

captivity pairing occurs readily in 3 in. × 1 in. glass tubes, in which flight is severely restricted (compare the case of *Anopheles maculipennis* var. *atroparvus*⁴). Moreover, males will mate with the completely immobile females actually engaged in biting, as already noticed by Pomerantzev⁵. All three types of mating last some two to three minutes and result in successful transfer of sperm to the spermatheca of the female.

Roth⁶ found that the mating reflex of *Aedes aegypti* is elicited by the characteristic sound of the female in flight, which is perceived by the long auditory hairs of the male antenna. Males of *C. nubeculosus* also possess these antennal hairs, which are erected during swarming but usually decumbent at other times. Mating in the swarm, and possibly in more confined spaces also, seems to depend on this mechanism; but mating with immobile feeding females must be a radically different case.

Activity of the females. The daily cycle of activity of the females has been investigated by sweep-net collections made at hourly intervals. There are distinct evening and morning peaks of activity, corresponding roughly to the two periods of male swarming. A few females are active also at other times of the day and night. The evening peak is three to four times as great as the morning peak. The excess of females in the evening were found, on dissection, to have large ovaries containing ripe eggs apparently ready for laying. The remainder of the evening fliers, the morning fliers and those taken at other times, almost all had small ovaries with undeveloped oocytes. Females with ovaries in any intermediate condition were rare. It was also very unusual to capture individuals with blood in the stomach.

The females with small ovaries that fly both in the evening and in the morning (perhaps a mixture of newly emerged insects and older ones that have recently oviposited) are probably in search of a blood meal. Having fed, they hide and do not become active again until the meal has been digested and the eggs have matured; they then show only one very sharply defined (evening) period of activity. No such distinct one between two age-groups showing different cycles of activity appears to have been made in studies on mosquitoes, possibly because the techniques commonly used are adapted to record only insects that are ready to bite.

Egg-laying. When an attempt was made to induce evening-caught females with ripe eggs to oviposit, it was found that those set up singly in suitable 3 in. × 1 in. tubes usually failed to lay though they might live for several weeks, whereas others left together in the tube in which they had been collected oviposited overnight. In a small experiment, only one out of ten females in individual tubes oviposited during the night following capture, as against ten out of twelve set up in three groups of four per tube. This remarkable density-dependent factor for oviposition has since been confirmed using laboratory-reared insects. The nature of the factor is unknown, and attempts to observe oviposition in the field were not successful.

Biting and longevity. The Chideock strain of *C. nubeculosus* is being maintained in the laboratory, where the complete life-cycle may be as short as three weeks. Females will not bite until two to three days old; but an activity factor is also involved, since those kept in 3 in. × 1 in. tubes often refuse to feed at all although given daily opportunities, while those

in larger (1½ cu. ft. approximately) cages almost all bite on the third day after emergence. Egg-laying takes place, if the females are suitably concentrated, four to five days after the blood meal, and the insect is then ready to bite again immediately and in due course to lay. As many as five successive batches of eggs have been obtained from a single female; mating in this case had taken place once only (at the time of the first blood meal), but more than 80 per cent of each batch hatched. Adult females may live for rather more than a month.

A fuller account of these studies is in preparation. [May 8.

¹ Kennedy, J. S., *Proc. Zool. Soc. Lond.*, **109** (A), 221 (1940).

² Nielsen, E. T., *Bull. Ent. Res.* (in the press).

³ Gibson, N. H. E., *Nature*, **150**, 268 (1942).

⁴ Cambournac, F. J. C., and Hill, R. B., *Amer. J. Trop. Med.*, **20**, 133 (1940).

⁵ Pomerantzev, B. I., *Mag. Parasit.*, *Leningrad*, **3**, 183 (1932).

⁶ Roth, L. M., *Amer. Midl. Nat.*, **40**, 265 (1948).

CARNEGIE UNITED KINGDOM TRUST

ANNUAL REPORT FOR 1949

THE booklet issued by the Library Association in connexion with the centenary of the passing of the first Public Libraries Act pays tribute to the part played by the benefactions of Andrew Carnegie in stimulating progress. The thirty-sixth annual report of the Carnegie United Kingdom Trust covering the year 1949* fittingly gives a detailed account of what the trustees have done for the development of library services, more especially as their decision to rehouse the Scottish Central Library seems likely to be their last major contribution in this field. One of their first decisions, on December 22, 1913, was to commission a report on the results of the library grants already given by Mr. Carnegie and on possible future lines of work.

During 1915-19 the Trust made grants to nineteen county councils to enable them to provide and maintain collections of books which would circulate among their villages, and in 1916 the Central Library for Students, known since 1930 as the National Central Library, was founded with the aid of a grant from the Trust, the immediate aim of the Library being to improve the supply of books to students in organised classes of adult education. The Scottish Central Library was established by the Trustees in 1921, primarily as a repository to supplement the resources of the fifteen Scottish county library systems and to supply books to individual readers in other counties. The Irish Central Library was established in 1923, on an earlier scheme for supplying rural libraries with loan collections of books. The period of the Trust's help to the three Central Libraries is now drawing to a close. The grant to the National Central Library, due to finish in 1941, was renewed, as an exceptional measure, during the Second World War and the subsequent five years and will terminate early in 1951. The Irish Library also receives a diminishing grant due to terminate in 1953; but the date at which the Scottish Library will become wholly independent of Trust grants is still uncertain.

* Carnegie United Kingdom Trust. Thirty-sixth Annual Report, 1949. Pp. viii + 44. (Dunfermline: Carnegie United Kingdom Trust, 1950.)

Since 1922 the Carnegie Trust has also made grants to the libraries of learned societies participating in the 'outlier library' system associated with the National Central Library, and help has also been given to the regional system of library co-operation, particularly for the compilation of a nucleus union catalogue of all the books available. With grants from 1926 onwards, for book purchase by small municipal libraries, and for supplying basic collections of books to boys' and girls' clubs, to the National Library for the Blind, the Seafarers' Education Service and the British Sailors' Society, as well as to institutions which exist to improve the general standard and status of librarianship, the total expenditure of the Trust upon library services, when existing commitments have been discharged, will amount, in round figures, to £1,640,000.

In the field covered by the Arts Committee of the Trust, the chief event of 1949 was the creation of the independent Drama Board. Financial considerations have precluded the trustees contemplating the establishment, as recommended in the Young-husband report, of a Carnegie School of Social Work, in association with an appropriate university, but a grant of £200 has been made to enable the National Federation of Women's Institutes to repeat in the Isle of Man the pioneer work carried out successfully in the Channel Islands. Satisfactory progress is reported in the two schemes concerned with juvenile delinquency and also from the Young Farmers' Clubs. The Mobile Club experiment in the Island of Mull has led to the formation of the permanent youth clubs and to appointment by the local education authority of a permanent youth officer for the island.

SIDNEY GILCHRIST THOMAS

THE centenary of the birth of Sidney Gilchrist Thomas on April 16, 1850, was commemorated by the Iron and Steel Institute by a special lecture, delivered by Mr. James Mitchell on April 26 during the annual meeting of the Institute.

Educated at Dulwich College and the Birkbeck Institute, London, Thomas intended to adopt medicine as a career; but the untoward death of his father compelled a change of plan. He became a clerk at the Thames Police Court in 1867; but he spent his time outside office hours in the study of science, taking such examinations in metallurgy of the School of Mines as were open to him as an external student. His interest in the removal of phosphorus from iron appears to have been aroused about 1870 while still a student at the Birkbeck Institute. From a study of the available literature he concluded that the non-removal of phosphorus in the Bessemer process was due to the siliceous lining of the converter and the siliceous character of the slag. A period of experimental work at home, later continued by his cousin, Percy Gilchrist, chief chemist at the Blaenavon Works, followed, and in a comparatively short period of time he was able to announce to the Iron and Steel Institute the discovery of the basic Bessemer process, by which ductile steel could be made from pig iron high in phosphorus, a discovery which, by opening up a new section of the iron-bearing riches of the world, revolutionized the steel industry.

The story of his announcement is dramatic. In September 1878 Lowthian Bell read a paper before the Iron and Steel Institute "On the Separation of Phosphorus from Pig Iron", in which, working on the

reactions, as they conceived them, which occur in the puddling process for the production of wrought iron, Bell and other metallurgists were endeavouring to eliminate phosphorus by washing processes, the chemical detergents being oxide of iron and similar materials. The most interesting feature of the discussion of this paper was that it provided the opportunity for Thomas to make the first public intimation of his own success in solving the great metallurgical problem of the time. An eye-witness records: "I remember distinctly the pitying smile of derision and the stony stare which pervaded the countenances of the distinguished assemblage. No one thought it worth while to refer to Mr. Thomas's claim or ask him 'How he did it'."

Within a year a paper was presented which was to establish the truth of the young man's claim. A paper by Thomas and Gilchrist on "The Elimination of Phosphorus" was prepared for the autumn meeting of the Institute held in Paris in 1878. The time, however, was not available to permit of it being read and discussed; but at the spring meeting of the following year a complete process, commercially proved, was given to the world. The delay at the Paris meeting had one further important, and probably decisive, result on the development of the process. The pre-print of the paper and a meeting with Thomas interested Mr. E. Windsor Richards so much that he obtained the consent of his directors to proceed immediately with trials on a works scale at Bolckow Vaughan's plant at Middlesbrough, the results of which added immeasurably to the rapid commercial development of the process. When in due course the subject was discussed by the Iron and Steel Institute during the spring of 1879, the meeting took a form which can be described without exaggeration as an international symposium, the speakers taking part coming from almost every country which at that time had an interest in the solution of the phosphorus problem. The basic Bessemer process was born.

Thomas was industrious to a remarkably high degree, with a highly developed sense of duty and responsibility, and a capacity for liking, and being liked, by a wide diversity of people. It is on record that he appealed to such very different individuals as Andrew Carnegie and William Ewart Gladstone. There is a repeated suggestion in his letters of a strong sense of fun, maybe even of mischief. He certainly possessed the truly great man's first essential characteristic of being ironically amused at his own apparent importance in the sight of others. He had a streak of almost super-caution, and did not relinquish the small but sure competence of his salary as a clerk of the Thames Police Court until the first royalties from his process became available. He also had 'an eye to the main chance', but it was an altruistic eye. Much more successful than many luckless inventors of the period in securing a substantial financial return from his invention, it is worth recalling that these gains—and they must have been considerable—were left, on his early death in 1885, to his sister for the benefit of the workers, or, as he wrote to her, "in doing good discriminately". For our purposes his outstanding characteristics were his pertinacity, patience, and a real ability to lead and inspire those with whom he was associated. Attractive as it may be to dwell on what must have been a very pleasing personality, it is his immense contribution to technical knowledge, the methods by which he made it, and their implications, which still remain important to-day.

F. C. T.