# An overview of Laser discovery and its relationship to Dentistry

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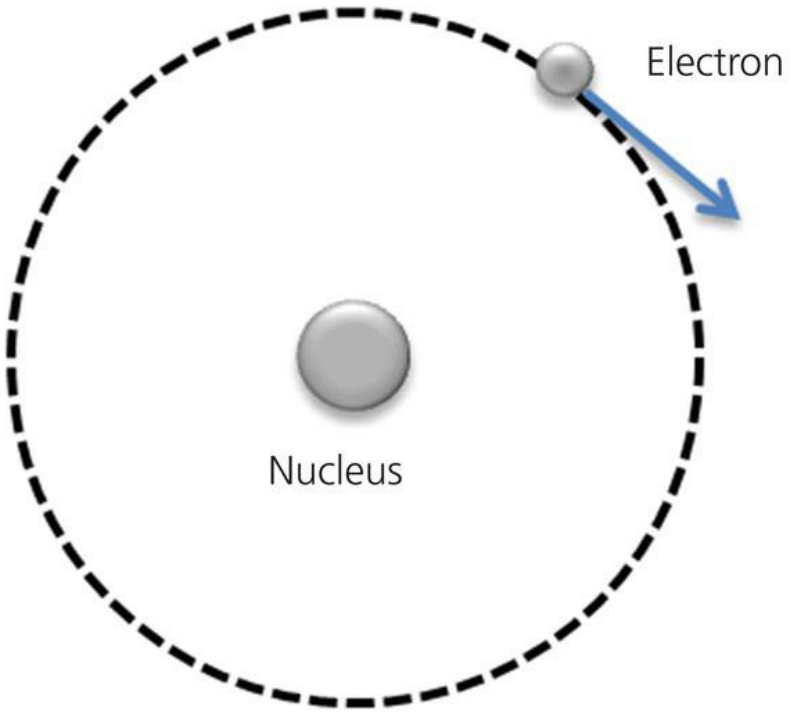
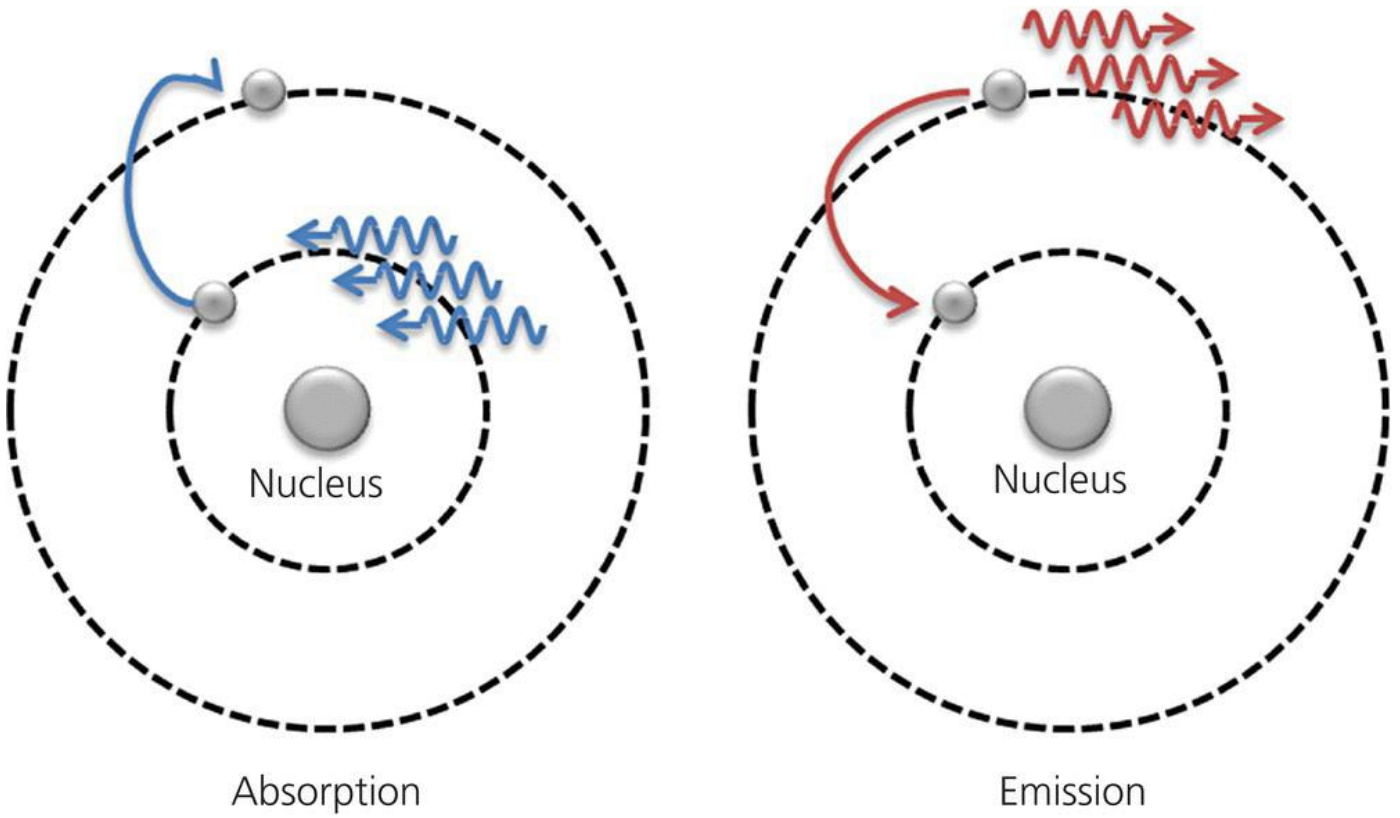
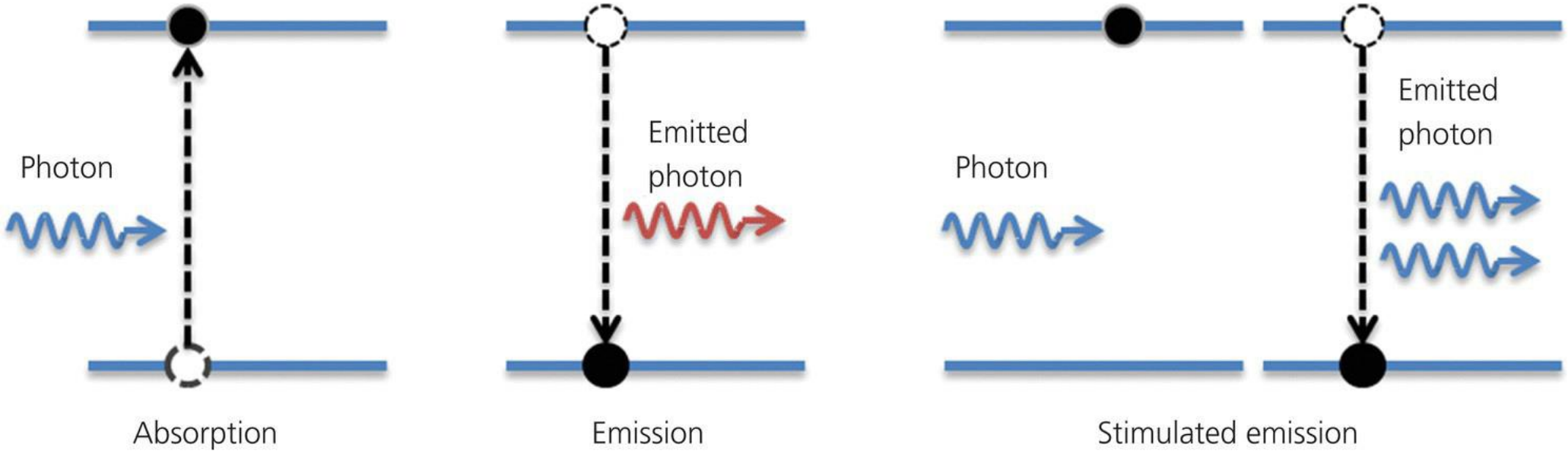
The nucleus's size would be smaller than the atom's size (100 000–10 000 times smaller)." The question then was: if the atom has a nucleus with an expressive positive charge, how is it that matter is usually neutral? Rutherford answered the question by proposing that the positive charge of the nucleus is balanced by particles with a negative charge, called "electrons," which revolve around the nucleus. He proposed a dynamic balance, as illustrated in Figure, because if electrons were not moving, they would be attracted to the nucleus.

Schematic of the atom according to Bohr.

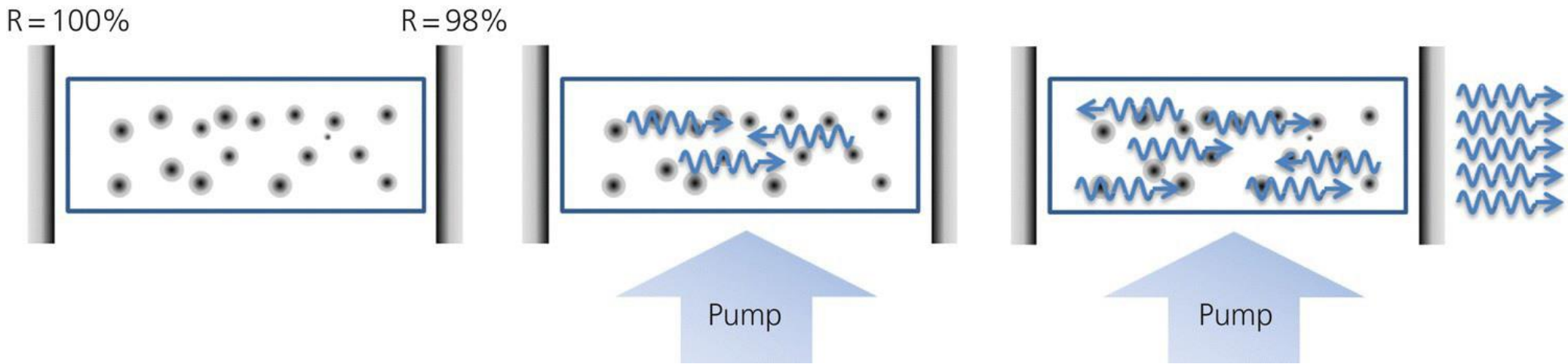





Representation of absorption and emission of photons by an electron, with transition to an energy level farther from (absorption) or closer to the nucleus (emission).



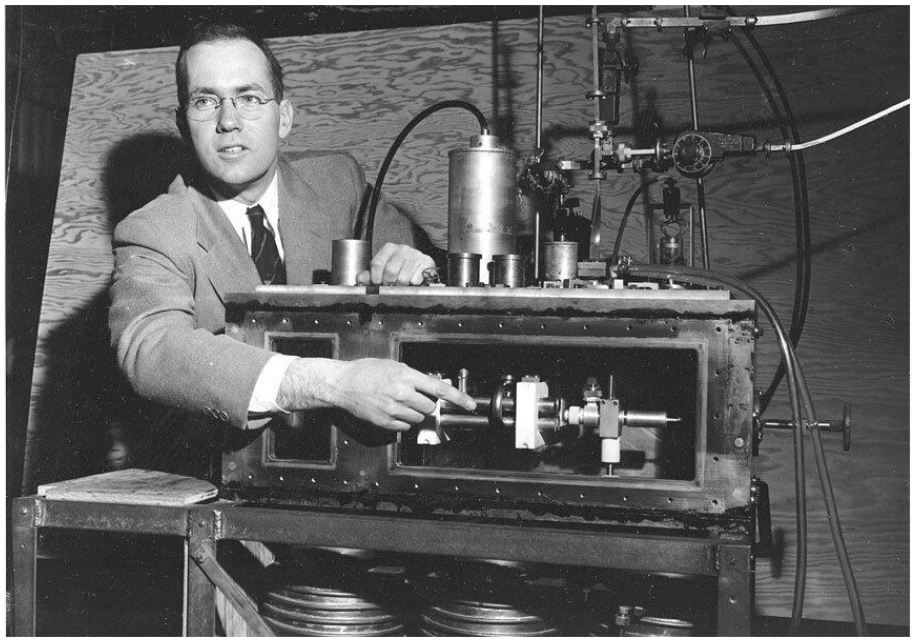

The figure shows the three processes that have been described. The schematic on the left represents the absorption process, where a photon interacts with the atomic system and is absorbed. In the middle schematic, emission is represented, where the atomic system, which is in the excited state, emits a photon and an electron is demoted to a lower energy level. On the right, stimulated emission is represented, where a photon stimulates the emission of a second, identical photon.




Schematic showing the generation of laser light. The active medium

# MASER

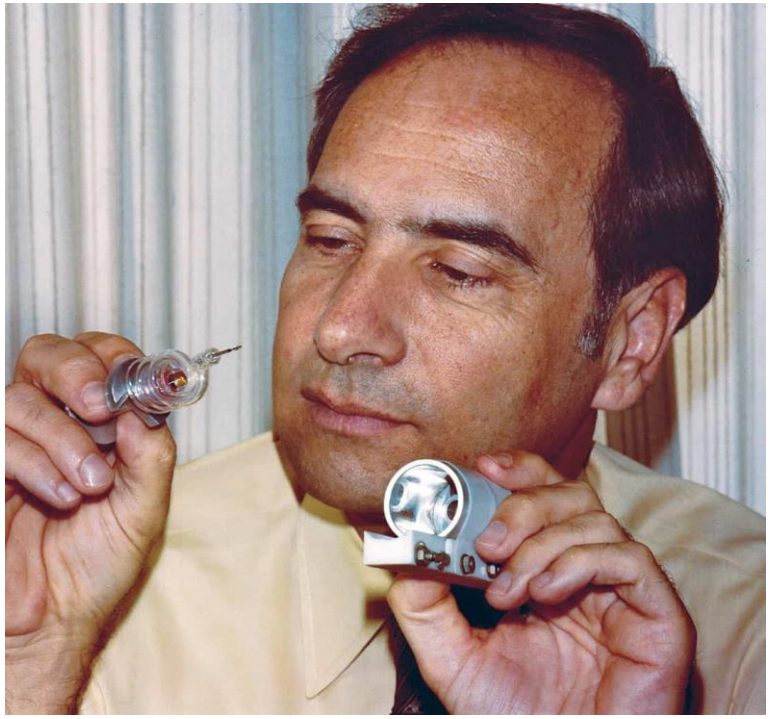
American physicist Charles H. **Townes** began working on microwave frequencies and proposed in 1951 the concept of a **MASER**, an acronym he and his students coined for **M**icrowave **A**mplification by **S**timulated **E**mission of **R**adiation.



# LASER

Another American physicist Theodore H. **Maiman** accomplished his goal in 1960, and his efforts in visible region of EM radiation result finally a brilliant red spot appeared on the poster board by using Ruby. The **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation (**LASER)** was born.

**Theodore H. Maiman** with the first laser prototype



**Maiman** submitted a paper reporting his evidence for a ruby laser to **Physical Review Letters**, the leading U.S. journal for publishing new physics research. Its editor rejected the manuscript, perhaps mistakenly believing it was just a follow-up to previously published work on masers. Maiman then submitted his report to the British weekly journal **Nature**, which accepted it immediately and published.


Soon after his invention was demonstrated, researchers began to examine Maiman’s vision of the laser as a useful instrument for medicine. Their efforts laid the foundation for the present clinical use of lasers in ophthalmology, neurosurgery, urology, oral surgery/dentistry. Then most of laser types known today are appeared within 4 year after.

In 1961, a laser generated from crystals of yttrium-aluminum-garnet treated with 1-3% neodymium (Nd:YAG) was developed. In 1962, the argon laser was developed, whereas, the ruby laser became the first medical laser to coagulate retinal lesions, when it was used in 1963. In 1964, Patel at Bell Laboratories developed the $CO_2$ laser.

The pioneer in laser surgery, ***Leon Goldman*** wrote in 1967: The dentist must work with the biologists and the physicians and the engineers engaged in laser research and not wait until other disciplines do the work for them. Almost 2 decades later, a dental practitioner heeded Dr. Goldman's call to develop what became the first laser designed specifically for general dentistry. On May 3, 1990, the first laser designed specifically for general dentistry Michigan dentist ***Dr. Terry D. Myers*** and his ophthalmologist brother ***Dr. William D. Myers***. Nowadays diode lasers are being extensively used in the field of dentistry.

# Laser and Dentistry

Lasers have revolutionized the field of dentistry, allowing for improved accuracy and precision in performing a variety of dental procedures. Lasers have been used in dentistry since the early 1990s and have become an essential part of modern dental practice.

# Types of Lasers

There are several types of lasers used in dentistry. These include carbon dioxide lasers, diode lasers, erbium lasers, and neodymium-doped yttrium aluminum garnet (Nd:YAG) lasers. Each laser can be used for a different purpose and has its own advantages and disadvantages.

# Applications of Lasers in Dentistry

Lasers can be used in many different applications in dentistry, including cavity preparation, hard and soft tissue ablation, tooth whitening, and dental implant placement. Lasers are also used for pain management and in biopsy procedures. Each application can provide a more precise and less invasive treatment than traditional dental methods.

# Advantages of Lasers

There are several advantages to using lasers in dentistry. Lasers are more precise than traditional dental tools, which reduces the risk of damage to surrounding tissue. They also reduce the need for anesthesia and can reduce recovery time. Lasers can also kill bacteria more effectively than traditional methods, which can reduce the risk of infection.

# Disadvantages of Lasers

While lasers have many advantages, there are also some disadvantages. Lasers are expensive and require specialized training to use. They also emit radiation, which can be harmful in large doses. Additionally, lasers can cause dry mouth and can be damaging to the eyes if proper safety measures are not taken.