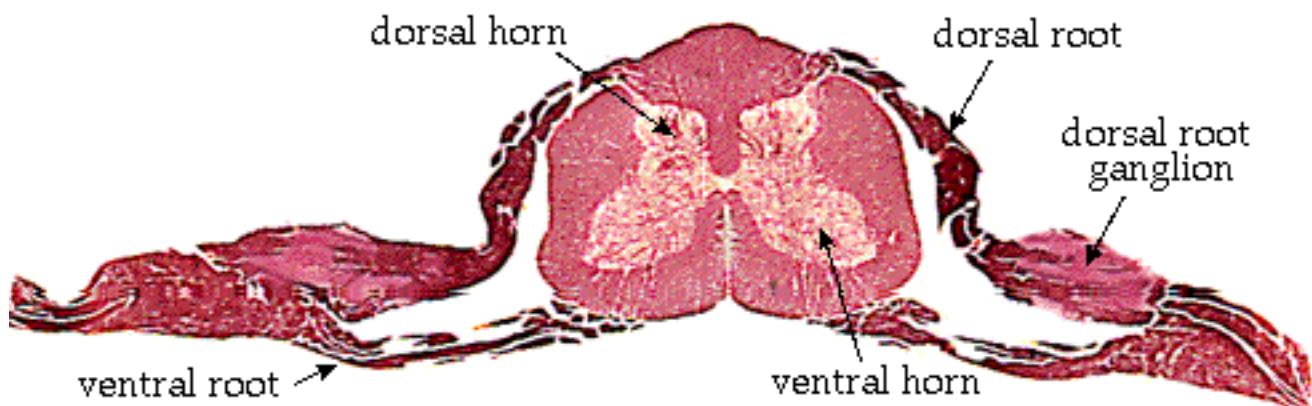


SPINAL MOTOR STRUCTURES

A. The spinal cord:

Although we usually study the spinal cord as a series of cross sections, it is important to remember that it is in fact a column, with continuous tracts and cell columns. However, the cord can be divided into segments by the nerve roots that come off of it; although the rootlets branch off nearly continuously, they coalesce into about 31 discrete nerves along the cord (8 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 1 coccygeal nerves). At each segment, rootlets appear to come out of both the dorsal and ventral halves of the spinal cord, as you see here:

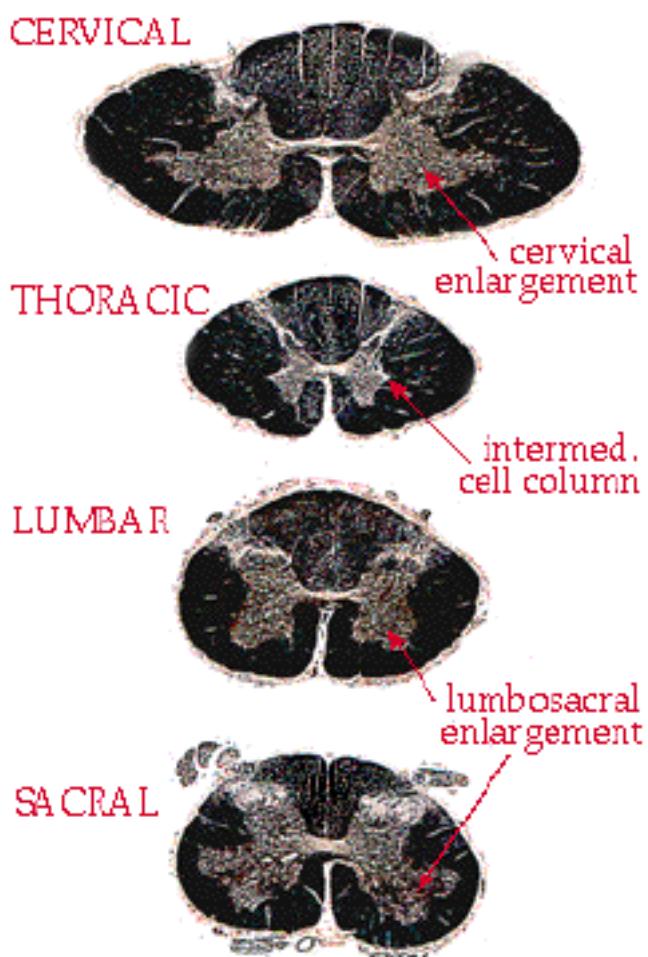


In fact, only the ventral roots are coming out of the cord - the dorsal roots are actually going in. Throughout the cord, the dorsal grey matter (**dorsal horns**) deals with sensory perception, and receives information from the periphery through the dorsal root. The **ventral horns** contain the **α -motor neurons**, whose axons exit the cord via the ventral roots and travel directly to the muscles.

Along the dorsal root is a collection of cell bodies called the **dorsal root ganglion**. Inside the ganglion are the cell bodies of all the receptor neurons that send processes out to the periphery. The free nerve ending in the tip of your finger that feels the paper cut actually has its cell body back in the dorsal root ganglion. As you can see from the picture, the dorsal root ganglion is actually located ventrally, but you can tell that it is part of the dorsal root.

B. Levels of the spinal cord:

By this time in the course you have probably noticed that different levels of the cord are different in shape. Could you identify the source of a section if you had nothing to compare it to? In general, you should be able to differentiate cervical from thoracic from lumbar from sacral. Here is a series of cross sections:



The first thing to notice is overall shape. Cervical sections tend to be wide and squashed looking, like an oval. Compare the cervical section to the round lumbar section.

The second thing to check for is a ventral horn enlargement. At segments that control a limb, the motor neurons are large and numerous. This causes enlarged ventral horns in two places: the lower cervical sections (C5-C8) and the lumbar/sacral sections. If you see an enlargement, you just need to differentiate cervical from lumbar. This can be done by shape (see above) or by proportion of white matter.

The amount of white matter relative to grey matter decreases as you move down the cord. This is logical - in the white matter of the cervical cord you have all of the axons going to or from the entire body, more or less. In sacral cord the white matter contains only

those axons going to or from the last couple of dermatomes - all other axons have "gotten off" at higher levels. This is why sacral cord looks like it has so much grey matter - really it has just lost all of the white.

So, in summary, here are the level cues so far: wide flat cord, lots of white matter, ventral horn enlargements = cervical. Round cord, ventral horn enlargements = lumbar. Small round cord, almost no white matter = sacral. And the remaining level, thoracic, is the easiest of all. Notice the pointed tips which stick out between the small dorsal and ventral horns. This extra cell column is called the intermediate horn, or the **intermediolateral cell column**. It is the source of all of the sympathetics in the body, and occurs only in thoracic sections.