

bottom water also flows westwards into the Pacific Ocean.

It is interesting to note that the increase in temperature of the bottom water in the direction of flow can be accounted for solely by mixing with the North Atlantic deep water. No increase in temperature due to heat conducted through the earth's crust can be detected, and earlier attempts to measure the speed of the bottom current based on the assumption that the increasing temperature is the result of such conduction have been proved worthless.

The vertical distribution of potential temperature far south has changed Wüst's views on the origin of antarctic bottom water. He now believes that the coldest water is that which is cooled right through on the antarctic shelf in winter and sinks down the continental slope. This was the view held by Drygalski and Brennecke, but it could not be proved, because all the observations made in the open sea show that the bottom water is always covered with a layer of warm deep water through which the bottom water cannot be seen to sink. This warm layer is only absent from channels or basins adjacent to the antarctic continent which are cut off from the open sea by well-defined ridges rising above the level of the layer. In such basins there may be almost complete mixing from the surface to the bottom.

Wüst, in attempting to find a vertical series of observations which showed the cold water from the shelf sinking down the continental slope, has used a series (Deutschland St. 125) in such an enclosed basin, from which the water cannot sink because of a ridge. His failure to recognise this fact and the omission of the ridge makes the diagram on p. 45 misleading. He distinguishes a slightly warmer bottom water which he calls

antarctic deep water; he believes it to be formed by the effect of strong cooling and formation of ice in autumn and winter on the surface water in a convergence region situated near the edge of the pack-ice between 60° and 66° S. In this theory, Wüst appears to be making a determined attempt to bring the views which he and Nansen have expressed on the formation of antarctic and arctic bottom water into accord with the known data regarding the circulation of the Weddell Sea. There is very little reason for believing that a convergence region exists; the deep water is probably bottom water which upwells in the middle of the cyclonic movement.

Wüst has shown that there is very close agreement between the distribution of antarctic bottom water and the distribution of sediments poor in calcium (particularly the red clay). North of 34°–36° N., where the streams of antarctic water die away, the bottom deposits are no longer poor in calcium. The antarctic water dissolves calcium and over each of these poor deposits it has been found to be enriched. The report shows that in such places the density of the water calculated from the usual chlorinity ratio is too low. By means of sections giving the distribution of potential density, it is shown that the density of antarctic bottom water calculated from the usual ratio is less than that of the North Atlantic deep water. This is because there is a chlorine deficit in the bottom water, or as there is some reason to believe, a chlorine excess in the North Atlantic deep water. Wüst points out that there is a pressing need of accurate physical and chemical determination of these small density differences, and of new tables and methods for the practical determination of density and salinity and the correction of densities calculated from chlorine contents. G. E. R. D.

Obituary

DR. F. A. BATHER, F.R.S.

FRANCIS ARTHUR BATHER, born in 1863, was the eldest son of the late Mr. A. H. Bather. From Winchester he gained a scholarship at New College, Oxford, where he graduated in 1886, taking first class honours in natural science. In 1887 he entered the Department of Geology in the British Museum (Natural History), where his care was chiefly the fossil echinoderms, and notably the crinoids. In 1892 he gained the Rolleston prize of the Universities of Oxford and Cambridge for research in biology. His first scientific publication of importance was on the Crinoidea of Gotland, in 1893. He was married at Stockholm in 1896; and in 1897 he was awarded the Wollaston fund of the Geological Society. On the retirement of Dr. Henry Woodward in 1902, Dr. Bather was appointed deputy-keeper, a position which he held until 1924, when he assumed the keepership vacated by Dr. (now Sir) Arthur Smith Woodward. He was elected fellow of the Royal Society in 1909;

and in 1911 was awarded the Lyell medal of the Geological Society, and served as president of that body in 1926–28. He was also a member of several foreign scientific societies. Retiring from the Museum in 1928, he still visited the Department of Geology to pursue his researches on crinoids, which had been seriously interrupted by his administrative duties as deputy keeper and keeper. Though failing in health during the past year, he was active until the last; and when, after two days' illness, he passed away on March 20, the sad news came as a shock to his many friends.

Such, in bare outline, was the professional career of one whose many-sidedness was continually a surprise to those who knew him; and, of course, such a bald enumeration of facts can give no distinctive picture of the man, even as a professional palæontologist. Nor is it always easy, in considering Dr. Bather's many activities, to draw the line between his professional and other interests.

The need of clear thinking in scientific researches, and of lucid exposition in scientific description, developed in him a mastery of style in writing and diction which harmonised with his appreciation of literature, and especially with his love of Shakespeare. That, in turn, found a further outlet in his dramatic talent—the practical expression of literature—just as museum ‘curating’ gave scope to the practical side of his scientific interest. He always insisted that all who could do so should draw the illustrations for their own scientific papers, and it is not, therefore, surprising to learn that he appreciated art, and to some extent practised both drawing and painting. So his many outside activities could be seen to spring from qualities which, used and developed in his professional work, demonstrated the essential harmony of his nature.

More closely bound to his strictly professional work were what were perhaps the two greatest preoccupations of Dr. Bather’s unofficial life—museum technique and scientific journalism. His chief official duties were ‘curating’ and identifying; and, as a wide knowledge of museum technique is obviously desirable for making a perfect curator, so research is necessary for identifying material; and the critical faculty which research engenders, easily developed in Dr. Bather into a flair for reviewing and other journalistic activities. It was to be expected, then, that when the Museums Association was founded, Dr. Bather from the first was one of its most active supporters and inspirers and, through the *Museums Journal*, its most eloquent mouth-piece. He presided at the Aberdeen conference in 1903, and his enthusiasm for the Association continued until his death. His journalistic activities were widely spread. Early in life he edited the periodical *Natural Science*, and for many years the *Museums Journal*. Articles, notices and letters were ever flowing from his pen; but perhaps his most appreciated efforts were the delightful reviews which he wrote for the *Times Literary Supplement*.

But all Dr. Bather’s outside interests, his zeal for museum technique, and his critical and literary talent, were subordinated to his professional work. Were the foreign museums ahead of the British Museum in this respect? Corresponding improvements must be procured for the Department of Geology. Did that standard obtain in any journal or scientific publication? The Department’s publications must set the standard for all outside bodies. So keen was he upon the adoption of this or that improvement, even in the little things of curatorial practice, that he appeared more pleased with the appreciation shown him by the application of one of them, than by a favourable reception of his scientific papers. I know that he sometimes felt that his labours for improved curating were not fully appreciated; whereas an enumeration of the improvements, great and small, in curatorial practice introduced by him should have effectively silenced that misgiving. He has been considered to have had too great a consideration

for minutiae. Indeed, his mind marched with his who wrote:—

“Thus, if this Age but as a comma show
 ’Twixt weightier clauses of large-worded years,
 My calmer soul scorns not the mark: I know
 This crooked point Time’s complex sentence clears.”

Dr. Bather insisted on the comma because he appreciated its relation to the whole.

If his colleagues have not always appreciated as fully as Dr. Bather would have liked all his curatorial ‘gadgets’, there is no fear of their ever under-rating the brilliance of his scientific work. His clear exposition, clean style, and description couched in the most direct language, as well as his orderly presentation and accuracy of detail, are nowhere better shown than in what he himself considered his master-work—“*Caradocian Cystidea from Girvan*”. This and his other scientific treatises are the standards to which his colleagues aspire in their own publications, and in which they recognise him as indeed a master.

It was Dr. Bather’s expressed intention, when at last relieved of administrative duties, to resume his interrupted researches upon fossil echinoderms, and particularly crinoids. It was the hope of some, at least, of his friends, that his last years would produce some masterpiece of synthetic thought dealing with the evolutionary aspects of palæontology. But, when Dr. Bather retired, he no longer possessed the energy needed to disengage himself from the multifarious interests which entangled him, and prevented him from resuming his studies uninterruptedly. Thus we consider his life-work incomplete. The larger vision may see in his widely-flung helpfulness a life better proportioned and more complete than we suppose.

Dr. Bather suffered fools kindly, and with humour; and if at times, like Wisdom, he led them by crooked ways and tormented them with his discipline, his patience with stupidity was remarkable; and no one who has been through his ‘mill’ will deny that it has been worth while to have been taught by Dr. Bather how to write a paper or arrange a collection, or will fail in gratitude to him. His intellectual honesty, and devotion to duty, tempered with a most kind heart, and lightened by a charitable sense of humour, indicated the quiet flow of his genius beneath a restless exterior. W. D. LANG.

PROF. S. F. OLDENBURG

WE regret to record the death on February 28 at the age of seventy years of Prof. Sergius Fedorovitch Oldenburg, the well-known Russian orientalist and former permanent secretary of the Russian Academy of Sciences.

Prof. Oldenburg was born at Byanking in Siberia and was educated at Warsaw and the University of St. Petersburg, where he specialised in oriental languages and more particularly the Indian dialects. After graduation he was for a