

inaccessible to all who are unacquainted with the Russian language.

The next important expedition after the Russian one was that of Captain Weddell, during the years 1822-24, whose observations Dr. Neumayer considers perfectly trustworthy and very valuable, notwithstanding the aspersions of a subsequent explorer, Dumont d'Urville, whose own expedition was resultless. Weddell's labours embrace valuable materials on currents, the variation of the compasses, and nautical and meteorological matters. What is of great interest, is his voyage to a high south latitude in January and February 1823. With his two little vessels, the *Fane*, of 160 tons, and the *Beaufoy*, of 65 tons, he made his way from the South Orkneys between great masses of ice, and reached, on the 20th February, in $33^{\circ} 20'$ W. long., to $74^{\circ} 15'$ S. lat., the highest which had hitherto been attained. He found the sea here so free from ice, that he named it "George IV. Sea," and expressed his belief that it would be an easy matter to approach much nearer to the South Pole. Having convinced himself that no land of any importance existed in this direction, he turned northwards.

In 1829 Captain Henry Foster was sent out by the British Government for the purpose of making observations on the physical geography of these regions. He fixed his quarters at Pendulum Bay, on the island of Deception, whose east end was fixed by Weddell at $63^{\circ} 2'$ S. lat., and $60^{\circ} 45'$ W. long. Foster stayed here from Jan. 10 to March 6, and carried on a series of valuable hydrographical observations. Among other things he determined the length of the simple seconds pendulum. Before his departure he fixed in an exposed position a self-registering maximum and minimum thermometer, which in the year 1842 was found by Captain Smiles, who found the minimum temperature during 13 years to have been $-20\frac{1}{2}^{\circ}$ Cent. Unfortunately the index of the maximum thermometer had got out of order and could not be read.

Captain Biscoe, with two small ships, the *Tula* and the *Lovely*, went out in the year 1830. The highest latitude reached by him was $68^{\circ} 51'$ S., under $12^{\circ} 22'$ E. long. On the 16th of March, 1831, he found Enderby's Land, and on February 15, 1832, he discovered Adelaide Island, one of a series which runs in a westerly direction, each of which bears the name of its discoverer. Behind these towers to a considerable height the stretch of land now known as Graham's Land. From the observations of Biscoe and others, we learn that beyond the 60th parallel of latitude east winds prevail. The results of this expedition were of high importance; but notwithstanding that some maintain Graham's Land and Alexander Land to have no connection, Dr. Neumayer believes this still remains an open question.

The discoveries of Biscoe to the south of the Indian Ocean were to some extent confirmed by Kemp, who, in the end of 1833, in 60° E. long. and just inside the Polar circle, discovered the land known by his name. The insular condition of this as well as of Enderby's Land might be held as established, if any dependence could be placed upon the statements of Morrell, an American voyager of 1823; in him, however, Dr. Neumayer puts little faith.

The Messrs. Enderby of London, in the year 1838, fitted out two little ships, the *Eliza Scott* and the cutter

Sabrina, the command of which they gave to Captain Balleny. The scene of Balleny's discoveries was the waters south of New Zealand, a quarter hitherto but little explored. On February 9, 1839, he discovered three islands, the centre one being in $66^{\circ} 44'$ S. lat., and $163^{\circ} 11'$ E. long. He did not manage to make his way farther south than 69° in $172^{\circ} 11'$ E. long. During the month of February, he sailed westwards on the 65th parallel, and on the 3rd March, in $118^{\circ} 30'$ E. long. and $65^{\circ} 25'$ S. lat., he found what is now known as Sabrina Land. More than once previous to this he believed he had seen signs of land, but the dense fogs prevented him from verifying his conjectures. In pursuing these discoveries in lower latitudes, the two little ships suffered much from violent storms, in one of which the *Sabrina* was lost with all hands.

(To be continued.)

BELGIAN CONTRIBUTIONS TO ASTRONOMY

Tableau de l'Astronomie dans l'Hémisphère austral et dans l'Inde.—De l'Astronomie dans l'Académie Royale de Belgique, Rapport séculaire (1772—1872). Par Éd. Mailly. (Bruxelles, F. Hayez, 1872.)

TWO publications by the same author lie before us, each meriting a separate notice. Of the first—an extract from the *Mémoires de l'Académie Royale de Belgique*,—it is difficult to speak more highly in many respects than it deserves. Learned and full as to its matter, clear and perspicuous in style, it tells in a very pleasant as well as instructive manner the story of southern astronomy. A good deal of misapprehension, we believe, exists as to the beauty of that part of the heavens which is for ever hid from European eyes. The Southern Cross seems to be more remarkable for its associations than its grandeur; and Canopus, the only gem of extraordinary brilliancy which never rises here, is yet outshone by our familiar Dog-star. Some parts indeed of the southern Galaxy are extremely luminous; and this may well be admitted without subscribing to the assertion of a somewhat flighty Hellenic observer, that around the bow of Sagittarius it gives light enough to read the smallest print! and the marvellous variable η Argus, ranging from rivalry with Sirius down to the edge of invisibility without a telescope, is an object of interest for which, in its own way, we might seek a parallel in vain. But on the whole we may well feel that there is nothing in the hidden region to compensate a voyage to gaze upon it. Nor indeed is that region as extensive as, without reflection, might be supposed. The part of the sky which never rises being equal to that which never sets, its radius is the distance of the pole from the N. horizon; and mere inspection will show that this is no preponderating portion of the whole, if to the visible hemisphere we add all that part, which, though beneath the horizon at any one time, will successively come into view at other hours of day and night. All this is of course perfectly obvious to any student of astronomy; but we mention it because the idea is perhaps not often realised, how little, comparatively, of the sky we lose in our latitudes, and that little not of the most interesting character.

If, however, we exchange the naked eye for the telescope,

we shall to some extent reverse our opinion. For our visible heavens contain no equivalent to α Centauri, the finest as well as the nearest of connected pairs; or to such superb agglomerations of stars as γ Toucani with its ruddy heart and white border, or ω Centauri, staring like a comet even to the naked eye; or all the richness of manifold combinations in the Nubecula Major. Such are the regions whose investigation by successive explorers has been so well delineated in the pages before us. We have sketches by a master's hand of many an earnest labourer whose best years were devoted to the undertaking. Among the rest we recognise the youthful Halley, who commenced at the early age of twenty the first regular telescopic survey of these unfamiliar regions, experiencing, in consequence probably of his youth, the vexatious tyranny of some petty despot at St. Helena, whose name, withheld by him, is not worth digging up out of merited obscurity;—Lacaille, the diligent, the accurate, the honourable, who on his return to France, out of 10,000 livres granted for his expenses, notwithstanding his having exceeded his stipulated task, insisted upon restoring the overplus of 855 to the Treasury;—Sir T. Brisbane, who had served under the Iron Duke, in the Peninsula, and whose appointment to the governorship of New South Wales led to a characteristic anecdote: Lord Bathurst having stated at head quarters "qu'il avait besoin d'un homme pour gouverner la terre et non les cieux," and Brisbane having appealed to his old commander as to whether his love of science had ever interfered with his professional duties, the reply was, "Non, certainement, et je dirai que dans aucune circonstance vous ne fûtes absent ni en retard, le matin, à midi, ou pendant la nuit; et qu'en sus, vous fournissiez le temps à l'armée."—Then we have the vicissitudes of honour and contempt encountered by Dunlop, whose unintelligible "Angosiades" (to borrow de Zach's expression) at Paramatta were more injurious to the progress of astronomy than the blunders of the unlucky old chevalier at Tarbes;—the unmerited troubles and vexations and mortal sickness of poor Fallows, condemned to work with a bad instrument, and abandoned without help till he found his best assistant in his devoted wife;—the brilliant career of Henderson, the detector of the parallax of Sirius;—the laborious attempts of Maclear to deduce the solar distance from observations of Mars, whose fault it certainly was not that the result was but partially satisfactory; and his more successful verification and correction of the meridian arc, not quite so accurately measured by Lacaille a century before—all these are given in most interesting recital, together with equally detailed notices of many less generally known observers. We have also a full record of a scientific expedition which has, perhaps, attracted too little attention in England—that sent by the United States to Chili; how Lieut. Gilliss erected his observatory on the columnar rock of Santa Lucia, in the middle of the town of Santiago, 176 feet above the street, where the stones could not be blasted for fear of doing mischief below, and had to be split up by water after being roasted with flame; how the inhabitants came up at night by hundreds to see and gaze through the astonishing *Maquina*, and had their curiosity gratified by the good-natured Americans, even to the sentry's turn last of all; how the weather was almost too fine, drawing so much upon their energies by the unremitting work of

a hundred nights, of which seventy-two out of seventy-six had been continuously clear, that they found the periodical rains setting in none too soon, and Gilliss's vitality was so dried up to the native standard of apathy, that he required a month of horse exercise to set him right; and how, with a staff so inadequate that they were obliged to confine their work to a portion only of the southern sky, 20,000 new stars were registered—a noble addition, of which we have reason to hope for the publication at no distant time.

Such are a few only of the narratives with which this admirable memoir abounds; and we only regret that our cordial appreciation of its general excellence is subject to some few, though not material, drawbacks in the way of omission. The graphic way in which minor circumstances and incidents are interwoven in the relation of less important undertakings makes us conscious that the story of Sir J. Herschel's memorable expedition to the Cape has been told in a too compressed form, and that details are comparatively absent which would have furnished matter not only of interest but of instruction. The candour of the writer has led him to state that much of his recital is based on an article in the *Edinburgh Review*: it would, perhaps, be an unfair, but it may not be an unnatural, inference that he had not had an opportunity of fully mastering the magnificent record of the Cape observations which astronomy owes to the liberality of the Duke of Northumberland. We miss, too, the first outspoken challenge of the pseudo-planet Vulcan uttered from a southern latitude, and justified by the event—the retort, not over courteous, of Liais, "L'observation du Dr. Lescarbault est fausse." And we should have preferred fuller information respecting the design of the great Melbourne reflector, and the conflicting opinions regarding its success. But we should be sorry to appear even to detract from the merits of a memoir which deserves, and will obtain, so high a rank among the materials for a general history of modern astronomy.

The second pamphlet is also extracted from the "Livre commémoratif" of the same scientific body, and is a history of astronomy as connected with the Académie Royale of Brussels, which has just reached the end of its first century. Its range is accordingly more limited, but the talent of its author has imparted a more than local value and interest to its contents. The Academy, founded under the auspices of the Empress Maria Theresa in 1772, experienced a total interruption through political troubles from 1794 to 1816. During its earlier existence it failed to awaken a scientific spirit in the Belgian provinces, and depended almost entirely upon the contributions of foreign talent, in which the conspicuous share claimed by England is testified by the names of Needham, Pigott, and Mann. A geodesical survey of Belgium being greatly needed, and the terms of some foreign astronomer being found exorbitant, application was made to Pigott, who was passing through Brussels in 1772 on his way to Spa. He immediately gave up his intended journey, and applied himself to the undertaking with a generous and disinterested earnestness which ought never to fall into oblivion. For five months, accompanied by his son, Mr. Needham, and his servants, he carried on the survey at his own cost, and with his own instruments, sent for from his observatory at Frampton House, near

Cowbridge, Glamorganshire. His enterprise met with all the reward he desired in the rectification of maps, in which some towns had been misplaced to an extent of five, ten, or fifteen leagues, or even more ! At this period there was actually no observatory in Belgium.

The varied labours and scientific insight of the Abbé Mann, a native of Yorkshire, who had turned Roman Catholic, served in the Spanish army, and become Carthusian, require more than a passing notice. Though Halley had previously traced an analogy between the tails of comets, the aurora, and electrical emanations, Mann might be considered in advance of his time in referring these phenomena, with light, heat, and magnetism (as a modification of electricity) to the same general principle, elementary fire ; and his view, expressed in one striking sentence, "Tout est analogue et harmonique dans la nature universelle," would still be considered as the announcement of an eternal truth. The imperfection of their instruments misled these sagacious reasoners as to the identity of the Galaxy, stellar clusters, and nebulae properly so called ; but restricting their too general hypothesis to this latter class, the anticipation is sufficiently striking which refers them to assemblages of primordial light or electric fluid, the luminous material of which the sun and stars are formed. And the words with which Mann commences his speculations are an embodiment of wise and sound thought : "On peut bien penser qu'une bonne partie de ce que je vais dire ne sera que des conjectures ; mais quand les conjectures sont fondées sur des observations et des expériences, et qu'elles donnent des explications naturelles des phénomènes, elles ne doivent pas être exclues de la physique, si on ne veut fermer la porte aux découvertes, qui ne viennent pour la plupart qu'à la suite de quelque conjecture heureuse, confirmées peu à peu par de nouvelles preuves, jusqu'à ce qu'elles parviennent au point d'une certitude entière."

The doubts with which the first discovery of the planet Uranus was received are recorded among these early memoirs ; they are well known—more so, probably, than an anecdote which was communicated to the present writer by a friend of the illustrious discoverer. When Sir Joseph Banks, and other fellows of the Royal Society, had failed to find the new object, Herschel had a portable tube constructed of silk, packed it up with his mirrors, and gave the doubters the meeting on the roof of Somerset House, where, the planet having been exhibited, Sir Joseph took off his hat and made him a bow, the rest of the company following his example.

After the reconstruction of the Academy, a considerable time (1816-1834) elapsed before it gave signs of activity ; and the state of science in Belgium may be conjectured from the fact that in 1823 the question was seriously proposed by that learned body whether the law of nutation was accurately understood, and, as well as the planetary perturbations, could be shown to be in accordance with the Newtonian theory. Two years afterwards, indeed, they decreed a prize to the Double Star Observations of Herschel and South. But even this was not done without such a singular deformation of the latter's name as must have much moved his choleric temperament, when he recognised himself (not, perhaps, immediately) as "un Anglais nommé Sawt !" However, during this period a master spirit was introduced among the members. To

the energy and perseverance of Quetelet, among obstacles of no uncommon kind, was due the foundation of an Observatory at Brussels, which received its instruments in 1834 ; and with the election of this astronomer at that period to the office of perpetual secretary commenced the era of scientific and intellectual progress in Belgium. We have not space to enter at length upon the subsequent history of the Academy ; but will only indicate a few points of interest with which some of our readers may, perhaps, not be familiar. Such are the following :—

The extension, by Baron Behr, of the very curious relation between the periodic times of the four innermost satellites of Saturn to the other members of the system, the revolution of Hyperion being quintuple that of Titan. The continuance of the alternate recurrence (1, 3 ; 2, 4 ; 5, 7 ; 6, 8), with a break in the order and value of the relation, will be noted, as well as the probability that either the apparent vacancy between Rhea and Titan is a real one, or must contain *two* undiscovered satellites. The periods of the satellites of Jupiter are known to be only approximately commensurable ; but the Baron has found that the revolution of the fourth equals twice that of the third plus $\frac{1}{3}$ of the difference between those of the second and first. Then we have Capocci's idea, in 1850, of a parabolic mirror formed by the rotation of a vessel of mercury, and utilised for a telescope by a large "flat," with Krecke's suggestion that a mass of melted metal might thus be cooled into a permanent paraboloid ; a notice of M. Neyt's (of Ghent) great success in lunar photography with a silvered mirror of $9\frac{1}{2}$ inches ; of delineations of Mars executed in 1864, 1867, and 1871, by Dr. F. Terby (from whom, by the way, we are expecting a valuable monograph of this planet) ; and of a catalogue, now in progress, of 10,000 stars. Besides these, there is much valuable information relative to meteors, zodiacal light, tides, geodesy, and similar subjects ; and the impression of activity and progress conveyed by Dr. Mailly's excellent memoir is full at once of promise and pleasure. We sincerely thank him for his labours, and wish him and the Society of which he is so able an historian all possible success.

T. W. W.

OUR BOOK SHELF

First Principles of Human Physiology, &c. By W. T. Piltner, certificated Teacher of the Science and Art Department. (London : Kempster, 1872.)

AMONG the least questionable services of the South Kensington establishment are the classes which have been held, under the superintendence of Prof. Huxley, and the personal guidance of three of our best physiologists, for instructing school-teachers in the elements of anatomy and physiology. The present hand-book may be taken as one result of these classes, and is interesting as an exhibition of what physiology looks like from what may be called the lay point of view.

The arrangement followed is that of Prof. Huxley in his admirable "Elementary Lessons," of which in fact this little book is a kind of diluted abridgement. Few readers will be sorry to miss the comparison of the three Cæsars, with the quotation from Hamlet, and the famous story of Mrs. A. ; but even in his weakest moments the master quotes Shakespeare, while the pupil introduces embellishments without alleviation.

It is only fair to say that the author writes clearly, and apparently has an intelligent understanding of the facts of