

THE LAST WORD

James R. Murray

QUANTITATIVE BIOTECHNOLOGY—A NEW APPROACH

The place of theory in science has yet to be completely understood. Sometimes there are theories where there is little data. There are rarely piles of data without some sort of theory, limited though it may be. I hereby propose "Bionumerology" as a domain of pseudo-scientific inquiry ("Biometrics" having been spoken for). Bionumerologists are keenly interested in all quantifiable parameters of biology—especially those that follow a dollar sign. Practitioners of Bionumerology (hereinafter denoted as BUGs) strive to answer a variety of questions, including:

- Where do the numbers come from?
- Why are they the way they are?
- What do they mean?
- Who's fooling whom?

Not just anybody can be a BUG. There are principles, standards, methods, and, it goes without saying, license, although we are self-regulated. For example, there are a few inviolable precepts, like "It is *verboten* to make up numbers." O.K., so what about the theory. Theories which are good for a while provide first principles that allow us to deduce, as special cases, that which we observe. Some of the candidates for the first principles (and corollaries) of Bionumerology are:

1. A buck is a buck.
2. There's no free lunch.
3. The politics of money should never be taken too seriously.
4. "Biotechnology" does not in fact include everything.
5. Don't believe everything you read.
6. You can't peel the onion without some tears.
7. Heisenberg's Uncertainty Principle was first developed for commercial biology.
8. If God wanted scientists to run businesses, he would have given them green eye shades.

Bionumerology faces many dilemmas, one being the divergence of interests of its clientele. Not all players want the same truth at the same time; occasionally it's even a zero-sum game. BUGs have responded to these pressures by seeking ever deeper and less conflict ridden levels of truth. For instance...

The Stock Market. BUGs have assembled incontrovertible evidence about the place of biostocks in the overall market, the relation of biostock prices to other financing forms (R&D limited partnerships, venture capital), and the timing of moves. The Genentech bellwether has worked without flaw since 1981. Since all know Genentech is *always* too pricey to buy, its levitation provides the best leading indicator of greed. Contrariwise, when the bubble breaks we will all know that the time for sales and real profits is upon us. No one will be able to use expectational financing any more, no matter how ingenious the story. (For those wondering where we are in the "cycle," the most recent bottom for Genentech and the rest was the summer of '84. It is extremely improbable that 1987 will see anything but a biostock blood bath, since the bioburst of '83 will pale in comparison to '86.)

The going concerns, referred to *en masse* by the misnomer "corporate partners" (CPs), have, as we all know, played a critical role in the financial development of

biotechnology. Their role has not been limited to their own cash contributions but has also included the "security blanket factor" (SBF), without which many venture capitalists and "public" investors could not have discriminated between buying biostocks and playing 32 Red in roulette. Unfortunately, SBF has been only a placebo in too many cases.

Some BUGs have felt a basic gnawing uncertainty about what the corporate partners' *real* game plan was. Risk aversion among the CPs has been pervasive, though not universal (Monsanto, for example, has bet the farm on biopromise). Some of us recently put our anxieties to rest. Except for our too pricey bellwether, each and every biofirm with a sufficiently large basket of goodies beyond the *mañana* stage, will have to face an acquisition attempt. Some will go along. Others will not, for now. I expect that those firms without a large enough basket of post-*mañana* goodies will finally get shook between '87 and '89 (this is the shakeout that was supposed to happen first in '82, then in '84). So, by 1990, coincidentally when all those products we've all heard about will be knocking off untold billions per year, there will be our too pricey bellwether, a good many fond memories, and a few handfuls of wholly owned biosubsidiaries. There won't be any more interesting bionumbers, so most of the BUGs will be eradicated. Any remaining will teach history.

Sleepers. BUGs are ever vigilant in their efforts to recognize the early warning signs of change. One of our main objectives is to discover those elements which will build sufficient force to become "real." There are always a great many seeds of change fighting to take root. I think that there is now sufficient evidence regarding two additional matters which will affect future bionumbers. First, the relative size and profitability of the health care sector will diminish. The untrained eye can see the pressures at the level of service delivery, a particularly labor-intensive component. Many years of BUG-prenticeship, however, enables one to see the impending damage to pharmaceutical incomes. Biotechnology investors predicated their largesse on continued health sector growth. Second, centers of advanced research, e.g. universities, will dramatically increase their roles as providers of new bioknowledge. The popular corporate partnership source of financing for biofirms will diminish accordingly.

A Technological Paradox. Bionumerologists are slavishly devoted to advanced technology, either as domain or technique of inquiry. Consequently, we have spared no expense in developing a computerized Reader and Advisor to support and enhance our efforts to find the invariants in the bionumbers. My version, called TOPSY, is picking up more human habits as it learns about what goes on in biotechnology. Most intriguing is its response lately when queried about "what will happen next." It has uncontrollable laughing fits, only stopped when the plug is pulled.

James R. Murray, Ph.D., is President of Policy Research Corp. International, P.O. Box 43222, Chicago, IL 60643. These opinions are the author's own, and are not necessarily those of Bio/Technology.