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The Excimer Laser: Its Impact on Science and Industry

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After the laser was demonstrated in 1960, 15 years were required to develop a practical method for extending laser emission into the UV: the Excimer laser. This historical review will describe the challenges with the new medium and provide an insight into the technological achievements. In the transition from Science to Industry it will be shown how start-ups successfully commercialized laboratory prototypes. The pioneers in this rapidly expanding field will be identified and the influence of government-funded research as well as the role of venture capital will be discussed. In scientific applications, the fields of photochemistry and material research were particularly stimulated by the advent of a reliable UV light source. Numerous industrial applications and worldwide research in novel applications were fueled In the early and mid 80's by progress in excimer laser performance and technology. The discovery of ablative photocomposition of polymer materials by Srinivasan at IBM opened the door to a multitude of important excimer applications. Micromachining with extreme precision with an excimer laser enabled the success of the inkjet printer business. Biological materials such as the human cornea can also be "machined" at 193nm, as proposed in 1983 by Trokel and Srinivasan. This provided the foundation of a new medical technology and an industry relying on the excimer laser to perform refractive surgery to correct vision Today, by far the largest use of the excimer laser is in photolithography to manufacture semiconductor chips, an application discovered by Jain at IBM in the early 80's. Moore's law of shrinking the size of the structure to multiply the number of transistors on a chip could not have held true for so long without the deep UV excimer laser as a light source. The presentation will conclude with comments on the most recent applications and latest market trends.