

RARETRIPS: An Interdisciplinary Training Program in Genomics for Rare Diseases

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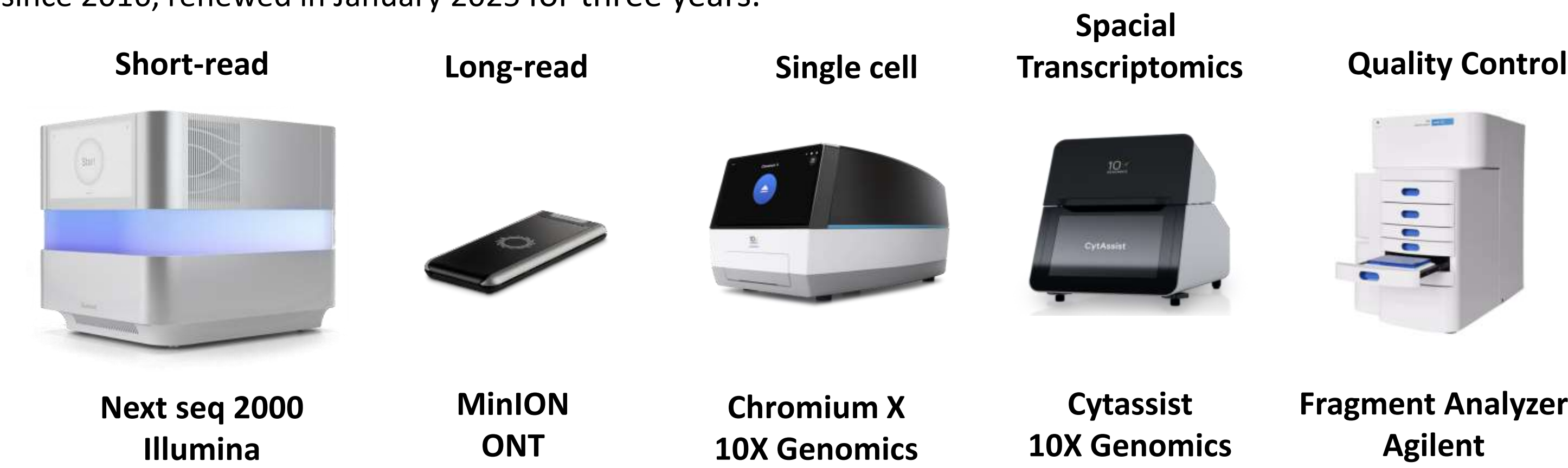
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Abstract

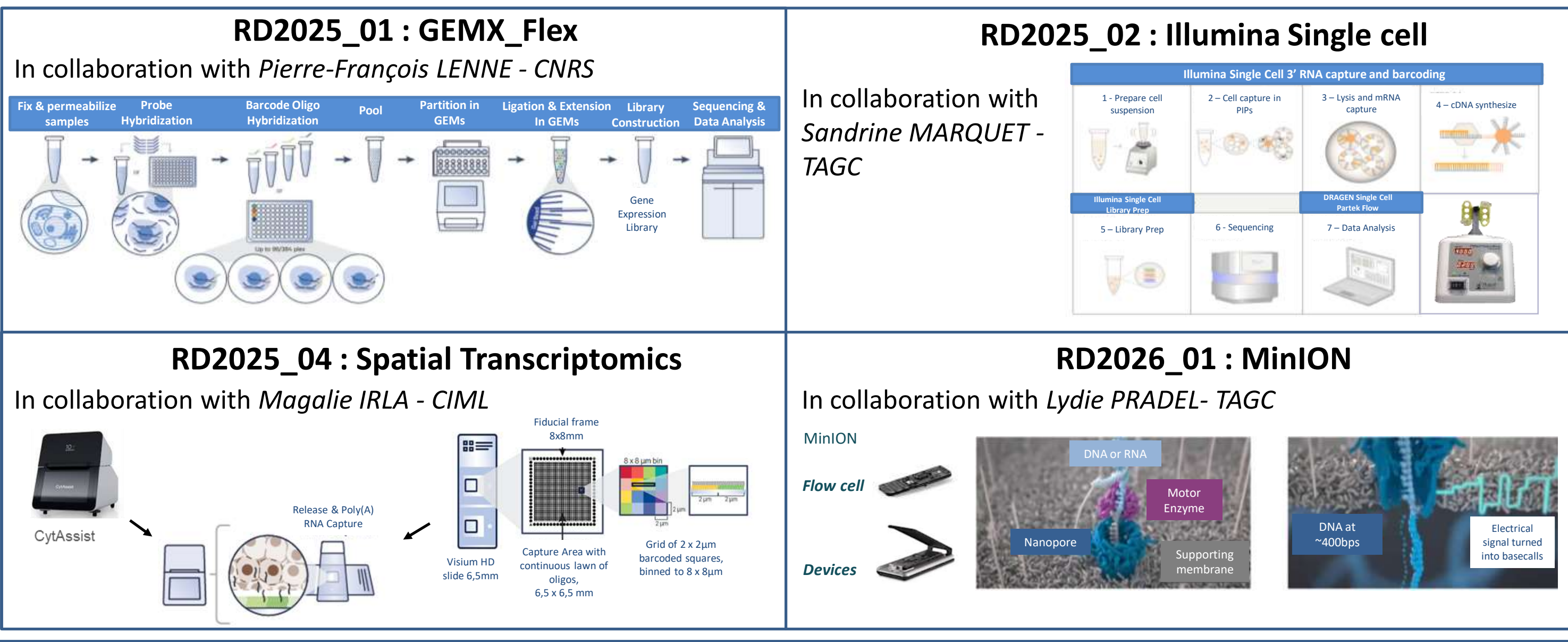
The TRIPs program, led by Aix-Marseille University and supported by France 2030 and the A*Midex initiative, aims to strengthen higher education by integrating teaching and research through the TIGER project. Within this framework, the Marseille Rare Diseases Institute launched the RARETRIPS project in 2024, focusing on interdisciplinary training in genomic approaches to rare diseases. The program relies on two main technological platforms: Transcriptomics and Genomics Marseille Luminy (TGML) as the primary training hub, and Genomics and Bioinformatics Marseille (Gbim) as a complementary site specializing in sequencing and clinical variant analysis. In order to transform the TGML's research environment into an educational space, the facilities underwent a major infrastructure upgrade to meet the requirements of the ERP5 category (public access building, level 5). Complementing these physical upgrades, the project was also awarded "Soutien RH aux Plateformes" (HR Support for Platforms) by the A*Midex Foundation in July 2024. This strategic award funded the recruitment of a dedicated pedagogical engineer, Anna-Maria Alklaiany, for a 24-month period.

TGML

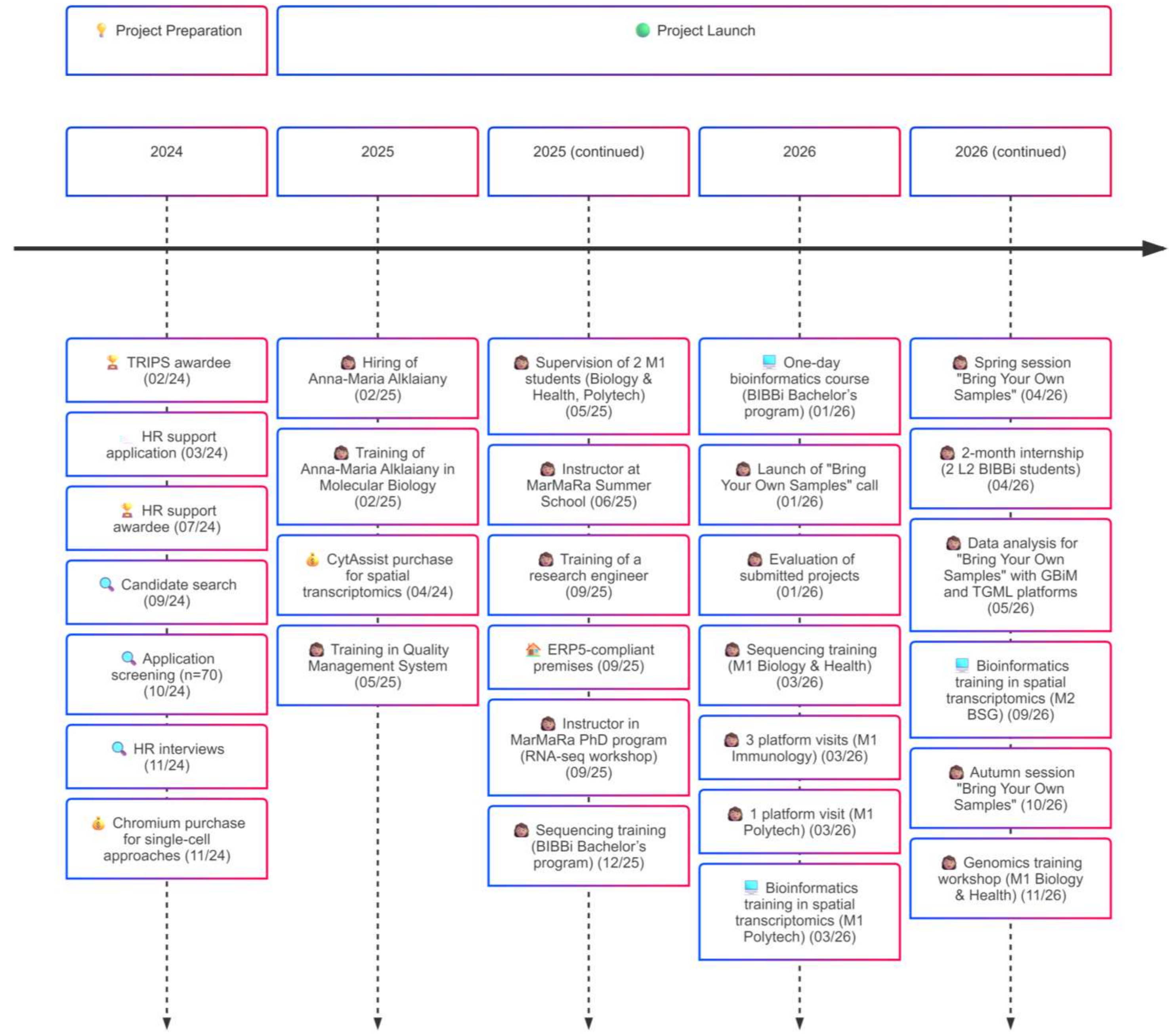
The TGML platform is part of the TAGC laboratory, a joint research unit of Inserm and Aix-Marseille University, and a component of the distributed infrastructure *France Génomique*. The platform operates under **ISO 9001:2015** and **NFX 50-900:2016** quality certifications, covering expertise, R&D in genomics, and bioinformatics in life sciences (renewed in December 2024). It has also held the "Aix-Marseille Technological Platform" label since 2016, renewed in January 2025 for three years.



The TGML platform develops research and development (R&D) projects and evaluate emerging technologies in research and **pedagogical contexts**.



Timeline of the RARETRIPS project



Timeline of the RARETRIPS project: This timeline illustrates the key stages of the project, from its conceptual design to its initial implementations.

RARETRIPS

Promote cutting-edge genomic approaches for rare diseases, including:

- Epigenomics & regulome analyses (e.g., ChIP-seq)
- Transcriptomics (bulk RNA-seq, single-cell RNAseq, spatial transcriptomics)
- Genome variation analysis

Provide interdisciplinary training in rare disease genomics by integrating:

Medical & molecular genetics, Bioinformatics, Epigenetics & Transcriptomics

Implement a large-scale educational program structured around 14 pedagogical actions, covering:

- LMD
- Early-career researchers & technical staff

Foster a strong link between research and education, ensuring:

- Direct integration of research tools into teaching
- Exposure of trainees to real research environments (TGML / GBIM collaboration)

Develop scientific & technical competencies including:

- Theoretical knowledge in genomics & related fields
- Advanced laboratory & computational expertise
- Scientific reasoning & clinical analysis skills

RARETRIPS example projects



The **BYOS** ("Bring Your Own Samples") project is a hands-on training program where participants analyze their own samples instead of predefined ones. Through intensive workshops, they learn the full RNA-seq workflow, from experimental design to data analysis, using advanced sequencing technologies, promoting a direct "learning by research" approach.

Call for applications, held twice a year (spring and autumn), offering the opportunity to take part in an in-depth training workshop.

This comprehensive workshop guides participants step by step through the bulk RNA-seq method using their own samples (from 1 to 8).

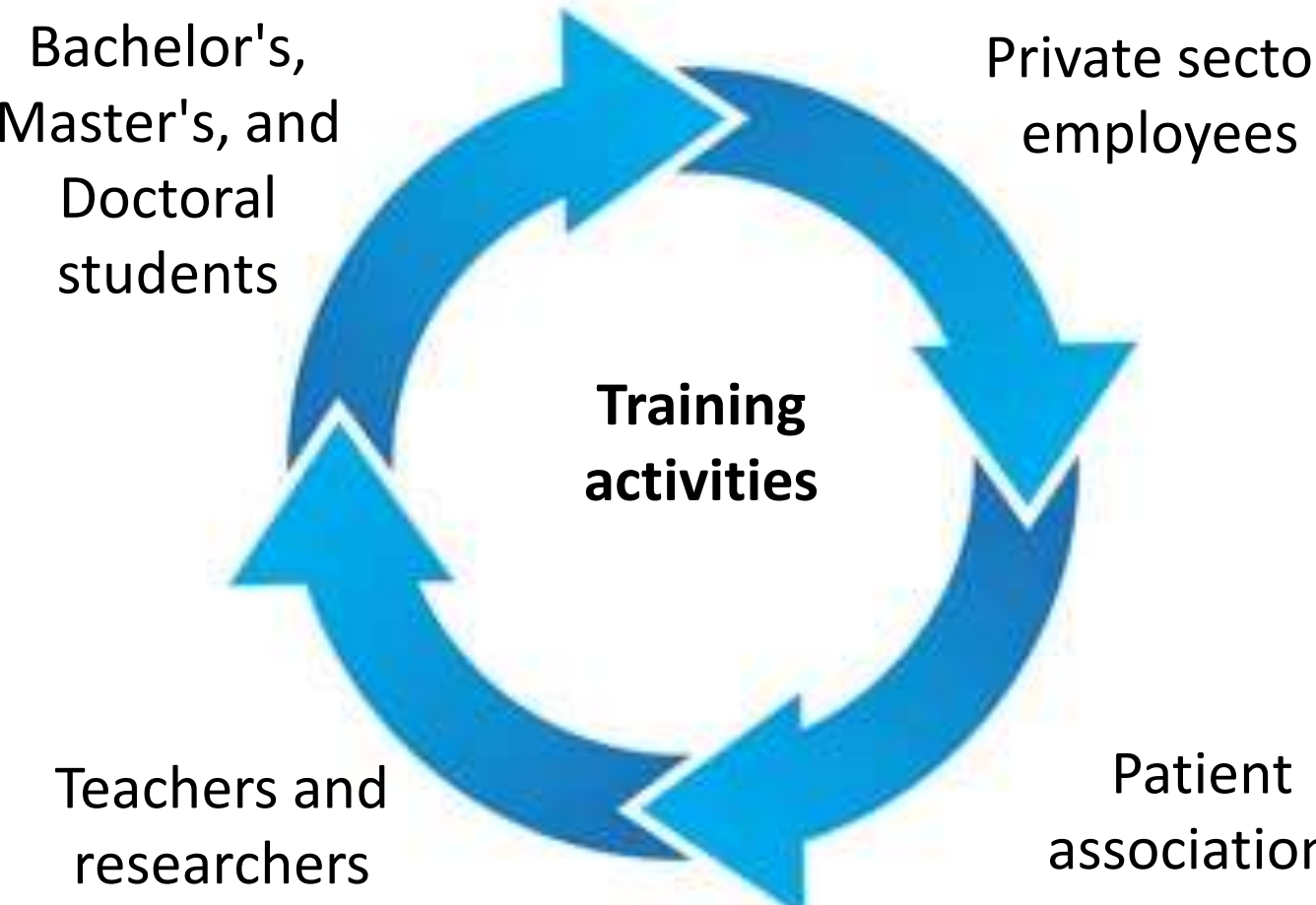
Who can apply ?

This workshop is open to Master's students (final year), PhD candidates, and early-career researchers. Exploratory and collaborative projects are particularly encouraged.



There are also numerous pedagogical initiatives, including, *e.g.*, practical laboratory sessions (TPs) for undergraduate students (L2 BiBBI), master's students (Master's in Immunology and Master's in Biology and Health), as well as engineering students (Polytech).

In addition, the platform organizes visits tailored to all academic levels.



RARETRIPS thus represents a cutting-edge training program at the interface of life sciences, bioinformatics, and statistics, addressing key challenges in genomic medicine for rare diseases and fostering the development of highly skilled researchers in this rapidly evolving field.