

## INTERNATIONAL PRIZE “LOMBARDY IS RESEARCH” 2026 EDITION

**Theme: Predictive Medicine Based on Artificial Intelligence and Big Data**

### FORMAL JURY MOTIVATION LETTER

**LAUREATE: Professor Ewan Birney**

Director of EMBL’s European Bioinformatics Institute (EMBL-EBI), Hinxton, Cambridge, UK

### Award motivation

The 2026 International Prize “Lombardia è Ricerca”, dedicated to “Predictive Medicine Based on Artificial Intelligence and Big Data”, is awarded to Professor Ewan Birney for his transformative contributions to computational biology, genomics, and AI-driven predictive medicine. Across three decades of scientific leadership, Professor Birney has shaped modern computational genomics. His groundbreaking work bridges basic molecular research, international database architecture, and advanced machine-learning paradigms, transforming vast biological and clinical data streams into actionable predictive models for human disease.

### Career achievements and global impact

Professor Birney’s contributions have provided the foundational bedrock for contemporary genome interpretation. In the late 1990s, he authored GeneWise, the benchmark algorithm for accurate vertebrate gene prediction that underpinned the analysis of the first draft of the human genome and dozens of eukaryotic species thereafter. He co-founded and led the Ensembl genome annotation project and served as the lead coordinator of the NIH-funded ENCODE consortium, mapping functional elements across the human genome.

In his leadership role as Director of EMBL’s European Bioinformatics Institute (EMBL-EBI), Professor Birney has overseen and safeguarded the world’s most comprehensive open-access biomolecular data infrastructure, including UniProt, Ensembl, and the AlphaFold Protein Structure Database, benefiting millions of clinicians and life science researchers globally. Furthermore, through his long-standing directorship at Genomics England and strategic advisory roles across European precision medicine initiatives, he has pioneered the structural integration of whole-genome sequencing and clinical data into national healthcare systems.

## **Breakthrough innovation: the DELPHI framework**

Aligning directly with the core theme of the 2026 Prize, Professor Birney was involved in the development and application of generative artificial intelligence to population-scale epidemiology. The DELPHI generative transformer model, developed by a multi-institutional team (Shmatko et al., 2025), establishes a novel computational paradigm that models the temporal progression and natural history of human multi-morbidity.

Unlike traditional discriminative algorithms that evaluate single health outcomes in isolation, the DELPHI generative framework processes longitudinal electronic health records to continuously forecast time-varying multi-disease trajectories across more than 1,000 diagnostic categories. By capturing temporal dependencies and individual risk profiles over decades, DELPHI provides a unified, highly scalable AI solution for early disease risk forecasting and population health management.

## **Translational impact on the Lombardy Healthcare and Research Ecosystem**

The associated translational project, "Delphi-Lombardia: AI for population-scale disease trajectories and in-silico quantification of coronary atherosclerosis", directly connects Professor Birney's AI framework with leading Lombardy research institutions: Centro Cardiologico Monzino IRCCS and Human Technopole.

The project aims to deploy an adapted state-space generative AI architecture across Lombardy residents. By integrating longitudinal diagnostic and medication data with high-resolution imaging and multi-omics, the initiative will derive and clinically validate non-invasive digital biomarkers of coronary atherosclerotic plaque burden. This effort will lead to a scalable, low-cost paradigm for early cardiovascular prevention and personalised care.

## **Short version for communication**

The 2026 International Prize "Lombardy is Research", under the theme "Predictive Medicine Based on Artificial Intelligence and Big Data", is awarded to Professor Ewan Birney for his transformative contributions to computational biology, genomics, and AI-driven predictive medicine. Across three decades of scientific leadership, Professor Birney has pioneered foundational genomic resources and contributed to advanced machine-learning paradigms, including the DELPHI generative transformer model for population-scale disease trajectory forecasting. His work bridges open biomolecular

databases with clinical epidemiology, enabling continuous multi-disease risk prediction to advance early prevention, personalized patient care, and public health planning.

### **Proposta di versione breve in italiano (per la comunicazione)**

Il Premio Internazionale «Lombardia è Ricerca» 2026, sul tema «Medicina predittiva basata sull'intelligenza artificiale e sui big data», è stato assegnato al Professor Ewan Birney per i suoi contributi trasformativi alla biologia computazionale, alla genomica e alla medicina predittiva basata sull'intelligenza artificiale. In trent'anni di leadership scientifica, il Professor Birney ha aperto la strada a risorse genomiche fondamentali e ha contribuito allo sviluppo di paradigmi avanzati di apprendimento automatico, tra cui DELPHI, un modello generativo per la previsione delle traiettorie di malattia su scala di popolazione. Il suo lavoro collega i database biomolecolari ad accesso aperto con l'epidemiologia clinica e consente di prevedere in modo continuo il rischio di più malattie contemporaneamente, per promuovere la prevenzione precoce, la cura personalizzata del paziente e la programmazione della sanità pubblica.