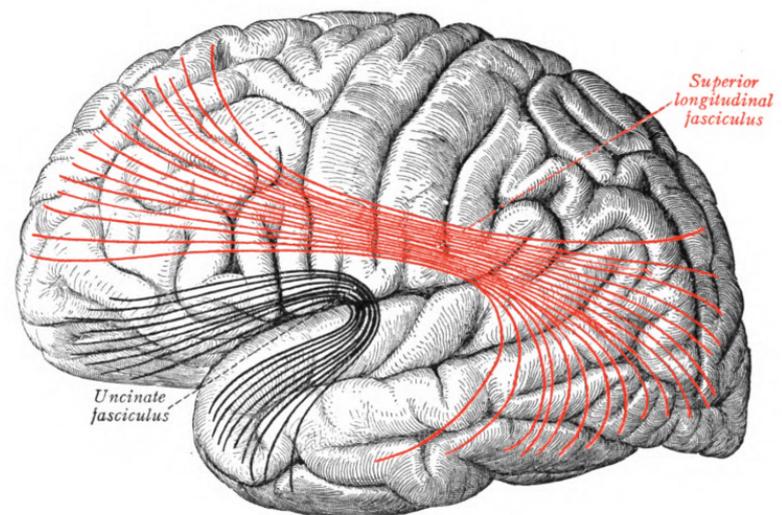


Superior longitudinal fasciculus



The superior longitudinal fasciculus (also called the superior longitudinal fascicle or **SLF**) is a pair of long bi-directional bundles of neurons connecting the front and the back of the **cerebrum**. Each **association fiber** bundle is lateral to the **centrum ovale** of a **cerebral hemisphere** and connects the **frontal**, **occipital**, **parietal**, and **temporal lobes**. The **neurons** pass from the **frontal lobe** through the **operculum** to the posterior end of the **lateral sulcus** where numerous neurons radiate into the **occipital lobe** and other neurons turn downward and forward around the putamen and radiate to anterior portions of the **temporal lobe**.

The description of human white matter **pathways** experienced a tremendous improvement, thanks to the advancement of **neuroimaging** and **dissection** techniques. The downside of this progress is the production of redundant and conflicting **literature**, bound by specific studies' methods and aims. The **Superior Longitudinal System** (SLS), encompassing the **arcuate** (AF) and the **superior longitudinal fasciculi** (SLF), becomes an illustrative example of this fundamental issue, being one of the most studied white matter association pathways of the brain. Vavassori et al. provided a complete illustration of this white matter fiber system's current definition, from its early descriptions in the nineteenth century to its most recent characterizations. They proposed a review of both **in vivo diffusion magnetic resonance imaging**-based **tractography** and anatomical dissection studies, enclosing all the information available up to date. Based on these findings, they reconstructed the wiring diagram of the SLS, highlighting a substantial variability in the description of its cortical sites of termination and the taxonomy and paratomy that characterize the system. They aimed to level up discrepancies in the **literature** by proposing a parallel across the various **nomenclature**. Consistent with the topographical arrangement already documented for commissural and projection pathways, they suggested approaching the SLS organization as an orderly and continuous wiring **diagram**, respecting a medio-lateral palisading **topography** between the different **frontal**, **parietal**, **occipital**, and **temporal gyri** rather than in terms of individualized fascicles. A better and complete description of the fine organization of **white matter** association pathways' **connectivity** is fundamental for a better understanding of brain function and their clinical and neurosurgical applications ¹⁾.

The aim of a study was to examine the **arcuate fasciculus** (AF) and superior longitudinal fasciculi

(SLF), which together form the dorsal language stream, using fiber dissection and diffusion imaging techniques in the human brain.

Twenty-five formalin-fixed brains (50 hemispheres) and 3 adult cadaveric heads, prepared according to the [Klingler method](#), were examined by the [fiber dissection technique](#). The authors' findings were supported with MR [tractography](#) provided by the [Human Connectome Project](#), WU-Minn Consortium. The frequencies of gyral distributions were calculated in segments of the AF and SLF in the cadaveric specimens.

The AF has ventral and dorsal segments, and the SLF has 3 segments: SLF I (dorsal pathway), II (middle pathway), and III (ventral pathway). The AF ventral segment connects the middle (88%; all percentages represent the area of the named structure that is connected to the tract) and posterior (100%) parts of the [superior temporal gyrus](#) and the middle part (92%) of the [middle temporal gyrus](#) to the posterior part of the [inferior frontal gyrus](#) (96% in [pars opercularis](#), 40% in [pars triangularis](#)) and the ventral premotor cortex (84%) by passing deep to the lower part of the [supramarginal gyrus](#) (100%). The AF dorsal segment connects the posterior part of the middle (100%) and [inferior temporal gyrus](#) (76%) to the posterior part of the inferior frontal gyrus (96% in [pars opercularis](#)), ventral premotor cortex (72%), and posterior part of the middle frontal gyrus (56%) by passing deep to the lower part of the [angular gyrus](#) (100%).

This study depicts the distinct subdivision of the AF and SLF, based on cadaveric fiber dissection and diffusion imaging techniques, to clarify the complicated language processing pathways ²⁾.

Classification

[Superior longitudinal fasciculus classification.](#)

1)

Vavassori L, Sarubbo S, Petit L. [Hodology](#) of the [superior longitudinal system](#) of the human brain: a historical perspective, the current controversies, and a proposal. *Brain Struct Funct.* 2021 Apr 21. doi: 10.1007/s00429-021-02265-0. Epub ahead of print. PMID: 33881634.

2)

Yagmurlu K, Middlebrooks EH, Tanriover N, Rhoton AL Jr. [Fiber tracts](#) of the dorsal language stream in the human [brain](#). *J Neurosurg.* 2015 Nov 20:1-10. [Epub ahead of print] PubMed PMID: 26587654.

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