thrust by the tail fluke suggests other possible ways of riding wind waves. If, for instance, the porpoise were cruising in the trough (or crest), he might be propelled along with the wave by sticking the tail fluke into the rising (or falling) water of the slope behind him. He could also combine shear-thrust riding with gravity- or float-planing. Since, however, these smart and playful animals evidently pay little attention to wind waves, this goes to show that none of our proposed ways of riding them can be practical. Evidently wind waves are not steep enough, and do not persist long enough, to do a porpoise much good. Only the abrupt and steep rise of a bow wave seems to be capable of giving him a worth-while push. But how does the porpoise produce the down-thrust of his tail fluke which he obviously needs in order to retain his position?

There appear to be other examples of bow-wave riding in the sea. Cousteau (*7*), in his book *The Silent World,* describes and shows a photograph of a tiny pilot fish which apparently rode the nose wave of a shark: "A thumbnail of a pilot fish wriggled just ahead of the shark's snout, miraculously staying in place as the beast advanced. He probably found there a compressibility wave that held him. If he tumbled out of it, he would be hopelessly left behind."

References and Notes

1. A. H. Woodcock, *Nature* 161, 602 (1948).
2. P. F. Scholander, *Hvalrådets Skrifter No. 22* (1940); L. Irving, P. F. Scholander, S. W. Grinnell, *J. Cellular Comp. Physiol.* 17, 145 (1941).
3. A. H. Woodcock and A. F. McBride, *J. Exptl. Biol.* 28, 215 (1951).
4. W. D. Hayes, *Nature* 172, 1060 (1953).
5. D. A. Parry, *J. Exptl. Biol.* 26, 24, Fig. 1 and plate 3, Fig. 9 (1949).

6. I wish to express my thanks to L. K. Coachman, O. Iversen, and H. Jensen for help in constructing and testing the bow-wave gadget. This part of the investigation was undertaken in spare time on the Arctic Institute Greenland Expedition 1958, which was aided by a contract between the Office of Naval Research, Department of the Navy, and the Arctic Institute of North America. At Scripps Institution of Oceanography I have enjoyed the benefit of discussions with W. H. Munk, and I had the able assistance of J. S. Kittredge and H. Andersen in the towing tests.

7. J. Y. Cousteau, *The Silent World* (Harper, New York, 1950).

The Forgotten Man: Sir John Lubbock

His contributions to zoology and his liberal record as a member of Parliament ought to be remembered.

R. J. Pumphrey

When Sir John Lubbock, the first Lord Avebury, died in 1913 (before the outbreak of the 1914–18 war) he was deeply mourned by thousands who knew him and revered by millions who only knew of him. By the end of that war his reputation was in complete eclipse, and it is only now and very partially beginning to emerge from an unmerited obscurity.

In a recent number of *New Biology* I found the following passage: "It is remarkable that up to 1914 there was no definite proof that bees could see colours. Everyone from Sprengel onwards had assumed it, but there were only a few experiments such as those of Lubbock (1875–6). These, though suggesting that bees possessed colour-vision, did not eliminate the possibility that they discriminated between different colours by their brightness alone. Indeed, the first full-scale experiments came from Hess (1913) who claimed that this was the case: that honey bees could not see true colours but only various shades of grey. For a time there was doubt, but in 1914 von Frisch began his classic work. . . ."

This is one example of how Lubbock's work is forgotten or, if remembered, described in such a way as to diminish its importance. It is simply not true that von Frisch proved what Lubbock had failed to prove 40 years earlier. Von Frisch does not mention Lubbock in his bibliography, and it may well be that he was only impelled to begin his color-vision work by a distrust of the work of Hess, who started out with a bee in his bonnet and was wrong about most things. Nevertheless, von Frisch's technique resembled Lubbock's very closely, and his results are open to the same sort of criticism. The final answer was given, so far as bees are concerned, not by von Frisch in 1914 but by Kühn in 1927, using pure spectral colors (a method invented by Lubbock though applied by him only to *Daphnia* and to ants). It is worth noting that Lubbock's experiments on bees were supported by extremely pertinent observations on the color sensitivity of wasps and ants, water fleas and dogs.

Lubbock answered contemporary criticism temperately and convincingly. He can hardly be blamed for not replying to the effusions of Hess, which in any case were not published till he was dying. Nothing subsequent should be allowed to obscure the fact that Lubbock was the first by 40 years to do experiments in this field, and that he got answers which, as far as they went, were absolutely right.

Yet, when I took a course in zoology at Cambridge in the twenties, although my pastors and masters spoke highly of the virtues of the experimental method (held by some of them to be a Cambridge invention), I never heard Lubbock mentioned. It is true that I never heard von Frisch mentioned either, and the extraordinary postwar development of comparative physiology in Germany passed almost unnoticed. Until I began to read for myself, I did not realize how much Lubbock had done, not only in his experiments and in pointing the way to further work, but in creating the climate of opinion in which experimental work in biology was possible.

The obscurity into which Lubbock's work relapsed after the 1914–18 war did not, however, cover only his contribution to zoology. He had been eminent, indeed preeminent, in many fields, and

The author is professor of zoology at the University of Liverpool.

This article is reprinted, with permission, from *Notes and Records of the Royal Society of London* [13, No. 1 (1958)].

in all his work seemed to be forgotten. I am not competent to make the reappraisal which is overdue, but it seems worth while to glance, however superficially, at his extraordinary career and to try to guess what qualities of the man and what circumstances of his time account for his success and his failure (if indeed it was a failure).

Boyhood

John Lubbock was born in London in the middle of a significant period in our history, in 1834, just after the great Reform Act, just before the first Factory Act and the accession of Queen Victoria. His birth was in fact roughly synchronous with the birth of the Liberal Party out of the tattered corpse of the Whigs. When he was very young the family moved to Down in Kent. His father was a baronet, a banker of very considerable fortune, a Fellow of the Royal Society, and an eminent mathematician, the first since Newton to battle successfully with the difficult theory of tides. John recorded his own first outstanding memories (from about his third or fourth year) as a glimpse of Queen Victoria's coronation procession and "the sight of a large insect under glass." This early interest in insects remained with him for life, but a much more important event occurred when he was eight. In his own words: "I first heard his name in 1842, when I was just eight years old. My father returned one evening from the City, and said he had a great piece of good news for me. He excited my hopes and curiosity, and at last announced that Mr. Darwin was coming to live at Down. I confess I was disappointed. I thought at least he was going to give me a pony! But my father was right. I little realised what it meant to me, nor how it would alter my whole life."

Friendship with Darwin

Darwin took to the small boy at once and very soon persuaded John's father to give him a microscope. So began a friendship which became only closer with the years till Darwin's death. It was firmly founded on both affection and respect, for, if the young Lubbock venerated Darwin, Darwin himself later confessed that he relied on the opinions of three men only—Hooker, T. H. Huxley, and Lubbock—and of these he put Lubbock first because of "the course of your studies and the clarity of your mind." Lubbock's introduction to scientific discipline was to report on some of Darwin's collections and to help in illustrating his work.

John went to a private school when he was eight and on to Eton at 11. He was removed by his father before he was 15, from motives which seem to have been mixed. Ostensibly and probably quite genuinely Sir John disapproved of the education given at Eton at that time, which consisted of Latin and Greek undiluted by science, mathematics, a modern language, or even English, though history (ancient) and geography (classical) entered into it to a limited extent. But also, he had two ailing partners in the family bank and found that banking was getting in the way of his mathematics. Young John was made a partner forthwith, and with increasing frequency he was left to hold the fort while his father got on with the tides. So he had to face loneliness and responsibility very young, and, with a self-discipline almost incredible today, he set himself to remedy the defects of his education. He organized his day of 17½ hours minutely, beginning with mathematics shown up to his father before breakfast and ending with German from 11 to midnight, because, as he said, nothing else kept him awake so well. It is true that the timetable admitted three-quarters of an hour of whist after dinner and a walk in the afternoon and made ample provision for prayer, meditation, and the reading of sermons. Even so, it is hardly surprising that John's health was at this time thought to be uncertain. It is clear that he had already acquired the faculty of economizing time and of turning from one subject to another without pause or hesitancy which was the marvel of his contemporaries to the end of his life. As he grew up he became bearded in the fashion of the time, but it was probably policy rather than fashion which guided him in this, for, contrary to fashion and in the face of an indignant family, he insisted on wearing elastic-sided boots, remarking that one could easily learn a language in the time saved from doing up laces.

Space does not permit a full survey of his career, but an idea of his multifarious activities may be inferred from the outstanding events of three separate years in his life.

In 1856 (aged 22) he got married; he did the work on the reproduction of *Daphnia* which earned his admission to the Royal Society two years later; and he originated and secured the agreement of all other English banks to a major alteration in banking practice known as the Country Clearing System.

In 1871 (aged 37), within a year of entering Parliament as Liberal member for Maidstone, his first private bill became law as the Bank Holidays Act; his Ray Society monograph on the Collembola and Thysanura was published (he first named the Collembola and distinguished them from the Thysanura); he became a vice president of the Royal Society and president of the Royal Anthropological Institute and was proposed as vice chancellor of the University of London, an office which he held for the next eight years.

In 1888 he served on royal commissions on elementary education and on gold and silver; published what to a zoologist is probably his most important book—*On the Senses, Instincts and Intelligence of Animals*; became a privy councillor and president of the London Chamber of Commerce.

In each of these three years there was an important zoological contribution, but they are not otherwise outstanding in the total of 79.

Success as a Back-Bencher

It is worth looking a little more closely at his parliamentary career. He was Liberal member for Maidstone for ten years and for the University of London for 20 before going to the Lords. He was never a minister and apparently never wanted office. His ambition before entering parliament is on record. It was: (i) to promote the study of science, both in secondary and primary schools; (ii) to quicken the repayment of the national debt; (iii) to secure some additional holidays and shorten the hours of labor in shops.

In another place he admits that he was also at that time anxious to carry a measure to prevent the then rapid destruction of ancient monuments.

In the event, he originated no fewer than 30 private member's bills which became law—all in his life-time except for three which were still on the stocks at the time of his death. A considerable number of these are acts regularizing the law as it affects commercial or professional practice, such as the Bankers Books Evidence Act, College of Surgeons Act, Dental Practitioners Act. The others are more directly related to what we should call "raising the standard of living," and they show clearly how far Lubbock was in advance of his time. Examples are the Open Spaces Act

(1890); the Ancient Monuments acts of 1882 and 1901; the Wild Birds Protection Act (1880); and the Public Libraries Amendment Act (1892).

The way of the private legislator was even then beset by obstacles. It was only too easy for a meritorious bill to be thrown out or talked out for irrelevant reasons, and any serious opposition could block it for years. The Bank Holidays Act, Lubbock's first, got through at once on its title, before opposing interests had time to mobilize. It was never intended as a measure for bank servants only, as its wording makes perfectly clear, but if it had been called a "National Holidays Bill" (which is what it was), it would certainly not have had so easy a passage. His second bill, on Early Closing, was in fact blocked in 1872 and finally got through in pieces after long delay as: (i) Shop Hours Regulation Act, 1880; (ii) Seats for Shop Assistants Act, 1900; (iii) Shop Hours Act (Early Closing), 1904; and (iv) Sunday Closing (Shops) Bill, 1908.

In the early days there really was sweated labor in shops. Many never closed, and the assistants slept under the counter when they got the chance. The first act of the series only succeeded in limiting to 72 hours a week the work of young persons under 17. A 12-hour day may seem to us more than enough for a child, but before the act a 17-hour day was usual, and even 120 hours a week was not unknown. It took Lubbock 30 years of work to get an act with teeth in it on to the statute book, but he was successful in the end. It is of interest that such important features of the welfare state as holidays with pay, and the 40-hour week stem from private motions of a Liberal more than 50 years before a Labour government was thought of.

His record of success as a backbencher has almost certainly never been approached and quite certainly never will be. He stands alone. And the same qualities which made him successful there account for his successes in some other fields; he was known to be absolutely disinterested, and he was a born and also a highly trained conciliator. If two eminent and pig-headed professors had been revelling for years in the sort of quarrel to which academic persons are prone, careless of whether they were wrecking every career and every enterprise within their ambit, Lubbock, and Lubbock alone, could persuade them that their interests were identical and that a common course of action was agreeable to both. And he could do this and still remain the friend of both. This talent became widely known when in 1871 he was called on to heal the breach between the Ethnological Society and the breakaway Anthropological Society. After that, the ambition of any society on the rocks through strife or incompetence, was to get Lubbock for president or treasurer; and in fact he found time to be president of about 25 learned societies, ranging from the Historical to the Statistical, and of about an equal number of commercial associations and government bodies. And he did work of the first importance in reconciliation during and after the industrial disputes towards the end of the century, especially the great dock strike.

The two great propagandists for evolution and natural selection were Darwin's personal friends, T. H. Huxley and Lubbock. And at first it seems odd that Lubbock, who was perhaps the more effective, should be less well remembered. Huxley was a combative spirit who genuinely hated complacent ignorance in high places. His quarrel was not with the Church but with churchmen who presumed to dogmatize without acquainting themselves with the facts. But he enjoyed the conflict, and if he could wipe the floor with a bishop or a canon of Christ Church it made his day; he does not seem to have been aware—perhaps he did not care—that though he usually silenced opposition he made few converts.

Lubbock took no part in these fireworks. As an evolutionist he believed firmly in progress and in human nature. He believed that if the facts were put to ordinary people in a way which

Fig. 1. Sir John Lubbock [From a portrait drawing by George Richmond in the possession of Mrs. Maurice Lubbock]

neither insulted their intelligence nor twisted the knife in their deepest feelings, they were bound to reach the same conclusions that he had reached and to convince themselves of their truth. Experience showed that as usual he was right. He wrote books and they sold by the hundred thousand, edition after edition, and in every language under the sun.

Author

His success is not really surprising, for he had hit on a technique then quite new and very rarely successfully copied since. He took the whole reading public into his confidence, and he never wrote down to it. There is hardly a book of his which could not be suitably read to the family before bedtime and which does not at the same time tell the expert much that he didn't know and suggest things he had never thought of. And he kept it up. From *Prehistoric Times,* published in 1865, to *Marriage, Totemism and Religion,* in 1911, there is hardly a consecutive three-year period in which a book by him, important, influential, and extremely popular, did not appear.

Books on botany, geology, archeology, sociology, and zoology; books on economics and books on scenery; books on the pleasures of life and the history of coins—it seems incredible that books by one man on such varied subjects should be always readable and almost always of substantial scientific value, until one considers Lubbock's special advantages and abilities. He knew everybody who knew anything; he never forgot what he had heard or read or seen, and he kept to the end of his life the sense of wonder and the curiosity of childhood; he saw the relations between apparently unrelated things, and he saw, with the clarity of the successful businessman, the best thing to do next. He was the master of the wide view and the limited and attainable objective.

As an economist he originated no far-reaching and speculative theories, but he was one of the first to see that if economics was ever to be scientific (and he thought it might) it must have facts. It was his insistence on the publication of bankers' returns and every sort of commercial statistics which has been instrumental in giving a later generation of economists the material on which to work. On coins and currency he could write not only as a collector (there were many collectors) but as a great archeologist and as a banker who had sat both on royal and on international monetary commissions.

He was not a great botanist, though he probably knew the flora of Europe as well as anyone of his time, but he could look at the plant world as an entomologist and an evolutionist, and he noticed that things which every botanist then took for granted needed explanation. His were among the first studies on form and function in plants, and he was the first to appreciate and to try to analyze the profound mutual influence of insects and flowering plants on their evolutionary histories.

Zoologist and Entomologist

As a zoologist, he wrote as one of the first to realize that it is what animals do that makes them interesting, and that the whole of classical taxonomy and anatomy and physiology is not an end in itself but an instrument for the understanding of their behavior. He was also the first to appreciate that behavior is only explicable in terms of the information animals receive from their environment. The order of the words in the title of the book I have already mentioned, is significant—*The Senses, Instinct and Intelligence of Animals.*

He was the first, after the great Réaumur, to realize the degree of intimacy necessary between an observer and the animal under observation before the latter's behavior is susceptible of intelligible description. Even Réaumur could not keep ants alive and under observation for more than a few months. Lubbock invented the simple but satisfactory observation nest, which is still standard, in which colonies could be kept under continuous observation for indefinite periods. He himself kept marked workers for seven years and had two queens of different genera which lived for 13 and 14 years, respectively. He was the first to put identification marks on individual insects, which now seems an obvious thing to do, like Columbus and the egg, but it gives him a claim to be the father not only of all sound subsequent work on the social insects but of much of modern ornithology as well. He was the first to work out, with any degree of completeness, the extraordinary life history of the domestic aphids, which overwinter in ants' nests and are literally put out to grass by the ants in the spring.

He was the first to use a maze as a device for the study of learning by animals, a method which has since been very extensively developed in the United States for testing the learning ability of vertebrates as well as invertebrates. He was the first to use the method of training which the Germans call *Dressur* as a test of sensory discrimination. This is the method which von Frisch has so successfully reinvented and exploited in the work of his school on the hearing and vision of fish and the smell and vision of bees.

He first discovered that the path followed by ants depended, in certain circumstances, on the angle from which light was falling on them and could be changed in direction quantitatively by moving the light source. This effect, rediscovered and christened the "*Lichtkompass* reflex" by Santschi (1911) 40 years later, is basic to all subsequent studies of sun-navigation by insects and birds. And he refers, in parenthesis in his work on color vision, to an observation which anticipates the work of Hertz on form vision in the thirties of this century.

The Peckhams, a pair of distinguished American entomologists, seem to have appreciated the importance of Lubbock's discovery of the light-compass reflex and accord him priority, but they make the singularly stupid reflection that it was a purely chance observation. If it was just chance, then it was just chance that Lubbock, on a walk before breakfast with Charles Kingsley, found the first fossil musk ox to be recorded in Britain and drew from this find the conclusion that the river gravel containing it was laid down in a glacial epoch. It was chance that led him on holiday in Switzerland to find an Eocene fossil in beds then supposed by Swiss geologists to be Triassic and unfossiliferous. It was chance that on another holiday he found a parasitic wasp which uniquely uses its wings to swim under water.

It was chance that he should find, in the rubbish of his own garden, an animal which he called *Pauropus*—an animal then new to science and still of questionable status, though Lubbock's guess that it is a primitive sort of centipede is perhaps as good as any.

It was chance which enabled him to buy up Avebury, the finest megalithic monument in Europe, under the nose of the speculative builder who was proposing to wreck it, and to put a spoke in the wheel of the London and South Western Railway Company when they intended to build a branch line through Stonehenge.

It was chance that led him to Halstatt at the moment when the working of the salt-mines by the Austrian Government was beginning to expose the richest burials and cremations of the early Iron Age known in Europe. (It was, incidentally, Lubbock who first clearly distinguished the hunting Paleolithic from the agricultural Neolithic cultures and gave them these names, which are still standard today.)

If these were all chances, they were not the sort of chances which happen to ordinary people. But of course they were not chance at all. The animal which he named *Pauropus* had probably been seen by others and dismissed, if it was thought of at all, as the larva of something else. This was the natural thing to do, for zoologists had too frequently been caught out in giving generic or even family rank to larval forms of animals already well known as adults, and they were learning caution. But Lubbock had enough knowledge to be sure that there was nothing it could be the larva of, and enough curiosity to examine it carefully and show that it was sexually mature.

Only once does he seem to have been caught napping. Towards the end of his life he was invited, with other distinguished persons, to inspect the recently "discovered" Piltdown skull, and he expressed a definite opinion about its age and importance. In his defense it must be said that he was old, he was ill, and he was fooled in very good company.

Eclipse

How was it possible that such an extraordinary man should have been forgotten so completely? Some reasons can be confidently given. The first world war effected a far more complete break with the past than the last. In the twenties everything Edwardian and Victorian assumed a haze of unreality, even for those who were born before the turn of the century. Even to his contemporaries Lubbock had seemed a little incredible; to the postwar world he naturally appeared entirely fabulous. The class from which he came—the class of the fairly affluent whose sons had filled the professions and the public service as a matter of course, and which could afford to act from principle rather than for monetary advantage—was extinct; the men of military age were dead, and the women of necessity married elsewhere. For that class had predominantly provided "officer material," and the half-life of junior commissioned officers in the 1914–18 war was only a few weeks. So government, local as well as central, passed into the hands either of the spivs, who had done very nicely out of the war, or of people doubtless well-intentioned but untrained and unprepared for that sort of responsibility. To neither did Lubbock seem to provide a satisfactory working model. He might truthfully have been described as an efficient idealist, and the Labour party, then as now, distrusted efficiency almost as much as the Tories distrusted idealism. He had been, if anything, a Liberal, and Lloyd George was busily engaged in the assassination of the Liberal party. He had been an internationalist, and President Wilson was sowing the dragon's teeth of "legitimate national

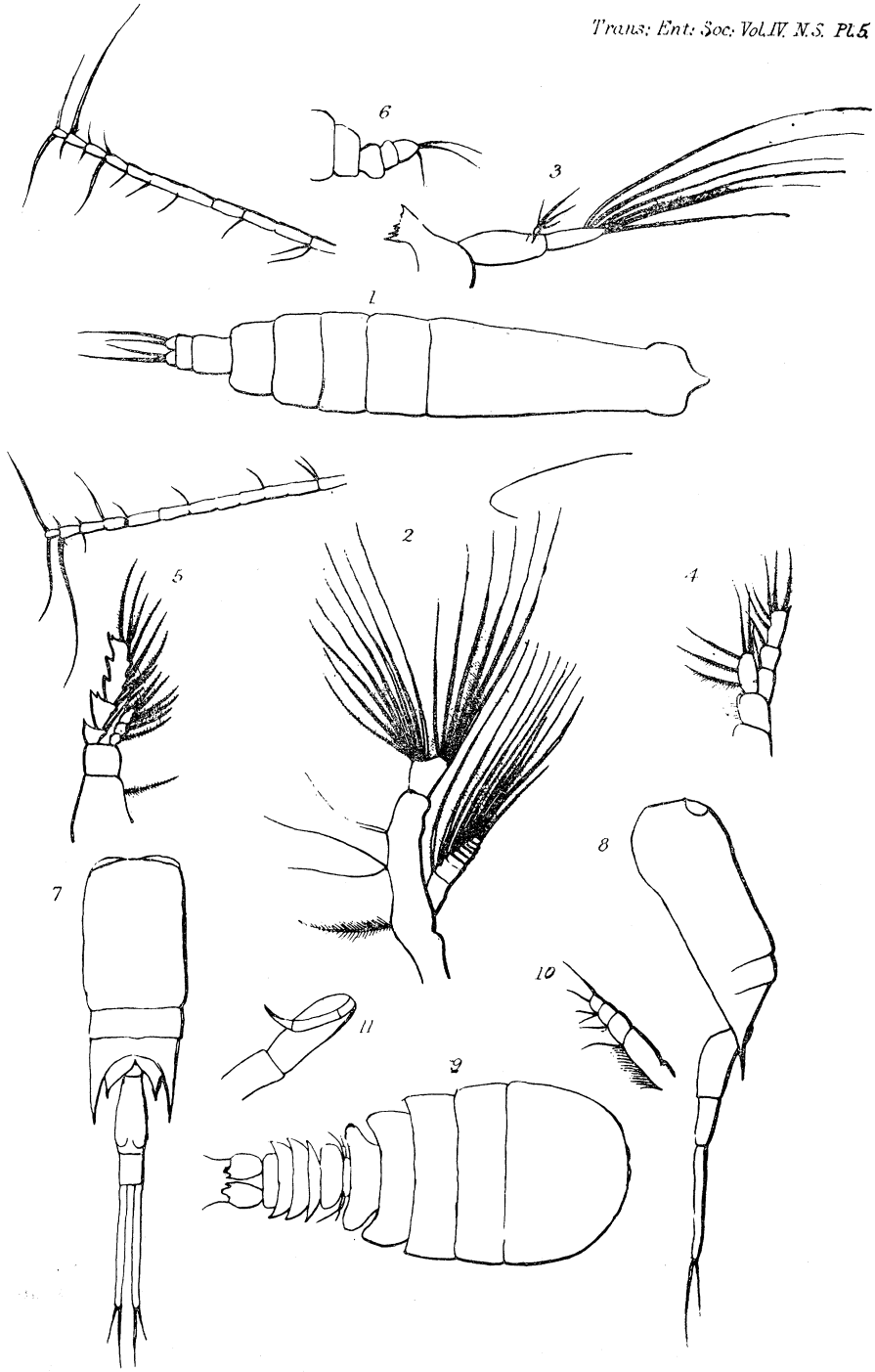

Fig. 2. One of 12 plates illustrating Lubbock's paper "On some Entomostraca collected by Dr. Sutherland in the Atlantic Ocean, *Trans. Entomol. Soc.* 4 (n.s.), pt. 2, 1 (1856). Each plate is subscribed "J. Lubbock, delt. et sculpt." and shows Lubbock's early mastery of the technique of steel engraving.

aspirations." As a banker he was naturally suspected of underhand skullduggery, and if no skullduggery could be detected, that only showed how cunning he had been. As a scientist he was clearly the rankest of amateurs, and science was becoming more and more professional. No one, it was obvious, could possibly have done all the work which appeared in his name. There was something rotten somewhere. It was better to forget him, to depreciate him, or to laugh at him.

And though no journalistic muckraking has ever disclosed enough muck to make the smallest item of news, it is not difficult to laugh at Lubbock. Even his name is faintly comic. With unusual insight he had written home from school at the age of eight telling his parents that he was quite popular because he did not mind being laughed at. It was true. Neither then nor later in life did he mind being laughed at, particularly if it served some cause he had at heart (though he was never so discourteous as to laugh at others unless he knew they were trying to be funny). He incurred a good deal of mirth among his contemporaries (including Ruskin) by giving in an address to a working men's college (and subsequently publishing) a list of the "100 Best Books." Such behavior seems to us both pompous and funny, especially in an eminent Victorian who had never been to a university and could hardly be supposed to know. And to cite it became the stock method of disparagement. But Lubbock knew what he was about. He was very rarely mistaken in his judgment of the state of public opinion or in his recognition of a business opportunity, and he knew that if he gave his list enough publicity, someone would find it worth while to publish the books on it at a price the workingman of those days could afford. And so it happened. Figuratively speaking, the last laugh was his.

Service in Many Causes

So I do not think Lubbock can be said to have failed. Though he was human enough to enjoy the honors showered on him in his life-time, he never sought fame for himself and would not have been distressed if it had passed him by. Of him, as much as of any man, it can be said: "If you require a monument look about you." The results of his life are unmistakably there—in science, in education, in the preservation of the countryside, in the less seamy aspects of the welfare state—and if others now get the credit, he would not have minded.

Perhaps the last word may be left to the late Aga Khan, who, writing to congratulate him on his peerage, said: "You have touched life at many points, done good service in many good causes and made wonderful use of your life and opportunities. Nor is it a light thing to have made no enemies."

Public Interest in Science News

Two surveys show a direct relationship between science education and assimilation of the news.

Hillier Krieghbaum

A typical American adult is curious about what scientists are doing, and despite the obvious difficulties of popularizing science information, a considerable portion of the general public is, at least, aware of the more dramatic activities of contemporary science.

These conclusions may be drawn from two recently released public opinion surveys made for the National Association of Science Writers, an organization of approximately 350 professional journalists, and New York University, which administered a substantial grant from the Rockefeller Foundation to finance these projects. Both surveys were conducted by the Survey Research Center of the University of Michigan.

The first of the public opinion surveys was made in the spring of 1957, among 1919 adults, to ascertain their responses to various media of communication and their attitudes toward science and scientists. The second was made a year later, in the spring of 1958, and included sampling of 1547 persons. Thus, the two surveys provide a comparison of habits and opinions for periods approximately six months before and six months after the launching of the first satellite, sputnik I.

Here are some findings that illustrate the potential curiosity about science. Two out of five newspaper readers (41 percent for both surveys) reported that they read *all* the medical and health news in their papers, and almost a third (30 percent in 1957 and 32 percent in 1958) said they read *all* the nonmedical science items. Of those interviewed in 1957, two-fifths (42 percent) wanted newspapers to print more medical news and a quarter (28 percent) wanted more space given to nonmedical science news. The question on this preference was not asked in 1958. Two-thirds of each sample (66 percent for 1957 and 62 percent for 1958) were willing that some other news should be eliminated in order that space might be provided for additional science news.

These surveys establish, probably for the first time on a carefully controlled basis of public opinion sampling techniques, that a national audience is waiting for and interested in news items that tell about developments in science. The Survey Research Center used generally accepted techniques of probability sampling, and the size of both samples insures a highly accurate reflection of the habits and opinions of adult Americans.

The amount of science news that was read was impressive, not only in itself but also in comparison with other categories. Only two groupings—"local events" and a human interest grouping for "people in the news"—ranked higher than medical and public health stories

The author is chairman of the department of journalism, communication arts group, New York University, and chairman of the Surveys Committee, National Association of Science Writers.