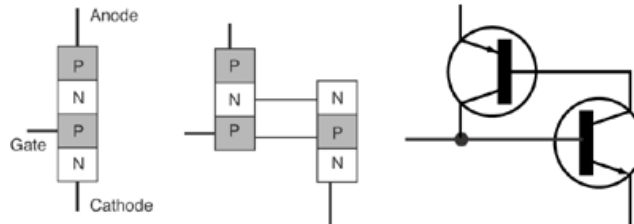


Etymology of *thyristor*

The word *thyristor* is a combination of the words *thyratron* and *transistor*. The word *thyratron*, in turn, was originally a trademark *Thyratron* registered by the General Electric Company and invented by G. E. scientist Albert W. Hull in 1929¹. Finally, *Thyratron* is a combination of the Greek prefix *thyr-* and suffix *-tron*. The

The prefix *thyr-* is from the Greek word *thura* (*θυρα*) meaning “door” or “gate.”



Edward L. Owen² “The name *thyratron* is derived from the Greek, *thyra* being equivalent to “door” (*θυρα*), i.e., to open a door (gate), and “tron” being a [Greek] suffix indicating instrument. The name *thyristor* is also derived from the same Greek root for door, except combined with a suffix “istor,” associated with modern solid-state devices, as in transistor. (The transistor having been introduced in 1948.) In 1957, GE introduced a new device (later known as a *thyristor*), but their engineers used the name *silicon-controlled rectifier* (SCR). Lyle Morton explained that, although *thyristor* was a logical extension of *thyratron*, GE engineers resisted adopting this newer name when it was introduced in 1965, preferring to use the older term SCR. Some old-timers still use this archaic term and confusion results. If a thyratron was the gate-controlled rectifier that operated on the principles of gas discharge devices, a thyristor was the modern equivalent solid-state device in the same way that a transistor was the solid-state equivalent to earlier vacuum tubes.”

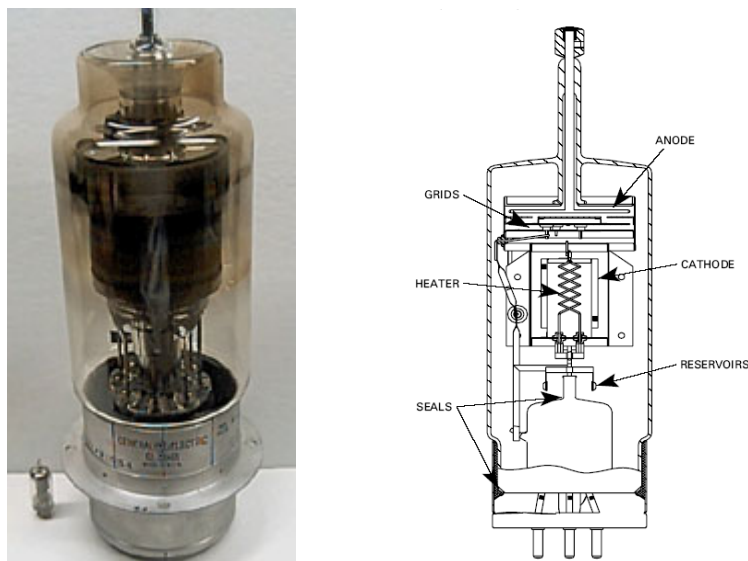


Figure 1: Left: Giant GE hydrogen thyratron, used in pulsed radars, next to miniature 2D21 thyratron used to trigger relays in jukeboxes. Right: E2V Technologies hydrogen thyratron

“The hydrogen thyratron is a high peak power electrical switch which uses hydrogen gas as the switching medium. The switching action is achieved by a transfer from the insulating properties of neutral gas to the conducting properties of ionized gas. Exploiting the basic principles of gas discharge physics, the hydrogen thyratron is designed to withstand a high voltage in the ‘off’ state, to trigger at a precisely defined time, to pass high peak current pulses in the ‘on’ state and to recover rapidly to the ‘off’ state to allow high repetition rate operation.

“Hydrogen thyratrons have a high voltage capability which extends up to 200 kV and a peak current capability which extends up to 100 kA. Certain designs can handle partial or full reverse conduction. Pulse widths from tens of nanoseconds to hundreds of microseconds are readily achieved. Pulse repetition rate capability up to 70 kHz has been demonstrated. Thyratrons are robust and forgiving devices which can tolerate fault conditions well in excess of normal ratings.”¹

The word *transistor* is a combination of “*transfer*” and “*resistor*”. While a single PN junction is useful, it also has its limitations. It can either conduct current or not, but can't really control how much current it will conduct. A transistor can control the current. Because of the way this device operates to transfer current (and its internal resistances) its name is a combination of the words "transfer" and "resistor:" transistor.

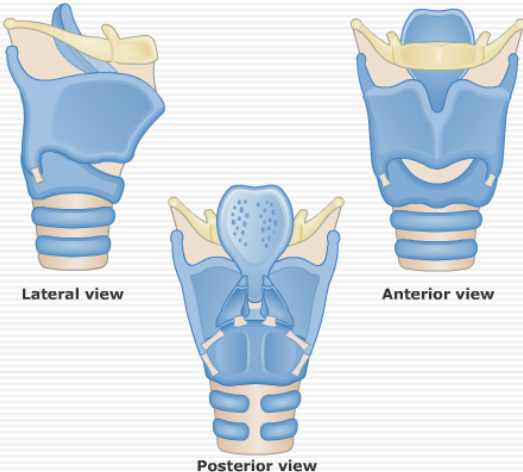
Another word that comes from the Greek word *thura* is *thyroid*. The Greek physician Galen (129 – circa 199 A.D.) used the phrase *chondros thyreoiedes* (*χονδρος θυρροειδης*) to describe the "Adam's apple" in the throat. *Chondros thyreoiedes* means "shield-shaped cartilage," and *thyreoiedes* comes from *thyreos*

¹ E2V Technologies, “Hydrogen Thyratrons Preamble”, www.e2vtechnologies.com

(θυρεος), an oblong, door-shaped shield (from *thyra* "door"), and *eidos* (ειδος) "form, shape." To the early Greeks, the thyroidal cartilage (Figure 2) resembled a soldier's shield, which, in turn, resembled a door.

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Lateral view **Anterior view**

Posterior view

TUTORIAL:
The walls of the larynx are supported by nine (9) cartilages, which are linked together by ligaments and connective tissue membranes.

Most prominent is the **thyroid cartilage**, which consists of two plates of hyaline cartilage arranged in a wedge-shape. At the back of the larynx, the plates are separated, and in front they are fused. At the top of the fused border, the thyroid cartilage extends anteriorly, forming the **laryngeal prominence** or "Adam's apple".

Superior to the thyroid cartilage is the **hyoid bone**. Although connected to the larynx by the thyrohyoid membrane, the u-shaped hyoid bone primarily serves as a location for the tongue muscles to attach.

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Figure 2: Thyroidal Cartilage

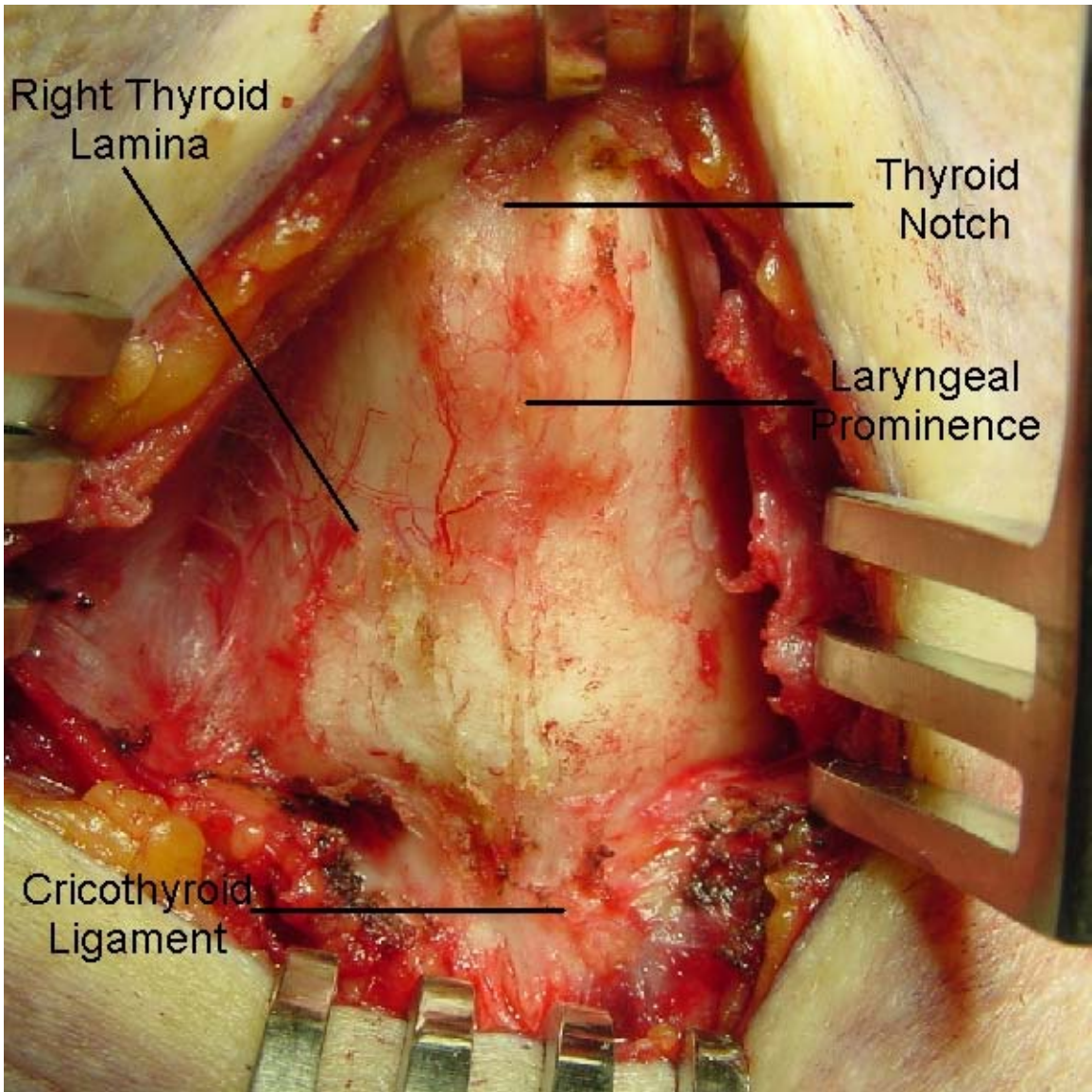


Figure 3: Thyroidal Cartilage

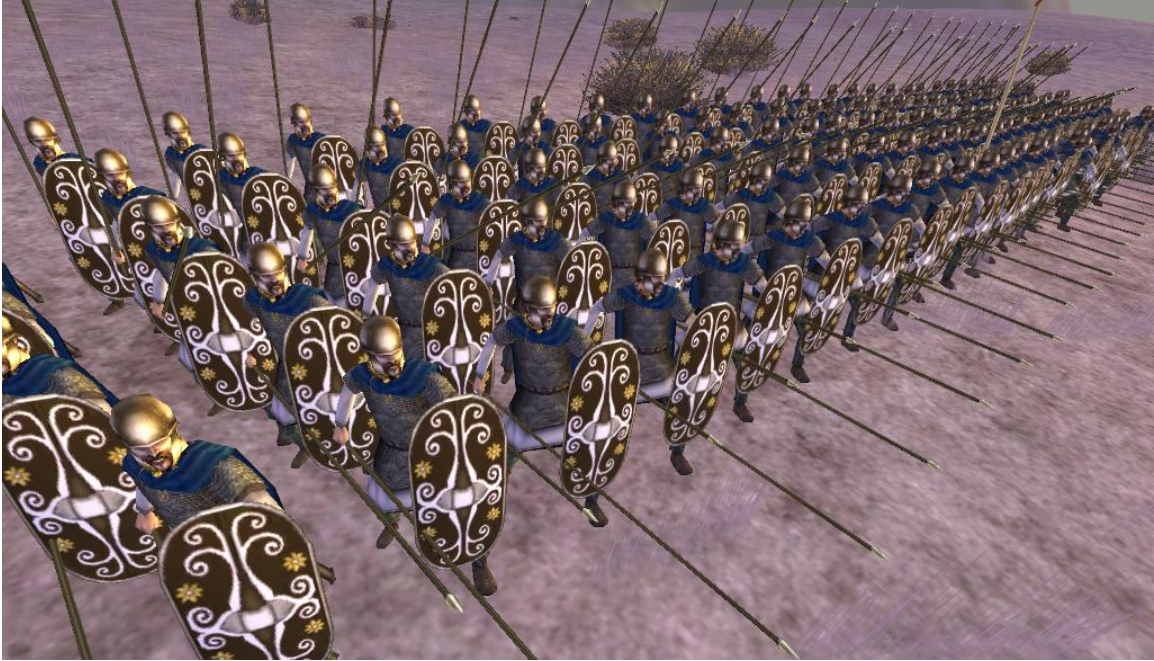


Figure 4: The Greek *Thureos* (*θυρεος*)

¹ Hull, Albert W. "Hot-Cathode Thyratrons," *General Electric Review*, 32, 231 (1929); 32, 390 (1929).

² Owen, Edward L. "New Science—New Language," *Industry Applications Magazine, IEEE*, Volume: 8 , Issue: 4, July-Aug. 2002.