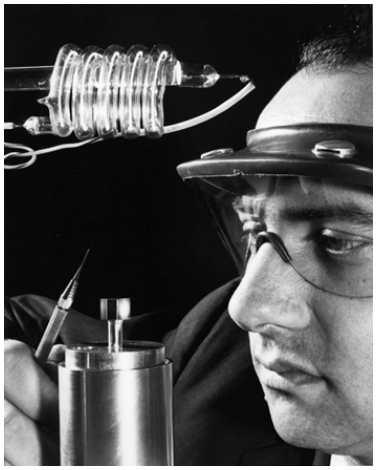
50 years of laser

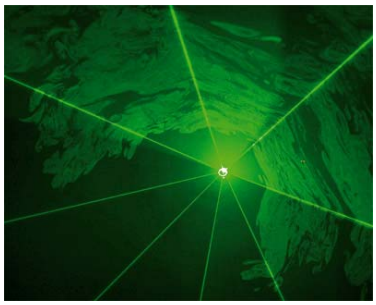
When the first laser was taken into operation in 1960, maybe only some very skilled scientist had an idea of how important this invention would become for mankind. The journal CERN Courier states in a 2010 edition that lasers and circular particle accelerators will even be the most important tools for scientific discovery within the close future.



Anyhow, the breakthrough in 1960 did not come unpredicted. Initially, Albert Einstein laid the theoretical basis leading to the first maser (as lasers were called at that time) by Charles H. Townes in 1954 and to the first laser by Theodore Maiman in 1960. When Maiman successfully tested his ruby laser for the first time on 16 May he found the solution for a problem which needed to be searched for. His short article about this milestone seemed to be so trivial that the journal Physical Review rejected the article. His article was not published until August, 1960 in the journal Nature.

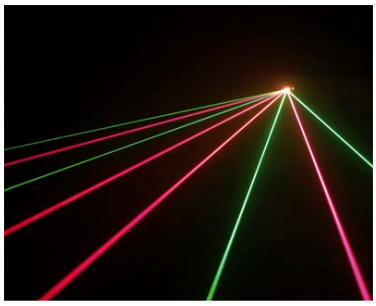
Nevertheless, there was a kind of race between different institutes in the whole world about the first fully-functional optical maser which later even led to a patent dispute. Finally, Townes and two Russian colleagues were granted the physics Nobel prize for their pioneer work in 1964.

After the ruby laser, a solid material laser, further kinds of lasers were developed which could be categorized in the kind of used laser-active material: next to solid material, it is liquids, gas and semiconductors. The type of pumping is also different: solid material and liquids can be moved by shooting photons, gas by electric discharge and semiconductors by injecting energetic load carriers.

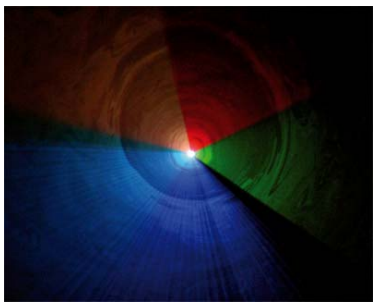


All of these have three main processes of interaction between light and material in common: moving and spontaneous or stimulated emission. This is where the acronym "laser" comes from: light amplification by stimulated emission of radiation (whereas the "M" in maser comes from microwave). The main characteristics are also common for all kinds of lasers: they have a very narrow frequency spectrum, a high parallelism of their radiation, a very narrow radiation angle and an extremely long coherence length, i.e. a very low radiation interference.

The first practical use was the laser printer in 1971 and the barcode scanner in 1974. In the entertainment industry, especially gas lasers and even more powerful semiconductor lasers are being used. Gas lasers had their highest popularity in the 1980s when e. g. Deep Purple toured with a futuristic laser show where Ludwig van Beethoven danced at the guitar solo of Ritchie Blackmore. At the same time, CD players with their laser diodes replaced vinyl records and revolutionized the music industry.



Theses days lasers are a irreplaceable permanent guest in the entertainment industry. In this context it is essential to emphasize, that laser beams might be harmful to eyesight. That is why lasers starting from **class 3** must be operated by someone with a laser safety certificate. The safety of a laser show requires responsibility and experience which cannot be learnt in a one-hour course. Detailed knowledge about the potential danger and respective action is the best prevention. Facts that are valid for the complete field of entertainment technology.



We do not need to worry about the laser's future: the laser will lead physicians worldwide to new insights, e.g. in the field of molecular physics. The theoretical basis of circular particle accelerators where lasers create polarized positrons that should collide with electrons is already available. It may also be possible to collide gamma radiation but the required high-power lasers need to be developed first. The physicians are optimistic to succeed doing so very soon and at home they may enjoy the colorful laser beams or listen to their favorite music from CD.

Sources:

- Klinger: Laser - Grundlagen und Anwendung, ISBN 3-440-00304-3
- CERN Courier, Volume 50 Number 10, December 2010, Seite 13ff.