



Science and Industry

In the course of my life I have lived near 5 large cities. I have also had the privilege of visiting many of the world's great cities. It is always nice to spend time in these places, because they provide tremendous opportunities for intellectual development.

You know when you're in a big city because you will see an orchestra hall, a major art museum, a library that is also a cultural center, live theatre, and a center of science and industry. Given our profession, we often gravitate to the look at the past and glimpse into the future on display in the hall of science and industry.

When visiting such a museum or center, it can be interesting to consider how frequently the terms "science" and "industry" are linked. Often we look at science and industry as if they were inseparable, or we might even think of them as one and the same. However, they are 2 distinct entities.

Science consists chiefly of investigation to expand existing knowledge, while industry seeks to capitalize on such knowledge. Although it is tempting to think that the 2 work hand in glove toward the betterment of patient care, this is not always the case.

Let's look at implant dentistry. Scientific investigation into wound healing led a team of researchers to the serendipitous discovery that a biocompatible material, such as the titanium oxide on the surface of optical chambers placed within bone, could become intimately linked to that bone. Even when the titanium chambers passed through the tissue, opening the tissue to allow the potential ingress of bacteria to underlying bone, the connection to these implants remained tenacious enough to prevent this from happening.

The clinical applications of titanium chambers inserted through tissue did not become apparent until the mid-1960s. When the investigating scientists realized the potential applications of their work, they chose to take the road less traveled. They continued to test a variety of titanium screw designs, configurations, dimensions, surfaces and other permutations before arriving at an implant that was used in humans. Even then, the scientists followed the path of research and continued on this path for more than a decade before publishing the earliest reports describing the process.

Had these investigators been working on behalf of industry, it is likely that a product would have been brought to market much sooner. Earlier introduction to the market might have been good, since osseointegration has, in retrospect, revolutionized implant dentistry. Of course, it is also possible that the introduction of osseointegration to the dental profession in 1971 would have been met with total apathy. Remember that a few years into human research of delayed loading protocols designed to achieve osseointegration, the dental implant

industry was dominated by implants that were loaded immediately and were designed to undergo a process known as fibrous integration. Rather than achieving a rigid connection to bone, fibrous integration allowed implants to move within bone like natural teeth suspended by periodontal ligaments. In those days implant dentists were willing to accept survival rates of 75% for periods of 5 years or less. The acceptance of implant dentistry, then called implantology, within the profession was low, and it was not growing. If commercial implants had been introduced into the marketplace at that point in time, with short-term research of an approach that sounded counterintuitive, it is distinctly possible that osseointegration would never have been embraced.

In real estate they say that the key is location. Perhaps in industry the key is timing. Science may demonstrate promising results in relatively short time periods, but if the market is not ready to accept the results of investigation, a market may never be developed. Conversely, we sometimes see burgeoning markets in search of products. When this happens, industry may go in search of products that have little or no scientific documentation.

In all, science probably has the easier road. Dedicated scientists can usually find funding to pursue their curiosity, so long as their work promises to add to accumulated human knowledge. As long as scientists remain curious, investigation will follow. Industry, however, responds to the bottom line. It really doesn't matter if industry creates the best mouse trap if no one purchases it. Consequently, industry is in a constant battle to anticipate the market and identify those solutions from the world of science that address this market. When new markets develop ahead of science, industry may respond with "solutions" backed by little or no science. If everything works out well there is no problem, but if outcomes suffer the scientific community will be quick to point an accusatory finger toward industry.

In our museums, the relationship between science and industry seems symbiotic. Science is supported by industry, and industry capitalizes on discovery. The museum demonstrates teamwork in action, but in real life, the 2 groups may rarely communicate. Alas, the image that is portrayed in museum exhibits, particularly those funded by corporations, may be more stylized than realistic.

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