## IX. INDIRECT/OTHER IMPACTS

The material presented earlier in this report represents an extensive array of activities, explanatory commentary, and data. However, there may be some danger of losing sight of the forest because there are too many trees. What we hope would emerge for the interested reader is a picture of a very large, dynamic enterprise that is beginning to reshape the thinking of an entire scientific establishment about the future of molecular devices for a wide range of electronic, optical, and electro-optic applications. This future is by no means assured, but the STC has provided an enormous impetus to help bring this future to reality. Good ideas are not enough. Even if a new technology is clearly superior to an existing one, there is no assurance that the new approach will be accepted and achieve commercial success, much less become a dominant technology. It will certainly **not** happen if individual investigators simply publish an interesting paper and hope the world will see the light. There are powerful forces that tend to resist change and the introduction of new technologies into the marketplace.

That is certainly the case with the field of molecular photonics under development in the MDITR. Just as new characteristics are seen to emerge in biological systems when simpler systems are organized into a complex new organism with new functions, new emergent properties can be detected in the complex organization of individual investigators made possible by the STC. In the first place, there is enormous synergy that is created by having theorists and synthetic chemists and physicists and electrical engineers all collaborating toward common goals. The interaction forces new ways of thinking, generates new ideas and makes new experiments possible that simply would never have happened without these cross-cutting collaborations (which initially can sometimes be a bit “awkward”). It should be noted in this connection that the unique perspective that the Director brings to this enterprise is a critical element in making all of this work. Second, the combined contributions and advances made possible by this new “organism” creates a (mini)tidal wave of successes that generates a certain excitement in the “user” community. Thus our references to rapidly growing interest on the part of DARPA, DoD, and the private sector do not come about because someone published an interesting paper. Rather, the combined efforts of leading investigators to create new materials and devices generates a sense that there is substance here, there is definite progress, and there is now the serious prospect that the erstwhile promise of molecular photonics may become reality after all.

In the early days, as is often the case when those promoting a new venture are trying to get traction, there was a bit more hyperbole about the future of molecular electronics and devices than was warranted given the knowledge and capabilities of the time. Consequently, when early efforts failed to deliver on those promises, the field got a black eye. That difficulty is one of the challenges that the Center has to overcome. It must convince an army of skeptics that the new results are real and will not once again lead to disappointment. In addition, the Center has the challenge of convincing the semiconductor (inorganic) photonics community that the organic photonics developments are not intended to displace semiconductor technologies, but that, if appropriately integrated, these developments will complement and enhance the power of the existing technologies.

All of these subtle but very real challenges are part and parcel of the strategy the Center is pursuing in order to ensure that this new and potentially revolutionary technology can in fact make a smooth transition into the marketplace. That is why the Director as well as the Associate Directors spend an enormous amount of time and energy working with other agencies, companies, and institutions to help the community understand both the stunning progress that has already been made and the potential for future advances that can significantly alter the technology landscape of our global community. There are constant, daily demands on

them for information about the field, for presentations to stakeholders, for “talking points” so that program managers can make the case to upper management, for advice on corporate strategies, and so on. This kind of engagement goes far beyond the normal demands of the academic research environment. But it is a responsibility that comes with the Center mantle and is an obligation that must be fulfilled in order to achieve the goals of the STC program and to justify the substantial investment in the program. The faculty involved have an unstinting commitment to these goals, but it must also be recognized that it is a heavy burden that is not always understood by those not directly involved and it may not be adequately factored into the calculus of expectations and duties.

In short, the STC has created an intellectual and technological ferment that is bubbling over with ideas and devices and strategies. The collective visibility and influence of the Center investigators has colored the thinking of a significant segment of the science establishment as well as corporate thinking. This in turn has led to a flurry of new programs at federal agencies to tackle new opportunities that are becoming evident. It has led to major rethinking in corporate laboratories about future research and development directions and it has stimulated many entities here and internationally to launch “photonics” centers or initiatives of one flavor or another. We have not tried to assemble such a list for this report since we cannot claim direct credit for such developments. Nevertheless, there are many examples, and we believe the work of the members of the Center and the very existence of the Center has played an **indirect** role in many cases.