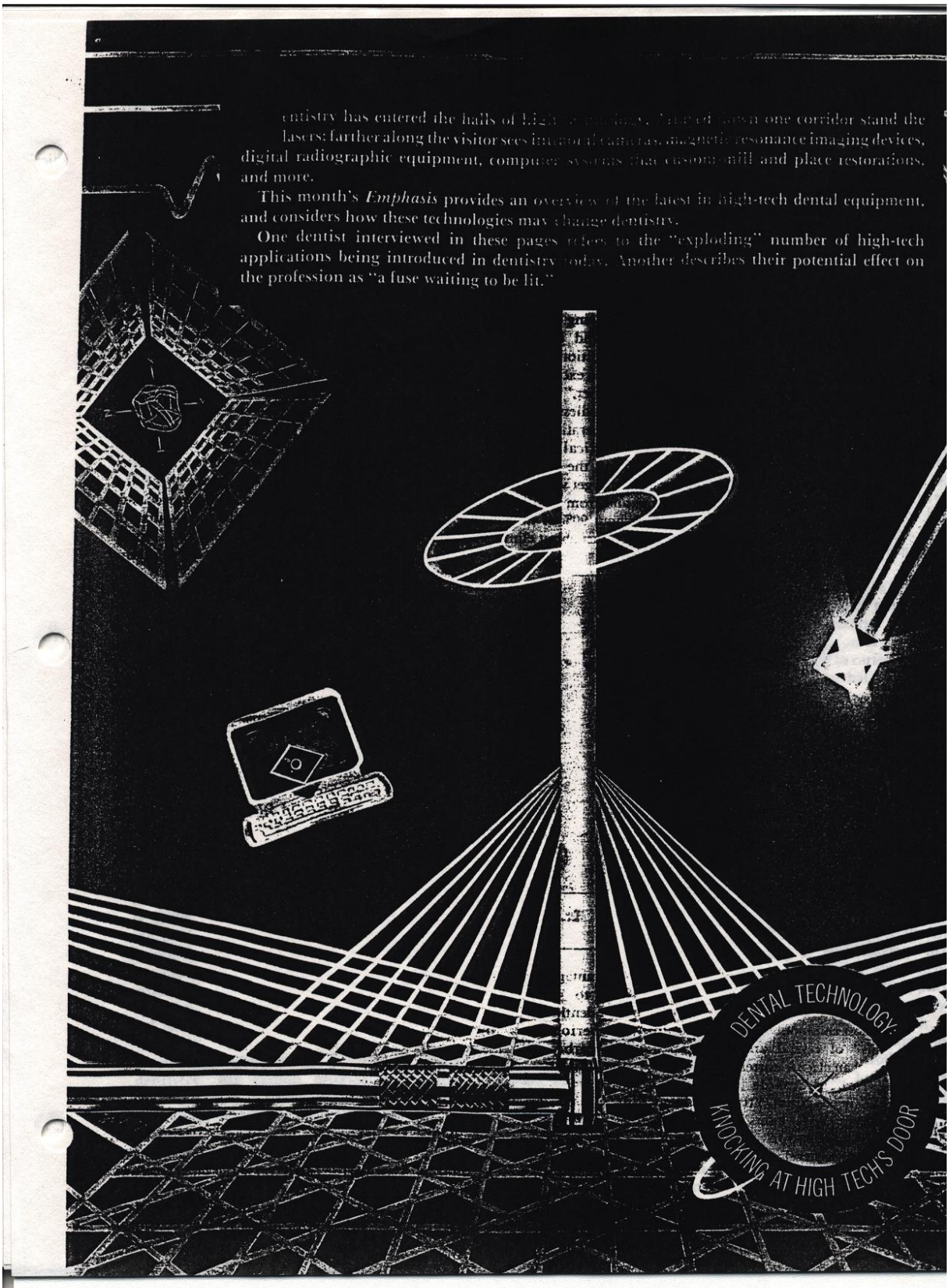

dentistry has entered the halls of [illegible]. Around one corridor stand the lasers; farther along the visitor sees intraoral cameras, magnetic resonance imaging devices, digital radiographic equipment, computer systems that custom-mill and place restorations, and more.

This month's *Emphasis* provides an overview of the latest in high-tech dental equipment, and considers how these technologies may change dentistry.

One dentist interviewed in these pages refers to the "exploding" number of high-tech applications being introduced in dentistry today. Another describes their potential effect on the profession as "a fuse waiting to be lit."

DENTISTRY - THE NEXT DECADE OF PROGRESS

A personal perspective of the advances to be seen in dentistry during the the next ten years as seen from the vantage point of a prosthodontist. February 9, 1989.

History and Current Status:

The progress of dentistry has not been a linear series of developments, but has, rather, consisted of periods of significant change followed by less dramatic times. These interim intervals have often been periods of refinement of the more dramatic developments, allowing the general population of dentists to absorb the advances made and prepare for the next accelerated growth stage.

The development of anesthesia, the casting process, 4 handed dentistry, high speed rotary instruments, elastomeric impression materials, metal ceramics, and dental implants are all examples of changes that have had relatively sudden and lasting impact.

I believe we are at the threshold of one of the most accelerated eras of progress that dentistry has ever known. The dental profession is a relatively small market and does not have the financial base for really significant inherent progress. With some notable exceptions, most of which were not cost intensive, most progress is made as the result of initial development in other areas of science.

The next decade:

The extremely rapid growth of computer science and applications is just beginning to have an impact on dentistry. The business applications are being accepted in larger dental offices, but few solo practices have used computers to an optimal degree. The clinical applications have been even less noticeable. However, it is my feeling that this is about to change. Such changes will probably not be implemented in smaller offices or in the offices of dentists that have practiced for over twenty years. Furthermore, major change will not be possible until these concepts are taught in dental schools, and the electronic equipment made a part of routine care in this learning environment.

Many dentists, especially those practicing longer than ten years have a basic lack of understanding of computer use, and there is a resistance to learning. Such resistance is primarily born of fear of the unknown. Those who overcome this reluctance usually find computer use addictive and essential. The lack of understanding must be overcome during the professional training period. Thus, if computer technology is to be broadly applied, it must be embedded in the general dental learning experience.

intrusion of the computer into the dental operatory, as monitors become routine for the display of radiographs.

Expert systems for dentistry seem a natural application. Such programs have begun to emerge (Int J Pros, 1988;1(3):268-280) more rapid development of other programs seems essential. Such "artificial intelligence" applications will become routine for the expansion of the information base of the general and specialist practitioners. The increasing litigious nature of the patient population, fueled by an unrestrained legal profession, makes such information bases essential. It is known that the Japanese have several such systems (diagnosis of oral pathosis and design of partial dentures) and many more will follow.

Imaging procedures will become the routine method of gathering and archiving patient data. The visual image is much more accurate and conveys substantially more information than written records can. Such images will also be manipulated by the dentist to covey to the patient the predicted treatment outcome, to portray various aspects of therapy choices, and to convey to the patient information of their own disease. Such imaging procedures may become essential, if insurance carriers are to demand such documentation. Such a demand would, in my estimation, be reasonable.

Specific imaging procedures will also be used to gather, analyze and convey information for dental laboratory procedures. One dental spectrophotometer has been developed (Francois Duret) and the appearance of others is assured. Such devices, when refined, will make tooth (and skin) color analysis and fabrication of restorations a scientific procedure rather than the error prone methods now used.

Several imaging and milling devices (CAD/CAM) are being developed and one is commercially marketed. The CEREC system (Mormann/Brandestini, Zurich, Switzerland, marketed through Siemens) images inlay preparations and mills out ceramic inlays. This device is limited to fabricating the dental surface, and the occlusal area must be formed by the dentist. The Minnesota System (Dianne Rekow) had been based on a 35mm camera/ endoscopic probe concept but has recently been converted to laser imaging. Although several years from being marketed, this system offers more complex application than does the CEREC system. The Japanese have ongoing research on at least 4 CAD/CAM applications.

Certainly the most fully developed is the Duret system (marketed by Hennson Intl, Viennes, France). Dr. Duret has been appointed a Professor of Research at the University of Southern California school of Dentistry and will assume full time duties there in July of 1989. This will mark the initiation of a clinical CAD/CAM program for USC. The Duret system uses a very sophisticated laser imaging system, a DEC computer for analysis and manipulation of the image, and a very precise machining device for the fabrication of single crowns and short span fixed partial dentures. Such units can be milled from porcelain (Dicor cast glass-ceramic) metal, or the inventors own formulation of a oriented fiber reinforced composite resin. The system has been shown for market at a national convention in France last November. Dr. Duret also has