They observed not only licking and chewing, but also ejection movements from the mouth resembling those induced when quinine solution is tasted. They concluded that the stimulated area must be a sensory and not a motor structure, which later received support by the fact that projections from the tongue were obtained at this same site[2]. Weak stimulation of the VPM did not induce ejection movements in our cats. Daily stimulation in this area, however, resulted in a comparable effect. Stimulated animals rejected concentrations of saccharin solutions 5 times more dilute than controls. This suggests that stimulation produced certain sensations which, when added to the taste sensations of the saccharin solutions, became undesirable to the animal. Lower concentrations of saccharin solution coupled with stimulation had the same effect as that produced by higher concentrations of saccharin without stimulation.

Zusammenfassung. Elektrische Reizung im VPM-Nukleus der Katze setzt die Schwellenkonzentration bei denjenigen Tieren, die Saccharinlösung reinem Wasser vorzogen, auffallend herab.

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Synapses in the Rat Stomach and Small Intestine

In several accounts of the ultrastructure of the myenteric plexus (Auerbach's plexus), synaptic junctions have occasionally been seen[1-3]. In the present research we intend to study the distribution and relative frequency of synapses of the myenteric plexus in the rat stomach (glandular portion) and small intestine (penultimate loop).

Specimens were fixed in 5% glutaraldehyde, post-fixed in osmium tetroxide, then dehydrated with ethanol and embedded in araldite (CIBA). Sections, stained with uranyl acetate and lead citrate, were observed at a Siemens 1 A electron microscope.

Typical synaptic junctions are observed in both segments of the alimentary canal: synapses are morphologically recognized (and indicated as 'conventional synapses') on the basis of the following characteristics: a) thickening of the 2 apposed membranes (pre- and post-synaptic membranes); this may vary from a prominent to a minimal synaptic thickening. b) Pre-synaptic knobs contain vesicles, which may form aggregations near the synaptic cleft; although vesiculated nerve processes in the myenteric plexus have been tentatively grouped in 4 classes on the basis of different vesicular content[4], no clear correlation between structure and position of synapses and kind of nerve process has yet been observed. c) Pre- and post-synaptic membranes appear quite parallel, with an intervening cleft of about 200 Å. In some cases electron-dense material occurs between pre- and post-synaptic membranes.

However, it should be mentioned that symmetrical membrane thickenings (in nerve processes devoid of vesicles) at inter-neuronal or glia-neuronal contacts, are observed and are provisionally interpreted as attachment zones. Moreover many vesicle-containing nerve processes run in contact with other nervous structures but do not show membrane thickenings suggesting a typical synaptic junction.

In the majority of cases, synapses are formed between a vesiculated nerve process and the pericarion or a dendrite of intramural neurons, and are thus identified as axo-somatic (Figure 1) and axo-dendritic (Figure 2) junctions. A small number of junctions could not be classified.

We tried to obtain quantitative data on the distribution of synapses in the myenteric plexus; for this photographic montages were made to get overall pictures of intramural ganglia, and the number of synapses per unit section surface or per nerve cell counted. We have so far observed over 300 synapses. On this basis, we conclude that there are more than 6 times as many typical synapses in the stomach as in the small intestine. This highly significant difference in the number of synaptic junctions seems to be mostly due to synapses between axons and short dendrites (Figure 3); these synapses are a common occurrence in the stomach.

In conclusion, if in the small intestine synapses are indeed so scanty, other interneuronal connections at present not morphologically detectable, or other transmission mechanisms, such as diffusion of transmitter over long distances, may be admitted. Close contacts between nerve cells at sites other than the morphologically differentiated regions commonly recognized as synaptic junctions, have

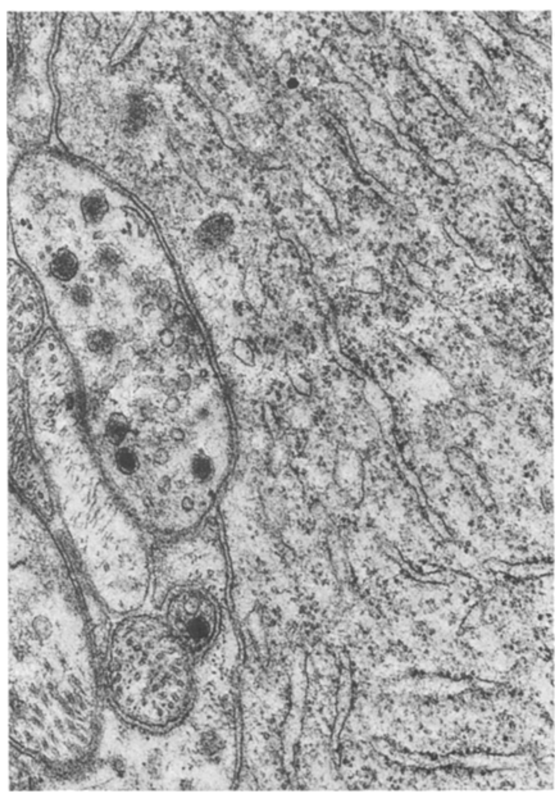

Fig. 1. Rat stomach. Myenteric plexus. Synaptic junction between a nerve fibre and the pericarion of an intramural neuron. The nerve process contains many agranular round vesicles partly aggregated near the presynaptic membrane, and a few large dense-core vesicles. × 40,000.

Fig. 2. Rat small intestine. Myenteric plexus. Synaptic junction between a nerve fibre and a dendrite of an intramural neuron. The nerve process contains agranular 'flattened' vesicles. × 57,000.

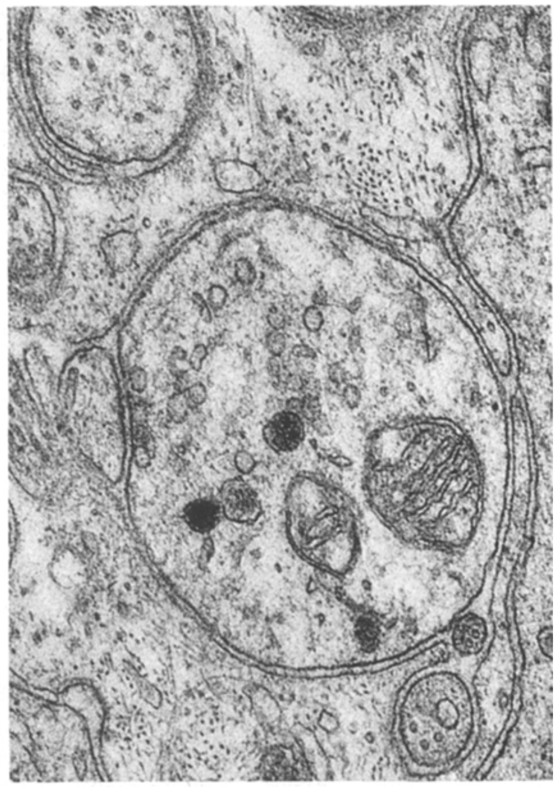

Fig. 3. Rat stomach. Myenteric plexus. A large nerve fibre makes a synaptic junction with a small nerve process, very probably a short dendrite stemming from an intramural neuron. × 50,000.

been reported both in the central nervous system[5,6] and in the intramural plexuses of the gut[7].

Morphological evidence suggests that in the small intestine relatively primitive transmission processes not only occur at the neuro-muscular junctions but also at junctions inside AUERBACH's plexus ganglia. Similar conclusions were reached by PATON and ZAR[8] through a pharmacological study of guinea-pig ileum. The higher number of synapses in stomach as compared to small intestine may be related to the richness of innervation from vagus nerve and to the high degree of extrinsic drive[9], which are typical of the stomach. Moreover, it has recently been shown that, following vagotomy, there is a dramatic fall in the number of synapses in the stomach[10].

In summary, both axo-somatic and axo-dendritic synapses were observed in the myenteric plexus of the rat stomach and small intestine. The relative number of typical (or conventional) synapses was significantly higher in the stomach[11].

Riassunto. Nel plesso mienterico dello stomaco e dell'intestino tenue di ratto si osservano tipiche giunzioni sinaptiche sia axo-somatiche sia axo-dendritiche. Il numero di contatti sinaptici per unità di superficie di sezione o per cellula nervosa è piú di sei volte maggiore nello stomaco che nell'intestino tenue.

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Ascending Neurons of the Spinal Cord Activated by Cold

The observation that cooling and heating the spinal cord may influence the ascending reticular activating system and thermoregulatory effectors requiring supraspinal control[1,2], is indirect evidence for the afferent conduction of the spinal thermal stimulus. Activation of ascending units of the medial lemniscal pathway during spinal cord heating[3] has confirmed this assumption for the spinal warmth stimulus. The increased discharge of spinal neurones at the segmental level during spinal cooling[4] further suggests that ascending units might be