elicitation studies Methodologies to translate evidence into policy responses and practical decisions.
Tentative Secondments and short visits	EPPO (non-academic) 3 months (not necessarily concurrent) to get insight into the practical aspects of making decisions on plant health within uncertain environments and data collection in France. NIB and UPM (academic) 3 weeks to collect data on local decision making and interaction within regulatory frameworks in Slovenia and Spain.
Supervisory team	Dr. Glyn Jones, (Glyn.d.Jones@fera.co.uk) FERA Science limited. Dr Jones is an experienced environmental economist who has worked on a range of environmental projects including the mid-term evaluation of the Rural Development Programme, projects on greenhouse gas mitigation methods in relation to the agriculture industry, and a number of projects on the assessment and uptake of technologies in agricultural and environmental settings. Professor Lynn Frewer, (lynn.frewer@newcastle.ac.uk) Newcastle University. Professor Frewer is professor of food and society at Newcastle University in the UK. Professor Frewer has extensive experience of PhD supervision, including projects which bridge the social and natural sciences, and has published extensively in the area of society, policy and decision making linked to the agrifood sector, and has published extensively in this area. Dr Sophie Tindale, (sophie.tindale@newcastle.ac.uk) Newcastle University. Dr Tindale is a researcher with active interests in society and agricultural policy, for example in relation to natural capital and ecosystem services.
Working conditions	The successful candidate will be based at FERA, York in the UK and be co-supervised at Newcastle University.
Educational requirements	A first degree in a relevant discipline, including, for example, psychology, economics, decision-sciences, geography, policy studies, sociology
Other specific requirements	None in addition to those specified regarding mobility.

Fellow code: ESR 15	
Title of individual research project	**Risk-benefit communication and Knowledge exchange platform**
Host institution	University of Newcastle Upon Tyne (UNEW), United Kingdom
Location	Newcastle Upon Tyne
Brief description of individual research project	The overall research objectives are • To understand societal perceptions of existing and emerging risks and benefits associated with the virome in the agricultural sector; • To develop effective communication strategies based on societal concerns and priorities • To link communication with effective policy responses. • The results will deliver a systematic understanding of the factors driving societal responses to emerging risks and benefits associated with the virome, together with information relevant to the identification of societally acceptable policy responses, and a validated communication strategy which can be utilised by policy, industry and other stakeholders and end-users to engage the public in dialogue about emerging issues associated with the virome.
Relevance for the ESR career development	Training will be provided in • Quantitative and qualitative research methodologies associated with social science data collection, • Theoretical underpinnings and experimental methodologies associated with the development of communication interventions. Training will also be provided in decision-making sciences
Tentative Secondments and short visits	EPPO (non-academic) 3 months to gain insights into the societal aspects of making decisions on plant health and data collection in France. NIB (academic) and ABP (non-academic): 3 weeks to collect data on local social context and their interaction with the regulatory frameworks in Slovenia and Spain.
Supervisory team	Professor Lynn Frewer, (lynn.Frewer@newcastle.ac.uk) Newcastle University. Professor Frewer is professor of food and society at Newcastle University in the UK. Professor Frewer has extensive experience of PhD supervision, including projects which bridge the social and natural sciences, and has published extensively in the area of society, policy and decision making linked to the agrifood sector, and has published extensively in this area. Dr Sophie Tindale, (sophie.tindale@newcastle.ac.uk), Newcastle University. Dr Tindale is a researcher with active interests in society and agricultural policy, for example in relation to natural capital and ecosystem services. Dr. Glyn Jones, (Glyn.d.Jones@fera.co.uk) FERA Science limited. Dr Jones is an experienced environmental economist who has worked on a range of environmental projects including the mid-term evaluation of the Rural Development Programme, projects on greenhouse gas mitigation methods in relation to the agriculture industry, and a number of projects on the assessment and uptake of technologies in agricultural and environmental settings.
Working conditions	The successful candidate will be based at Newcastle University in the UK and be co-supervised at FERA, York.
Educational requirements	A first degree in a relevant discipline, including, for example, psychology, economics, decision-sciences, geography, policy studies, sociology
Other specific requirements	None in addition to those specified regarding mobility.