them in the order of the angular separation of the two components. We thus get the following means, the number in parentheses indicating how many pairs are included in each mean:

MEASURED SEPARATIONS

With the 12-Inch	With the 18½-Inch	
"	"	
0.94	1.14	(5)
1.80	1.96	(5)
2.34	2.43	(5)
3.29	3.32	(5)
4.18	4.25	(5)
With the 12-Inch	**With the 40-Inch**	
"	"	
0.68	0.85	(5)
1.13	1.34	(6)
1.71	1.87	(4)
2.05	2.22	(6)
2.55	2.57	(5)
3.96	4.03	(8)
4.65	4.66	(6)
With the 18½-Inch	**With the 40-Inch**	
"	"	
0.83	0.88	(5)
1.54	1.59	(6)
1.98	1.93	(6)
2.45	2.50	(6)
3.54	3.55	(6)
4.34	4.29	(7)

Measures made with the two large telescopes show little or no systematic difference, but those made with the 12-inch yield smaller separations than either of the others, the difference being largest for small separations and becoming negligibly small for separations in the neighborhood of 5".

In the recently issued Volume 12 of the Publications of the Lick Observatory, Professor Aitken gives a long list of measures of double stars. Many of these were examined with both the 12-inch and the 36-inch telescopes of that observatory, so that we have an opportunity for making the same kind of tests as on Professor Fox's observations. The results similarly collected are as follows:

MEASURED SEPARATIONS

With the 12-Inch	With the 36-Inch	
"	"	
0.52	0.42	(20)
0.62	0.54	(25)
0.71	0.64	(20)
0.81	0.79	(24)
1.07	1.03	(24)
1.38	1.39	(21)
2.13	2.10	(26)
4.49	4.53	(18)

Here again we have a systematic difference that increases as the separation becomes smaller. But in Professor Aitken's measures the difference has the opposite sign from Professor Fox's, the measures with the smaller telescope coming out larger than with the greater telescope. It would be interesting to know whether these are instrumental peculiarities or whether they have their origin in the habits of the observers. In any case it seems likely that a discussion of the systematic errors of telescopes and observers would be well repaid in the additional accuracy with which double-star orbits could be computed after the application of systematic corrections. Some attempts at such a study have been made, but (so far as the reviewer is aware) none of them is as thorough as the importance of this matter warrants. Needless to say that the presence of systematic errors of this kind is evidence for the skill and the care of the observer rather than against. In the work of an inexperienced or careless observer, such small effects as these would be buried under an accumulation of accidental errors.

FRANK SCHLESINGER
ALLEGHENY OBSERVATORY OF THE UNIVERSITY OF PITTSBURGH,
September 30, 1916

The Sessile Barnacles (Cirripedia) contained in the Collections of the U. S. National Museum; including a Monograph of the American Species. By H. A. PILSBRY. Bulletin 93, U. S. National Museum, 1916.

In this great work, of 366 pages with 76 plates, Dr. Pilsbry brings the American sessile barnacles out of obscurity, and furnishes the means whereby all who will may continue the investigation of the group with as much ease as the nature of the subject permits. A critical review of the book could only be written by one who had covered at least a considerable part of the field by his investigations, and at present Dr. Pilsbry stands alone in this country in his knowledge of barnacles, with no

one competent to criticize his results in any detail. All we can say is that we recognize the same lucidity and fullness of treatment, and the same broadly philosophical point of view, which have long been familiar in the writings of the author on Mollusca. Adding to this the beautiful and abundant illustrations, it seems that there is nothing left to be desired.

To the general zoologist, perhaps the most interesting part will be that in which the work of Darwin on barnacles is reviewed. Darwin wrote about sixty years ago, and to-day Dr. Pilsbry has this to say of his work:

"His grasp of detail was so comprehensive and his language so lucid that one can not expect to improve upon them. In the field he covered one can not do better than to imitate. Yet it has been possible to extend the work in certain directions."

"His monograph on the subclass Cirripedia is one of the most brilliant morphologo-systematic studies to be found in the whole field of systematic zoological literature."

Under *Balanus* (p. 50) we read:

"It is a remarkable testimony to Darwin's insight and restraint that every one of the species of *Balanus* admitted by him is still accepted as valid."

Under Coronulinæ (p. 269):

"We owe to him a discussion of the morphology of the group so lucid that no subsequent student has been able to add anything of importance."

Under Chthamalidæ (p. 292):

"We owe the establishment of this family solely to the taxonomic genius of Darwin, who first brought the genera together and demonstrated their relationship. I have examined and dissected many more species, I suppose, than any one else, and I find all of the evidence supports Darwin's views."

Thus, had Darwin never been known as a great philosophical naturalist and evolutionist, he would still have stood in the front rank as a brilliant taxonomist and morphologist.

One of the important facts brought out by Dr. Pilsbry is that the so-called cosmopolitan barnacles, when belonging to the littoral or shallow-water fauna, present numerous subspecies which conform in general to the faunal provinces already recognized for other marine animals. In general, also, the distribution of species is more restricted than has been supposed, as it is found that many of the records are taken from specimens attached to ships, far out of their natural range.

It appears that the British Museum, which contains Darwin's types and the *Challenger* materials, has the most important collection of barnacles in existence. Second to this is the U. S. National Museum, which possesses no less than 76 types.

T. D. A. Cockerell

University of Colorado,
September 3, 1916

SPECIAL ARTICLES

ANTAGONISTIC SALT ACTION AS A DIFFUSION PHENOMENON

1. The writer pointed out in 1905[1] that the antagonization of the toxic action of NaCl by $CaCl_2$ (or in general of salts with univalent cation by small quantities of a salt with bivalent cation) was due to the Ca preventing the diffusion of the NaCl through the membrane of the cell. It is often difficult to decide whether or not the antagonistic salt action is a diffusion phenomenon or a phenomenon due to the action of the salt upon the living protoplasm. We possess, however, one object in which definite proof can be furnished that the antagonistic salt action is merely a diffusion phenomenon, due to a direct action of one (or both salts) on the membrane and not on the protoplasm; namely, the egg of *Fundulus*. In this case the embryo is the living protoplasm and by comparing the action of salts on the egg, while the embryo is still inside, with the action of the same salts when the embryo is freed from the membrane, we can make sure that the phenomena of antagonization observed in the egg of *Fundulus* are diffusion phenomena. This may be illustrated by a few simple examples.

[1] Loeb, J., *Arch. ges. Physiol.*, 1905, CVII., 252.