

orders cannot be accounted for by assuming that the atoms in the salt crystal are made up of single rings of electrons, or by assuming a uniform volume distribution of the electrons in spheres. A distribution which fits Bragg's data acceptably is an arrangement of the electrons in equally-spaced, concentric rings, each ring having the same number of electrons, and the diameter of the outer ring being about 0.7 of the distance between the successive planes of atoms.

If, as D. L. Webster assumes (*Phys. Rev.*, vol. v., p. 238, 1915) the trains of waves of the primary beam of X-rays are short compared with the distance which the rays penetrate the crystal, certain corrections have to be applied to the experimental data, and on this assumption it can be shown that the average distance of the electrons from the centre of the atom is small compared with the distance between the atoms.

Experiments are now in progress to test the validity of Webster's assumption and to determine more accurately the rate of variation of the intensity of the reflected beam with the order. It is hoped that it will be possible in this manner to obtain more definite information concerning the distribution of the electrons in the atoms.

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I HAVE to thank the Editor for his kindness in allowing me to see Mr. Compton's letter. I believe Mr. Compton is right in ascribing the rapid decline in the intensities of the X-ray spectra as we proceed to higher orders to the fact that the atom should not be treated as a point, but as a distribution of electrons in space; if this is so, we may hope to determine this distribution when we have measured the relative intensities accurately and have learnt to interpret them. This hypothesis and its consequences were discussed by me in the Bakerian lecture given before the Royal Society in March last. As only short notices of the lecture have yet appeared in print, I may mention one or two of the points then raised.

It seems convenient to imagine a periodic distribution of density such as occurs in a crystal to be analysed by Fourier's series, in a manner suggested by previous work of Rayleigh, Schuster, or A. B. Porter (*Phil. Mag.*, January, 1906, p. 154). Each harmonic distribution of density is responsible for one order of reflection. The results of measurements with calcite seem to show that the intensity (not the amplitude) of the reflection by a "harmonic reflector" is proportional to the amplitude of the harmonic distribution of density; that is to say, that the intensity of the reflection is proportional to the mass of the reflector. It is necessary to explain, not only why the intensities of the various orders fall off approximately as the inverse square of the number of the order, but also why atom-bearing planes give intensities whose reflections are proportional to the squares of the distances separating the planes. It appears that both laws follow from the same hypothesis, viz. that which supposes the reflecting electrons to be distributed in space through the volume of the atom, and which imagines much overlapping to take place—atoms of one plane being thrust far into the interstices of the next.

Experiment seems to fit in with these ideas. Probably, however, it is necessary to take account also of a difference in the distribution in different atoms. For example, certain results seem to indicate that the sulphur atom is more concentrated than the zinc.

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Early Figures of the Remora.

As remarked by Dr. Albert Günther, in his article on the history of the Remora ("On the History of the Echineis," *Ann. Mag. Nat. Hist.*, 1860, ser. 3, vol. v., p. 386), "there is scarcely a fish of the existence of which the ancients have been equally certain, and which has so much occupied their imagination . . . as the Echineis of the Greeks or Remora of the Latins." Also, the same author continues, "there is scarcely a group of fishes . . . which has been so little comparatively treated, and which has experienced a similar splitting up into nominal species."

The ancient legends associated with this fish, from which it derives its name, signifying "ship-holder," persisted until well into modern times; and what is probably the earliest illustration of the Remora in printed books shows several of these creatures engaged in arresting the progress of a vessel. The curious woodcut referred to is found in that late fifteenth-century work known as "Hortus Sanitatis," the author or compiler of which styles himself Johannes von Cube, or Cuba, by some thought to have been a punning pseudonym for Dr. Wonnecken, town

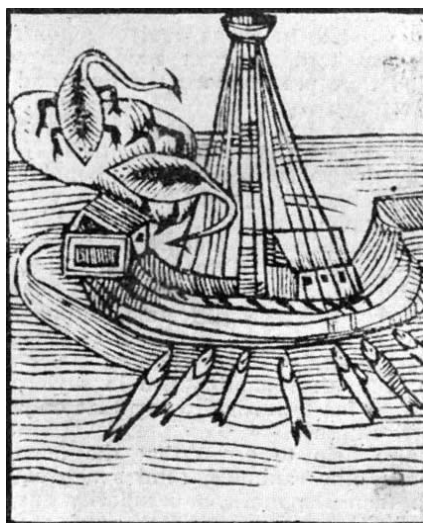


FIG. 1.—Earliest known printed figure of the Remora, from the "Hortus Sanitatis" of J. von Cube.

physician of Frankfort. First printed about 1490, the work enjoyed considerable popularity, as is proved by its having passed through several editions. A copy of the design representing the Remora, taken from the 1536 edition, is shown in Fig. 1.

The next oldest illustration of the Remora appeared in a book, or perhaps a map, printed during the first half of the sixteenth century, and was copied by Conrad Gesner in book iv. of his "Historiæ Animalium," published in 1558. It is shown in Fig. 2. The same figure, more or less modified, reappears in various seventeenth-century works on natural history, as, for example, those of Nieremberg, Aldrovandi, Jonston, Ruysch, and others.

Search for the original after which Gesner's figure was copied has proved unavailing; but the subject of the sketch, and also the verbal description, are traceable to the account of a West Indian species of sucking-fish, the first printed description of which is found in the "Libretto" of Peter Martyr of Anghera, published in 1504, and reprinted three years later in the collection of voyages known as "Paesi novamente Trovati."