Discussion of Heubner Article

Comments by Theodore Modis

The article by Huebner is a welcome change to the voluminous publications on acceleration, singularity, catastrophe and the like. Too much is being said on raippant change riding exponential run-away patterns uncontrollably and disastrously.

But there are a couple of di8ieulties that I have with Huebner's approach. The first one has to do with counting innovations. Huebner draws exclusively on 7198 "important events in the history of science and technologjf' as compiled by Bunch and Hellemans. Compiling lists of "important events is a process that inherently suffers from subjective biases. There are two ways to reduce subjective bias. One is to average many independently compiled data sets. The other is to enrich the sample with scientific data.

John Brockman has tapped the minds of over 100 of today's forixnost scientific and creative thinkers including several Nobel laureates by asking them what they think is the most important invention in the last 2IXi0 years [1]. Contributors such as Stewart Brand, Mihaly Csikszentrnihalyi. Richard Dawkins, Daniel Dennett, Howard Gardner, Sherry Turkle, Steven Pinker, Jared Diamond, Freeman Dyson, Murray Gell-Mann, and Leon Ledennan included in their greatest-invention lists the expected, such as the computer, the ludo-Arab counting system and the lens. but also the surprising, such as the eraser, classical music and the concept of free will! I wonder how many of the 7198 events by Bunch and Hellemans find themselves among the ones of Brockman's panel and vice versa. Moreover, 1 wonder which set would have been more appropriate for Huebner to use and whether it would not indeed be some average (intersection?) of the two sets.

Gediard Mensch bas compiled a set of "basic imovationJ' in his celebmted book Stalemate in Technology: Innovations Overcome the Depression [2]. He demonstrated that innovations come in bunches .and that this bunching is regularly spaced about 55 years thus intimately limited to the Kondratieff cycle. Even though Mensch's work became widely accepted, when 1 wanted to use it in my book Pnxlictions: Society's Telltale Signature Reveals the Past and Forecasts the Future, to corroborate Kondratieff's cycle, 1 felt .compelled to enrich it with more objective sets of data [3]. 1 found such a set in the historical discovery of the stable elements. Theé appearance is also bunched and regularly spaced echoing Kondratieff's wave. But in addition, this set of data is indisputably objective.

When 1 was an experimental physicist, we did not think highly of theorists and of those colleague experimentalists who wanted to become involved only with the analysis of the data. Collecting and cleaning the data are the longest, most painstaking and the most important part of a piece of researck Huebner did not attempt to evaluate the data. He used all 7198 innovations, important and unimportant

alike, hoping that the unimportant ones average out with the important ones. But this increases the bias in the data set. Unimportant innovations populate preferentially recent times (how many unimportant inventions can be accounted f0r in the middle ages?).

Huebner may argue that ignoring recent unimportant innovations would enhance his "signal" of declining innovations per population. And this brings us to the second difficulty I have with this article, namely linking the number of innovations to the number of world population. For decades now, world population increases dramatically but this increase comes from the third world and that is not where most of the innovations are being born.

There is no evidence that the number of innovations correlates to the number of world population. On the contrary, it can be seen that Mensch's bunching of innovations does not correlate with any bunching in population number, nor does the discovery of the stable elements. Scientific and technological breakthroughs generally abound in societies of high income and elevated standard of living. In such societies, the populations not only do not grow along exponential patterns but often shrink.

This is perhaps what Huebner's result is telling us. That the number of innovation-producing individuals is declining as percentage of the world population. In this case, it becomes a question of time.

Developing countries will eventually reach high standards of living with high income. They should then become producers of innovations. They would probably also decrease by then their reproduction rates.

I hope Huebner's paper stimulates some specialist in demographics to pick up the subject and carry it to more meaningful and probably less alarming conclusions.

References

[1] J. Brnckman, The Greatest Inventions of the Past .2,000 Years, Simon & âchuster, New York, 2000.
[2] G. Mensch, Stalemate in Technology: Innovations Overmme. the Depression; Ballinger, Cambridge, MA; 1979.
[3] T, Modis, Predictions-Society's Telltale Signature Reveals the Past and Forecasts the Future, Simon & Schuster, New York, 1992;
T. Modis, Predictions—10 Years Later, Gmwth Dynamics, Geneva,. Switzerland, 2002.

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