dose of the toxin for the fasting guinea pig was subsequently found to be roughly 220:1. Thus the importance of using the subcutaneous route of inoculation in addition to oral administration for detection of type E toxin in food substances is apparent. Cultures prepared from the German-canned fish and incubated at 37° C. were non-toxic for mice and guinea pigs in large doses. Only those which had been maintained at a temperature of 25–30° C. proved toxic to the animals.

It is important perhaps to mention that the two strains reported here, although similar immunologically and culturally, are not identical. They show distinct agglutinative properties. Furthermore, their toxins react differently in the chicken; young white leghorn chickens are highly susceptible to the toxin of the salmon strain but apparently insusceptible to that from the German-canned sprats.

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ANENT PARTHENOCARPIC APPLES

NAVEL apples[1] *Malus apetala,* falsely called bloomless or seedless, have gynomonoecious (purely pistillate) flowers, which have small green petals (hence are inconspicuous), lack nectaries (hence do not attract insects) and bloom after normal apples are normally through blooming. Navel apples, thus, stand slight chance of being pollinated, though a few belated normal blossoms may still persist to give pollen which the wind sometimes may waft to a navel flower. Navel apples are usually parthenocarpically developed. The Spencer (Seedless) navel is extremely fruitful in this way, the Wellington navel and the Navel No. 3 much less so, though over 90 per cent. of the fruit of these trees is also parthenocarpic. Yet, in three successive years at Arlington, Va., and one at Geneva, N. Y., over two thousand buds of Spencer, bagged (no pollination possible), *not one* fruit was parthenocarpically developed! A. B. Stout at Geneva, N. Y., during 1928 and 1929 had the same results: not one fruit developed from bagged buds. A similar test with Wellington and Navel No. 3 showed the same, save that those bags of Navel No. 3 which became aphid-infested set fruit 100 per cent. One year, a deliberate aphid infestation was made of bagged Spencer and Navel No. 3 buds. Not one Spencer developed, but Navel No. 3 set every bud of every spur! It was evident that the parthenocarpy was stimulative, but what was the stimulus? In 1934 I tried spraying trees with aphid extract, acetic and citric acids of varying concentrations. The results were nil.

In the spring of 1937, obtaining the suggestion from the work of Gustavson[2] like Gardiner and Marth,[3] I sprayed apple trees, my work being done at the Geneva, N. Y., station. The growth-substances were obtained from Dr. P. W. Zimmerman, of the Boyce Thompson Institute. The older Wellington trees having been destroyed and the younger trees too young to bear, I was limited to using only Spencer Navels of the parthenocarpic types, so I included such normal types as McIntosh, Sereda, Turley and Red Astrakhan. Of these forms the flowers were emasculated before blooming, before spraying and before bagging. Some branches with complete flowers left open were also sprayed. Indolacetic and naphthalene acetic were used in varying concentration even up to normal strength. In no case did fruit set occur, even with flowers left complete and open for pollination, among the Spencer navels or normal types. This corroborates the work of Gardiner and Marth, above mentioned.

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[1] A. B. Stout, N. Y. Bot. Garden *Bull.* No. 9, 1929.
[2] L. G. Gustavson, *Proc. Nat. Acad. Sci.,* 22, 622–636, November, 1936.

THE SPEED OF INSECTS IN FLIGHT

IN a recent issue of SCIENCE[1] Langmuir has called attention to a story "going the rounds over the whole country" relative to the almost incredible speed of 800 miles per hour supposed to be attained by a deer botfly (*Cephenomyia pratti*). He has very effectually challenged the contention that this insect can attain such a speed. The present writer would like to call attention to certain experiments and observations that have been made in recent years relative to the speed of insects in flight.

Outstanding among the attempts to determine the speed of insects in flight is the work of Magnan.[2] He determined the maximum speed of 32 species belonging to 8 orders. This was done by two methods. One was to attach to the insect a thread that was wound around a small drum mounted on ball-bearings so as to allow the thread to be unwound by the insect in flight. Each revolution of the drum was electrically recorded along with the records of a chronograph. Since the length of thread unrolled at each revolution was known, it was easy to compute the speed of the insect in flight. The other method employed was to time the insect in flight as it passed between two markers at a measured distance using a chronometer, aided with the cinematograph.

Of the 32 species of insects employed by Magnan, the greatest speed was attained by *Anax parthenope,* a dragonfly, which traveled 8 meters per second, or approximately 17.9 miles per hour. The next highest

[3] Gardiner and Marth, SCIENCE, September 10, 1937, p. 246; *Bot. Gazette,* September, 1937, pp. 184–195.
[1] I. Langmuir, SCIENCE, 87: 233–234, 1938.
[2] A. Magnan, "La Locomotion Chez les Animaux," *I–Le Vol des Insectes,* Hermann et Cie, Editeurs, Paris: 71–72, 1934.

speed attained was by *Aeschna mixta,* also a dragonfly, which made 7 meters per second. The third fastest was *Vespa crabo,* a wasp, which made 6 meters per second. Of the 5 species of flies used, the highest speed, 4 meters per second, was attained by *Tabanus bovinus,* a tabanid. Of the 5 species of beetles used, the highest speed, 2.5 meters per second, was recorded for *Melolontha vulgaris,* a chafer.

Magnan considered that these experiments did not give the full maximum velocity of the insects as they fly in nature. He held that the experiments indicated that certain insects would approach the speed of 10 meters per second.

Demoll[3] determined the speed of many species of insects belonging to 7 orders by timing them as they flew from the dark side of a room to a window on the opposite side. Of those insects used, hawk moths attained the greatest speed, that of 15 meters per second, or about 33.5 miles per hour. Next in speed came a tabanid, *Tabanus bovinus,* and a dragonfly, *Agrion.* Each of these attained a maximum speed of 14 meters per second. The greatest speed for a worker honeybee was 3.7 meters per second.

It is noted that there is a great difference in the determination of the maximum speed attained by insects of the same groups by these two experimenters. This difference also holds where the same species of insect was used by the two workers.

Tillyard[4] timed a dragonfly of the genus *Austrophlebia* over a measured stretch of between 80 and 90 yards, finding that it covered the distance in 3 seconds. This dragonfly, therefore, flew at a speed of nearly 60 miles per hour.

The results obtained by these three men indicate clearly that much more work is to be done before a final answer can be given to the question, "How fast can insects fly?"

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PASTEUR'S PATENTS

REGARDING the article which appeared in SCIENCE for October 8 under the signature of P. J. Federico, I would ask you, in my capacity of editor of the works of my grandfather—Louis Pasteur, kindly to refer your readers to foot-note 3, page 13 of volume III, "Etudes sur le vinaigre et sur le vin,"[1] in which note Pasteur explains why he took out patents.[1] See also note 1, page 410 of the same volume, where a reference to the patent taken by Pasteur for his process of manufacturing wine will be found. At the end of this note the words spoken by Balard (one of Pasteur's former teachers) before the Academy of Sciences, on February 27, 1872, regarding such patents may be quoted in translation: "This patent was taken by M. Pasteur when he had matured his process for preserving wine, in order to be guarded against undelicate people. He voluntarily allowed it to become public property, so those who speak lightly of this means of ensuring the property of an industrial discovery are therefore at liberty to freely make use of it." See also vol. V, "Etudes sur la bière," page 346 to 352.

PASTEUR VALLERY-RADOT

SOCIETIES AND MEETINGS

THE IOWA ACADEMY OF SCIENCE

THE fifty-second annual meeting of the Iowa Academy of Science was held at Morningside College at Sioux City, Iowa, on April 15 and 16 with 175 members and visitors in registered attendance. Members of the South Dakota Academy of Science were guests.

The presidential address, "Water Problems," was presented by Dr. A. C. Trowbridge, state geologist and professor of geology at the State University of Iowa. Other papers on the general program were "On the 'Curve of Deaths' and the Associated 'Curve of Lives.'" by Dr. H. L. Rietz, of the Department of Mathematics of the State University of Iowa, and "The Fir Forests of Iowa," by Dr. H. S. Conard, of the Department of Botany of Grinnell College. The annual address, "Science and Society," was presented by Dr. C. E. Friley, president of Iowa State College.

In addition to the general program, the academy met in nine sections for the presentation of 110 papers of special interest. A section on science teaching was initiated under the chairmanship of Dr. J. B. Culbertson, of Cornell College, Mt. Vernon, Iowa. The Junior Academy of Science of Iowa met with the academy with an attendance of delegates from eleven clubs. Dr. H. S. Conard, of Grinnell College, and Dr. George Hendrickson, of Iowa State College, presented talks on their program.

The following officers and section chairmen were elected for the next meeting, which will be held at Iowa State College at Ames, Iowa:

[3] R. Demoll, "Der Flug der Insekten und der Vögel," Jena: Gustav Fischer: 6, 1918.

[4] R. J. Tillyard, "The Biology of Dragonflies," Cambridge University Press: 322, 1917.

[1] In translation it reads: "As it frequently happens that scientific principles, when published by their authors, become in the hands of a third party, after being slightly modified or by the addition of a certain apparatus, the object of a patent, I (following the advice of duly qualified persons) applied for a patent, prior to publishing my paper in February, so that the same should be prior in date to any which my paper would give rise to; I may add that it is my intention not to make use of it."