

lower levels until it falls to its real place on the floor. The combination beyond the plane of the object, and therefore with figures enlarged, is also easy if the figures are small, but never quite so easy as combination on the nearer side.

These phenomena are as easy to me as any ordinary act of sight. No device of any kind, such as use of pencil or finger to fix the point of sight is at all necessary. I can watch the double images approach, combine, pass over, combine with the next figure, etc., with the greatest ease and certainty. Moreover, the sense of reality and of exact distance is as perfect as that of any other object.

In young normal eyes great difficulty is often experienced in getting this perfect perception of distance because the phantom is not perfectly clear. The reason is this: The two adjustments of the eyes, the axial and the focal, are invariably associated in every act of sight. Therefore, in the experiment the eyes are accommodated to the point of ocular convergence, i.e., the distance of the phantom. But the light comes from a greater distance, viz., from a real object—the floor. The retinal image, therefore, is not distinct and the figures are blurred. I no longer, now, suffer from this difficulty, because I have become presbyopic, and have, therefore, lost the power of accommodation. The clearness of the phantom is perfect almost immediately. When I was younger, there was always a considerable interval before the phantom became clear. The clearing up was the result of a dissociation of these two consensual adjustments. While the axial adjustment remained adapted for the distance of the phantom, the focal adjustment (accommodation) was changed to the distance of the real object. Now this dissociation of two adjustments so invariably associated in every act of sight, is difficult for most, and impossible for many persons. But until this dissociation is effected and the phantom becomes perfectly clear, the sense of reality, and especially the perception of distance, will be imperfect and vacillating. The use of glasses adapted to distinct vision at the distance of some one of the possible phantoms will make that particular phantom clear.

Now this clear perception of the distance of a phantom, nearer and smaller in proportion to the degree of ocular convergence, is, of course, not peculiar to me. All writers on the subject record the same result. All my pupils who succeed at all in binocular combinations get the same result. I am sure I have tried hundreds, I might almost say thousands, and always with the same result. This result is, therefore, normal and in complete accord with the laws of vision. For near objects, there are two modes of estimating distance, viz., by axial convergence (binocular perspective) and by accommodation (focal perspective). Now, of these two, the former is by far the more exact, and therefore takes control of judgment of distance if the two are not in accord. This is proved by naked-eye combination of ordinary stereoscopic pictures by ocular convergence. In such cases, we have the phenomenon of inverse perspective. The judgment of relative distance by axial convergence completely reverses the real relative position of objects. Binocular perspective overrides every other form of perspective, whether focal, or mathematical, or aerial, and comes out victorious in spite of the absurdity or even impossibility of its results.<sup>1</sup>

Now, in the case of phantoms, axial convergence fixes the distance. But this fixes also the size; for the apparent size of anything is a product of the retinal image multiplied by the estimated distance. The size of the figures will be small in proportion to the nearness of the phantom. This is in exact accord with the laws of vision. But Mr. Bostwick says, that in his case the figures seem smaller and yet more distant than the real object. He explains this, if I understand him aright, by the fact that in the dissociation of the axial and focal adjustments, while most persons follow the axial, he follows the focal adjustment, in estimating distance. Near objects require greater accommodation; but there is no such accommodation in this case, therefore the objects judged by this test will not seem nearer. But, again, since

<sup>1</sup> If anyone is specially interested in this subject, he will find it fully treated in my little volume, entitled "Sight," volume 31 of the International Scientific Series.

#### CALENDAR OF SOCIETIES.

##### Appalachian Mountain Club, Boston.

June 14. — Miss Lucy A. Putnam, An Ascent of Adam's Peak, Ceylon; Henry Lambert, Forests and Forestry in America and Europe.

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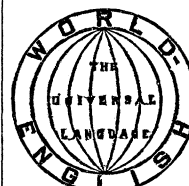
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they seem smaller, and since distant objects also seem smaller, they will seem more distant.

There are two objections to this explanation. 1. The accommodation is for the distance of the real object, as is proved by the distinctness. Why, then, should the object seem farther? 2. Again, distant objects seem smaller only because their retinal images are smaller; but this is not so in the case under consideration.

In justification of his view, Mr. Bostwick says that "in monocular vision an object appears distant or near according as the eye is fixed respectively on something nearer than it or something beyond it." I am familiar with the fact here referred to, but in this case the appearance of greater or less distance is so imperfect that it can hardly be called estimate. It may seem farther or nearer almost at will. It is a matter of fancy, not a sober certainty of rational judgment. In fact, there is no ground for forming any judgment.

Although Mr. Bostwick speaks of his estimate of the distance of the phantom as "distinct," yet I cannot but think that, for want of complete dissociation of the axial and focal adjustments the image is not quite sharp; and that, if he got the same sharp, realistic image which I get, he would see the distance as I see it. Of course, there is no disputing about how things seem to different observers any more than there is about tastes; but nevertheless, there are some things which are normal and reducible to intelligible law, and some not. Mr. Bostwick's case may be abnormal, but I think probably not. I well know how illusive binocular phenomena are. He will, I am sure, pardon me for thinking that with more practice in experiments of this kind he will come to see things as others see them.

JOSEPH LECONTE.

Berkeley, Cal., May 27.

#### A Rain of Fishes.

DURING a recent thunder-storm at Winter Park, Fla., a number of fish fell with the rain. They were sunfish from two to four inches long. It is supposed that they were taken up by a water-

spout from Lake Virginia, and carried westward by the strong wind that was blowing at the time. The distance from the lake to the place where they fell is about a mile.

THOMAS R. BAKER.

#### AMONG THE PUBLISHERS.

MACMILLAN & Co. have published a brief biography of the late English anatomist, William Kitchen Parker, written by his son, T. Jeffery Parker. It begins with an account of his birth and early life on his father's farm, and then of his schooling and his apprenticeship, first to an apothecary and afterwards to a surgeon. With his strong inclination for biological studies, it was natural that he should choose medicine as his profession; but it is evident, as indeed his biographer admits, that he had no great love for his profession and only moderate success in the practice of it. His prime interests in life, apart from his family, were two things not often found in conjunction at the present day, science and Wesleyan religion; and he seems to have been equally devoted to both and to have found no incongruity between the two. In biology he was largely self-taught; but a few discerning friends saw that he was capable of important original work, and assisted him in the prosecution of such work. He became a member of the Zoological Society and afterwards a fellow of the Royal Society; but the position that proved the most useful to him was the Hunterian professorship of anatomy and physiology in the Royal College of Surgeons, because it not only gave him the opportunity to lecture on his favorite subjects, but also added to his otherwise moderate income. His principal scientific work, his researches on the skull, is described at some length in this book, and there are briefer notices of his other studies and a bibliography of all his published works. His principal fault as a scientific writer, his son thinks, was his complicated style; his topics being arranged in a disorderly way and his sentences hastily constructed. Yet biologists will doubtless echo the words of the Royal Society that he was "an unworldly seeker after truth . . . whose beneficent influence will ever be felt in a wide-spreading and advancing science."

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The Rev. A. C. Waghorne, New Harbor, Newfoundland, wishes to sell collections of Newfoundland and Labrador plants, all named by competent botanists. He is going on a missionary journey along the Labrador coast, from the middle of July till October, and in return for much needed aid towards (Episcopal) Church purposes in that region, will be glad to be of service to any botanists who may write to him. Letters posted in the U. S. up to July 1 will reach him at the above address, and if posted later will be forwarded.

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This Company also owns Letters-Patent No. 463,569, granted to Emile Berliner, November 17, 1891, for a combined Telegraph and Telephone, and controls Letters-Patent No. 474,231, granted to Thomas A. Edison, May 3, 1892, for a Speaking Telegraph, which cover fundamental inventions and embrace all forms of microphone transmitters and of carbon telephones.

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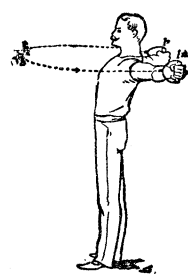
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