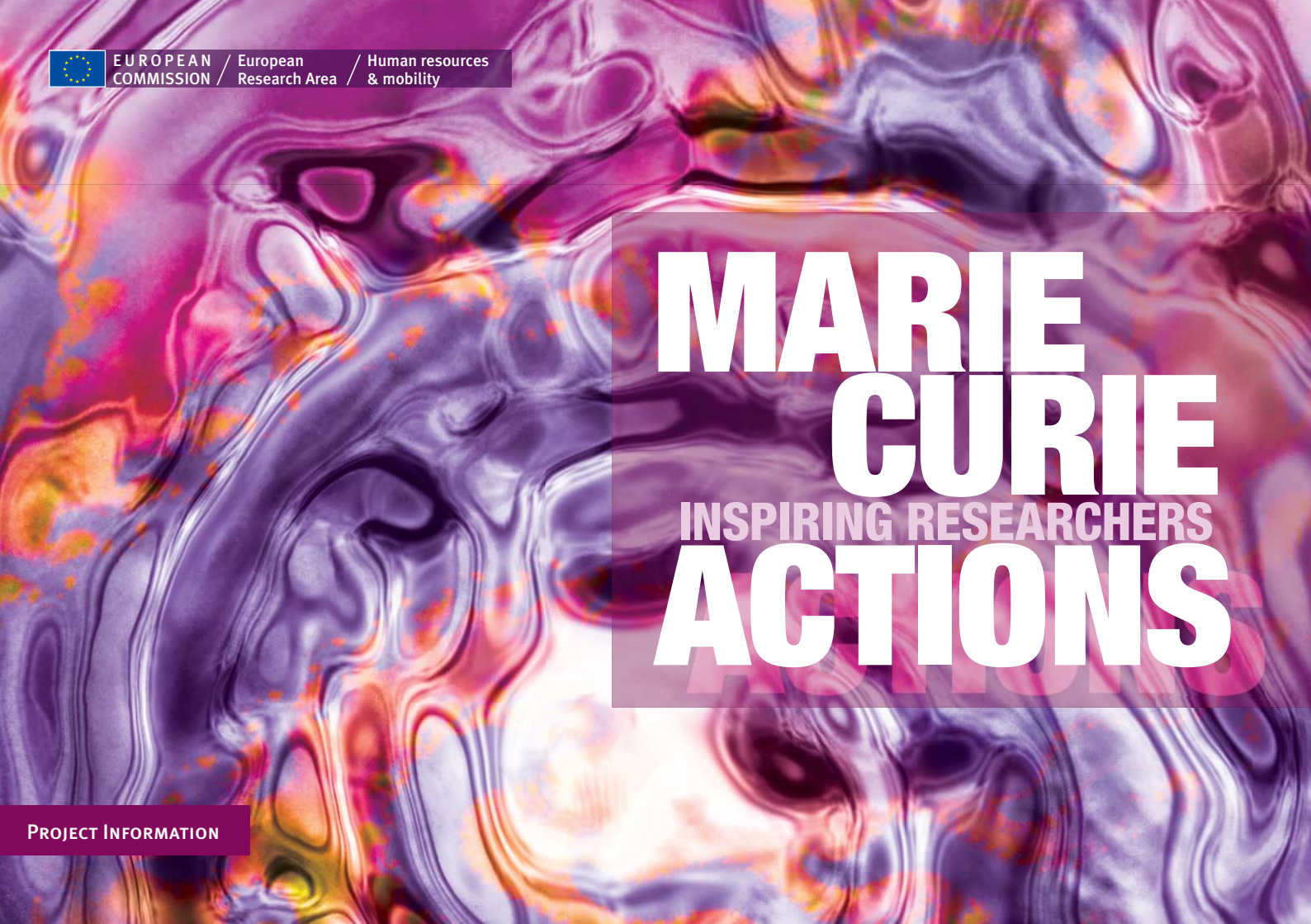
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2010

Directorate-General for Research

Life-saving science

Portuguese scientist Dr Tulio de Oliveira has lived all over the world. For over two years, his home was Oxford in the UK where he was a Marie Curie Fellow at the city's famous university. His project – HIVOxford – distinguishes between the factors that shape the evolution of HIV (Human Immunodeficiency Virus) within an infected individual, such as the immune system and antiretroviral drugs, and the forces driving the evolution of the virus in the population. In December 2006, the fruits of his labour were published in a groundbreaking article in *Nature* magazine, saving six lives and making headlines across the globe in the process.

Back to December 2004 in Oxford – Dr de Oliveira's project was ambitious. It aimed to shed light on the evolution of HIV and, in effect, map the progress of the disease in an infected individual. This entailed analysing the genetic sequence of the virus in one individual and comparing it to HIV sequences from other individuals from the same population group living in the same area.

By running the data through powerful computer programs, including some software he had developed himself, Dr de Oliveira was able to calculate the origin and temporal distribution of HIV-1 strains responsible for localised epidemics.

Renowned scientists as teachers

Dr de Oliveira was supervised by virus evolution experts Andrew Rambaut and Oliver Pybus. *'The time spent in Oxford was very productive, instructive and exciting. I learned many new scientific techniques but, crucially, I learned how to identify and solve complex scientific problems,'* says Dr de Oliveira. 'By the end of the fellowship, I was in a better position to identify scientific questions, learn new analysis techniques and use them to find the answers.'

His two-year fellowship saw him publish nine research papers, produce two bioinformatics software applications, and collaborate in the creation of a genetic database for over 900 RNA viruses. However, the highlight was the publication of his research in *Nature*. The results concluded without a shadow of a doubt

AIDS awareness campaigns promote solidarity with people affected by HIV/AIDS.

that the accused medical personnel were not responsible for the HIV and hepatitis C virus (HCV) outbreak at the Al-Fateh Hospital in Libya.

The path to *Nature*

The path to the *Nature* paper began in October 2006 when Dr Giovanni Rezza and Dr Massimo Ciccozzi from the Instituto Superiore di Sanità (ISS) invited Dr de Oliveira to Rome to discuss the potential analysis of HIV-1 sequence data isolated from 37 of the 418 children who were infected in an outbreak of the virus at the Libyan hospital. There he met Professor Vittorio Colizzi who gave him access to the genetic sequences of the HIV and HCV genetic sequences from the Libyan children.

Dr de Oliveira's goal was to determine the origins of the outbreaks. He began by analysing the HIV and HCV sequences using evolutionary techniques developed in Oxford. Initial results showed that one HIV-1 strain and three HCV strains were responsible for the infections. The origin of the HIV strain was mapped to West Africa and the HCV strains to West Africa and Egypt. A worldwide HCV strain was also detected.

The next, crucial step was to apply molecular-clock techniques to determine when the outbreaks started. Together with Dr Pybus, Dr Rambaut and Italian researchers, he applied various models of evolution to the data. The results revealed that both outbreaks began before March 1998 – the date the accused medical staff arrived in Libya. The findings were submitted to *Nature* and underwent a rigorous peer review process. In December 2006, the paper was published and, along with international pressure from human rights and medical organisations and interventions from high-ranking politicians, it eventually helped to secure the release of the medics in July 2007.

To Africa, where it all started

'In many respects, Marie Curie contributed to my career development. It gave me the opportunity to receive in-depth training on virus evolution, establish a solid network of collaborators and publish papers and software applications,' explains Dr de Oliveira. *'It also showed me how scientists can work together to answer questions that are important for everyday life. The fellowship and its results allowed my career to advance to a more senior academic position.'*

Dr de Oliveira's story does not end there. He is now working in South Africa where he is investigating the use of genetic analysis to identify networks of HIV-1 transmission. Specifically, he is studying how HIV-1 strains are transmitted in northern KwaZulu-Natal in South Africa. The findings will be integrated with geographic and demographic data gathered over the past 12 years and will help to enhance understanding of the causes and consequences of high-level HIV transmission in the area. He is also developing computer applications with Belgian and French researchers to classify HIV-1 strains and to support the clinical antiretroviral treatment of HIV-infected individuals.

Dr de Oliveira has some words of wisdom for prospective Marie Curie Fellows, saying: 'The identification of the research group is a crucial step and I advise prospective students to visit the group before and during the preparation of the project proposal.' His reasoning for this is that 'The two-year duration of an academic research project is a short time for an academic research project and in order to be productive the research project must be well defined in advance and the Fellow must work hard and stay focused.'

Project acronym ■ HIVOxford
Full project title ■ The intra- and inter-evolutionary dynamics of HIV

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Host institution ■ Zoology Department
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