Comment on Article by Graham Molitor (II)

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In 2003 the world will observe the 50th anniversary milestone of Watson & Crick's discovery of the double helix structure of DNA - a signal event in the development of the still-young field of biotechnology.

On a recent visit to Cold Spring Harbor Laboratory, I had the privilege of asking Dr. James Watson about how it felt to see the Genetic Revolution beginning to bloom nearly fifty years after his groundbreaking discovery. The Nobel Laureate took no time for self-congratulation or reflection about the remarkable progress during the past five decades. Instead, he dismissed the query with a terse summation: "We should have cured cancer by now."

To my mind, Watson's comment reflected the single-minded determination and the inherent unpredictability that characterize much of the work in biotechnology - both of which factors enormously complicate any forecaster's ability to project current trends and developments into the future. After all, biotechnology still is a field where the drive and talent of a small group or an individual (Craig Venter's quest is an obvious example) can result in significant developments - and it also remains a discipline where (in keeping with Watson's cancer comment) achieving a particular milestone sometimes resists even the most concerted efforts.

So it is a tribute to Graham Molitor's analysis and discipline that his "snapshot" of life science futures provides a wide-angle view that still manages to retain its focus around the edges. Without becoming enmeshed in excessive details or engaging in undue editorializing, the author gives us an overview of the key genetically driven changes now underway and forecasts their potential implications for the future. Along the way, he points out the significant ethical and policy issues that will accompany the technological developments and (not incidentally) are likely to influence the rate at which these changes are (or are not) adopted.

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With impeccable credentials and longstanding contributions to the futurist literature, Molitor's key "added value" here is as a well-trained observer with an historical perspective. As co-editor of the "Encyclopedia of the Future" - a definitive text for futurists throughout the world - Molitor clearly has honed a keen sense of what is (and is not) required to efficiently convey the essence of a trend or an idea. It is to the benefit of forecasters everywhere that Molitor now has devoted so much of his recent study to the implications of the Life Science Revolution.

Molitor's easy familiarity with the subject matter (some of which is understandably challenging to the lay public) might be mistaken by some readers as undisciplined or unfounded in its conclusions. In discussing projected changes in human life expectancy, for example, Molitor forecasts growth to 150 years, and even raises the possibility of a human organism remaining alive *indefinitely* - the kind of forecast that inevitably will draw fire from some quarters. But rigorous science and the disciplined extrapolation of historical trends are the hallmarks of Molitor's approach. His work is more about "forecasting" than "futurism"...more about extrapolation than imagination.

With an expansive overview like Molitor's there also is always a danger that readers will find themselves frustrated by their inability to "drill down" into the subject matter. It is precisely because these topics are so engaging and provocative that reading about them invariably leaves the reader wanting more. With that in mind, this is material that might lend itself even better to a live presentation or an Internet website - either of which forums would facilitate a more comprehensive exploration.

By way of example, the subject of "bioinformatics" is touched upon mainly in the context of the fascinating project to "mine" genetic information from a comprehensive database of the largely homogeneous Icelandic population. But far broader applications of bioinformatics are a central element of the work now underway in leading biotech companies and research institutions - and the application of information technology to biological models will have increasing impacts on the shape of this industry's future.

At Biogen, for example, we invested heavily in bioinformatics as a necessary step to capitalize on the mass of data that was becoming available through the race to decode the Human Genome. Because Biogen already possessed the expertise and infrastructure necessary to develop and manufacture biologic drugs, we were (and are) well positioned to take advantage of the emerging bioinformatic capabilities for discovering relevant drug candidates.

And one has to look no further than IBM for a prime example of an informatics company that is becoming increasingly engaged in life science work. IBM's project "Blue Gene," seeks to apply the computational power of one quadrillion operations per second (!) to the mysteries of genetics. No wonder Juan Enriquez, director of the Life Sciences Project at Harvard Business School, reports that many individuals at IBM headquarters envision their organization becoming a life science company within the next three years.

My point is that the convergence of the digital and genetic revolutions is a megatrend that portends *significant* advances in the years ahead. Since these developments have profound implications on the "fourth wave of healthcare advances," I would like to have seen more analysis along these lines. But then again, I would have enjoyed more analysis on each of Molitor's topics. With a little luck, the author's fascination with genetics has only been furthered by his concentrated work on this subject during recent years. The futurist community would be well served by his ongoing contributions in this important arena.