

# Response to James H. Maxwell's Essay, "The Iron Lung"

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I WENT BACK TO SEE WHAT I HAD WRITTEN IN the 1971 essay, which seems to be the beginning of James Maxwell's disagreement with my way of looking at things. I did indeed express misgivings about halfway technologies, although not quite in the terms attributed to me. I was principally worried about the future costs of such measures, especially the transplantation of kidneys and hearts, chronic renal dialysis, and, most frightening of all, the prospect even back then of the development of an artificial heart. What now catches my eye in the essay is the figure \$80 billion a year, which was the rough 1971 estimate of the nation's total cost of what I referred to as medical care, now more fashionably known as "The Health Care Delivery System." The number for the year 1950 had been \$10 billion. That was startling, but not as startling as what happened later, with the estimated figure for 1985 now pegged at around \$350 billion.

So, we still have the same sort of problem, getting worse. To jump so easily from \$10 to \$80 to \$350 billion in 35 years, even allowing for inflation during those years, should be making us nervous for the future. Part of the increase—I cannot find reliable estimates of just how much, but surely a significant part—can be assigned to the new and increasingly complex technologies brought into use year after year for medical diagnosis and therapy.

But I did not intend to criticize the iron lung for its usefulness, as Maxwell asserts. To the contrary, I had worked on a good many wards at the Boston City Hospital and the Neurological Institute of New York during the two decades before the Salk vaccine, and I had respect for the lifesaving (not just the life-extending) properties of this instrument. Later on, in the early 1960s, long after poliomyelitis had come under control, I made rounds at Goldwater Memorial Hospital in New York and observed the small colony of totally incapacitated polio patients who were still being kept alive by respirators ten years or longer after their initial infection, and my admiration for this iron lung was undiminished, although somewhat ambiguous.

My point was that this kind of technology could not possibly serve as a satisfactory answer to the problem of poliomyelitis. It was required at the time, but only because there was nothing better. The real problem in polio, unsolved until the early 1950s, was the inner mechanism of the disease. This could only be got at by basic research, and that, in the end, is what luckily happened, although it did not happen quickly. Several decades of elegant research were needed before it could be known that there were three (and only three) distinct types of polio virus, each possessing its own, unique antigen, and that each virus could be grown to abundance in tissue cultures. Once these two items of basic information were in hand, it was a sure thing that a vaccine could be made. In a masterpiece of applied science and development, Jonas Salk and his colleagues made one, and that was the end of poliomyelitis as a public health problem.

This seems to me a straightforward account of an event that has had counterparts elsewhere in medicine and, if the country's research efforts are continued, will have still more in the future. Maxwell states, "In contrast to the prediction that halfway technologies are replaced by definitive technologies, the iron lung was superseded in most of the industrial world not by the Salk vaccine, but by more modern-day respiratory equipment." By this he means, I assume, that while halfway technologies may be replaced by something totally different, they may also lead to other useful advances on their own, as has happened in respiratory therapy since the 1950s. I have no quarrel with this, beyond pointing out that most of the illnesses for which advanced respiratory equipment is now necessary (emphysema, postoperative surgery for lung cancer or heart disease, other lung diseases) also represent situations where we still lack a deep understanding

of the mechanisms of the diseases in question and have no other choice in treatment.

What worries me most about Maxwell's persuasive text is something between the lines, a doubt about the value of basic research as the way to go in medicine. He cites Joshua Lederberg, who said in 1983 (to quote Maxwell) that "the dramatic discovery of the structure of DNA in the early 1950s is only now beginning to produce knowledge with possible clinical applications." But of course, and it will probably take still more time. Nobody doubts that the current biological revolution is bringing us nearer to the point where definitive, conclusive, and rational kinds of therapy, still unpredictable but almost certainly waiting out there for comprehension, will become available for cancer, dementia, arthritis, diabetes, coronary disease, and any other human disorder on the list, bar aging and death itself.

I do hope Maxwell is not suggesting that we must wait for existing technologies in medicine to turn themselves into therapeutic and preventive insights, as Price (1965) sees the events leading to progress in the physical sciences. Medicine has nothing resembling a steam engine in its past history, waiting there to lead it to something like thermodynamics. Looking back, medicine's old technology consisted in large part of things that really never worked at all and usually did more harm than good: bleeding, cupping, huge doses of mercury, incantations, blistering ointments. If pressed, medicine can bring up a few useful old pieces of empiricism: digitalis, quinine, cowpox vaccination, a few others, but it is a very short list.

We have, for our professional future, nothing else to rely on with confidence except research. If the results seem to Maxwell to take a long time, that's the way it is in difficult areas of science and I can think of no way to change it. After all, the most spectacular of all technological advances in medicine have occurred in the infectious diseases, and over 60 years of very hard basic research were needed before the first glimpses of bacteria and viruses could lead to the general application of antibiotics and multiple vaccines. We are now nearly rid of tuberculosis, syphilis of the brain, and rheumatic fever, the dominant threats to survival when I was a medical student, but none of these benefits came overnight, nor did they fall into our laps. They came straight from the science of microbiology, after time.

I conclude by yielding James Maxwell his main point: the iron lung was a practical and often valuable piece of technology for its

time, and saved the lives of some victims of poliomyelitis. I will agree, as well, that other advances in respiratory therapy, derived from the iron lung, have since occurred. But this iron lung was, and is, a temporizing device, not aimed at the disease process but at its results.

If he is really convinced, as I suspect (and as he writes) that effective technologies for treatment and prevention will come along in medicine empirically, growing out of earlier technologies, without the need of insights into disease mechanisms provided by fundamental research, then I am in flat disagreement. Of course, it is true that modern research depends on its own kind of laboratory techniques—recombinant DNA, monoclonal antibodies, instrumentation for biochemical analysis, etc., but these are not technologies in the sense that the iron lung was one; they are there to meet the needs of research. Still, if Maxwell wants to put it that medical advances come out of technology, and if what he means is that DNA probes are going to be useful in finding something better than today's chemotherapy for cancer, then I would be inclined to say yes indeed, come join the club.

## References

- Price, D. de Solla. 1965. Is Technology Historically Independent of Science? *Technology and Culture* 6:553–68.
- Thomas, L. 1971. Notes of a Biology-watcher: The Technology of Medicine. *New England Journal of Medicine* 285:1366–68.

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