includes eight families. One of these families, the Asteropectinidæ, contains species with non-attaching larvæ. Two other families (the Asterinidæ and the Gymnasteriidæ) have species with attaching larvæ (Asterina, *Q.J.M.S.*, 1896, and Porania, *Q.J.M.S.*, 1915). It is true that the Asterinidæ approach the Cryptozonia in some respects, but taken by itself this fact might rather lead us to look on the Asterinidæ as "primitive"—an annectant family between the two great orders of starfish. The Gymnasteriidæ are frankly Phanerozonate.

While Asteroid classification is admittedly perplexing, we are on fairly safe ground when dealing with the recognised families. At present it is known that members of five different starfish families (Gymnasteriidæ, Asterinidæ, Echinasteridæ, Solasteridæ, Asteriidæ) have attaching larvæ, while members of only one family (Asteropectinidæ) have larvæ without a sucker.

Dr. Mortensen's virtual narrowing down of Phanerozonia to Asteropectinidæ renders valueless his citations of Sladen, Ludwig, Hamann, and Gregory in support of the arguments in his letter. I yield to no one in appreciation of Dr. Mortensen's work, but even if the adult Asteropectinidæ were in some respects a primitive family (I believe the opposite), still to draw the conclusion which he says "inevitably" follows from this premise, in defiance of the direct data of comparative Asteroid ontogeny, not to speak of other considerations, would surely be one of those strangely naive misuses of the Recapitulation theory which have done much to obscure its essential truth.

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December 22.

Age and Area in Biology.

IN his recent book, "Age and Area," Dr. Willis gives (p. 114) the following: "Table showing in the horizontal lines the average number of vice-counties in Britain reached by the most widely distributed species in each genus of different sizes, and by the second, third, fourth, and fifth most widely distributed species."

	Average No. of vice-counties reached by the				
	1st sp.	2nd sp.	3rd sp.	4th sp.	5th sp.
Genus of over 10 sp.	108	104	96	86	79
6·10 sp.	103	84	64	49	33
5 sp.	98	76	39	22	16
4 sp.	89	61	35	13	..
3 sp.	89	48	27	..	..
2 sp.	73	33	..	..	..
1 sp.	50	..	..	..	..

Dr. Willis is convinced that the only explanation of the gradual diminution in average distribution from top to bottom of the table is that the average age of the species in the upper rows is greater and that they owe their wider distribution to their age. The gradation can, however, be explained without the help of either the principle of "Age and Area" or that of "Size and Space," as will become obvious if the method of constructing the table be considered. The average distribution of all the species in each of Dr. Willis's classes, in part obtained from the table above and in part from the London Catalogue, tenth edition, proves to be as follows:

No. of spp. in Genus	over 10	10-6	5	4	3	2	1
Average No. of vice-counties reached	40	48	50·25	49·5	54·6	53	50

The averages thus vary somewhat irregularly. In taking the average of the most widely distributed species in the first class, more than 90 per cent. of the lower numbers are rejected, in the second more than 84 per cent. are rejected, in the third class 80 per cent., in the fourth 75 per cent., in the fifth 66 per cent., in the sixth 50 per cent., and in the seventh none at all. Naturally this changes an approximately equal set of numbers into a falling series.

It is now possible to deduce the converse of Dr. Willis's theorem; for by reversing his process and rejecting the higher numbers it can be shown that the age of the "youngest" species decreases with the size of the genus.

The average distribution in vice-counties of the *least* widely distributed species in each genus according to size of genus, in part from Dr. Willis's table and in part from the London Catalogue, is as follows:

No. of spp. in Genus	over 10	10-6	5	4	3	2	1
Average No. of vice-counties reached	3	5·4	16	13	27	33	50

The regularity continues for the next "youngest" species, as can be seen from the original table. In neither case would the regularity suffer if the vice-comital numbers were redistributed to the species by any random method, for the chance of a genus receiving both a very high and a very low number would increase proportionately with its size.

W. C. F. NEWTON.

The John Innes Horticultural Institution,
Merton, October 31.

Soaring Flight and the "Olfactory" Organs of Birds.

THE note on page 784 of NATURE, December 9, misses the point of the theory I wish to be tested. The theory is that the well-developed "olfactory" nerves and apparatus of those birds which are capable of soaring flight has the function, not of smell, but of a delicate tactile sense whereby the bird is able to detect and take instant advantage of those upward air currents which recent experiments with gliding machines have shown to be so important in soaring flight.

It has been shown by Darwin and others that vultures do not smell with their well-developed olfactory apparatus. The experiments referred to in NATURE of December 9 show that this nervous apparatus is not necessary to give the bird its homeward direction or to enable it to indulge in flapping flight. So well-developed an apparatus is almost sure to have some function. It is obvious that soaring birds are in constant need of a means to detect the direction and strength of wind currents, especially those in an upward direction, and to adjust their balance and their wings accordingly. When soaring, the eyes and bill of the bird are directed downwards and the mucosa of the nostrils is exposed to any upward currents of air. I think it very likely, therefore, that the well-developed "olfactory" apparatus of these birds is a mechanism for detecting the direction and quality of air currents, and that the central "olfactory" ganglia enable the requisite adjustments of balance and direction of wing and tail planes to be made. The fact that birds whose nostrils have been plugged have been able to fly home by flapping in no way contradicts this theory.

To test it, I suggest in the first place that the