A chapter on the history of the germinal layers is promised in volume second. It is pleasant to find from the names of Agassiz, and Brooks, and others, that Embryology is gaining a sure foothold in this country.

The book throughout evinces the greatest ability and care. Clearness and truth will make it attractive to the student, and it may safely be predicted that a fresh impetus in embryological research among young students in this country and abroad will date from this publication. If this prove to be the case, the author may well feel repaid for his labor. H. F. O.

ON ANGULAR APERTURE OF OBJECTIVES FOR MICROSCOPES. By Geo. E. Blackham, M.D., F.R.M.S. New York Industrial Publication Company. New York, 1880.

We are glad to see that the vexed question of the angular aperture of the objectives has at length been treated in an exhaustive manner by Professor Blackham, who, by an untechnical method of treating the subject, has endeavored to interest a wide range of readers. The work has been produced in handsome form, and has eighteen sheets of diagrams. A critical review of this book will appear at a later date.

COAL.

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II.

The fearful loss of good material involved in mining and preparing Anthracite, as shown in the accompanying tables, though greatly to be deplored, seems to be almost inevitable. The disposition of the coal in large solid beds, and in highly inclined positions, involves strong supports to keep the superincumbent mass from crushing and closing the avenues to the mines; and these supports must consist of massive pillars of the solid coal itself. Wooden props, however ponderous and strong, can only be used for the minor supports. Some of this pillar coal is ultimately removed, but much of it is inevitably lost, especially in the larger beds which frequently range from 20 to 40 feet in thickness, and are often inclined at an angle of from 40 to 70 degrees.

It is estimated that not more than 66 per cent. of the coal is ever taken out from the mines. That which is brought to the surface is run through a huge structure from 80 to 100 feet high, very appropriately called a "breaker," ingeniously contrived for the destruction of coal. There are over 300 of these immense buildings in the Anthracite region, costing on an average $50,000 each, or an aggregate of $15,000,000. To the top of these the coal is hoisted, and then descends through a succession of rolls and screens, emerging at the bottom, in a series of assorted sizes, from huge blocks of lump coal to unmerchantable dust, which forms a grievously large proportion of the whole. This process involves a loss of good coal, equal to 20 or 25 per cent. of the entire quantity mined. For the coal wasted in mining, say 40 per cent., and in preparing, 25 per cent., no one is paid; it is a total loss to landowner, miner and shipper.

Plans for utilizing the waste coal dirt, or culm of Anthracite collieries, have been frequently suggested, but none have come into general use. The Anthracite Fuel Company, at Port Ewen, on the Hudson, in 1877, used 90 per cent. coal dust and 10 per cent. fuel pitch, and made 300 tons of fuel per day, consuming over 50,000 tons of culm. The Delaware and Hudson Company also use at their mines 60,000 tons per annum. They now ship all their coal down to pea sizes, and consume the culm in generating steam. If all our coal companies would follow this excellent example it would enable them to sell half a million tons more coal, and burn the same amount of refuse, thus earning or saving half a million dollars per annum, to add to their revenues. The Philadelphia and Reading Railroad Company has recently introduced a method of burning coal dust in the furnaces of its engines, and the plan appears to meet with success.

The amount of water which drains into a mine from a mile or more of surface is enormous, for the average amount of rain and snow fall is 58,840 cubic inches per square yard annually, and the mines are liable to absorb not only the rain fall on the surface immediately over them, but all that which by contour of the surface, or by converging strata, tends towards them. On an average possibly five tons of water are hoisted for every ton of coal raised—another loss chargeable to mining.

The preponderance of waste coal seems excessive; but the writer's experience in surveys of certain tracts of land, and in preparing maps which show the area exhausted, compared with the amount marketed from ten or more colleries, in a period of 20 years, proves that the loss is not over-estimated, especially in the Mammoth Bed, whose average thickness is 25 feet. An eight-foot bed of coal yields much better in proportion. When they exceed six or eight feet in thickness, especially if steeply inclined, they are not only expensive to mine, but a large proportion of the coal must be left to support the rocky roof.

The Bituminous coals, particularly those of the United States, are not subject to these serious losses, and are quite cheaply mined and prepared. No breakers are required, as the only division is into coarse and fine coal, which are easily separated by screens; and the fine coal can be readily converted into coke, making a better condensed fuel than the coal in its natural shape. The Bituminous beds are nearly horizontal and rarely more than six feet thick, so that it is not necessary to leave extensive pillars; and as the coal is above water level, or in shallow basins, it is not necessary to put up extensive hoisting and pumping machinery. The simple, natural ventilation of American Bituminous mines also does away with the extensive and costly appliances for this purpose of Anthracite mines, in spite of which so many miners annually fall victims to the noxious gases.

The total amount of coal still to be mined, according to the accompanying tables, is 26,361,076,000 tons. The total waste, as experience has shown, is equal to two-thirds of the coal deposit, and reaches the appalling amount of 17,574,050,666 tons, leaving us only 8,787,075,533 tons to send to market. In all our calculations of Anthracite we have counted the area as if in a level plain, and made no allowance for the undulations which must necessarily increase the amount of coal. But as many of the flexures are abrupt and broken, making much faulty and refuse coal, it will cover any over-estimate of area or thickness we have made in our calculations.

Our tables show that 360,017,817 tons have been