The subject who is truly loyal to the Chief Magistrate will neither advise nor submit to arbitrary measures. JUNIUS

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GENETICS » READING OUR OWN BLUEPRINTS

By knowing our genomes, we will begin to truly know ourselves

The science is poised to change humanity in a profound way

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The anticipation of tailored therapy is perhaps the most alluring prospect in the era of the personal genome. RON EDMONDS / AP

Most of us are fascinated with the forces behind our being. We comb our family histories for explanations of who we are or predictions of what's to come. Some seek answers from deities, spirits or the stars.

We all see the impact of what's absorbed from our experience and environment, and there are also chance and circumstance to consider. But we are about to have the possibility to read our individual DNA blueprint – our own genome – heralding a new era of human understanding and the long-awaited opportunity for personalized medicine.

This summer, two astounding scientific studies have publicly released into databases the first genome sequences from single identified individuals, namely genome pioneer Craig Venter and Nobel laureate and DNA icon James Watson. In 2001 came the first drafts of the human genome sequence, mosaic prototypes patched together from a mix of anonymous donors, which took 10 years and billions of dollars to complete.

Those undertaken in the next few months will cost $100,000. Within five years, your genome sequence will be available for less than $1,000.

Harvard's George Church is already announcing the first volunteers selected for their Personal Genome Project (with more openings if you qualify). And soon, you could have your newborn's six billion chemical-base gene code digitized to your BlackBerry before you leave the hospital.

Will you want or need this?

I believe you will, because the reasons "to know" will eventually outweigh reasons to remain uninformed. Others may not be so sure. Regardless, we should prepare, because this science is poised to change us in a profound way.

The genome is the DNA instruction book contained in each of our body's trillions of cells. It directs all aspects of our development from conception to adulthood.

At least in the physical sense, your life follows a plan. The study of our genomes will confirm the role of genetic factors shaping and influencing our minds, our personalities, even our senses of proportion. But just because something is "genetic" doesn't mean it is absolute; we mitigate the effects of genes all the time.

Your genome also archives the story of your ancestors. We inherit DNA from our parents, as they did from their parents, and so on right back to the beginning. Already, certain genome scans can tell you where your ancestors came from and the mix of your blood.

Beyond mere curiosity, there are pragmatic reasons to become informed about our individual genomes. First and foremost, it will shift our personal health approach from reactive to pro-active.

Today, the benefit of being "sequenced" is no greater than the snippets of information gleaned from a few of the individual 20,000 or so human genes. In the Venter genome study worked on by our Toronto team, predictive power exists for only a handful of traits (such as eye colour and cholesterol), and much of this can be culled from a family history anyway.

However, as thousands of genomes and their associated personal characteristics are tabulated from the studies under way, a critical mass of data will eventually reach a threshold where it eclipses the value of any single initiative.

Some of the data will be highly predictive for disease onset or trait development, but most will be significantly influenced by external factors, such as diet and environment, and unknown factors – even randomness. There will be an overwhelming change in health-care strategy as it becomes feasible to align preventative and therapeutic interventions with individual needs, rather than using generic paradigms. So much of today's medical practice is by trial and error, and anyone who has followed the impact of chemotherapy treatments on a cancer patient, for example, knows all too well how much harm such a process can invoke. The anticipation of therapy by design, tailored to the individual, is perhaps the most alluring of prospects in the era of the personal genome.

Of course, there will be challenges. How can privacy be protected amid such an onslaught? In the first phase of access to predictive genetics, concern has often been expressed that we should not inform people of their predisposition (or fate) if there is nothing they can do about it.

This concern is legitimate, and has formed our ethical approach to the provision of such information within mainstream medicine. The lessons we learn will undoubtedly come into play as we move from an era with focus on one gene at a time to that of genomics, in which we can have our complete genomic package. What can we do to prepare society for the explosion of information potential, ensuring that it is embraced as knowledge and matured into wisdom?

Many of the concerns about predictive medical information will likely fall by the wayside as prevention, treatment and cures become realistic. We all harbour different variants in our genomes, some advantageous, some neutral, some that could be deleterious. The more this becomes apparent, the more hope for equality. And as more individuals put their genomic profiles into the public realm, effective research will be facilitated, and strategies to lessen the untoward effects of certain genes will emerge.

It is awe-inspiring that the human genome has evolved to one that can direct the formation of an organism with a mind capable of decoding its own instruction manual. It is in our nature to seek information, and we can now turn our attention inward. There should be no surprise when we find that, by knowing our genomes, we will begin to know ourselves for the first time.

MARGARET WENTE AND JEFFREY SIMPSON will return