TECHNOLOGY

Color Laser Stores Data

A new memory-storage system grows in capacity with every additional color used from a multicolored laser beam—By Jonathan Eberhart

➤ A MANY-COLORED ray of light will soon enable scientists to store as many as 100 million bits of information in a single square inch of photographic film.

The secret is in a device that singles out the desired color from the ones in the intense beam of a laser. Called a wavelength selector (since the wavelength of light determines its color), it can make as many as 125,000 color choices per second.

Combined with several other far-out inventions, the selector becomes the heart of a memory-storage system that grows in capacity with every additional color.

Developed by International Business Machines Corporation, it enables bits to be stacked on top of one another without taking up additional space.

"Memories" in the new system are stored on special photographic plates. Locating the proper spot on the plate for each memory is the job of a previous IBM invention called a beam deflector, which is so accurate that it can single out more than 130,000 separate spaces in an area the size of a match head.

To "plant" a memory, then, a light beam starts in the laser. It goes through the selector, which uses crystals to filter out unwanted colors, through the deflector, which aims the beam, and on to the photographic plate.

Even the plate embodies its share of inventions. One is very recent; the other almost 60 years old.

The older invention is that of a Frenchman, Gabriel Lippmann, who won the Nobel Prize in Physics for it in 1908. Unaided by lasers or wavelength selectors, he developed the color-stacking principle using only crude arc lamps.

Lippmann's principle is based on the fact that light waves going in one direction interfere with those coming the opposite way. By putting film emulsion on a mirrored backing, he was able to "photograph" the interference patterns of light "going and coming" through the emulsion. These patterns, which are characteristically different for every color, are in the form of "nodes" or tiny disks, stacked along the beam of light.

In a memory unit, a decoding device would "read" the spacing between the disks in order to see what colors were present.

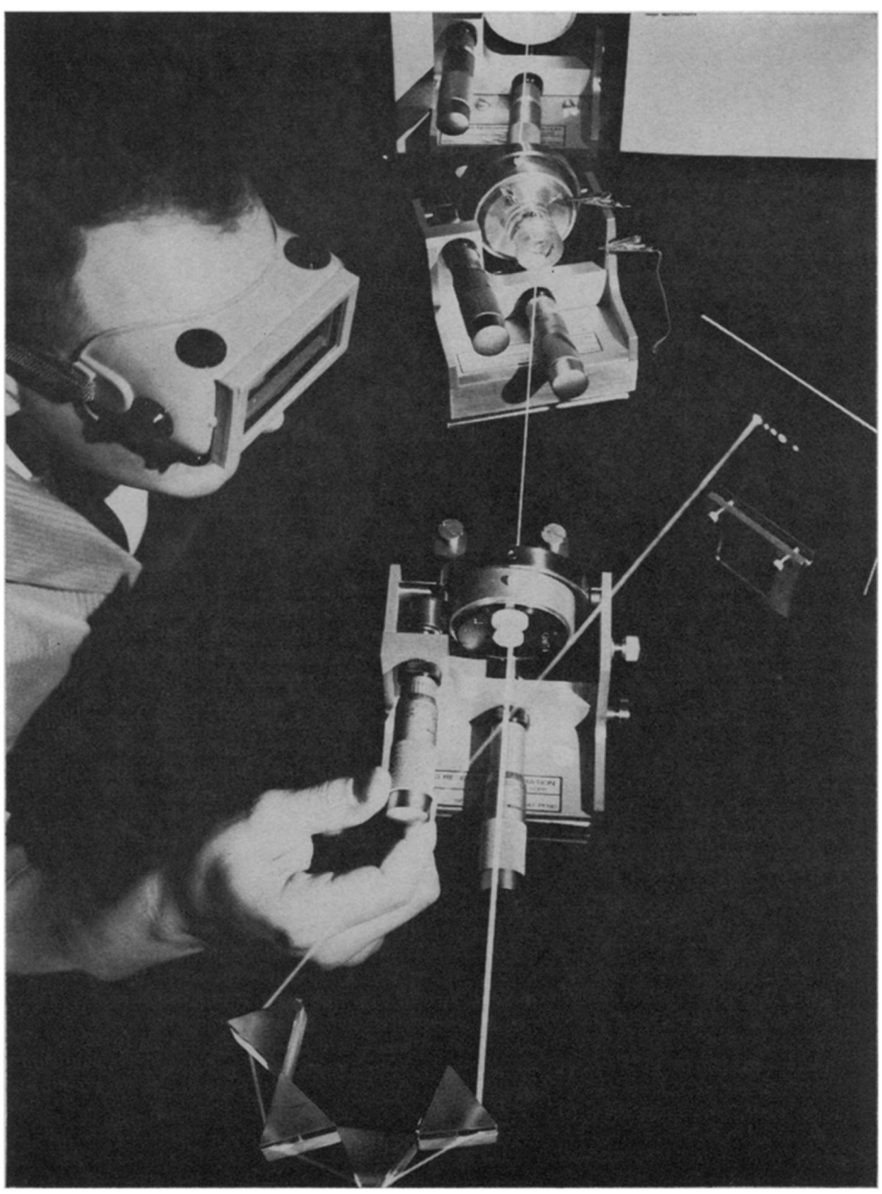
The other invention is called photochromics.

It is simply a way of making plates that turn dark when exposed to light, then lighten again when the light is removed. IBM's variation would turn dark from one color, lighten from another.

The two inventions have different purposes. Lippmann's is permanent, for "read only" files that cannot be erased. These would include mathematical tables, library material, etc. A photochromic spot, however, will fade after a few seconds, even if not erased by another color of light. Photochromics, therefore, are useful only for brief storage—perhaps long enough for a computer to use the data in processing—unless each spot is constantly renewed.

All of IBM's equipment is so accurate that the only limit to the number of bits storable in one spot appears to be the number of colors obtainable in a laser beam. IBM's best is eight, though they have gotten as many as 10 from other light sources.

• *Science News, 90:51 July 23, 1966*



IBM

A CHOICE OF COLOR—A laser color selector, developed by International Business Machines Corporation, operates at electronic speeds and determines which of several colors a multicolor laser will generate and emit. Here a light beam travels through the selector (center), through prisms (lower center) and to a screen (right center). The prisms are not part of the selector but serve in this multiple exposure to separate dots on the screen. Dr. Millard A. Habegger of IBM's development laboratory in Poughkeepsie, N.Y., is making a manual adjustment.