electrical discharges or thunderstorms, and this conclusion is amply confirmed by similar observations made in other parts of the globe. A very large number of these cases of sheet lightning at Oxford are, as suggested by Prof. Loomis in 1868, due to the escape of the electricity of the clouds in flashes so feeble that they produce no audible sound, and they occur when the air being very moist offers just sufficient resistance to the passage of the electricity to develop a feeble light.

## *SALVADORI'S PAPUAN ORNITHOLOGY*

*Ornitologia della Papuasia e delle Molucche*, di Tommaso Salvadori. Parte terza. 4to. pp. 597. (Torino, 1882.)

THE completion of the third and concluding portion of Count Salvadori's great work upon the Birds of New Guinea and the adjoining Islands is an event that should be duly chronicled. We have already spoken of the plan of this great undertaking, and of the excellent way in which it has been carried out, in our notices of the preceding volumes (see NATURE, vol. xxiii. p. 240, and vol. xxiv. p. 603). We will now say a few words upon he general results arrived at.

The ground covered by the present work embraces, it must be recollected, the whole of the northern portion of the great Australian region. The mainland of this district is New Guinea, but it also contains the islands of the Moluccan Archipelago up to "Wallace's Line," besides various groups situated to the east and south-east of New Guinea, and extending as far as the Solomon Islands. In the "Papuan Sub-region," as it is generally called, thus constituted, it will be evident that variation must necessarily play a much more important part than in the solid continent of Australia. Not only do the species isolated in the different islands obtain a better chance for the exaggeration of their peculiarities (as has been so well shown by Mr. Wallace in his "Island Life"), but in the mainland of New Guinea we find mountains reaching to such an altitude as to cause the presence of a very different fauna from that of the adjoining lowlands. From these two causes it would be naturally expected that the ornithology of the Papuan Sub-region would be more rich in species than that of Australia proper. And such, indeed, is shown to be the case by the completion of Count Salvadori's work, whereby the first summary has been effected of the Papuan Ornis, since recent researches have revealed to us its luxuriance. In Mr. Gould's great work upon the Birds of Australia little more than 700 species of birds are given as inhabitants of the whole of that great continent. By Count Salvadori's volumes, we find that 1028 species are already known to us from the Papuan Sub-region, and, as we all know, a very large portion of New Guinea and many of the adjacent islands are still *terra incognita*. Much therefore remains to be added to the Papuan Avi-fauna, whilst in Australia the subject is comparatively exhausted.

Taking a general survey of the forms of Papuan bird life, we see at once how nearly akin it is to that of Australia. Recent researches especially have shown that nearly all the peculiar forms of the Australian Ornis have their representatives in the Papuan Sub-region. Some of these forms, however (for example, the Paradise-Birds and the Cassowaries), are much better represented in the Papuan Islands than on the Australian Continent, and the Papuan Islands must be regarded as their original home, whence they have sent forth stragglers into the Southern Continent.

Such general facts as regards the distribution of bird life in the Australian Region may be easily gathered from an inspection of the contents of the present work. But our author, we are glad to see, promises us to put them forward in his own shape, in an "Introduction to the Ornithology of Papuasia and the Moluccas," which he is now preparing. In this supplementary volume will be likewise given chapters on the history and bibliography of the subject, and a chart to illustrate its somewhat complicated geography. Count Salvadori is evidently determined to spare no trouble in order to render complete the results of his eight years' hard labour on the Birds of Papuasia and the Moluccas.

## *OUR BOOK SHELF*

*Cutting Tools Worked by Hand and Machine.* By Robert H. Smith, M.I.M.E. (London: Cassell, Petter, Galpin, and Co., 1882.)

STUDENTS of mechanical engineering, and more especially those who study machine tool construction, have up to the present time found it very hard to obtain a suitable text-book relating to the theoretical part of the subject; hitherto almost the only books relating to it have been published in Germany.

This work comes to hand at a time when the want of such a work is much felt, and students attending mechanical engineering classes will find that it will help them considerably in understanding the construction, theoretically and practically, of the machines dealt with. The author in his preface states distinctly that he does not intend the book to be a descriptive treatise on tools, nor does he refer to all the different cutting tools in use, but he has happily chosen the more important machines, and gives a very full description and illustration of each. The subject of driving power is dealt with and fully explained, and results of experiments carried out by the author on the subject are carefully arranged in tables.

In the first chapters cutting tools for wood are discussed, the wedge action of any cutting tool being clearly described and illustrated; also the method of grinding and setting edge tools, frequently a very difficult task for beginners to accomplish. He also gives the results of experiments carried out by himself on the power required to be exerted through certain tools when doing a fixed amount of work, an interesting subject from a theoretical point of view.

The chapter on chipping-chisels and hand-planes fully explains the action and construction of the several tools, the different angles of the cutting-edge of cold chisels are shown, and the author points out the reasons for varying the angle according to the quality of the metal. The whole chapter goes into the subject practically, the explanations being clear and to the point. The next chapters deal more especially with wood-working machinery. The variety of teeth used in the different kinds of saws, including inserted teeth, are amply illustrated, the important matter of setting the teeth being fully explained, with experiments showing the power absorbed in driving the different saws, this also being usefully arranged in tables; after which the author goes on to explain the different machines used in working the metals, milling machinery having its full share of the text. The cutting speed and rate of feed for milling-cutters is gone into, and in the latter part of the chapter the milling-cutters themselves are dealt with.

Chapter V. relates to the various methods of planing

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