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.

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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.

factors which control flower color in plants of the genus Nemesia. A packet of seeds, labeled "Nemesia —Newton's Glories Mixed," was obtained from Peter Henderson and Co. in New York City, and sixteen plants were raised. Comparison with the description of this genus in the Flora Capensis seemed to indicate that these plants belonged to the species *N. strumosa.*

It was desired to obtain seed from self-pollinations for the next generation, but every flower which was selfed set no seed whatever, and as many as fifteen flowers were pollinated on some plants. Some crosses between these plants, made at the same time as the selfings, were fertile, proving that both the pollen and ovules were functional and that the failure to set seed was due to physiological incompatibility, commonly called self-sterility. Two families studied in the succeeding generation gave the same results, although few intra-family crosses were made.

In the third generation, three families were studied more intensively. In one, ten plants were selfed and all proved self-sterile, although one plant exhibited a slight tendency to be pseudo-fertile. Seventy-four of the ninety possible crosses were made and showed that two and only two intra-sterile, inter-fertile groups were present, of which one consisted of seven and the other of three plants. Ten plants of a second family were completely self-sterile when as many as ten flowers on a plant were self-pollinated. Fifty-nine crosses were made within this family and again two groups were found to be present. All crosses behaved regularly. In the third family, six plants belonged to one intra-sterile, inter-fertile class and six to another and all twelve were self-sterile. Only one cross exhibited behavior not in accordance with the general trend. Inter-family crosses between the two latter families showed that no group was common to both. A similar result was noted for the first and third families but, unfortunately, I did not cross the first two.

This study is being continued this year to learn whether Nemesia behaves like Nicotiana and most other plants which have been studied with respect to self-sterility.

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A NEW VASCULAR FUSARIUM DISEASE OF PEAS

DURING the course of an investigation of pea diseases, particularly of Fusarium wilt, carried on under the direction of Dr. J. C. Walker, of the Department of Plant Pathology, University of Wisconsin, a wilt disease possessing many of the characteristic symptoms of Fusarium wilt, caused by *F. orthoceras* v. *pisi* but produced by another species of Fusarium, has been repeatedly separated from the pea disease complex. This disease was first seen in Wisconsin in 1931, and was encountered frequently and found to be wide-spread in Wisconsin, Maryland and Delaware during the 1932 season. Specimens were also received from New Hampshire, Massachusetts, Idaho and Montana.

The new disease is tentatively referred to as "near-wilt" because of its close resemblance to the wilt disease previously described by Linford.[1] As they occur in the field and upon plants grown in artificially infested soil, the symptoms of the two diseases are so similar that it is practically impossible to differentiate them by this means. Typically the foliage takes on a yellowish cast, the leaflets and stipules become recurved and the stunted plant dies prematurely. Usually the vascular elements become brightly stained an orange or reddish color some distance up the stem.

One of the significant features of the new disease is that it occurs upon varieties known to be 100 per cent. resistant to *F. orthoceras* v. *pisi.* This is of great importance to both growers and seedsmen, for it means that certain seed stocks sold as resistant to the wilt caused by *F. orthoceras* v. *pisi* may wilt in the field because of another fungus.

Satisfactory diagnoses of these two diseases can only be made by culturing the causal fungi. The purple pigmentation of the near-wilt Fusarium upon certain media is useful in distinguishing it from the wilt pathogen. Although there is a wide range of pigmentation exhibited by the various strains of *F. orthoceras* v. *pisi* this purple type seldom is approached. An additional aid in distinguishing them is the abundance of spores, including macroconidia, produced by the near-wilt Fusarium, inasmuch as *F. orthoceras* v. *pisi* produces but few spores in culture and these few are microconidia, with infrequent exceptions.

The new disease may be distinguished from Fusarium rootrot, caused by *F. martii* v. *pisi,* since in rootrot a cortical decay of the underground stem conspicuously precedes the invasion of the stele, while both near-wilt and wilt are primarily diseases of the xylem tissue and not of the cortex. Under field conditions diseased plants frequently show both cortical and vascular invasion, and culturing must be used to identify the fungi present. *F. martii* v. *pisi* is easily distinguished in culture from the two vascular Fusaria by its masses of blue green spores.

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[1] M. B. Linford, "A Fusarium Wilt of Pea in Wisconsin," Wis. Agr. Exp. Sta. Res. Bul. 85, 44 pp. illus. 1928.