Dr. Withering, on the contrary, remarked the connexion of the rings with fungi, but had not noticed their progressive enlargement.

During the growth of fungi, the author observes, they so entirely absorb all nutriment from the soil beneath, that the herbage is often for a while destroyed, and a ring appears bare of grass, surrounding the dark ring; but after the fungi have ceased to appear, the soil where they had grown becomes darker, and the grass soon vegetates again with peculiar vigour.

For the purpose of observing the progress of various circles, he marked them by incisions for three or four years in succession, and found their annual increase to vary from eight inches to as much as two feet, according to the species of fungus to which they are owing; for he has observed as many as five species that have this mode of growth;—*Agaricus campestris, Ag. orcades, Ag. procerus, Ag. terreus,* and the *Lycoperdon bovista.*

The author has had many opportunities of remarking, that when two circles interfere with each other's progress, they do not cross each other, but are invariably obliterated between the points of contact. The exhaustion occasioned by each obstructs the progress of the other, and both are starved; a circumstance which he considers as a strong confirmation of his hypothesis.

He has further remarked, in one instance, that different species of fungi appear to require the same nutriment: for, in a case of interference of a circle of mushrooms with another of puff-balls, the circles were, as in other cases, both obliterated between the points of union.

With the hope of ascertaining in what length of time a soil might recover the power of producing a fresh crop of fungi, a groove was cut along the diameter of a mushroom-ring, and a quantity of the spawn taken from its circumference was inserted along it; but the experiment unfortunately failed altogether, and the author had no opportunity of repeating the experiment.

Observations on the Structure of the Stomachs of different Animals, with a View to elucidate the Process of converting animal and vegetable Substances into Chyle. *By* Everard Home, *Esq. F.R.S.* Read April 30, 1807. [*Phil. Trans.* 1807, *p.* 139.]

The author's observations on the stomachs of the porpoise and of ruminating animals, contained in two former communications, led him to believe that the fourth stomach of ruminating animals is subdivided during life, in a greater or less degree, into two cavities. In the camel, and in some others, this division is permanent. In the bullock, sheep, &c. it is only occasional. This arrangement leads to a presumption, that in the fourth stomach the food undergoes two changes, the one preparatory to the other.

With a view to investigate the subject, Mr. Home describes the internal structure of a series of stomachs, which he observes to form principal links in the gradation from the most perfectly ruminating to the truly carnivorous animals.

For ascertaining correctly the form of any stomach, it was found that it should not be distended at the time of the animal's death; that it should be examined as early as may be after death; and that its form is best shown by gently distending it with air.

For the purpose of examining its internal membrane, it should be inverted previous to inflation; by which means, the folds that are generally observable in that membrane wholly disappear, as they arise merely from its want of contractility, when compared to the more elastic nature of the external coats.

The stomachs of which Mr. Home has given descriptions, accompanied with drawings of most of them, are those of the turkey, cod, hare and rabbit; beaver and dormouse; the water rat, common rat and mouse; the horse and ass; the kanguroo; the hog, pecari, and elephant; the mole; the stoat and armadillo; together with those of men and of dogs. The circumstances principally noticed in these descriptions are the extent to which the articular lining is carried; the appearance of the membrane that succeeds its termination; the situation and forms of any glands that are observable in the several parts of each stomach; and, more especially, a contraction which in some animals forms a permanent division of the last stomach into two parts, and even in others, as man, where no such division has been observed. Mr. Home is of opinion, that a similar, though partial, subdivision takes place during life by muscular contraction, as some traces of it may in general be detected after death, if the stomach be examined early and under favourable circumstances.

From the anatomical structure of the different stomachs described in the present and two preceding papers, Mr. Home is led to consider the functions belonging to the several parts of that organ.

The cuticular lining of the first, second, and third stomachs of ruminants has occasioned them to be considered as mere reservoirs; but since they are supplied with secretions, he thinks that, like those in the crops of birds, they assist in softening the food and in preventing fermentation. It appears also, from Dr. Stevens's experiments, that even these have somewhat of a solvent power.

Mr. Home makes a remark that he thinks deserving of notice, respecting the preparation of food in the first cavity; namely, that a certain quantity is always retained there, even though the animal has fasted for a whole week previous to its death.

The digestive process of ruminants he considers as very similar to what takes place in birds with gizzards, who swallow the food without mastication. It is then softened in the crop; after which the gizzard, like the grinders of the ruminant, prepares it for solution and conversion into chyle.

This general resemblance having led him to a more minute comparison of their glandular structure, it was observed, that at the entrance into the gizzard there is a glandular zone that secretes the true gastric juice, having the power of dissolving the food. This *solution*, according to Mr. Home, is the second step in the process of digestion, and is effected in ruminants by the cardiac portion of the

fourth stomach. The glands, from which this fluid is secreted, are very distinctly seen in the upper portion of the stomach of the deer; and in the lower portion are other glands, which secrete a fluid, to complete the process of digestion by forming chyle.

In the porpoise and whale tribe the two processes of solution and chylification are completely separate, as there can be no doubt of the food being dissolved before it arrives at the third stomach; since the opening leading into that cavity is too small to admit anything but fluids to pass, and the analogy between the second and third cavities of the whale, with the two portions of the fourth of ruminants, is very great.

In the cod there are only two cavities, one for solution, with a structure that bears a strong resemblance to that of the second cavity of the porpoise, and having orifices similar to those in the plicated portion of the stomach of the deer. Beyond this first cavity in the cod, the food cannot pass till it is broken down; so that the analogy between the fish and the porpoise is very strong: in both one and the other, solution is a step previous to the formation of chyle, which is performed by secretions from glands of a different structure, and applied to the food in a different cavity. And in this, the bird, the fish, and the whale tribe, all agree.

The animals most nearly allied to the ruminants in their mode of digestion are those which occasionally ruminate, as the hare and the rabbit; and in these also that part of the stomach nearest to the œsophagus is never emptied, as happens in perfect ruminants.

The next variety in the process of digestion is that of the beaver and dormouse, in both of which there is a glandular structure, peculiar in quantity, which seems to correspond with the solvent glands of other animals, and renders it probable that an increased secretion of solvent liquor renders rumination unnecessary.

Next to these follow animals with a cuticular reservoir, in which the food macerates before it is submitted to the process of digestion, as in the water rat, the common rat, and the mouse. In the first there is a permanent division, but in the two last it is only muscular.

The stomachs of the horse and ass are also very nearly allied to these in their structure, and must be considered of the same kind.

That of the kanguroo is peculiar, having pouches at its cardiac extremity lined with a glandular membrane. This stomach is, from its unusual length, more capable of subdivision into a number of cavities by muscular contraction; and Mr. Home thinks this form likely to facilitate regurgitation for the purpose of ruminating, which this animal has been seen to perform.

The other stomachs that are observed to have pouches at their cardiac extremity are those of the hog, pecari, hippopotamus, and elephant. That of the hog, excepting for a single pouch at its cardiac extremity, would very much resemble those of the horse or rat.

The stomachs that come next under consideration are those adapted to digest *animal* food. In these there is little difference observable in the cardiac portion (because animal substances are easily dissolved);

but the principal difference observable is at the pylorus, because, as Mr. Home conceives, some animal substances, after solution, are less readily changed into chyle than others.

In the most perfectly carnivorous animals, the internal membrane is extremely uniform in its appearance; but even in these a division or capability of it by muscular contraction is observable.

The first instance in which Mr. Home remarked this division in the *human* stomach, was in a woman who was burnt to death, after having been unable to take much nourishment for several days before. But since that time, as he has taken frequent opportunities of examining the human stomach recently after death, he finds that this contraction may generally be met with in a greater or less degree; but when a body is examined as much as twenty-four hours after death, this appearance is rarely to be met with; which accounts for its not having been before particularly noticed.

The series of stomachs arranged according to their structure, which has been given, includes the principal peculiarities that appear to Mr. Home capable of influencing the process of digestion: it is, however, considered only as a first imperfect attempt, which he hopes that other inquirers will render more complete.

Experiments for investigating the Cause of the coloured concentric Rings, discovered by Sir Isaac Newton, *between two Object-glasses laid upon one another. By* William Herschel, *LL.D. F.R.S.* Read February 5, 1807. [*Phil. Trans.* 1807, *p.* 180.]

The account, given by Sir Isaac Newton, of these coloured arcs, appeared to Dr. Herschel highly interesting, but he was not satisfied with the explanation of them. Sir Isaac Newton accounts for the production of the rings, by ascribing to the rays of light certain fits of easy transmission and alternate reflection; but this hypothesis seemed not easily to be reconciled with the minuteness and extreme velocity of the particles of light.

With the view of inquiring further into the cause of these phenomena, Dr. Herschel, so long since as the year 1792, borrowed of this Society the two object-glasses of Huygens, one of 122, and the other of 170 feet focal length. Notwithstanding various interruptions, the series of experiments, made in the course of this time, has been carried to a considerable extent; and Dr. Herschel thinks the conclusions that may be drawn from them, sufficiently well supported to point out several modifications of light that have been totally overlooked, and others that have not been properly discriminated.

The aim of the present paper is to arrange the various modifications of light in a clear and perspicuous order; but Dr. Herschel reserves his sentiments upon the cause of the formation of concentric rings, for a subsequent communication.

The first section describes different methods of making one set of concentric rings visible. The first method consisted in placing a double convex lens, of 26 inches focus, upon a piece of glass, of which