

If, however, our rays are circular arcs of unequal curvatures, we may have crossing, and may also have magnification or diminution. It is obvious, from Figs. 6 and 7, that to give a magnified virtual image without crossing, the upper ray must be bent downwards more than the lower one; and that if the lower ray be bent down more than the upper, the image seen will be diminished.

These rules must be borne in mind in attempting to explain that very common form of mirage in which distant objects are greatly magnified in their vertical dimensions, without any other change. Fig. 4 may help us to understand how this magnification arises. If we suppose an object to travel along between two of the rays which proceed from the eye, it is clear from the diagram that the object will begin to be sensibly magnified as it enters the region of rapid change, and the magnification will increase as the object nears the intersection of these rays, at which point it becomes infinite, which practically means that, if placed at this point, it will give rise to an appearance of the greatest possible confusion. As it travels further away between the same two rays it will begin to be again recognised by a highly magnified and inverted image. One of the commonest, I believe the commonest, form of mirage in Australia is one in which small bushes at a distance are magnified into trees; and I believe the foregoing to be the correct explanation.

The magnification over water which gives rise to the architectural columns of the Straits of Messina and of the polar regions is more probably to be explained by the action represented in Fig. 6, the region of most rapid change of density being at a height somewhat greater than that of the top of the object, so that the top is greatly elevated by refraction, while the bottom remains nearly in its true place.

The quasi reflection illustrated in Fig. 4 may be produced artificially by carefully depositing alcohol or methylated spirit, to the depth of about an inch, upon water contained in a glass vessel with plane parallel sides. The spirit, though lighter, has a higher index of refraction than the water; and at the place of intermixture of the two liquids we have a gradual but very rapid diminution of index in descending. On bringing the eye close to the vessel, and looking obliquely downwards towards this part of the liquid, very perfect inverted images will be seen. The field of view afforded by this arrangement is, however, extremely limited; and a much finer effect is obtained by the arrangement now before you, in which three liquids are employed, the middle one having the highest index of refraction, while its specific gravity is intermediate between those of the other two. The three liquids are—(1) A strong solution of alum at the bottom; (2) pure water at the top; (3) Scotch whiskey mixed with enough sugar to make its specific gravity intermediate between those of the other two liquids. It is introduced last by means of a pipette.

Plate III. represents the appearance which this arrangement afforded when set up at a window of my house looking towards the mountains.

Every object in the landscape was tripled, the three images being seen at once; and the vertical breadth of the strip of landscape thus tripled at one view extended from the top of the hills down to the houses on the Lisburn road. The figure only shows the more conspicuous objects. When the sun was shining on the front of the row of houses represented, which was nearly half a mile distant, I was able to see distinctly the chimneys and windows, and even to see whether the blinds were up, down, or half-way down. It was easy to fancy that the inverted trees and houses were the reflections of the upper ones in water. But a much more striking effect, as of water, was at the place which is left white in the figure, at the junction of the middle and lower image. This had all the appearance of a calm bay or lake glistening in the sunshine. There are only two natural objects

to which this peculiar glistening belongs, with brightness far surpassing that of all the dry and solid parts of a landscape. One of these is water, and the other is the sky. A bit of sky has, in fact, been trapped between two portions of land; and it is a similar trapping of sky in the midst of dry land that produces the irresistible impression of a lake of water in the mind of the traveller in the desert. The middle image is probably formed by rays which have taken a path something like those in Figs. 1, 2, and 3. The highest and lowest image are formed by rays which have only been bent one way.

The arrangement of three liquids just described, which was suggested to me by Prof. Clerk-Maxwell, is extremely effective, but requires much delicacy in its preparation to ensure success.

Triple images of objects below the level of the vessel may be obtained by employing only the two first-mentioned liquids—alum water and pure water, or strong brine and pure water. A little gentle stirring is advantageous whichever arrangement be employed, a glass rod being inserted vertically, passed a few times slowly round the circumferential portion of the liquids, and then withdrawn.

With the two-liquid arrangement I have obtained three spectra, the middle one inverted, by employing as object a horizontal slit in the shutter of a dark room; and very brilliant colour effects were obtained by bringing the eye to the conjugate focus of the slit. A screen held at this conjugate focus, which was at first close behind the vessel of liquid, and slowly receded day by day, received an image of the slit very similar to that which would be formed by a cylindrical lens.

In order to see the three images (or spectra), it was necessary to hold the eye behind the conjugate focus. When it was held in front (that is nearer to the vessel), only two images were seen, sometimes only one, the middle or inverted image being always wanting.

A similar lengthening of focus day by day was observed with the three-liquid arrangement, which would doubtless yield similar colour effects.

ON THE GEOGRAPHICAL DISTRIBUTION OF THE FALLOW DEER IN PRESENT AND IN PAST TIME*

NATURAL History shares with History the doubtful honour of having not a few chapters which are, to use a well-known expression of Tallemand, nothing more than "des fables convenues," or which, in fact, contain generally accepted fabrications. To this shadowy side of science Geology gives the largest contributions, but Zoology, especially as regards the habits, habitats, and geographical distribution of animals, is by no means poor in them. Of the Fallow Deer (*Cervus dama*) it is generally stated in all zoological text-books, "It is a native of the Mediterranean area, and was introduced thence into Germany, Scandinavia, and England, after the Crusades." And yet the Fallow Deer was, many thousand years ago, not only an inhabitant of Africa and Western Asia, but also as much at home in Southern Russia, and even in Central Europe and Denmark, as in Italy and Southern France.

My researches into the geographical distribution of the Fallow Deer in former epochs have been caused (like those upon the history of the Domestic Fowl†) by a discovery in the ancient history of the city of Olmütz. In the same formation as the skull of the fowl there spoken of was

* By L. H. Jeitteles. Translated from *Der Zoologische Garten* for August 1874. [I have thought it desirable that this article should be better known, as even in such recent works as Mr. Boyd Dawkins' "Cave Hunting," and the new edition of Bell's "British Quadrupeds," the ancient fable of the Fallow Deer being *indigenous only in Southern Europe* is repeated.—P. L. S.]

† See *Der Zoologische Garten*, bd. xiv. pp. 55 et seq.

found, along with the implements and vessels of the old Bronze period, a piece of an antler, which, from its flattened form and entire want of snags and branches, I concluded at once must be referred to the Fallow Deer. Careful comparison of it with the antlers of the Red Deer, Reindeer, Moose, and Irish Elk, in several museums, as also in rich private collections, confirmed me in this belief. Experienced students of the Cervidæ agreed with me, although certainly a still more weighty authority—Herr Prof. Rüttimeyer, of Basel—indicated the possibility of the fragment from Olmütz having belonged to a Red Deer.

In the third article of his "Recherches sur les ossements fossiles," Cuvier has already mentioned the existence of fossil Fallow Deer. In page 191 (of the 8vo. edition of 1836) he speaks of "bois assez semblables à ceux du Daim, mais d'une très grande taille trouvés dans la vallée de la Somme et en Allemagne." On Plate 167 (Figs. 19a and 19b) are figured two pieces of antlers from Abbeville, of which 19b certainly belongs to *Cervus dama*. Moreover, Cuvier tells of a drawing sent to him by Autenreith (of which he gives a copy, Pl. 168, Fig. 11), "d'un crâne et d'un merrain y adhérent, déposés au cabinet de Stuttgart; pièces que ce savant rapportait au cerf à bois gigantesques, mais qui me paraissent plutôt se devoir rapporter à le Daim, à cause de la longueur de la partie cylindrique."

Subsequently similar remains of antlers were discovered at Gergovia, near Clermont, in the department of Puy-de-Dôme, and at Polignac, near Le Puy, in the department of Haute-Loire. These are spoken of by Robert under the name *Cervus dama polignacus*, by Pomel as *Cervus somonensis* and *C. Roberti*, and by Gervais (Zool. et Pal. Franc. ed. 2, Paris 1859, p. 145) under the term *Cervus somonensis*, taken from Desmarest.

Gervais says of them that they are "des bois de Daims qui indiquent une espèce ou variété bien plus grande que celle dont il a été question ci-dessus" (i.e. *Cervus dama*), and that these horns are "d'un tiers au moins plus grand que ceux du Daim ordinaire."

Georg Jäger, in his "Review of the Fossil Mammals of Wurtemberg,"* mentions numerous discoveries of the remains of Fallow Deer in the caverns and turbaries, as also in the diluvial fresh-water chalk of Wurtemberg. Moreover, Jäger states that in the Museum of Mannheim there is not only a skull of *Bos primigenius*, but also one of *Bos prisca* and of its ally *Bos prisca affinis*, along with a skull of *Cervus dama giganteus*, from the diluvium of the neighbourhood of Mannheim.

In the Museum of Linz, in Upper Austria, are displayed numerous remains of animals from the diluvium of the neighbourhood of Wels, which were dug up at Buchberg, near Wels, when the Elizabeth Railway was made. Besides a fragment of antler of a Red Deer, a molar of *Ursus arctos* (not *U. spelæus*), a fine molar of *Elephas primigenius*, and teeth of the horse, there is in the Linz Museum, labelled as obtained from the railway-cutting, a fine large fragment of an antler which must have belonged to the Fallow Deer. Like the fragment of the Red Deer's antler from the same locality, it is whitened and has a calcined appearance. I examined this interesting specimen several times in 1870 and 1873, and have to thank Herr Kaiserl. Rath Ehrlich, the custos of the museum, for a photograph of it.

In October 1873 I examined personally the formation at Buchberg, and convinced myself of its being truly diluvium. In many places it had been dug into deeply for gravel. The horns and teeth in the museum of Linz were apparently obtained from one of these pits in the diluvium, but lay in the marly layer which is found under the gravel.

Fragments of antlers undoubtedly belonging to the

Fallow Deer were discovered in the autumn of 1828 by Dr. Fr. Aug. Wagner in the ash-heap of an old place of sacrifice between the town of Schlieben and the village of Malitzschkendorf, in the circle of Schweinitz in Saxony, in great abundance, along with those of the elk, ox, roe, and sheep.* Dr. Wagner, a physician in practice in Schlieben, made his researches with scientific precision, and determined the remains of the animals with care and exactness, as will be evident from his book, at the bombastic title of which one must not be alarmed. In the determination of the specimens of antlers he was assisted by the distinguished zoologist Prof. Nitzsch, of Halle. The specimen of elk's antler is figured (Tab. v. Figs. 3, 4, 5), but unfortunately none of those of the Fallow Deer. Besides remains of plants and animals, this sacrificial heap supplied bones of various sorts. As regards the Fallow Deer, Wagner writes (p. 34): "At various times in the excavation of the temple were found fragments of antlers which apparently belonged to the Fallow Deer. But as an entire specimen was never put together, nor even such fragments as could make the fact incontrovertible, it remains uncertain whether this species was sacrificed along with *Cervus alces*, and the subject requires further investigation."

Of a *Cervus fossilis dama affinis*, Alex. v. Nordmann figures five teeth in his "Palæontologie Südrusslands."† But the Fallow Deer was found even further north in the period of the diluvium and in later prehistoric times. For example, in 1871, within the city of Hamburg, and subsequently from one of the arms of the Elbe, there were disinterred numerous upper and lower jaws and fragments which differed only in size from those of the living *Cervus dama*, and the teeth of which were nearly identical. These were associated with remains of the Aurochs and another large *Bos*, and with bones of the horse, pig, &c. The remains first discovered lay in compact black peat at a depth of from 20 ft. to 22 ft. among stumps of trees.‡

In the "Bulletins du Congrès international d'Archéologie préhistorique à Copenhague, en 1869," § Steenstrup has given a short description of the remains of animals from the kitchen-middens and turbaries of Denmark, which were exhibited in the University Museum on the occasion of the Congress in 1869. Amongst them (pp. 160 *et seq.*) he includes the Fallow Deer, of which the horns and bones are found in the upper peat-layers of Denmark.¶ At the same time he adds, "Cet animal n'est pas originaire du Danemark: il est bien constaté qu'il a été introduit dans le pays pendant le moyen âge."

Of the occurrence of remains of the Fallow Deer in England also there is some evidence given, although with a caution as to the necessity of subsequent more accurate examination, by Owen in his "History of British Fossil Animals and Birds" (London, 1846.) From the peat-moor of Newbury were exhumed "portions of palinated antlers" and teeth "which accord in size with the Fallow Deer" (*op. cit.* p. 483.) Buckland likewise found in the large cavern of Paviland, on the coast of Glamorganshire, along with remains of the mammoth, rhinoceros, and hyæna, various antlers, "some small, others a little palinated." But Owen rightly remarks that these last may have belonged to the Reindeer just as well as to the Fallow Deer. ¶

* Detailed accounts of these discoveries are given in Dr. Wagner's "Ägypten in Deutschland oder die germanisch-sciavischen wo nicht rein germanischen Alterthümer an der Schwartzen Elster." Leipzig: Hartmann, 1833.

† Helsingfors, 1858-60, Pl. xviii. Figs. 4-8.

‡ Dr. K. G. Zimmermann in "Neues Jahrb. f. Mineralogie Geologie u. Palæontologie." Heidelberg, 1872, heft i. p. 26.

§ Copenhagen, 1872.

¶ Le Daim (*Cervus dama*) Bois et ossements provenant des états supérieurs de la Vourte, *op. cit.* p. 162.

¶ Sir Victor Brooke tells me that in his opinion *Cervus boydii*, Boyd Dawkins, founded on remains from the fresh-water strata at Clacton, is identical with *C. dama*. Mr. Boyd Dawkins acknowledges that the antlers are almost alike in size and form, and apparently only distinguishes his species because *Cervus dama* "has never been found to occur in a fossil state in Northern or Central Europe."—P. L. S.

* Nov. Act. Acad., Cæs. Leop. Car. xxii., pars post. 1850, pp. 807, 893, 897, 899, 907.

Among the remains of animals in the Swiss Pile-dwellings also have occurred fragments of horns apparently belonging to the Fallow Deer. Rüttimeyer, in his "Fauna der Pfahlbauten der Schweiz," says as follows:—

"A number of flat bits of shed antlers with smooth surface, in the collection of Oberst Schwat, of Biel, found in the Lake of Biel, can, to judge from their dimensions and form, be only referred to the Fallow Deer. Similar bits from Meilen, perfectly agreeing with the abnormal forms which the Fallow Deer's antlers present in aged individuals, can only be referred to this deer. Yet I must remark that no perfect antlers of this animal from the Pile-dwellings have come under my observation, nor even examples of the skull, which, next to the antlers, would give the most certain indications of this deer. Incontrovertible evidence of the spontaneous existence of this deer north of the Alps remains therefore still to be obtained."

On the other hand, there is positive proof of the existence of this deer in the "Terremare" of Italy—the equivalent of the Swiss "Pfahlbauten." In the Museum of Modena are two fragments of antlers, which Prof. Canestrini has spoken of in his "Oggetti trovati nelle terremare del Modenese," and subsequently in Mortillet's "Materiaux pour l'histoire positive et philosophique de de l'homme." In 1870 Dr. Carlo Boni, former director of the Museum of Modena, had the kindness, at my request, to send these fragments to me at Basel (where I passed the winter of 1869-70), for comparison with my specimen from Olmütz, and Prof. Rüttimeyer saw them too. He declared, as regards one of them (marked "624 Gorzano"), that it could not certainly be referred otherwise than to *Cervus dama*.

Besides Moravia, the Fallow Deer appears to have existed formerly in the bordering country of Lower Austria. At Pulkau, near Eggenburg, south of the Thaya, was found, in a sacrificial heap of former days examined by Dr. Woldrich, along with ancient vases, stone, bone, and horn implements, remains of the dog, ox, and Red Deer, likewise a fragment of an antler, which was "apparently a frontal snag of the Fallow Deer."*

In the Middle Ages the Fallow Deer still inhabited the woods of Switzerland, as appears from the benedictions of the monk Ekkehard, of St. Gall, of the eleventh century,† and as is shown by the German edition of Gesner's "Thierbuch,"‡ even at a later period. In the latter work it is said, p. 84: "Der gemeine Damhirsch wird an vilen anderen Orten gejagt, auch in den Waldern d'Heivetieren als bey Lucern oft und vil gefangen: nennen es gemeinlich Dam, Dämmlin od.' Dannhirsch, besser Damhirsch."

In a Latin edition of Gesner's "Historia Animalium,"§ now before me, however, I find no notice of the presence of *Cervus dama* in Switzerland. It is only said (i. p. 308): "Nostra vero dama etiam in Europa capitur, cum alibitum circa Oceanum Germanicum, ut audio. Germani vulgo vocant dam vel dämmlin, vel dannhirtz, vel damhirtz potius; Itali daino, nonnulli danio: Galli dain vel daim: Hispani gamo vel corza."

In both editions of Gesner, moreover, Latin and German, the Fallow Deer is unmistakably figured.

According to the writing on Spekle's map of Alsace, there were Fallow Deer in Wasgau up to 1576.¶

In the neighbourhood of Rome, besides, have been found numerous fragments of Fallow Deers' horns, along with remains of *Hyæna spelæa*, *Cervus tarandus*, and *Rhinoceros megarhinus*, in a Post-pliocene travertine on the heights of Monte delle Gioie.¶

* See Woldrich in "Mitth. d. Anthropol. Gesellsch. in Wien," bd. iii. pp. 13 and 19, Pl. iv. Fig. 54 (1873).

† "In bellum dannam faciat benedictio summam," vers. 128 of the "Bened. ad mensas Ekkehardi" in the "Mitth. d. Antiquar. Gesellsch. zu Zürich," iii. p. iii.

‡ Forer's edition: Heidelberg, 1606.

§ Editio secunda: Francofurti, 1620.

¶ Gérard, "Faune historique de l'Alsace," Colmar, 1871, p. 328.

¶ Trutat et Cartailhac, "Materiaux pour l'histoire de l'homme," Vme. année 1869, p. 299.

Finally, we may remark that the Fallow Deer appears to be figured upon the Assyrian monuments; and, moreover, so faithfully as not to be mistaken for any other species of deer. We have only to look at Plates xxxv. and liii. of Layard's "Nineveh" to see this. Again, amongst the pictures upon the walls of the Egyptian tombs this species of deer is found. Its hieroglyphical name is Hanen.*

We now come to the present geographical distribution of the Fallow Deer. Occasionally this deer still occurs wild in Western Asia. Tristram notices it as found in Mount Tabor, in Palestine, and in the woods between that mountain and the gorge of the Litany River,† and "met with it once about ten miles west of the Sea of Galilee." Lartet had previously obtained teeth of this deer from the bonebreccia of the Lebanon.‡

In Africa, according to Hartmann, the Fallow Deer is found at the present time in the shrubby desert-valleys and on the edges of the cultivated lands in Tunis, Tripoli, and Barquah, up to the Wadi Nahun.§ Gervais speaks of it as found in the neighbourhood of La Calle, in Algeria. || Loche, in his "History of the Mammals of Algeria," says that it is now rare in that province.

In the island of Sardinia, in Certi's time, Fallow Deer were found in enormous quantities in all parts of the island, especially in the plain of Sardinia.¶ Not less than 3,000 head were at that time killed every year in Sardinia. It is remarkable that in this island the Fallow Deer is called *Crabolu*, corrupted from *Capriolo*—meaning Roe, which last animal is not found in Sardinia; whereas the Red Deer is met with occasionally, especially in the eastern portion, but attains a much less size here than on the Continent. According to Bonaparte and Cornalia ("Fauna d'Italia") this species of deer is still common in above-named island.

In Spain it seems that the Fallow Deer is seldom found wild at the present time—at least A. E. Brehm, in his "Beitrag zur Zoologischen Geographie Spaniens" in the Berliner Zeitschr. f. Allgemeine Erdkunde (1858, s. 101), can speak from personal observation only of those he met with in parks. On the other hand, Graëlis mentions *Cervus dama* as an inhabitant of the Sierra Guadarrama. The Spaniards of the present day call the animal "Gamo" or "Paleto." According to Buffon (Hist. Nat. tome vi., Paris, 1756, s. 170), the Fallow Deer of Spain in his time was nearly as large as the Red Deer, and had a longer tail than the same animal in other parts of the world. Gérard (Faune Hist. de l'Alsace, s. 327) tells us that this deer is found to this day wild (*à l'état naturel*) in France, in Nivernais, the Cevennes, and in the Alps of Dauphiny. He gives no authority, and Gervais, in his "Zoologie et Paléontologie," says nothing about it.

As for Greece, Blasius says, in his "Säugethiere Deutschlands," Braunschweig, 1857, s. 455, that Bélon found the Fallow Deer in the Greek Islands. But Erhard does not mention it in his "Fauna of the Cyclades." Von der Mühle, however, speaks of it in his "Beiträgen zur Ornithologie Griechenlands," 1844, s. 1.

From the foregoing data the following conclusions may be formed:—

1. The Fallow Deer lived in prehistoric times, partially in company with other extinct mammals on the Lebanon, in Southern Russia, Italy, France, Upper Austria, Wurttemberg, Baden, Saxony, near Hamburg, and in Denmark. It appears also to have occurred in Switzerland and in England, likewise in Moravia and Lower Austria.

2. Within the historic period it was found in Egypt and Assyria, and even in the later part of the Middle Ages in Switzerland and Alsace.

* Hartmann in Brugsch, "Zeitschr. f. Ägypt. Sprache und Alterthumsk." Jahrg. ii. p. 21.

† P. Z. S., 1866, p. 86.

‡ Bull. Soc. Géologique, France. Vol. xxii. p. 542.

§ Berliner Zeitschr. f. Erdkunde, 1868, p. 252.

|| Zool. et Paléontol. Française. Ed. ii. p. 145.

¶ "I quadrupedi di Sardegna," 1774, pp. 104, 105.

3. It is still found wild in Western Asia, Northern Africa, and Sardinia, and apparently also in parts of Spain, likewise in Greece, and perhaps also in the Cevennes and parts of Dauphny.

4. The size and strength of the antlers, as well as the dimensions of the skull, have decreased in the course of time. Skulls of the existing Fallow Deer as well as their antlers are smaller than those of the prehistoric period.

[P.S.—Lord Lilford, whose knowledge of the larger mammals of Southern Europe is very extensive, tells me that he has himself met with Fallow Deer wild in many parts of Sardinia, in Central Spain near Aranjuez, and in the province of Acarnani in Greece.

In December 1864 the Zoological Society received from Mrs. Randal Callander a small dark-coloured Fallow Deer from the Island of Rhodes, where, however, it may have been introduced by the Knights.

Lastly, I have lately received from Mr. P. J. C. Robertson, H.B.M. Vice-consul at Bussorah, the skin and horns of a "Spotted Deer," found wild in that part of Mesopotamia, which must belong either to the Fallow Deer or to a very closely allied species.—P. L. S.]

THE LATE SIR WILLIAM JARDINE

ORNITHOLOGISTS will learn with regret that Sir William Jardine, Bart., died, after a few days' illness, at Sandown, in the Isle of Wight, on Saturday last, the 21st of November, aged 74. The labours of the deceased baronet extend over nearly half a century. In 1825 he commenced, in conjunction with the late Mr. Selby, of Twizell, the publication of the "Illustrations of Ornithology," which seems to have been his earliest contribution to natural history, and almost immediately became recognised as one of the leading zoologists in Scotland, if not in the United Kingdom. In 1833 he undertook a still more important work, "The Naturalist's Library," forty volumes of which appeared in the course of the next ten years, and served to popularise in a most remarkable manner zoological knowledge among classes to whom it had hitherto been forbidden through the high price of illustrated works. With this publication, though its value may have been impaired by the progress of science, Sir William's name will always be identified; for, having as contributors Selby, Swanson, Hamilton Smith, Robert Schomburgk, Duncan, William Macgillivray, and others, he was yet not only the author of a large proportion of the volumes, but to each he prefixed the life of some distinguished naturalist. Of his labours, however, we cannot now speak in detail; it is sufficient to notice his excellent edition of Alexander Wilson's "American Ornithology," the establishment of the "Magazine of Zoology and Botany" (afterwards merged in the "Annals of Natural History"), and of the "Contributions to Ornithology." Sir William's expedition, with his friend Selby, in 1834, to Sutherlandshire—a country then less known to naturalists than Lapland—gave a great impulse to the study of the British fauna and flora, and almost marks an epoch in the history of biology in this island. Though ornithology was his favourite pursuit throughout life, Sir William was not merely an ornithologist—other classes of the animal kingdom had a fair share of his attention, and he was a recognised authority on all points of ichthyology. Botany and geology were also studied by him to advantage, and the science last named he enriched by his splendid "Ichthyology of Annandale," the chief materials of which were found on his own ancestral estate. With all this he was keenly addicted to field-sports, and a master equally of the rod and the gun. Sir William married first a daughter of Mr. David Lizars, of Edinburgh, and by her had a numerous family, of whom the eldest daughter was married to the late Hugh Edwin Strickland, F.R.S. After

Lady Jardine's death he married the daughter of the Rev. W. Symons, the well-known geologist. Sir William Jardine was a Fellow of the Royal Society and of the Royal Society of Edinburgh, as well as of many other learned bodies, and, until the last few years, was a constant attendant at the meetings of the British Association, in the affairs of which he had interested himself from its foundation.

LECTURES TO WOMEN ON PHYSICAL SCIENCE

II.

Prof. Chrchtschowovitsch, Ph.D. "On the C. G. S. system of Units." Remarks submitted to the Lecturer by a Student.

PRIM Doctor of Philosophy
From academic Heidelberg!
Your sum of vital energy
Is not the millionth of an erg.²
Your liveliest motion might be reckoned
At one tenth-metre³ in a second.

"The air," you said, in language fine
Which scientific thought expresses—
"The air (which with a megadyne⁴
On each square centimetre presses)—
The air, and, I may add, the ocean,
Are nought but molecules in motion."

Atoms, you told me, were discrete,
Than you they could not be discreeter,
Who know how many millions meet
Within a cubic millimetre;
They clash together as they fly,
But *you!* you dare not tell me why.

Then, when, in tuning my guitar,
The intervals would not come right,
"This string," you said, "is strained too far,
'Tis forty dynes,⁵ at least, too tight."
And then you told me, as I sang,
What over-tones were in my clang."

You gabbled on, but every phrase
Was stiff with scientific shoddy;
The only song you deigned to praise
Was "Gin a body meet a body;"
And even there, you said, collision
Was not described with due precision.

"In the invariable plane,"
You told me, "lay the impulsive couple;"⁷
You seized my hand, you gave me pain,
By torsion of a wrist too supple.
You told me, what that wrench would do;
"T would set me twisting round a screw."⁸

¹ C. G. S. system—the system of units founded on the centimetre, gramme, and second. See Report of Committee on Units: Brit. Ass. Report for 1873, p. 222.

² Erg—the energy communicated by a dyne acting through a centimetre. See Note 5.

³ Tenth-metre = 1 metre $\times 10^{-10}$.

⁴ Megadyne = 1 dyne $\times 10^6$. See Note 5.

⁵ Dyne—the force which, acting on a gramme for a second, would generate a velocity of one centimetre per second. The weight of a gramme is about 980 dynes.

⁶ See "Sound and Music," by Sedley Taylor, p. 39.

⁷ See Poinso, "Théorie nouvelle de la rotation des corps."

⁸ See Prof. Ball on the Theory of Screws: Phil. Trans., 1873.