Science, Technology, and People[1]

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Introduction

This article started as an essay about the impact of technology on oceanography. It evolved into a summary of lessons learned and conclusions drawn about how science affects technology, and vice versa, and about the central role of people—scientists and technologists—in the interaction between science and technology. The essay is about three things that may seem quite disconnected: Pasteur's Quadrant, Success Factors for Science and Technology, and Myers-Briggs Type Inventory. The goal is to try to pull these threads together, in an oceanographic context, and build on and borrow from what some others have said and written.

In a true big-picture way, my approach will be to discuss some general ideas, and then give some specifics. This will probably be kind of frustrating to those of you who prefer to think in terms of the specifics first, and then let the bigger picture emerge from the details. In fact, this different kind of thinking is part of my message.

So you can decide whether to read further, I'll give you my punch lines now, so you can see where this is going:

- Science and engineering are symbiotic, not sequential.
- People are different, in particular scientists and engineers are often different from each other.
- Uncontrollable external factors, serendipity and opportunity are some critical factors in success, and in bringing to fruition technology and science.
- Don't overestimate the impact of science on technology, nor underestimate the impact of technology on science.

How Science Works

People see things in different ways; this can be frustrating but also can be a potential strength. For example, consider the following classical stereotypes:

- Scientist's Classical View: science needs an instrument, technology builds it, scientists use it and publish the results (and get the credit)
- Engineer's Classical View: just give me the specifications, and I'll build it for you
- Funding Agency's Classical View: engineers just want to build stuff regardless of whether it will ever be used, so unless a scientist is part of the development project, it might be wasted development money

We know this classical view has some connection to reality, and we know it has its limitations and frustrations. I'll discuss a bit later *why* things might be this way, but first let me offer an alternative set of viewpoints:

- Scientist's Alternative View: are there any new gadgets out there that might let me explore some part of my research subject better than I can now, and who can I talk to about this?
- Engineer's Alternative View: new technology allows new ways of seeing the ocean, some scientists have enough vision, courage, and patience to try those new ways, and they make the first progress in a new arena by such use (and get the credit)
- Funding Agency's Alternative View: I tolerate numerous "failures" in science, meaning studies that produce nothing of consequence, papers that no one reads, and experiments that yield nothing new, all in the hope for the occasional breakthrough and high-impact effort. Why can't I support some technology developments that may be failures, but may have great impact?

Reframing the problem as I've done above is an essential skill. Here are some insights and perspectives that help us to reframe things.

Pasteur's Quadrant

Donald Stokes (1997) examined the 1945 Vannevar Bush idea of a progression from basic research to application and decided there was little evidence in favor of it, and much evidence against it[3]. He used the examples of Niels Bohr, Thomas Edison, and Louis Pasteur to illustrate his point. On a spectrum from basic research to applications, Bohr resides clearly at the basic

[1]Based on a talk given at the Monterey Bay Aquarium Research Institute, February 6, 2002.
[2]These are the thoughts, conclusions, and opinions of the author, and not necessarily of the Office of Naval Research.
[3]This is the conclusion of all studies that have attempted to portray basic research as the clear progenitor of technology. The connections are tenuous at best, highly diffusive, and quite slow. See, for example, Kostoff (1997).

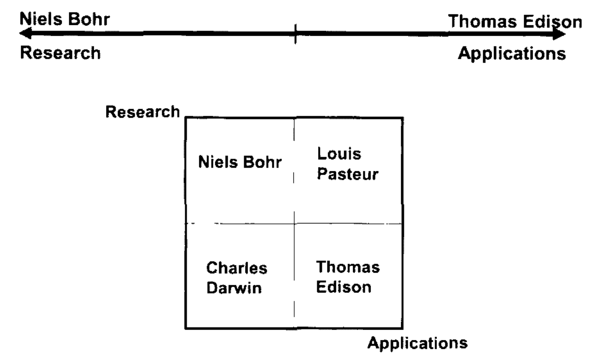

Figure 1. *(Top) One-dimensional spectrum from research to applications, with Bohr and Edison placed along the spectrum. (Bottom) Two-dimensional spectrum of research and applications, with Bohr and Edison placed in their quadrants, Pasteur in his "use-inspired research" quadrant, and Darwin in his quadrant of observation and documentation. Redrawn from Stokes (1997).*

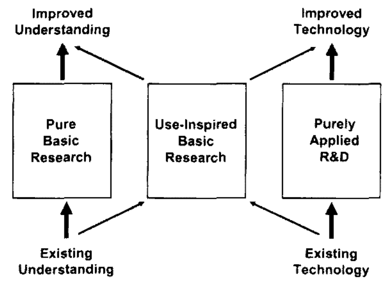

Figure 2. *Stokes' Revised Dynamic Model of research and technology, showing the near independence of research and technology, coupled by the use-inspired research of Pasteur's Quadrant. Redrawn from Stokes (1997).*

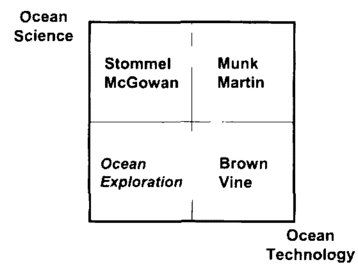

Figure 3. *The Ocean Quadrants, showing ocean science versus ocean technology or applications. Names are supplied to illustrate the quadrants.*

research end, and Edison is clearly at the applications end. The problem is where to put Pasteur, who just wanted to keep the food from spoiling, but had to invent microbiology to solve his problem. Stokes suggests taking the line-spectrum and bending it in the middle so that we now have research on one axis and applications on the other (Figure 1). If we simplify the picture by just making the picture high-and-low "research-ness" and high-and-low "application-ness" then Bohr and Edison get their quadrants, and Pasteur moves into the high-high quadrant of both research and application, without needing to choose between them. One can interpret "Pasteur's Quadrant" as being use-inspired research (Stokes' view), or as being research-inspired application.

As an aside, the low-low quadrant would appear to be undesirable, but Stokes describes it as the "Darwin" quadrant, in which one simply observes and documents, and provides the information base upon which discoveries and applications can be built, not necessarily by the person doing the observing and/or documenting.

Stokes goes on to provide a dynamic model of how existing research and technology lead to improved research and technology (Figure 2). The main point of this model is that research/science tends to beget more research/science, technology tends to beget more technology, and there is very little cross-talk. He suggests that Pasteur's Quadrant is the principal mechanism to obtain the cross-talk.

Consider the ideas of Pasteur's Quadrant and apply them to oceanography. The issue here is the dichotomy between science and technology. That is not quite the same thing as Stokes talks about, but is quite similar. He gives a quest for improved understanding as the goal of the basic researcher; that is the goal of science, in general. He gives the quest for improved technology as the goal of applied R&D; that is the goal of the engineer, in general. The engineer may express this as "problem solving," but the point is that a better (or new) technology is the result of the effort.

Figure 3 is an oceanographic version of Stokes' ideas. Henry Stommel and John McGowan are in the science, not technology quadrant, driven by the quest for understanding the ocean and not by any special societal or military problems to be solved. Neil Brown and Allyn Vine are in the technology but not science quadrant, driven by improved technology and tools, and not by any quest to understand how the ocean works. Walter Munk and John Martin are in the use-inspired, Pasteur's Quadrant, where you absolutely cannot fault the quality of their science or their vision, but where clearly the motivation for their work has often been quite practical problems. The Garrett and Munk spectrum for internal waves arose out of cold-war concerns for finding or hiding submarines, and John Martin's work on iron fertilization arose from concerns for CO_2 uptake by the ocean. Finally, Ocean Exploration is placed in the fourth quadrant, to signify the importance of methodical exploration and documentation, with the goal more of describing than of understanding, and of trying to lay a framework of data and information for later use in science and technology.

Each reader could probably find some alternative names to put into these quadrants, and may take issue with my suggestions. The point is not whose names are on them, but rather we can easily find names to put on them, especially on the use-inspired Pasteur's

Quadrant. And these are names that are significant; we are not forced to relegate third-stringers and low-impact workers to the use-inspired quadrant. In fact, we have consequential work and people that can be put into every quadrant.

Consider now Stokes' Revised Dynamic Model with an oceanographic spin (Figure 4). The boxes are now curiosity-driven Ocean Science, use-inspired Ocean Science, and Ocean Technology. The inputs, outputs, and arrows are the same.

The unfortunate mythology is that the left-most box is most highly-valued, and work in the other boxes is less important, less prestigious, and (the unspoken conclusion) less worthy of National Science Foundation (NSF) or other basic research funding. However, the mythology may not be a deeply held conviction. It may be just a posturing in front of one's peers to gain status as a "real scientist" rather than as someone who is unable to think of "good questions" about the ocean. Research proposals use all the valued phrases, such as, *"My long-term goal is to understand how the ocean works,"* but also usually try to argue why the information might be useful in some application or technology. So the scientist is bowing to the cultural norm to function in the left-most box of curiosity-driven research with no goals other than improved understanding, but is actually doing work that has some application in mind, like mitigation of climate change or protection of habitat. It goes even further when the proposal points out some application that is hindered by lack of understanding. One sees in proposals statements like, *"Prediction of near-shore currents is critical for many societally-relevant problems, but our lack of fundamental understanding about bottom friction in shallow-water environments is hindering our progress. My goal is to understand the fundamental hydrodynamics of stratified flows over rough topography."* This is pure use-inspired science, even though presented through the cultural filter of curiosity-driven research. Pasteur's Quadrant lives.

Now let's look at the right-most box, that of Ocean Technology. It can indeed be useful to take known technology and produce improved technology; this is analogous to the left-most box being seen as the way to get from existing understanding to improved understanding. If only the left-most and right-most boxes existed, we'd have the simple, classical separatists' view of science and engineering presented earlier. The connections would be sequential: the curiosity-driven scientist decides what she needs to make progress in understanding, tells the engineer, and some time and money later, the new widget produces new data.

The middle box makes all the difference. It provides the extra degree of freedom to allow technology to yield new understanding.

There are some useful conclusions to draw at this point:

- The existence of the use-inspired quadrant in Figures 2 and 4 means scientists can work toward improved understanding without having to maintain the mythology that curiosity-driven research is the only valued activity. They no longer have to choose between curiosity-driven research and being a technologist; they can now be involved with use-inspired research and still contribute improved understanding.
- Secondly, the lack of a linear, sequential paradigm means technologists no longer have to choose between being separate from the science, or being secondary to it. The two subjects are now in parallel rather than in series, and considerable opportunity exists for symbiosis rather than subservience.
- The fourth quadrant in Figure 3 of ocean exploration now has a context as possible progenitor to both science and technology, as being an essential part of the enterprise, and as being yet another application and partner for the scientist and technologist to consider.
- The use-inspired quadrant—"problem-solving research"—is more likely to motivate team and multi/interdisciplinary efforts, because it is the problem that demands the breadth of tools and ideas that are usually beyond the individual, and most real problems are not tractable within the confines of a narrow discipline.

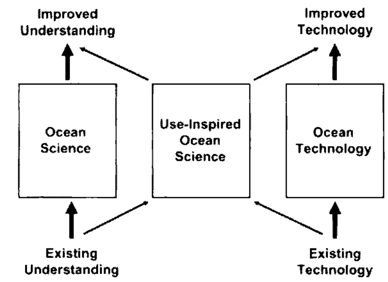

Figure 4. *An Oceanic Dynamic Model of science and technology/applications.*

Success Factors for Science and Technology

One can list many factors that might be important ingredients in the success of a science or technology project: people, money, time, patience, serendipity, tenacity, passion, politics, external technologies, opportunities, courage, vision, etc. My observation is that the possibly long list clusters into four principal components, or whatever your favorite methodology is for extracting order out of complexity:

- People (including tenacity/passion, curiosity, courage, vision), and things related to people
- Money
- Serendipity (favors the trained, open mind)
- External Factors (politics, opportunities/circumstances, other science and technology developments; things you do not control)

These are not really independent, of course: money comes from politics, for example, and serendipity allows one to see that some external development may be useful in one's own field and problems, or to observe the opportunity and to grab it.

People and Money are the most essential ingredients; nothing happens without both of them, although you may need only one person and not necessarily very much money. My favorite example of "critical mass" is G.I. Taylor (pick your favorite, creative person) sitting alone in a room. And a lot of money is not always good; it can prevent critical thinking and encourage sloppiness. (But maybe this is just a funding agency person talking....)

Serendipity means just keeping your eyes open; this alone can produce remarkable advances. But it is the External Factors that move things along. The External Factors are things you have no control over, like Digital Signal Processor (DSP) chips, Fast Fourier Transforms (FFTs), affordable titanium, good weather at sea, and changes of political administrations.

It is easy to discount the External Factors and the serendipity and the opportunities, because there are no equations for them, there are no calculable leading terms, they are not our responsibility, and we can't control them. But if you ignore them, your chances of success are greatly diminished. So we need to develop a mindset that is like a radar constantly scanning, being open to all opportunities, being prepared to exploit serendipity, and being aware of advances in other fields that might impact our own.

Additional success factors arise from research on innovation.[3] One interesting result is the role of early failures on later successes, and on the rate of progress. At a constant level of effort, technologies advance slowly, then erupt, then slow down again. Less obviously, in those early stages of slow growth, there may be big swings in performance between individual successes and failures. The greater those variations, the steeper the slope of later, explosive progress. Taking risks pays off, and learning from failures pays off.

Over time, the secret guild of Washington funding-agency program managers, especially at the Office of Naval Research (ONR), has evolved "Good Strategies" for program management of basic research, and some "Basic Principles" by which one should formulate and judge a broad basic research program. These were developed independently, at different times, by different people; they are remarkably similar:

Good Strategies	Basic Principles
• Choose good people	• Attract, retain and support good people
• Leave them alone	• Foster innovation
• Provide sufficient resources	• Balance the investment portfolio
• Build better instruments	• Sustain selected infrastructure
• Measure something not measured before	
• Work between established disciplines	
• Have patience	
• Show interest	
• Demand written results	

Note the appearance of People as number one in both lists. The development and use of new instrumentation, and the patience to see it through, is fundamental to progress in science, but it is people who develop and use technology, and make progress in science.

Additional intermediate conclusions:

- People are critical, in addition to other factors, some of which are external and not controllable.
- Success demands "*Carpe Opportunity*" which means you have to know it is there.
- Risk-taking and failures must be encouraged and be part of the culture.
- New instruments and measurements are essential.

People Are Different

Scientists and engineers are often different from each other, as are accountants and administrators and librarians. They look at things differently, make decisions differently, and achieve satisfaction with differing methodologies.

About 80 years ago Carl Jung began to develop a simple but insightful view of how people function; he continued this effort for half a century. He posited that we each have two mental functions, perceiving and judging. All day long we go back and forth between these functions, observing our surroundings and taking in data, and making decisions and judgments based on those data. The alarm goes off in the morning (data), our nose sticking out of the blanket is cold (data), it is still dark outside (data), so we decide to sleep in a little longer (judgment).

This is not touchy-feely stuff, just because it is about people. What follows is based on hard-nosed statistics, and provides some empirical eigenfunctions of behavior. It is descriptive, not predictive, although one may observe tendencies. More importantly, it provides a language to discuss differences and conflicts, and some tools for better self-management. See Kroeger et al. (2002) or Martin (1997) for more information.

On the basis of his observation of people, Jung suggested that people tend to have two rather different ways to perceive the world around them:

- in terms of details, hard facts, practicalities, actualities, and their five senses, or
- in terms of generalities, possibilities, insights, patterns, relationships between the facts, and their intuition.

The world of "is" versus the world of "might be."

Jung coded this behavior as "S" for Sensing, and "N" for iNtuitive. In the U.S., the distribution across the population is about 70% S, 30% N. This probably comes as a surprise to academics reading this; the academic world is predominately N (theories and concepts), so that is your working (and possibly social) context.

Jung felt that people tended to prefer two different ways of making decisions:

[3]See, for example, Gryskiewicz and Hills (1992). There is a vast literature on innovation and creativity, and a distinct community studying it.

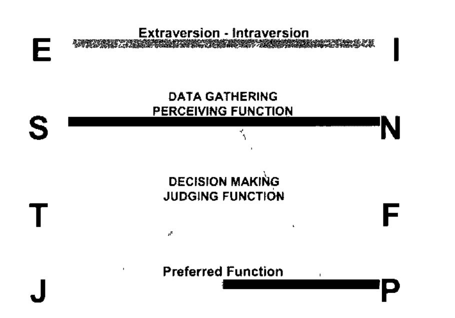

Figure 5. *The Jung-Myers model for personality description, codified as given by the Myers-Briggs Type Inventory (MBTI). A person's behavioral preferences are coded by one's choice from each of the four dichotomies, for example ENTP.*

- in terms of cold, hard, objective facts and logic, very principle-based
- in terms of people-values, relationships between people, and harmony amongst those involved in the decision

He coded these extremes "T" for Thinking, and "F" for Feeling. This does NOT mean that some folks don't think and some folks don't feel! The words are translated from the German, and they only imply the main basis for the decision-making. In the U.S., the distribution is about 50-50 T-F, although men tend more to be T (about 2:1) and women tend more to be F (about 1:2). This is the only gender-linked of Jung's behavior dimensions.

Jung had one more dichotomy that he developed to describe behavior, and invented the words for it: Extraversion and Intraversion[5], coded "E" and "I." The Extraverts live in an external world, interacting with people, developing ideas by discussion, thinking out loud, and becoming energized by the people and activities around them. Intraverts prefer their internal world of ideas, emotions, and impressions, prefer quiet for concentration, develop ideas by reflection, and think before responding. In the U.S., E's are somewhat in the majority.

Jung did not encode his fourth characteristic of behavior, he just wrote about it, late in his career. He felt that of the two mental functions, perceiving (data-gathering, S-N) and judging (decision-making, T-F), that we each prefer one of them to the other, and use it more often. It dominates our behavior, he felt. Later workers in this field (Myers and Briggs, in fact) have encoded this behavior very simply as "J" or "P." The "J" folks get their satisfaction from a high degree of organization, from closure, from decisions and judging. The "P" folks get their satisfaction from options, from the possibilities, from being adaptable, from flexibility and from postponing decisions until "all the data are in." In the U.S., J's are somewhat in the majority.

All this behavior is encapsulated in the Myers-Briggs Type Inventory, the world's most commonly used psychological instrument. Some 2 million people take it each year, in over a dozen countries and languages. Figure 5 shows there are four scales, each with two possibilities. I come out an ENTP in the MBTI framework, meaning I'm happy to think out loud and interact with people (E), prefer the big picture and not getting mired in details (N), make my decisions logically and objectively (T), and dislike early closure and inflexibility, much preferring options, opportunities, and adaptability (P). This doesn't mean I can't function in those other modes, I just don't prefer it and am not as good at it (because I don't get as much practice). Under stress I tend to revert to what I am most comfortable with, ENTP. My wife is ISFJ, the complete opposite in all four dimensions. This is not uncommon, and is probably the source of the old aphorism, Opposites Attract. If you can't be everything, maybe you can marry what you are missing.

The most common Myers-Briggs types in the U.S. are _S_J, about 46% of the population. The least common type is _NT_, about 10% of the population. (Pure chance would suggest 25% for each of these two-letter types.)

One bit of statistics: people in various career groups tend to cluster with their Myers-Briggs types. Accountants are strongly ISTJ, with a strong sense for order and closure and a decision-making function aimed at logic and being objective. Engineers are traditionally ISTJ and ESTJ. University professors and artistic folks cluster on the N dimension rather than S, administrators and senior managers on the TJ dimensions, social workers on F rather than T, etc.

There are some uncomfortable aspects to this. Scientists are strongly NT, both male and female. Teachers in K–12 are dominated by SF, the opposite. Their teaching style and what they emphasize does not encourage the young scientists. As one research site stated, "*Young NT future scientists find few kindred spirits in their teachers.*" Imagine what this means for the young female scientist wannabe.

What does this Myers-Briggs framework mean in the workplace, in the laboratory, in our situation with engineers and technologists and scientists?

Take the classic engineer, say ISTJ, and the classic scientist, say ENTP, and suppose they are trying to work together. The natural style of the engineer is to think before responding, the natural style of the scientist is to think out loud. The natural style of the engineer is to focus on the doable details, the specific design, the specifications, in fact. The natural style of the scientist is to ponder the possibilities, to not get dragged into the technology details, to imagine the impossible. The natural style of the engineer is to get

[5]Over time, "intravert" has morphed to "introvert," and has taken on an unfortunate connotation of withdrawn and shy. Within the framework here, intraverts are just as valued as extraverts, but probably quieter! If you want to know what an extravert thinks, just listen. If you want to know what an intravert thinks, you have to ask, and probably wait for the answer.

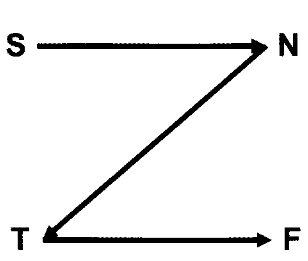

Figure 6. *The Z-Model for problem solving, progressing from facts (Sensing) to possibilities (iNtuition), to logical decisions (Thinking) to human-based value considerations (Feeling).*

the specs, make the design, build the widget, and get on with it; closure. The natural style of the scientist is to keep thinking of changes, of other ways to do it, of option after option. How do we say it tactfully; these styles clash. But here's the point: if the two folks understand their different styles exist, then they bring a remarkable strength to the table, a way of working together that covers all the possibilities. They talk, they listen, they reflect, they enthuse, they think grand thoughts, they think details, they stick to business, they develop options. But if they do NOT know they are different, or if they assume they are right and the other person is just obstinate and unable to see the truth, then it is a train wreck.

This is my point: people in general are different. Engineers and scientists are very likely to be different (with different motivations as well as different working styles), and they will be different from the accountants and the marketing folks and the secretaries and the administrators and the librarians, and they had better all work together and use those differences as a strength rather than let it be an obstacle.

There is a very simple scheme to do this. It is called the Z-Model (Figure 6), and can be used by individuals or teams. You start with Sensing (and get the facts right), go to iNtuition (and make sure it all fits together and has the right context), then go to Thinking (and develop some good, objective decisions), then finally go to Feeling (and make sure the people involved will be satisfied and on-board). And before you start, you agree to work to a final deadline and not try to reach closure as soon as possible. Finally, if it is a team, the E's have to shut up and listen to the I's, and the I's have to make sure they say what is on their mind, even if they are not asked[*].

This approach is not peculiar to MBTI. In the military, something called the "OODA Loop" is taught: Observe, Orient, Decide, Act, and then loop back to observe the consequences of the action. Observe: that's the S of the Z-Model; what are the facts? Orient: that's the N of the Z-model; what is the context for the facts, the big picture? Decide: that's the T of the Z-Model; make your judgement in a logical, objective way. There is no F in the OODA Loop....

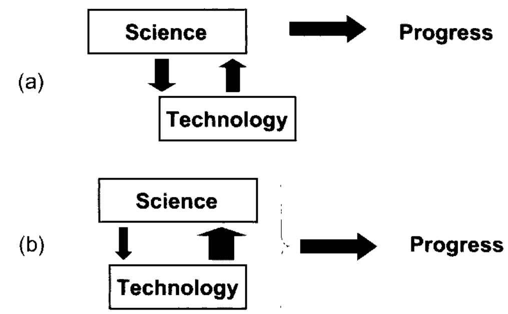

Figure 7. *(a) The old view of the interaction of science and technology, in which progress comes from science, and technology is subservient to science. (b) The modern view, in which science and technology are symbiotic, and technology has a larger and more immediate impact on science than science has on technology.*

What this use-all-the-talents-and-approaches-strategy does is gives a team working together the power to overcome their differences and actually make use of them as a strength. People are different, but this can be very powerful.

Some more intermediate conclusions:

- Pasteur's Quadrant allows us to view use-inspired basic research as another way to overcome the apparent conflicts between science and engineering; they become symbiotic, each needing the other, rather than competitive.
- We often see conflicts between people, between professions, between ways of thinking[**]. If we can find a way to reframe the conflict so the elements of it are complementary, then we have the possibility of drawing strength from the conflict, and resolving it, rather than being consumed by it.

Pulling the Threads Together

In the old, never-was-correct view (Figure 7a), science asked technology for solutions and thus was the alpha dog in the relationship; without science, technology had no customer, and there was no progress. Science provided the new insights to technology; without science, technology had no way to improve and no future. Alpha dog squared. In the new view (Figure 7b), there is no alpha dog, just symbiosis. The new ideas of science become the new technologies (albeit slowly), but the new technologies are the source of the

[*]Professional facilitators have all kinds of techniques to move a team toward good decisions that utilize the diversity of strengths on the team. See, for example, the Normative Group Technique.

[**]As a side benefit, observing that different people function differently can turn meetings into interesting events. Just listen to the discussions and presentations and arguments, and note how some folks work from their perceiving function, other from their judging function, some are absorbed by details, others by possibilities, etc. Listen to the language, and then listen to the interactions between the folks. Many arguments are just Myers-Briggs conflicts, not substantive arguments.

new science ideas (sometimes quickly). The hard problems of the real world become the genesis of the new sciences: spoiled food begets microbiology: use-inspired research.

For this to work, the scientists and engineers need to work as equals, but they are different. It is the differences that are the strength; if this is understood, it can be used positively.

In the end, high-performing teams of scientists and engineers working symbiotically, addressing use-inspired research, would seem to be the essence of success. But not quite.

Two identical great teams will differ in how they make use of External Factors, exploit opportunities, capture serendipity. You've got to keep your eyes open for what the others don't see or don't recognize.

Hindsight and Traces

In the 1960s, both the U.S. Department of Defense (DoD) and NSF tried to determine the role of research in the development of real technology important to defense and society/science, respectively. They used nearly opposite methodologies. DoD's Project HINDSIGHT chose 20 weapons systems, looked backwards, and asked where did the ideas and things come from, upon which those systems were predicated? Materials, electronics, aerodynamics, etc. They found some seven hundred critical events, of which fewer than 1 in 10 could be traced to research of any kind at all, and fewer than 1 in 100 could be traced to curiosity-driven basic research from outside DoD. They concluded that technology builds primarily upon technology, not science.[5] NSF commissioned a rebuttal study, called TRACES, that sought the antecedents of videotape recorders, oral contraceptives, electron microscopes, magnetic ferrites, and matrix insulation. NSF found that these were based on identifiable basic research, which was no surprise because that is how they were picked. Both studies were seriously flawed, of course. DoD only went back 15 years, and looked at highly integrated complex systems. NSF looked for what happened to some known winners, and stuck to technological components, not systems. However, both studies noted the importance of critical events of serendipity, both noted that people crossing disciplinary boundaries and having unusual tenacity and tolerance for failures were part of the success stories, and both noted the very long time it took to get new ideas into applications (on average nine years from the idea for the application to its actual implementation, preceded by 20–30 years or more from the basic research to the idea for the application).

The lessons to draw from these and other assessments are:

- It takes a long time to get from a new idea to a new, overnight success. 30-50 years is not unusual.
- Serendipity and other external factors, especially developments in other sciences and technologies, make up many of the critical events.
- People come and go, but only a few make remarkable advances.
- Funding need not always be from the same source, but it always needs to be there.
- Science to application is not linear, never was, never will be.

Clustered Conclusions

- We need both scientists and engineers for progress; shared passions and objectives may be the key. There must be common goals and common enthusiasm.
- People—especially scientists and engineers—are different; this is good, not bad, if you understand it.
- External factors are often the catalyst to success; foster ways to find and exploit them. Bringing in ideas from other fields may be helpful; this is a benefit of multi/interdisciplinary teams.
- Given that technology tends to build on existing technology, but new science often depends on new technology, don't overestimate the impact of science on technology, nor underestimate the impact of technology on science.

Epilog

I wish I had known these things at the beginning of my career.

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[5]This is one of the pieces of information behind the ideas in Figure 2.