morial to F. C. S. Schiller (1864–1937). Following there will be a symposium on the Concept of Law in the Mathematical and Natural Sciences, in which Morris R. Cohen, of the College of the City of New York, will speak on philosophy; D. J. Struik, of the Massachusetts Institute of Technology, on mathematics and physics, and Otto Glaser, of Amherst College, on biology. In the afternoon there will be a symposium on the Concept of Law in the Social Sciences, in which R. H. Lowie, of the University of California, and Alexander Lesser, of Columbia University, will represent anthropology, and George A. Lundberg, of Bennington College, sociology.

A MEETING of the New York Geographical Association at the State Normal School, Cortland, N. Y., will be held on Saturday, November 13. During the morning session a series of papers will be presented, and a land use field trip will be conducted during the afternoon. Dr. George B. Cressey, of Syracuse University, will give an account at the annual banquet of his work in Siberia during the past summer.

THE annual meeting and dinner of the U. S. Institute for Textile Research has been postponed from November 4 to Friday, November 12, at the Hotel Commodore, New York City. Textile Research Progress will be the subject of papers and addresses at an open research conference in the afternoon and at the dinner, and results of researches of the Textile Foundation, the Chemical Foundation, the American Association of Textile Chemists and Colorists, and the U. S. Institute will be described. The study of Organization of Production and Distribution in the Textile Industries, now nearing completion at the Wharton School of Finance and Commerce, Philadelphia, Pa., will be described at the dinner on Friday evening by Dean Joseph H. Willits and his associates, Messrs. Balderston, Taylor and Davis, and Dr. Wanda K. Farr, of the Chemical Foundation, will report progress on research on the chemistry of cellulose. The Hon. Francis P. Garvan, president of the U. S. Institute for Textile Research and of the Chemical Foundation, will preside at the dinner, and the first vice-president, Dr. E. H. Killheffer, will act as toastmaster. W. E. Emley, chairman of the Research Council, will preside at the afternoon conference.

AT the recent meeting of the annual clinical congress of the American College of Surgeons in Chicago, Dr. Max Cutler, director of the Tumor Clinic of Michael Reese Hospital, announced the establishment of the Chicago Tumor Institute "to conduct research on the causes, diagnosis and treatment of cancer, and to instruct and assist physicians, surgeons, clinics and hospitals in the diagnosis and treatment of cancer." Associated with Dr. Cutler in the direction of the institute will be: Dr. Ludvig Hektoen, director of the McCormick Memorial Institute for Infectious Diseases of the University of Chicago, *president;* Dr. Arthur H. Compton, professor of physics, University of Chicago, *vice-president;* Dr. Henri Coutard, of the Curie Institute, Paris, and Sir Lenthal Cheatle, of London. Plans have been completed for the remodeling of the building at the southeast corner of Dearborn and Elm Streets, which will house the activities of the institute. It will be ready for occupancy and the institute will begin to function about March 1. Dr. Coutard plans to arrive on November 10 and to spend three months in research at the California Institute of Technology.

DISCUSSION

THE PERENNIAL FLYING FISH CONTROVERSY

THE method of operation of the mechanism involved in the aerial travels of the oceanic flying fishes (*Exocoetidae*) would seem to be beyond solution if one were to judge from the perennial blooming of the controversy concerning the alleged possibility of a wing-flapping flight. Those of us who, on a basis of aerodynamics, observation and anatomy, have long been satisfied that the flight of these fishes is in the nature of that of a motorless glider, are sometimes at a loss to understand the point of view of those who continue to believe that simple observation alone can be used to establish a flapping flight without any reference to the limitations of the motor mechanism necessarily involved or to the principles of modern aerodynamics. As long ago as 1930[1] the writer decided to make no further attempt to answer such comments as appear on the subject from time to time. However, the most recent attempt[2] to establish wing-flapping for flying fish has caused a reconsideration of that decision for reasons that should be sufficiently obvious in the following discussion.

In this most recent case, there is a list of seven items in support of the wing-flapping belief. These are here repeated and each is subtended by such comments as the individual items require.

"The course was not a trajectory, but flat." No one has thought to consider these fish as simple projectiles. The feats of modern gliders to which these fish, on the other hand, have been compared are certainly not trajectories and may be just as "flat" as those of any flying fish. Many birds, *e.g.*, the albatross, although

[1] C. M. Breder, Jr., *Copeia,* 4: 114–121, 1930.

[2] E. L. Troxell, SCIENCE, 86: 177–178, 1937.

capable of wing-flapping, manage to out-glide any flying fish in an identical environment without any recourse to wing-flapping. Such movements are brought into play for other purposes. As flying fish are unable to produce such movements, when they find themselves in similar circumstances they are either forced down or manage to keep aloft by other manipulations.[3]

"The angle of emergence, probably 5° to 7°." The angle of emergence is perforce conditioned by the fish's behavior and ability as a swimming mechanism. While the resulting flight is undoubtedly influenced by the angle of emergence, there is nothing intrinsic in this angle to either preclude a soaring flight or to favor a wing-flapping one. A glider may be snapped into the air at a much higher angle or may be towed to flying speed at one much lower. It is the latter type of take-off that the fish so often simulate in their well-known "taxi" movements in which only the lower caudal lobe remains immersed. The details of this movement are well known and have been figured and described in the fullest detail by Hubbs (1933).[4]

"There was apparently uniform speed." The speed may be regulated by changing the camber of the wings, a feat no glider is built to accomplish, but one which gives the fish a much greater flexibility of flight and a generally smoother performance. Even so, marked variation in speed in straight-away flight is not a notable feature of gliders.

"The fishes turn in their flight." So may anything with a rudder. Further, much of the curving in the flights of flying fish is caused by extrinsic wind pressures forcing the fish to swerve.[5] This item and all those preceding raise questions that could equally well be asked concerning the behavior of a glider or a soaring bird if there remained in the minds of any one a query regarding the possibility of a hidden interior source of power.

"The wings seemed to flutter." If viewed from directly behind, the "flutter" resolves itself into a side-to-side, rocking motion on the longitudinal axis, the right wing tip being up when the left is down, a condition not compatible with an ordinary flapping flight. This condition of instability is, however, one associated with the large lateral dihedral angle between the wings that these fish use in initiating a flight in order to obtain a maximum lift. In a fair breeze or when flying speed has been sufficiently increased by any means, the wings are customarily lifted a little, decreasing the lateral dihedral and increasing stability at the expense of some lift, a loss proportionally permissible in ratio to the increased speed of translation.[6]

"There was flight in both calm and rough weather." Flights are longer, higher and more sustained with a light breeze than in a dead calm.[1, 4, 5] Flight in a dead calm is least and is induced by the taxi maneuvers in which flying speed is attained.

"There was a distinct runway in the take-off." This apparently refers to what has been more generally called the taxi. Both flapping birds, such as gulls, planes and gliders, use analogous methods to get into the air with flying speed. This item, like the rest, can not be used to distinguish one kind of flight from the other.

In the text of the article under discussion, mention is made of the appearance on the surface of the water of two parallel rows of dots and is described as ". . . undoubtedly made by the tips of the fluttering wings before the fish had completely cleared the surface." If indeed the "dots" were caused by the wing tips, a change of the word "fluttering" to "oscillating" would satisfy this writer. This would stagger the dots instead of placing them in the pairs that Troxell illustrates. Since, however, the "dots are ever expanding Newton's rings in close series, it is difficult to estimate just how accurate such an observation might be. The writer once thought he detected some such disturbance in very calm weather, but the larger rings made by the rapidly oscillating caudal fin so far obscured them that certainty was not possible. Forbes,[7] observing flying fish from an airplane, describes surface marks as follows: ". . . I distinctly saw the undulating wake of the fish's tail, looking like a row of dots on the surface of the water." Could it be that the "dots" of the tail were mistaken by the more recent observer for pectoral dippings? It may be mentioned that Troxell made no reference to the rapidly beating tail fin with its lower lobe trailing in the water, a most conspicuous feature of the take-off. One wonders what function this violent muscular activity serves if the fish is fluttering its way aloft.

The pectoral musculature, from an anatomical side, has been shown long ago to be in no way adequate to the demands of wing-flapping exertion.[8] There is nothing in the nature of a sternum-like structure for the necessary attachment nor a muscle mass in any way sufficient for the work required. All flying animals employing a wing-flapping mechanism, bats, birds or pterodactyls, have necessarily the required large power plant.

It is worth noting in this connection that the tiny fresh-water characid flying fishes of the subfamily

3 C. M. Breder, Jr., *loc. cit.*

4 C. L. Hubbs, *Pap. Mich. Acad. Sci. Arts and Letters*, 17: 575–611, 1933.

5 C. M. Breder, Jr., *Zoologica*, 9: 295–312; 1929; C. L. Hubbs, *Smiths. Rep.:* 333–348, 1935, and *Pap. Mich. Acad. Sci. Arts and Letters*, 22: 641–660: 1937.

6 C. M. Breder, Jr., *Copeia*, 4: 114–121, 1930.

7 A. Forbes, Science, 83: 261–262, 1936.

8 W. G. Ridewood, *Ann. Mag. Nat. Hist.*, 8: 544–548, 1913.

Gasteropelecinae have a well-developed sternum-like process and a muscle mass attached to it that should certainly be adequate for a wing-propelled flight.[9,10] Field observations of *Thoracocharax maculatus* (Steindachner) could not satisfy the writer if such was the case.[11,12] These flights were only seen at night by aid of a flashlight and were of such erratic occurrence that details of this sort could not be distinguished. On an anatomical basis it may well be, however, that here alone, in the fishes, is to be found a true wing propelled flight. If such is the case, the small size of these fishes and the failure to see any evident flapping in field observation leads one to incline to the idea that such wing movement might well approach to the mechanics of a buzzing insect flight. Against this is the form of the pectorals which are surprisingly similar to those of the exocoetids, and quite unlike any insect wing.[13] Since the field observations were made, other species in aquaria and in a fairly large outdoor pool have been experimented with in an attempt to study the flight to better advantage. So far a simple leap, such as a variety of fish might make, has been the only result. In the field it was quickly found that these fish would not fly unless there was water ahead of them; in other words, they could not be forced to fly ashore. Just how they knew when there was and when there was not open water ahead is not understood, but may be basic to their refusal to fly in small aquaria. This should not apply to the pool in question, which has two arms, each over twenty feet in length.

No longer ago than last year, a similar controversy took place on these very pages which the writer purposely refrained from entering. This was instigated by Mills[14] and adequately answered by Forbes[15] and Loeb.[16] Considering the literature alone since 1930 there have appeared four critical dissertations—three by Hubbs already referred to of some length, and one by Carter and Mander.[17] The earlier literature, running back to before the time of an adequate aerodynamic basis, need not be discussed here, except to say that it is of great volume and of large variation in quality. A lead into its vastness may be had from the bibliographies in the more recent papers mentioned herewith. In the light of this, it seems unfortunate that field naturalists continue to present the anachronism of explaining why and how the oceanic flying fishes flap their wings to locomotor effect on a basis of more or less extended shipboard observation without bothering to take into consideration two fundamental elements involved; namely, that of mechanical possibility on an anatomical basis and that of the aerodynamic possibility on an engineering basis. There is adequate data to show that all the performances noted in the Exocoetidae are well in accord with the calculable limits of their aerodynamic characteristics as gliders.

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9 *Ibid.*

10 C. M. Breder, Jr., *Bull. Amer. Mus. Nat. Hist.*, 57: 91–176, 1927.

11 *Ibid.*

12 C. M. Breder, Jr., *Zoologica*, 4: 159–297, 1926.

13 *Ibid.*

14 C. A. Mills, SCIENCE, 83: 80 and 262, 1936.

15 A. Forbes, SCIENCE, 83: 261–262, 1936.

16 L. B. Loeb, SCIENCE, 83: 260–261, 1936.

17 G. S. Carter and J. A. H. Mander, *Rep. Brit. Assn. Adv. Sci.*, 105: 383–384, 1935.

HOME OF THE ANCON SHEEP

IN Darwin's "Animals and Plants under Domestication," Chapter 3, he refers to the ram lamb born in Massachusetts in 1791 with short crooked legs, like a turnspit dog, which was the ancestor of the Otter or Ancon, a semi-monstrous breed, valued because they could not leap over fences; since exterminated. His statement is based on the report of Colonel Humphreys, *Philosophical Transactions,* London, 1813, page 88. This achondroplastic character was perhaps recessive, because the Otter ram and ewe always produced Otter offspring (except one questionable case). I do not know of other published first-hand statements on the Otter sheep.

In May, 1899, while I lived in Cambridge, I paid a visit to Dover, Mass., and interviewed Mr. Frederick Wite, grandson of Seth Wite, Jr., the originator of the Ancon or Otter race of sheep; also Mr. George Ellis Chickering, of Dover, and his brother. In a graveyard I found a stone with the inscription, "Mr. Seth Wite Jun^r Who Died July, 1799, Aged 46."

Mr. Chickering, who was probably about 65, stated that his father, who died in 1857, had Otter sheep, which he disposed of just before his death, and Mr. Chickering's father told him they were Otter sheep of Mr. Wite's breed. Mr. Chickering did not know of any Otter sheep later than this. He remarked that the sheep had peculiar crooked legs and thought likely they could not jump fences as well as other sheep, though his brother, standing by, said they would jump fences on occasion.

Mr. Wite's farm was on the Charles River, about three miles southwest of the village of Dover, near the Sherborn line—Latitude 42° 14′ 15″ N; Longitude, 71° 19′ 30″ W. This Frederick Wite, who appeared to be about 70 years old, knew that his grandfather, Seth Wite, Jr., had originated the Otter sheep, but knew nothing more about it. Mr. Wite, like Mr. Chickering, had never heard the name Ancon (only Otter) applied to these sheep.

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