Windows to the Brain:
Axial Anatomy 2

Prefrontal-Subcortical Circuits
Cortical Association Tracts

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Right side of each section: Major cortical association tracts are labeled and color-coded to match the figure below. *

**Major Long Cortical Association Tracts**

- cingulum
- superior longitudinal
- superior fronto-occipital
- inferior fronto-occipital
- uncinate
- inferior longitudinal

**Brief guide to neuropsychiatric symptoms associated with injury to tract.**

**Superior Fronto-Occipital (Subcallosal) Fasciculus**
- Orbital & medial prefrontal cortex ↔ parietal cortex
- Akinetic mutism; disordered initiation & preparation of speech movements; transcortical motor aphasia; anomia & reduction of spontaneous speech with normal articulation

**Cingulum - Short Fibers**
- Cingulate cortex ↔ frontal, parietal, occipital & temporal cortex
- Anterior - lack of emotional affective response to pain; anxiety; OCD; depression; panic; akinetic mutism  
  **Posterior** - impaired integration of visuospatial & memory processing

**Cingulum - Long Fibers**
- Frontal cortex ↔ temporal cortex

**Superior Longitudinal (Arcuate) Fasciculus**
- Frontal cortex ↔ parietal, occipital & temporal cortex
- R - left hemispatial neglect; L - conduction aphasia (fluent aphasia with impaired repetition, mostly preserved language comprehension); ideational apraxia (can't carry out skilled movements and/or commands); depression; speech arrest; anomia  
  **Posterior** - transcortical sensory aphasia (impaired auditory comprehension, intact repetition & fluent speech)

**Uncinate Fasciculus**
- Orbital & polar prefrontal cortex ↔ anterior temporal cortex
- Deficits in retrieval of past information: R - episodic context-dependent memory, personal experiences, autobiographical; L - context-free memory, general knowledge of facts

**Inferior Fronto-Occipital Fasciculus**
- Ventrolateral & dorsolateral prefrontal cortex ↔ posterior temporal & occipital cortex
- R>L - impaired orienting of attention; visual recognition abnormalities; R+L - impaired pursuit eye movements; inaccurate reaching under visual guidance; impaired motion perception; R or R+L - impaired seeing/selecting in crowds; impaired spatial relations; visual agnosia & poor visual memory; impaired recognition of places & directions to get there; getting lost

**Inferior Longitudinal Fasciculus**
- Temporal pole ↔ occipital cortex
- Disorders in recognition (visual agnosia) impaired visual recent memory; R or R+L - impaired face recognition (prosagnosia), visual object agnosia, visual hypoemotionality if cue presented visually; R+L or L>R - contralateral deficit in color vision (hemiachromatopsia); L-bilateral misnaming of objects presented by touch (tactoverbal dysfunction)

Left side of each section: Tracts involved in major prefrontal cortical-subcortical circuits and major subcortical structures are labeled and color-coded to match the figures below.*

### Major Prefrontal - Subcortical Circuits

In psychiatry, the prefrontal cortex is generally divided into three principal areas. Each area has reciprocal connections with subcortical structures that form cortico-subcortical circuits.

<table>
<thead>
<tr>
<th>Dorsolateral circuit</th>
<th>Orbitofrontal circuit</th>
<th>Anterior cingulate circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>mediates executive functions such as organization, planning &amp; attention</td>
<td>mediates socially appropriate behavior, impulse control &amp; empathy</td>
<td>produces motivation by balancing the inhibitory input of the supplemental motor area with its own stimulus that supports wakefulness &amp; arousal</td>
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</tbody>
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### Major Subcortical Structures

This cartoon of a lateral view of the brain and skull shows the approximate positions and configurations of the major subcortical structures. The colors assigned in this figure are used in the sectional atlas to facilitate structure identification.

*Catherine H. Taber, Ph.D.*

Major Prefrontal-Subcortical Circuits

- Dorsolateral
- Anterior Cingulate
- Orbitofrontal

Major Cortical Association Tracts

- cingulum
- superior fronto-occipital
- inferior fronto-occipital
- uncinate
- superior longitudinal
- inferior longitudinal

Anterior Cingulate

Dorsolateral
Major Prefrontal-Subcortical Circuits

- Dorsolateral
- Anterior Cingulate
- Orbitofrontal

Major Cortical Association Tracts

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lateral ventricle
Major Prefrontal-Subcortical Circuits

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- Anterior Cingulate
- Orbitofrontal

Major Cortical Association Tracts

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Brain structures:

- Caudate
- Putamen
- Thalamus
- Lateral ventricle
- Fornix
Major Prefrontal-Subcortical Circuits

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- Anterior Cingulate
- Orbitofrontal

Major Cortical Association Tracts
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- Inferior fronto-occipital
- Uncinate
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Anatomical areas:
- Amygdala
- Basal forebrain
- Hippocampus
- Substantia nigra
- Mamillary body
- Hypothalamus