Título de las prácticas/*Practice Title*:

Inference and comparison of prokaryotic pangenomes: orthology vs sequence identity

Descripción de las funciones del alumno/*Description of student functions*

The student will join a transdisciplinary research group that investigates the evolutionary dynamics of microbial and viral populations by combining computational models and comparative (meta)genomics. The student will work with prokaryotic genome databases, applying advanced bioinformatic tools to reconstruct the pangenomes of a large number of bacterial and archaeal species. By comparing the pangenomes obtained through orthology- and sequence identity-based approaches, the student will assess the performance of each method, both in terms of robustness to strain sampling and suitability to answer relevant evolutionary and ecological questions. The student will also participate in group meetings and discussions aimed at developing her/his science communication skills in a multidisciplinary environment.

Requisitos: *(indicar titulación y curso); otros requisitos adicionales (idiomas, informática, otros conocimientos, etc)/ Required formation and skills of the student*

Computational Biology Master student with computer programming skills (Python, C++, Matlab, etc). Knowledge of basic bioinformatic tools for comparative (meta)genomics and/or mathematical modeling is desirable, although these skills can be acquired during the training period.

Proyecto formativo/*Student Formation Program*

Módulo PRACTICAS EXTERNAS. El objetivo fundamental de las Prácticas Externas es guiar al alumno para que aplique en el mundo real los conocimientos que ha adquirido previamente en un entorno de trabajo en grupo que reproduzca de una manera realista las condiciones que se puede encontrar en su futuro lugar de trabajo. El estudiante podrá familiarizarse con el mundo laboral (horarios, responsabilidad, actitud, organización, etc), y con la metodología de trabajo adecuada a la realidad profesional, contrastando y aplicando los conocimientos académicos adquiridos.

EXTERNAL PRACTICE module. The fundamental objective of the External Practices is to teach the student to apply in the real world the knowledge that he has previously acquired in a group work environment that reproduces in a realistic way the things that can be found in his future place of work. The student can become familiar with the working world (schedules, responsibility, attitude, organization, etc.), and with the work methodology appropriate to the professional reality, contrasting and applying the academic knowledge acquired.

Actividades a desarrollar en la práctica académica/*Activities to carry out during the academic practices*

The general goal of these academic practices is to provide the student with a comprehensive overview of scientific research in the context of a transdisciplinary study of the microbiome. The student will be involved in data collection and analysis, computational modeling based on the real

data, hypothesis testing, and dissemination of results. The student will perform the following specific tasks, with the support of the supervisor:

1) Compilation of a database of good-quality bacterial and archaeal genomes from public repositories (e.g. NCBI Genome).
2) Inference of pangenomes based on orthology criteria (i.e. through the identification of orthologous gene groups). This can be done using EggNOG and/or panX.
3) Inference of pangenomes based on sequence similarity. This will be done by clustering gene sequences according to arbitrary sequence similarity thresholds.
4) Comparison of the resulting pangenomes according to compositional, functional, and reproducibility criteria. Critical assessment of each method's suitability to address relevant evolutionary and ecological questions. This will include a preliminary study of the correlation between pangenome diversity and ecological niche breadth for each of the methods.
5) Realization of the "Trabajo de Fin de Master". Time and results permitting, the student's report should contribute to a future manuscript that will be submitted to an international research journal.

Besides the specific skills required to accomplish these goals, the student will acquire transversal skills in oral communication, scientific writing, and critical thinking.

Nº de plazas:	**1**
¿El alumno tendrá trato habitual con menores?	**No**
Fecha de inicio:	**1/2/2021**
Fecha de fin:	**1/7/2021**
Horas semanales:	**25**
Horario jornada laboral:	**A convenir**
Importe Ayuda/Bolsa de estudio:	**€/mes**
Tutor académico:	**Jesús Israel Pagán Muñoz**

Email:	**jesusisrael.pagan@upm.es**
Departamento tutor académico:	**Biotecnología – Biología Vegetal**
Tutor empresa:	**Jaime Iranzo Sanz**
Email tutor empresa:	**jaime.iranzo@upm.es**
Departamento tutor empresa:	**CBGP**
Ubicación de la estancia de las practicas	**Campus Montegancedo - UPM**
ENTIDAD COLABORADORA:	**UPM**
A cumplimentar por Oficina Prácticas ETSIAAB: **Créditos a reconocer (Nº ECTS)**:	

Enviar por email a: OFICINA DE PRÁCTICAS ACADEMICAS EXTERNAS – ETSIAAB
secretaria.pei.etsiaab@upm.es – Secretarias: Visitación Pérez / Susana Pardo - Tfno: 913363686)