II. THE LIXISCOPE

A. THE LIXISCOPE CONCEPT

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The principle of the Lixiscope is extremely simple. (Figure 1) It is based on a modular approach toward X-ray imaging where the three major components are physically independent entities, and therefore easily replaceable and interchangeable. The three major components are: the X-ray source, the converter phosphor or scintillator, and the microchannel plate visible-light image intensifier. The X-ray image of an object formed by the X-ray source falls onto the converter phosphor or scintillator which converts the X-ray image into a visible-light image. This visible-light image is then intensified by a factor of 10^5 or more by a high-gain microchannel plate visible-light image intensifier whose output can be viewed directly, photographed, or coupled to other imaging devices. Because of the high gain of the microchannel plate image intensifier, it is possible in some applications to use a radioactive source instead of an X-ray machine. In this manner, the whole X-ray imaging device becomes completely portable.

In the Lixiscope prototype, a "point" radioactive source is inside a shielded source holder. (Figure 2) A finger-controlled mechanism unshields the source to collimate the radiation onto a converter phosphor which is shielded from ambient light, but is optically coupled to the night vision image intensifier. Because of the source collimation and two layers of lead glass in the intensifier, no significant radiation above natural background reaches the viewer. The Lixiscope is powered by a single 2.7 volt battery in the handle.

Since its inception, there has been a large interest in the Lixiscope. Because of its small size and portability, there are many potential medical and

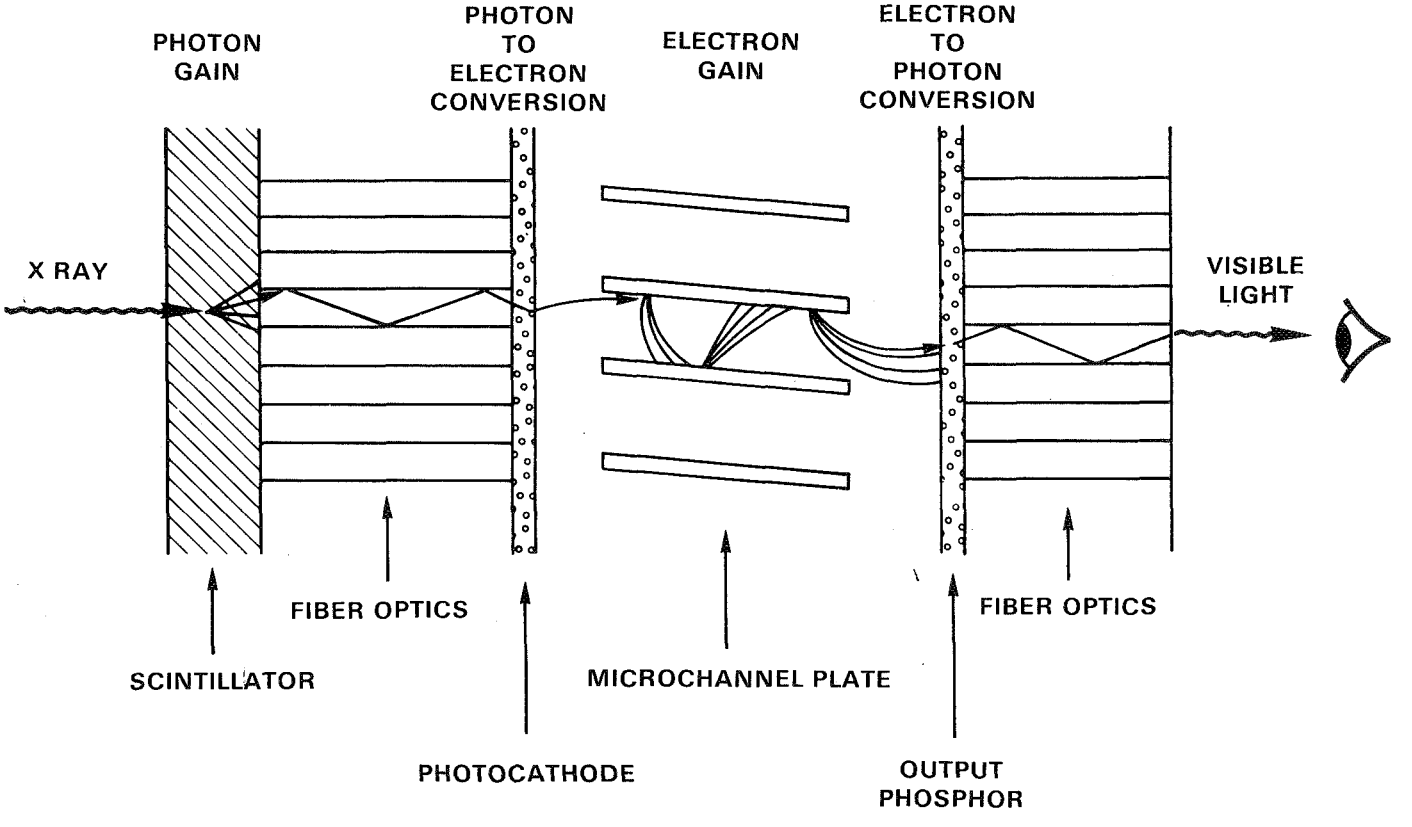

Figure 1. Principle of the Lixiscope

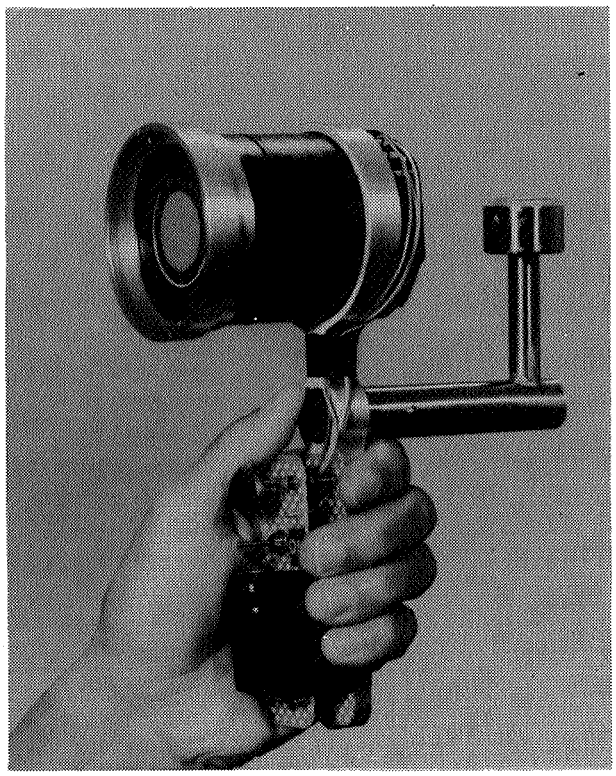

Figure 2. The Lixiscope Prototype

industrial applications. During the past year, experts in some areas of medicine and medical physics have, on a rather limited scale, tested the prototype Lixiscope. The preliminary impressions and evaluations of the potential applicability, advantages, limitations, as well as shortcomings of the Lixiscope in the respective fields are described in this report. There have not been any formal large-scale clinical evaluations of the Lixiscope. This conference can be considered only as an initial effort in this direction.

To put the Lixiscope in its proper perspective, the following characteristics should be considered.

1. The Lixiscope is a small-sized, fully portable fluoroscope.[1-4] As such, its most promising applications are likely to be in those situations where large size is not important but portability is, such as where electricity is not available or where easy maneuverability is necessary. Therefore, it will not replace or duplicate the functions of existing X-ray imaging devices, which are large-sized and non-portable. There are areas of overlap where the Lixiscope can serve as a complement to the larger instrument.
2. When performance characteristics such as image quality and dose rates associated with the Lixiscope are considered, one should take into account the specific manner in which it is to be used. In this regard, publications may have been misconstrued by implying that the Lixiscope is the only low-dose imaging device, or that it can achieve dosage reductions of 10^3 times in all applications. This is not the case. There are other existing devices and methods which have equal performance characteristics at low-dose levels comparable to the Lixiscope. However, in fluoroscopy, the Lixiscope not only achieves these performance characteristics simply and efficiently, but also in an extremely compact, rugged, and *fully portable* manner. Small, portable fluoroscopy is the most important characteristic of the Lixiscope.
3. Because the Lixiscope is essentially a fluoroscopic device for real-time X-ray imaging, the best way to present the real-time images would be in the form of a movie or a video tape. However, in the accompanying photos, the fluoroscopic images were recorded on instant-processing film. As such, they are not direct X-ray radiographs, and should not be compared with the resolution and quality of X-ray radiographs.
4. The prototype Lixiscopes used for these evaluations were constructed entirely from off-the-shelf items. No effort was made to optimize their performance for a given application.

References

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