has written upon the subject, whose works we had in hand, spoke definitely on the position of *Anopheles* in actually biting. Nuttall and Shipley describe the bending of the proboscis, and in fact the entire mechanism of biting, and other authors are almost as detailed as they; but to the position, no one seems to refer.

In the hope of getting other information I wrote to Dr. L. O. Howard, and received this reply: "I never saw *Anopheles* bite but once, and that was in the dusk while I was sitting on the platform of a railroad station at Fresno, Cal. My impression was that the beak was not in the plane of the body; but that the head was bent downward. Mr. Pratt, when he was living in Virginia, was frequently bitten by *Anopheles,* and tells me that he has a positive recollection that the head was bent downward and that the hind legs were curved upward."

I wish it distinctly understood that this is not a contribution to knowledge. It is an illustration of how many men may make observations in certain lines and absolutely ignore the most obvious points. It is also intended as a suggestion to those who may have made and recorded direct observations on this point, to publish their experiences.

John B. Smith.

Rutgers College,
New Brunswick, N. J.
December 22, 1904.

SPECIAL ARTICLES.

THE DISCUSSION IN THE BRITISH PARLIAMENT ON THE METRIC BILL.

There lies before us a reprint from the Parliamentary Debates in the House of Lords on February 23, 1904. The order of the day was the second reading of the bill for the compulsory introduction of metric weights and measures into the United Kingdom of Great Britain and Ireland. We will make some extracts from the discussion which will show the present conditions over there and which will interest us because it is universally admitted that the adoption of the metric system by one branch of the English race will secure its adoption by the other. The reading was moved by Lord Belhaven and Stenton, but the principal advocate of the bill was Lord Kelvin. In order to show how great change had taken place in public opinion on the measure in recent years, as compared with the time not long ago when the chief argument of the opponents of the bill was that public opinion was not yet ripe for it, the noble lord presented petitions from thirty town and city councils, representing a population of over 8,000,000, from fifty chambers of commerce, thirty retail dealers' associations, forty-three trades unions representative of 300,000 workers, sixty teachers' associations, inspectors of weights and measures in eighty districts and a large number of individual signatures, bringing the total number of individuals represented to 333,000. A nearly equal number additional were promised within a week, the Liverpool Chamber of Commerce sending theirs separately by Lord Avebury, together with several chambers of agriculture. The difficulties alleged to be experienced by foreign countries in making the change were declared non-existent. His Majesty's representatives abroad at the time stated the change was made without much difficulty; though some countries were more rapid than others, there never had been any desire to return to the old system, and the adoption of metric weights and measures had assisted the development of trade. Switzerland commenced to use the metric system eighteen months from the passing of the law. There was no great difficulty found there in the towns, but it was some time before it was adopted in remote country places. In Germany it was adopted more quickly than anywhere else. Two years and one month were allowed, and the interval thus granted was sufficient to insure the adoption of the new system in all details; it was an accomplished fact by the day named. There is no desire to go back to the old system, and the change has contributed to a rise of German trade and commerce, foreign trade deriving much benefit. There are some persons who object from a dislike to mental effort, and who prefer to muddle on with the British system described by the prime minister as 'arbitrary, perverse and utterly irrational.' To these I reply that

the metric system is bound to be adopted sooner or later, and that personal inconvenience for a few days should not be allowed to interfere with a measure calculated to promote the trade and prosperity of the country.

We have had nine years of permission to use the metric system without thereby rendering ourselves liable to punishment for a breach of the law, and experience has proved that the change from the system that has been so long in use in this country to a new system can not be made over the whole country voluntarily. *It is a case for compulsion,* and I think the legislature will be thanked by the country for having applied compulsion. In Germany, France and Italy no inconvenience has resulted from the introduction of the metric system, and there has never been such a thing as a complaint. The change in Germany occupied only two years. I have in my hands a statement by Sir Wm. Ramsay, in which he wrote: "I was in Germany during the change there; it gave no trouble whatever and was recognized within a week."

It is interesting to know that the decimal system, worked out by French philosophers, originated in England. In a letter dated November 14, 1783, James Watt laid down a plan which was in all respects the system adopted by the French philosophers seven years later, which the French government suggested to the King of England as a system that might be adopted by international agreement. James Watt's objects were to secure uniformity and to establish a mode of division which should be convenient as long as decimal arithmetic lasted, a thing we may consider as absolutely settled.

I hope this bill will be sent forward with full pressure to the other house, 333 members of which have declared themselves in favor of it and ready to support it.

In introducing the bill, Lord Belhaven and Stenton recalled some of the testimony given in the blue book, known as the 'Report on Weights and Measures,' made to the house of commons July 1, 1895. That report contained three recommendations, viz:

(*a*) That the metrical system of weights and measures be at once legalized for all purposes.

(*b*) That after a lapse of two years the metrical system be rendered compulsory by act of parliament.

(*c*) That the metrical system of weights and measures be taught in all public elementary schools as a necessary and integral part of arithmetic, and that decimals be introduced at an earlier period of the school curriculum than is the case at present.

Of these recommendations the first was complied with by the permissive act of 1897, which made the use of the metric system in trade lawful (it was previously illegal to use it), and the third was adopted under the educational code of 1900. The second is in the bill now before us. An important point in the history of this subject is, that in August, 1902, there was a colonial conference attended by all the premiers of the self-governing colonies, which passed this resolution: "It is advisable to adopt the metric system of weights and measures for use within the empire, and the prime ministers urge the government represented at this conference to give consideration to the question of its early adoption." And since that time the colonies have been pushing the matter with great earnestness.

The saving of time in education by the use of the metric system is not only in the teaching of the tables, but the whole system of compound addition, subtraction, multiplication and division, and the system of computation called 'practise.' Last year inquiries were made of head masters of schools on this subject, and 197 sent replies, of which 161 said the saving would be one year, 30 said it would be two years, and 6 said that it would be three years. The senior mathematical master of Edinburgh high school wrote: "An average scholar would save at least a year and a half, probably two. I conceive it to be not only a saving of time, but an economy of mental effort which is incalculable."

The commercial value of the metric system has been reiterated by British consuls in foreign countries for many years. In the *Board of Trade Journal,* February 15, 1900, the British consul at Amsterdam says: "The iron and steel manufacturers' unions of Germany have adopted a uniform system of

dimensions based on metric weights and measures. The classifications are making more and more progress in Germany, not in the iron trades alone, but in other manufactures. In the future Germany, and the continent generally, will have a constantly increasing advantage over British manufactures in foreign countries, unless the metric system be fully and entirely adopted by Great Britain. I may mention as an undoubted fact that the preference which Germany has obtained here over Great Britain regarding railways, bridges and other railway material is mainly owing to the existence of this metric classification."

Other items in the discussion were that Russia had directed her iron and steel works to alter their rolling machinery so as to produce only rods, rails and sheets on a metric scale, that 45 per cent. of British exports were to non-metric countries and 55 to metric countries (66 per cent. of United States imports are invoiced in metric measures). At present Britain has eighty different denominations represented by 155 different kinds of weights and measures, which by this bill will be reduced to thirty denominations represented by fifty-three different kinds of weights and measures, or only one third the present number.

The bill was read a third time in the house of lords, May 17, and referred to a select committee to arrange the practical details necessary to carry it into effect. It was then passed and sent to the house of commons, and read the first time. This discussion showed that there was a very great popular demand in England for the introduction of the metric system, more than there is in this country at the present time. England is a small country, and the adjacent countries, France, Belgium, Holland and all Scandinavia use the metric system, hence people in general are brought much more in contact with it than in the United States, where we only touch the metric system directly in Mexico, and even this contact is having a decided effect in making the system familiar to our citizens.

The principal arguments now relied on by the opponents of the metric system here are that it has not displaced the old measures in countries where it has been legalized, and that its introduction would be a matter of enormous expense. Any one who has had personal experience in foreign travel, or who will take pains to inquire of any of the thousands of emigrants that come among us, will soon convince himself that the metric system is the principal system in actual use in trade and commerce in European countries.

The very large number of working people who appear in Lord Kelvin's list as advocates of the metric system are drawn to its support not only by the actual contact with metric-using nations, but also by the handicap imposed by the British system on getting a useful practical education. This point is increasing in importance since the complete change of both British and American text-books to the metric system. The absurdity is patent of requiring the workman to use an old system different from that in which all knowledge is gathered by the original workers and communicated to their students, and of which the great mass of operatives are ignorant. The operatives themselves, as soon as they become fully aware of it, demand the possession of this key to knowledge and the higher education.

We have heard a great deal in the last three years about the enormous expense of adopting the metric system. The great majority of people who talk about this expense do not know anything about the actual use of the metric system, and have not brought one scrap of testimony that supports their views from countries that have made the change, while most of those who advocate the system are in the actual use of it as teachers, investigators, etc. The opponents of the system are in the position of a man who condemns a tool without ever having used it. Now Lord Kelvin said in his argument before the lords that "last year inquiries were made of head masters of schools, 197 sent replies, of whom 169 said the saving of time by teaching the metric system would be one year, thirty said it would be two years and six said it would be three years. The senior mathematical master of Edinburgh high school wrote, that in view of the wearing out of teachers and scholars in

obtaining a knowledge of the British system, the adoption of the metric system would result in not only a 'saving of time, but an economy of mental effort which is incalculable.'" Lord Kelvin's argument applies with even more force to the United States. The committee on coinage, weights and measures say in their report No. 1701, April 21, 1902, made to the first session of the fifty-seventh congress: "When we consider there are over 15,000,000 school children in the United States being educated at a public cost of not less than $200,000,000 per annum, the enormity of the waste will be appreciated. In the lifetime of a single generation nearly $1,000,000,000 and 40,000,000 school years are consumed in teaching a system that as a whole does not agree with any other nation in the world, and which does not offer any advantage whatever to compensate for its complexity. Surely the children and teachers of the country are worthy of quite as much consideration as the temporary personal and pecuniary interests of some manufacturers, who have failed to furnish, by either themselves or their representatives, any evidence whatever that the manufactures of Germany or Switzerland have or did suffer any loss whatever by the recent adoption of the metric system in those countries. No one in this country has proposed to affix any penalties legal or otherwise to the use of the customary system, what we do want, and are entitled to work for as citizens, is that the government shall adopt in all its work the metric system, which is already the international system for a majority of the civilized world."

The *American Machinist,* of January 14, sums up the matter by saying what is true: "The testimony of men who have had experience in all parts of the world with both systems in the manufacture of machinery is practically unanimous, that most objections to the metric system are based upon purely *imaginary difficulties,* and that the testimony of men who have not had such experience *does not amount to anything.*

We are constantly asked what advantage will the metric system be to this or that particular business. The whole community is larger than any part of it, and is entitled to first consideration. We have shown above that one of the largest and most important activities in this country, the business of education, will be enormously benefited, and every other trade or business will also be benefited, by the increased effectiveness of mental effort in every direction which is the necessary consequence of substituting a simple and rational system for the complex, irregular and barbarous system now in vogue.

WILLIAM H. SEAMAN.

CURRENT NOTES ON METEOROLOGY.

TEMPERATURES IN THE FREE AIR.

THE valuable data concerning the temperatures in the free air obtained during the daily 'soundings' made at the Prussian Aeronautical Observatory at Berlin, are discussed by J. Homma in the *Meteorologische Zeitschrift* for October, 1904. The observations considered are those of the year 1903, and they are grouped by seasons and by good and bad days, the temperatures being summarized for different altitudes. It is to be noted that the ascents were made at different *morning* hours, between nine and twelve, and, therefore, the mean obtained is not to be regarded as accurately representing the conditions during the twenty-four hours. The vertical temperature gradients for the four seasons show a very slow decrease up to 2,000 meters in winter, and a rapid decrease in spring and summer. The average rate of temperature decrease for the year is about 1.3° per 100 meters near the surface, but decreases aloft, up to about 2,000 meters (0.9°), and then increases with altitude. The mean decrease of temperature for May, June and July between the surface and 500 meters is more rapid than the adiabatic rate of 1.8° in 100 meters.

BAD WEATHER, GOOD ROADS AND FARMERS.

PROFESSOR A. P. BRIGHAM, in the *Bulletin of the American Geographical Society* for December, emphasizes the need of good roads in the United States, and points out how great is the handicap of bad roads to farmers and to railroads. In this connection, the weather is an important factor, for when the roads are