comprehensive investigations, covering a wide range of both plants and animals, appear to make it clear that the side-by-side pairs are invariably present in the primary meiotic division. *Tradescantia virginica* presents no exception in this respect. Although the profile view of the metaphase seems to show the contrasting ring and rod bivalents, the polar aspect, which appears to have been neglected by other investigators, makes it clear that the two are identical and only represent the face and lateral views of identical structures.

Further, in *T. virginica,* the so-called zygotene or zygonema phase can always be seen at the appropriate stage. Since this stage is properly regarded as the precursor of the side-by-side bivalents (the so-called parasynaptic mates), its presence automatically excludes the possibility of end-to-end pairs of chromosomes (telosynaptic mates). There is thus an additional reason for regarding all the chromosome pairs of *T. virginica* as side-by-side mates and *none* of them as end-to-end mates. Following a sound practise in cytology and transferring these results to the interpretation of the less clear conditions presented by the genus Rheo and certain species of Oenothera, it becomes obvious that the pairs of consecutive homologous segments present in the persistent spireme in these cases in reality represent so-called parasynaptic bivalents, strung out in a longitudinal series. Thus, if we were to arrange the vertically elongated bivalents found at metaphase in Allium or Lilium end to end they would accurately correspond to the strings of chromosomes found in the three genera as discussed in the present connection.

E. C. JEFFREY

LOCAL ELECTRIC ANESTHESIA

IN the issue of SCIENCE for February 24, 1933, is an interesting article, "A Method of Outlining Cutaneous Nerve Areas," by Professor Thompson and Dr. Inman, of the University of California, in which an important use of anesthesia from an alternating current is described and discussed.

During the summer of 1892 I worked with A. E. Kennelly, chief electrician of the Edison Laboratory at Orange (later professor of electrodynamics at Harvard), studying the effects of alternating currents and the huge magnets there upon the human body. Professor Kennelly and I published a paper on "Some Physiological Experiments with Magnets at the Edison Laboratory."[1]

We noted that summer that anesthesia and analgesia could be produced by alternating currents above 2,000 vibrations, though this was not alluded to in the paper mentioned.

[1] *New York Medical Journal,* lxi: 729–732. 1892.

However, in an article[2] of mine in the *American Medical and Surgical Bulletin* appeared the following paragraphs, which I have just copied from the *Bulletin* at the Academy of Medicine Library:

> Several years ago Mr. Kennelly and I experimented at the Edison Laboratory with the sinusoidal current. The results of these experiments have never been made public, for lack of time, until the present moment. We established one singular and interesting fact, which is of therapeutic value, and which I will detail here. The experiments were tried upon Mr. Kennelly, Dr. Charles E. Atwood, one of the assistants at the Vanderbilt Clinic, who kindly aided me, and upon myself. The same results were obtained in each of us. Applying one pole to a nerve trunk, say at the wrist, and another at an indifferent point, there were no perceptible effects as long as the vibrations were below 2000 per second. When we reached that point the parts supplied by the nerve beneath the pole became anaesthetic, so that pricking with a needle or knife, or touching the part, was not perceived. Both the anaesthesia and analgesia were so marked that an incision might have been made without the consciousness of the individual operated upon. The higher the rate of vibration the more noteworthy was this effect. Our apparatus did not permit of our going beyond 3000 vibrations per second. * * * The return of sensibility was instantaneous on interruption of the electric current. Doubtless small operations might be performed by this new method of local anaesthesia. As yet the procedure is in its infancy.

In the autumn of 1892 after this summer work at Orange I asked the surgeons in the surgical department of the Vanderbilt Clinic to be on the lookout for some simple case on which the newly found electric anesthesia could be tested. I was testing it out for various nervous disorders in the Nervous Department of the Vanderbilt Clinic, where I was chief of clinic, with Professor Allen Starr. In a few days Dr. Percy Turnure brought in a young woman with a painful felon of the left forefinger which was exactly suitable for the purpose. The electric anesthesia was quickly produced and Dr. Turnure lanced the finger tip. The operation was apparently painless, though as soon as the current was removed sensation returned, with of course such pain as would be natural after any similar incision.

So far as I know this was the first operation under that type of local anesthesia.

About 1902 Leduc in France began writing articles on electrical anesthesia.

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SELF-STERILITY IN NEMESIA

SEVERAL years ago, working in the greenhouse at Princeton University, I undertook to study the genetic

[2] *Am. Med. and Surg. Bull.* ix: 765–808. 1896.