economic entomology, the mission of the land-grant colleges and short courses.

E. W. Allen.
U. S. Department of Agriculture.

SCIENTIFIC BOOKS.

The Lower Devonian Fishes of Gemünden. By R. H. Traquair. Transactions of the Royal Society of Edinburgh, Vol. XL., Pt. 4, pp. 723–739, pls. 7, 1903.

Dr. Traquair's recent paper will be welcomed as throwing light on *Drepanaspis,* one of the lowliest vertebrates. In earlier papers Dr. Traquair has briefly referred to this armored form, known only from the lower Devonian slates of Rhenish Gemünden: in the present memoir he completes his studies upon it, basing them upon a remarkable series of the fossil which he has collected during the past dozen years.

Gemünden fossils, one may note incidentally, are remarkable for the great beauty with which their external characters have been preserved, shown especially in mollusks, trilobites and starfish; and the armored fishes have proven no exceptions to the rule. The specimens however, are always pyritized and are therefore, unfortunately, valueless for histological study. Besides *Drepanaspis,* the only armored fish known hitherto in detail from this horizon, Traquair now describes a *Coccosteus,* a *Phlyctænaspis* and two forms *insertæ sedis.* Of these the first, *Gemündina,* is a fish somewhat ray-like in form, characterized by a stout vertebral column and an integument well encrusted with shagreen denticles. What it is no one can say, although its describer regards it as 'possibly a chimæroid,' admitting, however, that his idea 'rests more upon feeling than upon anything else.' Until, therefore, more and better material can be secured one is constrained to conclude that nothing further need be said about its affinities. *Hunsrückia,* the second problematical form, is represented only by a series of vertebral arches whose structures suggest very doubtfully a pleuracanth shark. Regarding *Drepanaspis* the paper gives many interesting details, and they do not, we find, lead the author to alter his earlier opinion as to the affinities of this form. He places it near the classic *Pteraspis,* and regards it as the more generalized, a view which will probably meet general acceptance. It is a source of satisfaction to students of these earliest chordates that in the present form both dorsal and ventral sides are now known with fair accuracy. Desirable, none the less, is a better knowledge of the region of the mouth, which is practically terminal, surrounded by a rather indefinite series of dermal plates, and of the lateral angles of the body, where possibly an opercular opening is situated. And while we are duly grateful to Dr. Traquair for his skilful and continued efforts to elucidate this remarkable form, we are none the less impatient for further details. The object is, at the best, difficult to orient, and as a symptom of this it may be doubted whether the interpretations of even an author of Dr. Traquair's experience and acumen are always valid. Thus, his grounds seem inadequate for distinguishing dorsal and ventral sides. In no specimen figured is the relation of the dorsal lobe of the tail shown convincingly to be continuous with the so-called dorsal aspect; moreover, the eyes occur on the side which Traquair regards as ventral. Unless additional evidence is forthcoming, it would accordingly seem to me more probable that the 'labial' of Traquair was the 'rostral' plate, a structure which appears constant in *Heterostracans.* This interpretation would permit the eyes to be seen at the sides of the dorsal armoring, as indeed, they occur in *Pteraspis,* and would enable us, at the same time, to locate the greater number of the larger plates on the dorsal side. This conclusion is the more satisfactory on comparative grounds, since there is not an instance in the chordate phylum in which the eyes and the most complete part of the armoring appear on the (morphological) ventral side. And I doubt whether, on the present evidence, we can assume, with Professor Patten, that *Drepanaspis* might have evaded the law of vertebrate orientation by swimming on its back. Dr. Traquair has attempted to solve this dorsoventral difficulty by suggesting that either the orbits are 'sensory' pits, *i. e.,* not orbits, or

that, 'since the specimens are all crushed absolutely flat, it is by no means certain that in the original uncompressed condition the openings did not look out to the side.'

BASHFORD DEAN.

First Report on Economic Zoology. By FRED. V. THEOBALD, M.A. London. 1903. Pp. xxxiv + 192.

Under the above heading F. V. Theobald, a high authority on economic entomology in Great Britain, has published, under the auspices of the British Museum (Natural History), in three parts, his initial report of economic zoology. The volume in question is preceded by an introductory chapter of some extent by E. Ray Lankester, consisting of a classification of animals from the point of view of economic zoology. The same writer has added considerable correspondence on the dreaded tsetse fly disease of Africa, termites or white ants and the locust plague of the same country, as well as other matters not pertaining to entomology. Mr. Theobald is well known from his valuable treatise on the Culicidæ of the world, which has already reached the fourth volume. Although the main portion of the report is devoted to injurious insects and to other economical entomological questions, there is also frequent mention of the injury accomplished by mammals and birds and other pests as well as of fungous and other diseases. Much valuable information is furnished in regard to the means of preventing insect losses, a considerable proportion of which has been derived from actual experience or from reports of trustworthy persons. The work is not only of special interest and value to persons engaged in agriculture in Great Britain, but also to those of nearby countries in Europe, where many of the same species occur, although not always in the same degree of abundance. Many of the species considered are cosmopolitan, while others are common to North America and Europe, which makes the work also of interest to farmers of the United States. Among the most interesting species treated are the following:

The bud moth (*Hedya* (*Tmetocera*) *ocellana* Fab.), a well-known pest in the northern United States; the mussel scale, or, as it is more familiarly known in America, oyster-shell bark-louse (*Mytilaspis pomorum* Bouché), the pear leaf and 'big bud' mites. Among potato pests is a species of caterpillar, *Hydræcia micacea,* which works in the same manner as our stalk borer, *Hydræcia nitela* Say, well and unfavorably known to potato growers in the United States. Frequent mention is made of injury by millipedes attacking potatoes and other useful crops.

Considerable attention is given to the occurrence of the Colorado potato beetle in England, more especially in Tilbury, where it has been established for some little time. Judging by this report of local occurrence, it would not seem difficult to stamp out the pest in that region so as to prevent its spread to other portions of the country and eventually to the continent of Europe.

The so-called leather jackets or maggots of the crane flies or daddy longlegs (Tipulidæ) are considered somewhat at length. Records are cited of injury to hundreds of acres of grass land by these insects, and it seems probable that much injury is done by related species (of which there are many) in the United States, which is undetected or attributed to other forms of insects.

There is always danger of introducing European species into America, and it is singular that some of the commonest pests of England have never found a complete establishment with us, for example, the thousand-legged worm or millipede, *Polydesmus complanatus,* which has undoubtedly often been brought to this country in soil and has been mentioned as occurring here, but which our authorities state has not gained a permanent foothold. The same is true of the ear wig, *Labia minor,* which is said to be a pest in Europe, well established in America, but never injurious, so far as we know, in our own country. Another species frequently found in old buildings, in furniture and in old wood generally and commonly called death watch, *Anobium domesticum,* is in the same category, having undoubtedly been brought here in wooden material but, for some unknown reason, failing to survive. Mr. Theo-