BY CARL J. BERGQUIST

# In the beginning there was coherent light

*Build a basic experimenter's laser. You'll put it to work performing a variety of experiments we will present in future columns.*

THIS NEW ONGOING COLUMN BEGINS BY PRESENTING A BRIEF HISTORY OF LASERS, SOME BASIC THEORY, AND DETAILS OF HOW TO BUILD A LASER YOU CAN USE TO CONDUCT A WIDE VARIETY OF EXPERIMENTS THAT will be presented in future columns.

**WARNING! ! !**

**This article deals with and involves subject matter and the use of materials and substances that may be hazardous to health and life. Do not attempt to implement or use the information contained herein unless you are experienced and skilled with respect to such subject matter, materials and substances. Neither the publisher nor the author make any representations as for the completeness or the accuracy of the information contained herein and disclaim any liability for damages or injuries, whether caused by or arising from the lack of completeness, inaccuracies of the information, misinterpretations of the directions, misapplication of the information or otherwise.**

In the early 1900's, Albert Einstein published a paper addressing the properties of what he called stimulated emission of radiation or SER. His theory explored the principals of photon production through inner atomic activity. It solidly laid the groundwork for what is obviously one of the most important inventions of this century; the "LASER" the anacronom for light amplification by stimulated emission of radiation.

It wasn't until the 1950's that Bell Laboratories began to search for laser applications. Earlier research was hampered by financial restrictions, the demanding needs of the military during two world wars, and the perception by many that the final result would amount to little more than a fancy flashlight. In the end, however, all the development frustration, time, and money expended to produce that first blast of laser red light, from a rod of synthetic ruby crystal, was worth the wait.

In the forty years since its introduction, lasers of all types and varieties have become an important part of our lives. They are used by surveyors to measure distances accurately, in manufacturing plants to control the smoothness of surfaces with great precision, and they even show up in such everyday places such as automobile speed traps, CD and videodisc players, and electronic pointers used by lecturers.

## Laser light theory and properties

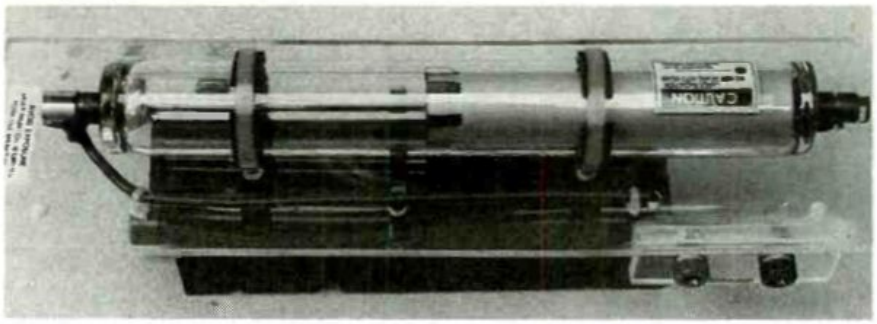

**FIG. 1**— LASER TUBE CLOSE UP. This one is the Spectra-Physics model No. 088. It is shown mounted on a Plexiglass platform with the high-voltage power supply directly below it.

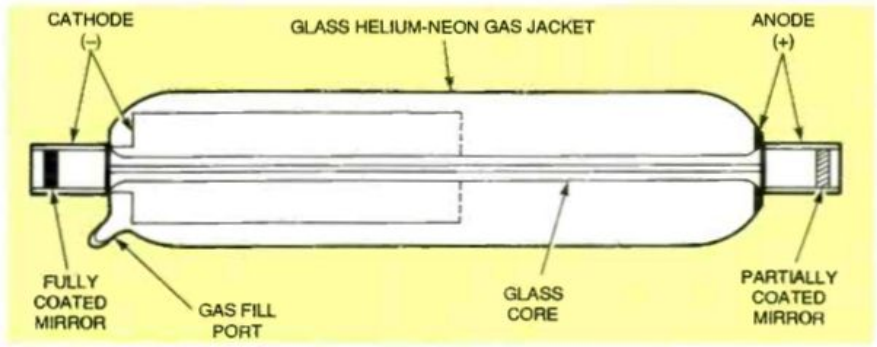


**FIG. 2**— BASIC DIAGRAM OF AN He-Ne laser tube. Some tubes have metal ends instead of the solid glass envelope. The glass fill port is used during manufacturing to charge the tube.