THE TONGUE

1. The tongue is essential for _____, _____, and _____.
2. What two types of muscle is the tongue?
3. The tongue is covered by what membrane?
4. What separates the tongue into two sections?
5. What side of the tongue presents projections and what are the projections called?
6. Structurally, the tongue projections are made of what?
7. What are the four types of papilla?
8. What is the most numerous type of papilla? Least numerous?
9. What is the structure of Filiform papilla?
10. What is the function of Filiform papilla?
11. Where are foliate taste buds seen and what do they look like?
12. Where are the taste buds found in Filiform papilla?
13. What is Filiform covered by?
14. Where are fungiform papilla found and what do they look like?
15. Fungiform papilla are _____ and project _____.
16. Fungiform papilla have (few/many) tastebuds on the _____ surface.
17. Where can the Vallate papilla be found?
18. Vallate papilla are surrounded by a _____, which the _____ open into.
19. Where are taste buds found on Vallate papilla?
20. What type of glands are seen in Vallate papilla and what are they called?
21. What are the three tasting papilla?
22. What three papilla have secondary papilla?
23. How far into the epithelium do taste buds extend?
24. What are the three cell types of taste buds and what does each do?
25. What two taste bud cell types extend from the basal lamina to the taste pore?
26. Where is the sweet taste sensation found?
27. Where is the salty taste sensation found?
28. Where is the bitter taste sensation found?
29. Where is the acidic (sour) taste sensation found?

DUCTS & GLANDS

30. What is a major salivary gland with a long duct?
31. What are two minor salivary glands?
32. Major glands are covered by a _____ with septa that contain _____.
33. Because the major glands have these two cells, they secrete _____.

34. What are the secretory units of the lobules of glands?
35. What type of secretory units are there? Give examples of each.
36. When a secretory unit is spherical, what is it known as? When its heavily elongated?
37. What is serous acini lined by and what important structure does it contain?
38. Where is the nucleus found on a serous acini? A mucous acini?
39. What are found in the cytoplasm of mucous acini prior to preparation?
40. What surrounds the seromucous acini and give two examples?
41. In mixed acini, the _____ acini is surrounded by a _____ demilune.
42. In mixed acini, what is found between the serous and mucous cells?
43. What moves the secretory product into the duct/lumen and where is it found?
44. What are the three types of salivary ducts?
45. Serous glands have well developed _____ and _____ ducts.
46. What are intercalated ducts lined by?
47. Intercalated ducts add _____ and remove _____ from the serous secretion.
48. What are striated ducts lined by?
49. Striated ducts add _____ and remove _____ from the serous secretion.
50. What does striation mean here?
51. What are the interlobar ducts and what do they do to the secretion?
52. What are the four layers of the general GI tract from lumen out?
53. What are excretory ducts lined with?
54. What are the functions of saliva? Big hint Tex, it's not only to soften up your overcooked buffalo burger; there are seven of them.
55. What is the enzyme in saliva that begins carbohydrate digestion?

GI TRACT GENERALITIES

56. What are the three levels of the mucosa from inside out?
57. What are the functions of the epithelium layer of the mucosa?
58. What is the lamina propia made of?
59. What does the muscularis mucosa do and how many layers are there?
60. The submucosa is made up of _____ and sometimes has _____.
61. The inner _____ of the muscularis externa _____, while the outer _____ layer _____.
62. The muscularis externa is connected to what plexus?
63. What forms the serosa?
64. The serosa is a single layer of _____ followed by _____, which is the adventitia.

ESOPHAGUS & STOMACH

65. How long is the esophagus and what lines it?
66. The lamina propria contains what in the esophagus?
67. What is thick at the beginning of the esophagus?
68. Describe the submucosa of the esophagus.
69. How does the muscularis externa change throughout the esophagus?
70. What are the folds in the stomach called and what are they for?
71. What is the mamillary area?
72. What are the depressions in the mamillary area called?
73. What are the four areas of the stomach?
74. What part(s) of the stomach have short pits and long glands?
75. Where is the pylorus and describe it?
76. Where are glands commonly found in the general GI tract?
77. What type of epithelium lines the mucous membrane of the stomach?
78. The epithelial of the stomach, aka the _____, lines both the _____ and the _____.
79. What helps protect the gastric surface from acid and rough chyme?
80. In the stomach, multiple _____, _____, _____, glands open into a _____ pit.
81. What are the three major areas of the fundic glands?
82. What are the four types of gastric gland cells?
83. Where are mucous neck cells seen and what do they secret?
84. What are seen between the mucous neck cells?
85. What secretes pepsinogen and where is it found?
86. What do parietal cells secrete and where is it found?
87. Enteroendocrine cells are (small/large) cells that _____ reach the lumen.
88. Where are enteroendocrine cells seen?
89. What gives the gastric glands a beaded appearance?
90. What secretes _____, the stimulator of parietal cells to produce HCL.
91. What enhances the absorption of Vit B12 in the terminal ileum?
92. What is Vit B12 necessary for the development of?
93. If there is a lack of adequate production of intrinsic factor, what happens?
94. Pernicious anemia is seen in what type of patients?
95. What are the four subtypes of enteroendocrine cells?
96. What do EC cells secrete and its effects?
97. What do A cells secrete and its effects?
98. What do D cells secrete and its effects?
99. What type of cells line the glands in the cardiac region and what do they do?

100. What do the pyloric glands secrete?
101. What type of nerve plexus is found in the _____ of the stomach?
102. What makes the stomach's muscularis externa unique?
103. What type of plexus is found in the muscularis externa of the stomach?

SMALL INTESTINE

104. What is the principle site of digestion?
105. Brunner's gland is found in the _____ of the _____.
106. Peyer's patches are found in the _____ of the _____.
107. What is GALT?
108. What projects from the _____ of the small intestine?
109. Give the names of the small intestine mucosa's permanent folds?
110. Lining the lumen of the intestine are _____, which are _____ epithelium.
111. What are seen between the enterocytes, and how long do both live?
112. Enterocytes have microvilli that are covered by what?
113. What does the cell membrane of enterocytes contain and what does it do?
114. Glycocalyx is important for the terminal digestion of what?
115. The core of villi contains an extension of _____.
116. What brings about the milking effect of lacteal in the villi?
117. In S. intestine villi, what are seen near the basement membrane?
118. What are the two types of glands seen in the lamina propria of the s. intestine?
119. What is found at the base of intestinal gland cells? What do those cells secrete?
120. Where are enteroendocrine cells found in the small intestine?
121. What 5 enteroendocrine cells are found in the lamina propria of the s. intestine?
122. What are M cells? Is it an enteroendocrine cell?
123. I cells produce _____, which is involved in _____.
124. K cells produce _____, which is the _____.
125. What cell could K cells be compared to in the stomach?
126. S cells produce _____, which influences _____.
127. These cells seen in the lamina propria live 4 weeks and give rise to other cells.
128. What is the function of the alkaline fluid produced by brunner's glands?
129. Brunner's glands also secrete _____, which enhances _____ and inhibits _____.
130. What is syndrome is characterized by peptic ulcers?
131. During Zollinger Ellison syndrome, what is often increased?
132. What is Zollinger Ellison syndrome also known as?
133. Where does Zollinger Ellison syndrome usually manifest?

134. What organ is responsible for Zollinger Ellison syndrome?

LARGE INTESTINE

135. What is the large intestine also known as?
136. Unlike the small intestine, the large intestine lacks what apical modification?
137. The lamina propria of the L. intestine contain _____, with what cells within?
138. What lies between the lamina and capillaries of the LI and what does it consist of?
139. What does GALT stand for?
140. What is the function of the collagen table?
141. Where are lymph vessels seen in the L. intestine? Where are they not seen?
142. Why does colon cancer spread slowly?
143. What is special about the submucosa of the L. Intestine?
144. In the L.I., what is the outer layer of the muscularis externa known as?
145. What forms haustra?
146. What is special about the serosa of the L. Intestine?
147. What is the vermiform appendix?
148. In the anal canal, the upper half is lined with _____, while the lower half _____.

THE LIVER

149. What is the largest gland in the body?
150. The liver has what type of secretion functions?
151. Bile is secreted by what method?
152. Bile pigments _____, while bile salts aid in _____.
153. What is bile's number one function?
154. What are secreted via the endocrine function?
155. In its endocrine like function, vitamin D is converted into _____.
156. In its endocrine like function, thyroxine is converted into _____.
157. The liver is covered by _____ and made up of a number of _____.
158. What are the three liver lobule classifications?
159. The classic lobule is _____ in shape and made up of _____.
160. What is the classic lobule also known as?
161. What is in the middle of the classic lobule and what is found between the hepatocytes?
162. What is found at the periphery of the classical lobule and what is found within it?
163. The portal lobule depicts what function of the liver?
164. The portal lobule is a _____ block with the _____ in the center formed within _____.
165. Where is the bile secreted in the portal lobule?

166. The liver acini is a _____ area that is the _____ unit of the liver.
167. The short axis connects _____, while the long axis _____.
168. The liver acini depict the quality of _____.
169. Where are the three zones of vascular perfusion found?
170. If there is a loss of vascular perfusion, what is the order of zone death?
171. If there is bile stasis due to a toxic substance, what is the order of zone death?
172. What is the zone death due to the absence of blood flow known as?
173. What structures empty into the sinusoids?
174. Sinusoids drain into the _____, which form _____, which form _____.
175. Sinusoids are lined by _____ and _____ which are _____.
176. Sinusoids are _____ type.
177. Hepatic veins drain into the _____.
178. What lies between hepatocytes and liver sinusoids?
179. What forms the origin site of lymph vessels?
180. What is the perisinusoidal space also known as?
181. The perisinusoidal space forms a pathway for what?
182. What cells are found in the perisinusoidal space and what is there function?
183. Where is the space of mall found?
184. How many nuclei do hepatocytes have?
185. What is formed by the grooves in neighboring hepatic cells?
186. Bile canaliculi drain into ducts called _____, which combine to form the _____.
187. What does bile consist of?
188. What do bile salts do?
189. How are carbohydrates stored in the liver?
190. The liver converts what three things?
191. Hepatocytes produces all plasma proteins except what?
192. What two things are used to synthesize fat in the liver?
193. What is absorbed and split into glycerol and fatty acids?
194. Cholesterol is used in the formation of _____.

GALL BLADDER & PANCREAS

195. How much bile can the gall bladder store?
196. What stimulates the gall bladder to release bile?
197. The mucous membrane is lined by _____ and thrown into _____.
198. The mucous membrane of the gall bladder is _____ with numerous _____.
199. What does the gall bladder lack?

200. What are the deep diverticulum from the mucosa to the muscularis externa called?
201. What is clinically significant about Rokitanksi Aschoof sinuses?
202. The serous acini are found in the _____ pancreas?
203. What digestive enzymes are found in zymogen granules?
204. Are the digestive enzymes active or inactive?
205. What are the duct cells within the acini called?
206. What is the order of ducts in the pancreas?
207. What two hormones effect the secretion of the pancreas?
208. What are the three types of cells in the endocrine pancreas?
209. What does CCK do?
210. What does secretin do?
211. What makes up 1 to 2% of the pancreatic volume?
212. Describe B cells.
213. Describe A cells.
214. Describe D cells.
215. Refer to Figure I for the functions of hormones.

SKIN

216. What are the components of the skin?
217. What is the thick skin?
218. Where is thin skin?
219. What is the epidermis made of?
220. What is the dermis made of?
221. What is the hypodermis made of?
222. How does the epidermis and dermis interdigitate with each other?
223. What are the 5 layers of the epidermis?
224. What layer lays upon the basement membrane above dermis? Type of epithelia?
225. What layer has many layers of cells with processes?
226. What layer has 2 or 3 layers of protein granule containing cells?
227. What layer is only seen in thick skin?
228. What is the most superficial layer? Describe.
229. What produces keratin?
230. _____% of cells of the epidermis are _____, which are born in the _____.
231. In addition to basal cells, _____ and _____ cells are seen.
232. Melanocytes do what?
233. What do keratinocytes synthesize/use?

234. In the case of a severe burn, what is damaged?
235. What corpuscle resembles a cut onion?
236. What are pacinian corpuscles?
237. What has a _____ capsule, which encloses many _____ of cells?
238. Where are stem cells and new keratinocytes found?
239. Where are langerhan cells found?
240. The combination of the stratum basale and stratum spinosum are known as _____.
241. The stratum spinosum resists the effects of _____.
242. The S. Granulosum provides what two function?
243. What are the other 10% of the cells of the epidermis?
244. Kerationcytes are born in the _____, die in the _____, are buried in the _____.
245. How long does the epidermal cell move through the layers?
246. What is the process by which living cells differentiate into keratin filled dead cells?
247. Why do the cells of the stratum granulosum die?
248. Where are merkel cells found and what is their function?
249. Langerhans are _____, thus are modified _____.
250. Where are melanocytes found?
251. What are the four epidermal derivatives?
252. What is responsible for the growth of hair?
253. The external root sheath is the epithelial growth that connect what two structures?
254. What is the internal root sheath made of?
255. How thick is the dermis?
256. (True or False) The dermis is vascular.
257. What three cells are found in the dermis?
258. What are the two layers of the dermis?
259. What is the hypodermis largely composed of?
260. The upper papillary layer is made of a thin _____ with a _____.
261. What type of tissue is the lower reticular layer?
262. Where is the lower reticular layer highly vascular?
263. Where are cutaneous diseases rarely found? What type of diseases would occur?
264. What type of gland are the sebaceous glands?
265. Where are sebaceous glands found and what do they produce?
266. Since the sebaceous gland is holocrine, what happens to the stratified epithelium cells?
267. Where are the eccrine sweat glands found?
268. Where are the apocrine sweat glands primarily found?
269. Apocrine sweat glands have a _____ part that opens into the _____.

270. Apocrine sweat has an _____ and has _____.
271. Eccrine sweat glands have a _____ part, with a _____ duct that opens _____.
272. Eccrine sweat functions in what?
273. The contraction of what causes hair to stand up?
274. What are the 4 encapsulated exteroceptors?
275. What is the nonencapsulated exteroceptor?
276. The Arrector pili muscle also controls what in a cold climate?
277. What may the arrector pili muscle help express to the skin?
278. What are Krause end bulbs responsible for?
279. What are Free nerve endings responsible for and where are they found?
280. Free nerve endings are mostly _____.
281. What are Meissner's corpuscles responsible for?
282. Meissner's corpuscles are probably modified _____ found where?
283. What forms the capsules of the corpuscles?
284. What are Pacinian corpuscles responsible for?
285. What are Ruffani corpuscles responsible for?
286. Where are Ruffani corpuscles found?
287. Refer to Figures II, III, IV, V for receptors

NUCLEUS

288. What is the space between the inner and outer membrane of the nuclear envelope?
289. The Nuclear envelope has 2 distinct _____.
290. The _____ is _____ with the ER membrane.
291. What are nuclear pores?
292. Nuclear pores have a _____, forming a _____ channel.
293. Nuclear pores contain what units?
294. What provides the energy for transport of nuclear resident proteins?
295. What are the common X-linked disorders?
296. The X gene in men comes from which parent?
297. What are the two types of chromosomal proteins?
298. Non-histone chromosomal proteins are _____ and give 2 examples.
299. What are the classes of chromatin in the interphase nucleus?
300. What is transcriptionally active and in a _____ conformation?
301. What does the 'eu' stand for?
302. Heterochromation is _____ and 90% _____.
303. What is the interphase?

304. What is a karyotype?
305. What do karyotypes allow for?
306. What is the characteristic pattern of a karyotype and what is it named after?
307. How are the karyotypes named?
308. Down's syndrome demonstrates what genetic abnormality?
309. XO chromosomes are representative of what disorder?
310. XXY of what?

CELL REPRODUCTION MITOSIS

311. What is the definition of the cell cycle?
312. The cell cycle is regulated by what proteins?
313. What is the G-phase?
314. When does DNA replication occur?
315. Which phase is variable and which is relatively constant time wise?
316. What is the interphase?
317. What is a replication fork?
318. How many replication forks does a chromosome have?
319. What is replicated during the replication phase?
320. What is the M-phase?
321. What is the nuclear division known as?
322. What is cytokinesis?
323. What are the phases of mitosis in order?
324. On the inside of the nuclear envelope, what is found?
325. What happens during the prophase to the nuclear envelope?
326. What does chromatin condense into?
327. Condensed chromosomes contain what?
328. What defines and protects the end of a chromosome?
329. What attaches a chromosome to the mitotic spindle?
330. What are microtubules attached to?
331. When is the spindle apparatus found? What is that time period also known as?
332. Where do chromosomes align?
333. What are kinetochore responsible for?
334. What do kinetochore contain?
335. What do kinetochore break down?
336. What is the mitotic spindle apparatus comprised of?
337. What is a centrosome responsible for?

338. What is a centrosome composed of?
339. Prior to mitosis, how many centrosomes are there?
340. During mitosis, where do centrosomes migrate and why?
341. When do the sister chromosome separate?
342. What is the proposed mechanism of the anaphase motility?
343. The reformation of the nuclear envelope during the telophase requires what enzyme?
344. During telophase, _____ decondense into _____, and the _____ dissolves.
345. Physical cell division, which uses a similar mechanism to _____ is _____.

RESPIRATORY

346. What are the two parts of respiratory histology?
347. Nasal cavities have an anterior _____ and posterior _____.
348. What occurs in the conducting parts?
349. What occurs in the respiratory parts?
350. What are the six conducting parts?
351. What are the three respiratory parts?
352. What are the three regions of a nasal cavity?
353. What lines the upper ¼ of the nasal cavity? What is it an organ of?
354. The olfactory mucosa is lined with _____, and consists of _____, _____, & _____ cells.
355. The olfactory receptor cells are modified _____ neurons which combine to form _____.
356. What is the function of sustentacular cells?
357. What is the function of basal cells?
358. The conducting mucosa has _____ epithelium with _____ cells, and what glands?
359. Because the conducting region is _____, it is able to do what to inspired air?
360. What do the serous glands in the conducting region do?
361. What do the mucous glands in the conducting region do?
362. What tube is wide and flexible with U shaped hyaline cartilage?
363. What is found on the posterior side of the trachea?
364. What is found between the trachea's rings and what is it for?
365. What are the four primary layers of the trachea?
366. What cells are found in the epithelium of the trachea?
367. What type of epithelium is found in the trachea?
368. Microvilli are found on _____ cells, which are the _____.
369. What are the neuroendocrine cells also known as and what do they produce?
370. What 6 things are found in the loose connective tissue of the lamina propria (trachea)?
371. What is found between the mucosa and submucosa of the trachea?

372. In the loose CT of the tracheal submucosa, what tissues, vessels, and glands are found?
373. The cartilaginous layer is covered by _____ and contains what muscle?
374. What type of epithelium is found in the bronchi?
375. Describe the cartilaginous layer of the bronchi.
376. How is the bronchi related to the duodenum and esophagus?
377. The U or C shaped rings of the trachea form it into what shape?
378. What shape are the bronchi?
379. Bronchioles have a _____ diameter with what type of epithelium lining?
380. Where does gas exchange occur?
381. The bronchioles have a thick layer of what?
382. What three important things do bronchioles lack?
383. Alveoli are _____ with _____ and _____. What separates alveoli?
384. What are the two types of alveolar cells?
385. What are alveolar epithelial cells joined by?
386. Epithelium of Type I Pneumocytes? Type II?
387. The pleura is a _____ in two layers (_____ & _____), made up of _____ epithelium.
388. The alveolar septum has two basal lamina's, what are each lined by?
389. The connective tissue of the septum contains macrophages, also known as _____.

MEIOSIS

390. What is meiosis?
391. Gametes are genetically _____.
392. What physically exchanges in Meiosis I?
393. The genetic recombination includes a _____ assortment. How is it written?
394. What results from meiosis I?
395. No DNA replication occurs in _____, and thus resembles _____.
396. What is female gamete production known as and when does it begin?
397. Some cells in the embryonic ovary differentiate into _____.
398. Cells progress to _____ and then arrests until _____ when _____ begins.
399. Prophase Oogenesis, _____ oocyte _____ cell division results in a cell with _____.
400. Which cell has all the cytoplasm and what cell is discarded?
401. What arrests Meiosis II?
402. When can Meiosis resume and why?
403. A second asymmetric division yields a _____ and a _____.
404. What is male gamete production known as?
405. Where is the egg fertilized and where does it implant?

406. Where and when does spermatogenesis occur?
407. Haploid cells in men are known as what?
408. ___ mature spermatozoa per meiotic division.
409. Where do spermatids become spermatozoa and what is the change?
410. Where and what process must sperm undergo to fertilize the egg? How long does it take?
411. What reaction cannot occur until capacitiation occurs?
412. Capacitiation involves changes in _____ mediated by _____ and _____ reactions.
413. Sperm must recognize _____ in the _____.
414. Binding to the zona pellucida induces a _____ increase in sperm intercellular _____.
415. What are released allowing for sperm to transverse to the egg surface?
416. When sperm and the egg fuse what is discharged?
417. What are the function of cortical granules?
418. Nuclei unites to form what?

Figure I – Hormones in Pancreas

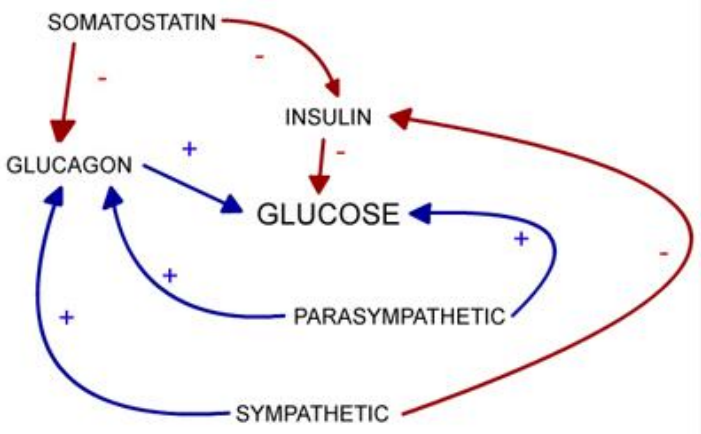


Figure II – Krause End Bulb (*Grey's Anatomy*)

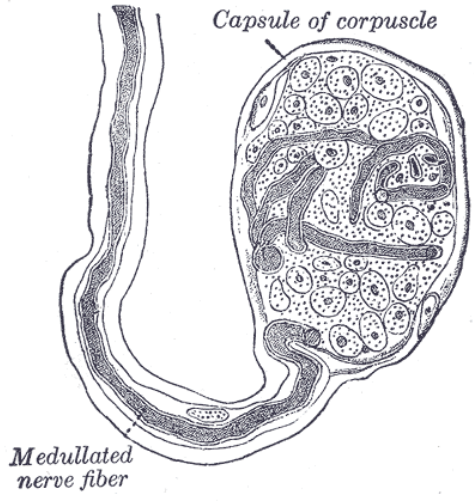


Figure III – Pacinian's Corpuscle (*Grey's Anatomy*)

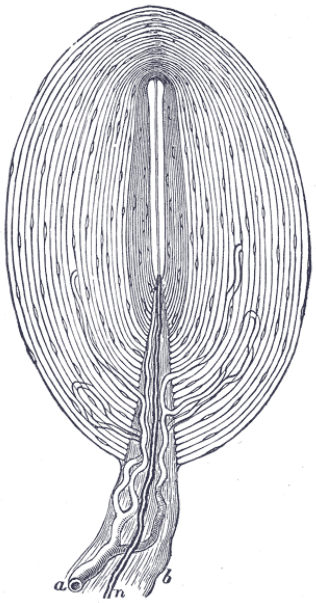
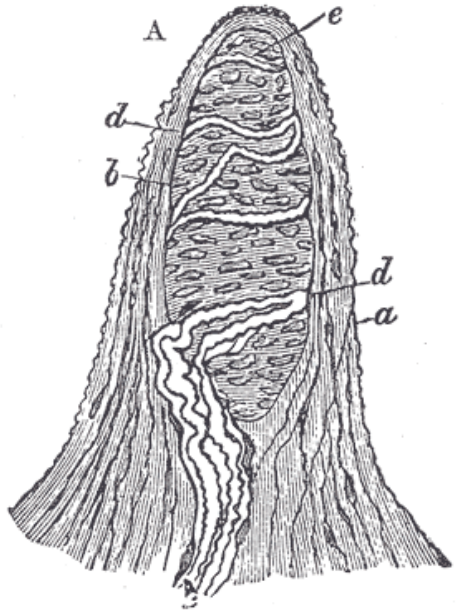


Figure IV – Meissner's Corpuscle (*Grey's Anatomy*)



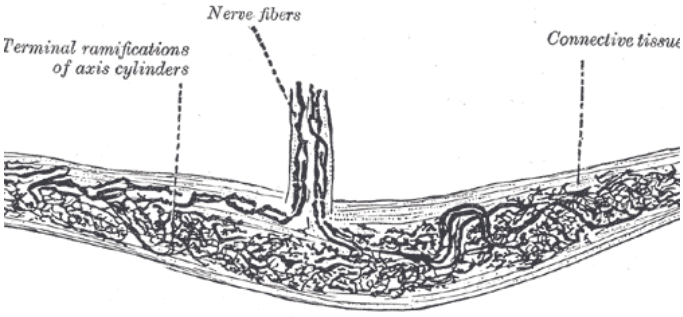


Figure V – Ruffini Corpuscle (*Grey's Anatomy*)