EDITORIAL

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THE IMPLEMENTATION OF FINDINGS PUBLISHED IN SCHOLARLY ARTICLES

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Articles published in scholarly journals, such as this one, tend to be mainly addressed to researchers at universities. Industrial follow-up and implementation of results from a scholarly article appears to be the exception, rather than the rule. Research grant specifications, as well as university policies, favor the generation of new knowledge, rather than the implementation of good ideas. But without patent protection, corporations have low motivation to expend the considerable effort to reduce ideas to practice after they have been openly published. The author speculates that the situation could be much more dynamic if there were a system of priority of implementation. According to such a system, the first company to successfully implement an idea that first appears in a peer-reviewed journal article, as validated by its debut in the marketplace, would have a grace period during which competitors would have to pay them a fee to sell a generic version of the same thing.

Who follows up on promising published results?

Pick up a published research article at random from a peer-reviewed academic journal. Then, while focusing on that one article, ask yourself whether you think that someone in industry will implement those findings in the real world. I believe that in most individual cases the answer will be "no".

As a university-based researcher myself, I often have an optimistic expectation that a given publication from our group will become adopted as a practical solution to an existing need in industry, the environment, or healthcare, etc. But at the same time, deep down, I count each mere publication as a success, and I feel vindicated when others at least cite a given publication. Just a few days ago I caught myself explaining to a graduate student that such a view of the world is much too narrow. We researchers need to be concerned about how the science and technology that we develop becomes transferred into practice.

The roots of the problem were elucidated by Begley and Carmichael in the May 24, 2010 issue of *Newsweek* magazine. These authors decried the fact that only 0.6% of newly discovered disease-fighting molecules receive approval by the US Food and Drug Administration (FDA). The very low rate of technology transfer was attributed to a gap between academic researchers and industry. The former are motivated to publish new scientific findings. Federal grants place a premium on innovativeness, not utility. And there is scant government support to cover the considerable expenses associated with reduction to practice and scale-up, let-alone the risks associated with product introduction

and marketing. Though there is a vague assumption that industry as a whole tends to benefit from advances in science and technology, relatively little attention is being paid to the fact that most published findings do not get used in practice.

The Road *vs.* the Traffic

There are different ways to react to the relatively low "success rate" of technology transfer from academic research articles into industrial practice. Here are a few:

- Advances by academic scientists provide *options* for industrial companies and entrepreneurs. It's reasonable to expect that only the most attractive options will get picked up an implemented.
- We live in a world of *specialization*. The role of the academic scientist is to contribute to infrastructure, as in the building of a road. The role of the industrial engineer, along with many other individuals, is to do the hard work of reducing scientific findings to practice and profitability. This is like driving trucks on the roads built by the scientists.
- "After a typical scholarly article is published, several people read the title, one or two read parts of the abstract, and maybe, after several years, a graduate student will be the only one who actually reads it, and they will cite it in their thesis, which nobody reads."
- Industrial leaders have little incentive to follow up on results published in a peer-reviewed journal because there is usually *no patent protection*. They are afraid that once their prototype enters the market, competitors will just copy it. Reverse engineering and copying is expected to be cheap, compared to true development.

A Proposal: Priority of Implementation

So what's the answer to the situation described in the forgoing paragraphs? How can we overcome the tendency for academic scientists to mainly write for each other, focusing just on the advancement of our careers? And how can society encourage more useful efforts at reducing ideas to practice? For what it's worth, let's suppose that the government were to establish a system based on the priority of implementation. Such a law might grant a grace period of three to five years during which the first company to develop and commercialize an idea would be protected from generic versions of the same thing. Or maybe the producers of the "knock-off" product would pay a fee to the company that was first to the market. And suppose that 2% of the profits were automatically shared with the authors who first openly disclosed the essential concept in a peer-reviewed article? Imagine the eagerness, then, with which corporate developers would scour the pages of each new published article! And imagine the more efficient transfer from published findings to practical implementation! I hope that I have introduced this idea is a sufficiently provocative way so that someone is inspired to find a more practical way to implement it!

By the way, if any readers know of concrete evidence, pro or con, regarding how many people actually read a typical research article, I would appreciate it very much if you would e-mail this information to me at hubbe@ncsu.edu.