EMBRACING GENOMICS: THE FUTURE OF MEDICINE

Mark Florman
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CEO, Time Partners
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time-partners.com

One of the greatest scientific breakthroughs of our time is the unraveling of the human genome (the entire set of genetic information stored in every cell). It has been long known that each individual's genetic make up plays an important role in susceptibility to various diseases, reaction to different medicines, longevity and more generally, the individual's health profile. One of the first questions doctors ask during routine examinations is whether there is a family history of certain diseases. It was also well-known that even a small change (a so-called "single point mutation") in the genome can cause severe disease and much research had been devoted to the understanding of the relationship between the single mutation and the evolution of these hereditary diseases. However, the mere vastness of the genome – stored in code form in the DNA molecules carried by chromosomes and made up of approximately 3 billion distinct chemical components – made the task formidable.

This all changed in the last decade of the 20th century, when a group of scientists set out to read and decode the entire human genome. The Human Genome Project, as the collective effort came to be known, began in 1990 and concluded in 2003. The largest joint scientific project in history, it involved more than 20 different research centres and 50 different teams from across the globe at a cost of more than $3bn. The project stimulated and set off a host of new technologies, techniques and associated procedures that over time have not only lowered the cost of genetic sequencing dramatically but also found diverse applications for human health and medicine. However, genomics has yet to attract significant media coverage because it is difficult to understand, and the impact is not felt directly in our daily routines.

Yet many of us have become familiar with genomics and its tools without realising it. Escaping from the confines of the global pandemic has been possible because of the development of so-called mRNA vaccines using techniques and tools spawned by the genomic revolution. In addition, monitoring of the spread and evolution of the coronavirus variants would have been impossible but for the ready availability of fast and inexpensive sequencing machines originally developed for the study of genomics.

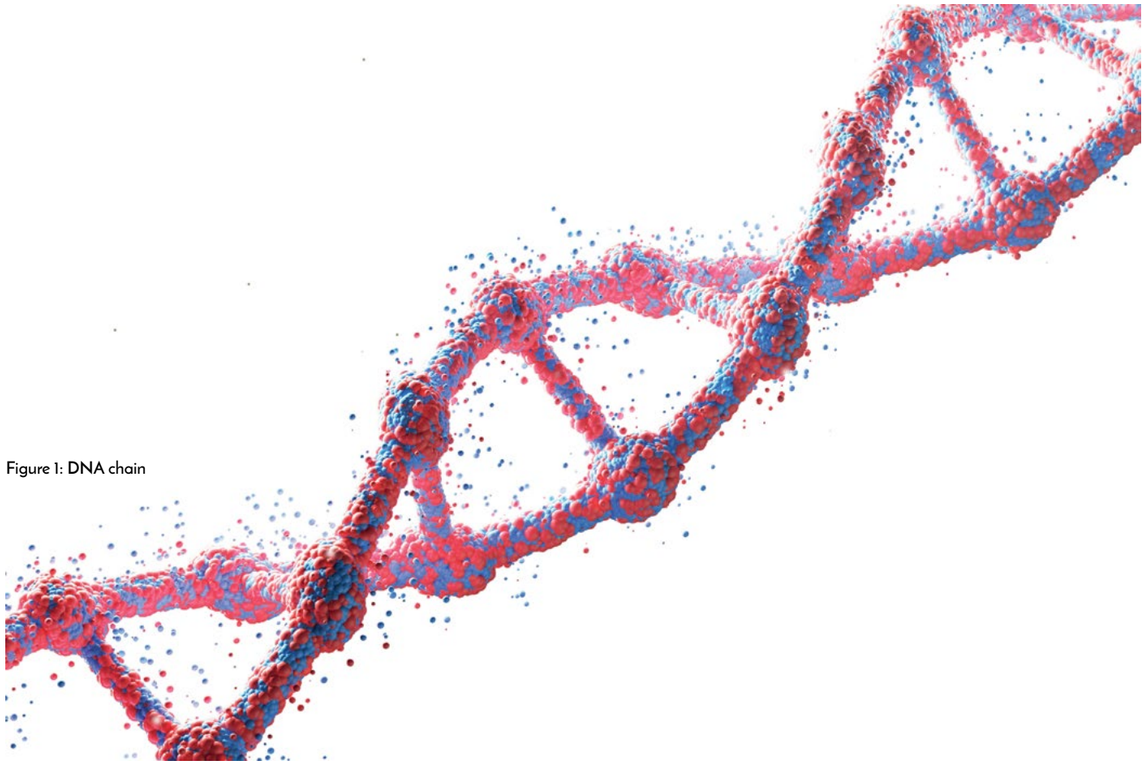

Figure 1: DNA chain

This application of genomics has not been lost on the world, but the true social impacts of sequencing the full genome are yet to be realised. The human genome provides us with a blueprint of how we are put together. It allows us to discover what has gone awry when we suffer from disease and ultimately how to cure the disease by putting things back into place the way the blueprint of a 'normal' organism would instruct.

The applications of genomics around the world have soared over the last two decades. From Dr Christian Happi's early detection of Ebola in Nigeria, to the NHS 100,000 Genomes Project, efforts are increasingly focused on bringing genomics into routine healthcare and uncovering new diagnoses across a range of diseases. Genomics has a variety of uses including oncology, reproductive health, genetic diseases and agriculture, to name a few.

Our primary task is now to scale the outputs and solutions to benefit the global population. At Time Partners, we have had the good fortune of building a partnership with Illumina, a global leader in DNA sequencing and array-based technologies. Illumina has made a significant commitment to supporting the growth of the field by establishing accelerators (in San Francisco, CA and Cambridge, UK) for start-up companies who are exploring different facets and commercial applications of genomics. The accelerator provides sequencing credits and expertise, access to state-of-the-art-labs, coaching and also provides the start-ups with support in early-stage financing. We have had the opportunity to back some of the most exciting genomics businesses through our vehicle, Time Boost Capital. The vehicle matches investments raised by the companies following admission into the accelerator in Cambridge, UK.

In addition, we are trying to extend the reach of the applications of genomics beyond its traditional geographical focus. I am delighted to be connected to the non-profit organisation PAST. PAST explores Africa's fossil heritage, funding and backing African paleontological research and leadership within science. Despite our knowledge of humans' common origins in Africa, only a small fraction of the genomes sequenced today include individuals of African descent (c2%). Africa also has the most diverse genomic make-up of any continent. As the science behind genomics was primarily developed in the US and Europe, it is perhaps not surprising that the majority of genetic studies have been performed on Americans and Europeans. However, it is necessary to correct this. To quarry the oldest and richest vein of genetic information in the world would not only enrich our overall knowledge of human health but will also help in addressing many of the diseases that burden the African continent.

There is not only great promise but great excitement in being involved in such a project. With access to the blueprints for every living organism, imagination can run wild and for the moment the applications for improved human health, well-being and longevity seem boundless. Some of the most brilliant minds are at work and we must ensure the benefits are gained globally.