

number of persons who have been admitted for the first time since the museum was opened, July 1872, is about 4,000. There is a society in connection with the museum which meets monthly, having for its object original research. Papers have been contributed, amongst others, by Dr. Grierson, Dr. Sharp of the London Entomo-

logical Society, and Mr. Shaw, schoolmaster. Dr. Sharp gave an exhaustive account of the Colorado beetle, and Mr. Shaw illustrated, by means of large diagrams, Darwin, Lubbock, and Müller's discoveries on the fertilisation of flowers by insects.

J. SHAW

Tynron, Thornhill

THE AUSTRIAN ARCTIC EXPEDITION¹

NO doubt most of our readers have some acquaintance with the story of the memorable Austro-Hungarian Arctic Expedition in the *Tegetthoff* under the leadership of Lieutenants Payer and Weyprecht. We have at various times since the return of the expedition, upwards of two years ago, given details of the adventures of the party

and of the results obtained; in vol. x. p. 524, we published a map showing the geographical discoveries which had been made. In the work named below all who have heard anything of the expedition or who take an interest in Arctic exploration will be glad to have a complete history of its doings from the artistic and graphic pen of one of its commanders, Lieut. Payer. We venture to think that Payer's narrative is likely to take its place



The Austrian Flag Planted at Cape Fligely.

among the classics of Arctic exploration; the skill with which he has told the story of an expedition so full of strange and unexpected events, the enthusiasm and interest which mark every page, its pathos and humour, the value of the information it contains, and the attraction of its numerous illustrations, are sure to make it a permanent favourite with old and young, and constitute it an authority on Arctic matters generally.

The *Tegetthoff*, a screw steamer, expressly built for the purpose of this expedition, of 220 tons burden, fitted out for two years and a half, left Bremerhaven June 13, 1872, and Tromsøe about a month later, for the purpose of exploring the Arctic Seas in the Novaya Zemlya region. The vessel was equipped mainly at the expense of the

¹ "New Lands within the Arctic Circle. Narrative of the Discoveries of the Austrian Ship *Tegetthoff* in the Years 1872-1874." By Julius Payer, one of the Commanders of the Expedition. Maps and numerous Illustrations. Two vols. (London: Macmillan and Co., 1876.)

Austrian Count Wilczek, and, including officers and men, had only twenty-four souls on board. The ultimate destination of the expedition was not rigidly defined; they might make their exit by Behring Straits, or winter on the Siberian coast, or on any lands which they might be fortunate enough to discover. The first ice was met with in about 74° N., near the coast of Spitzbergen, and it remained with the ship more or less till the end. Only the year before, in a preliminary reconnaissance in a small sailing vessel, the *Isbjörn*, by Count Wilczek, the sea between Spitzbergen and Novaya Zemlya was found to be almost free of ice, and with a properly-equipped steam-vessel there seemed to be no obstacle to pushing northwards indefinitely. In 1872 things wore a very different aspect. The ice was entered in 74° N., and it required careful navigation to reach Cape Nassau, near which the *Tegetthoff* was overtaken by Count Wilczek in the

Isbjörn, who had thoughtfully followed to establish a depot for the exploring ship in the north of Novaya Zemlya. The two ships parted company on August 20, and a few hours after the *Tegetthoff* was beset by the ice in lat. $76^{\circ} 22'$ N., long. $63^{\circ} 3'$ E., and she never afterwards got out. Completely at the mercy of the moving ice-field, the ship drifted slowly in a general north-east direction during the winter, till somewhat north of 79° she turned westward in the middle of February, 1873. Though generally westward, the course was somewhat erratic. During the spring and summer of 1873, every effort was of course made to free the ship from her helpless position, in which apparently nothing could be done to carry out the object of the expedition. To be imprisoned thus for another winter appeared utterly intolerable, but all the efforts made failed, and by August everyone felt resigned

to the inevitable. In August the ship took a turn towards the north, and on the 30th of that month the whole aspect of things suddenly brightened for the ice-bound explorers by the unmistakable sight of new lands. When in $79^{\circ} 43'$ N. and $59^{\circ} 33'$ E., new life was awakened in every breast by the sight of the mountains and glaciers of what is now known as Kaiser Franz-Josef's Land. Thus, then, when hope was lowest, the expedition drifted into success. It was too late that season to explore the new-found land, and it can easily be imagined how impatient all were for the advent of spring, to enable them to commence to gather the fruits of their lucky find. Lieut. Payer strongly advocates autumn as the best season for sledging, but as they could not run the risk of another winter in the ice, the sledge journeys were commenced early in March, and by the beginning of May Lieut. Payer had made



The Aurora during the Ice Pressure.

three separate expeditions into Franz-Josef Land. In the first expedition, a short one, he explored Wilczek Island, the most southerly, and the south part of Hall Island. In the second journey he went right northwards, 160 miles, as far as he could go with sledges, to Cape Fligely, $82^{\circ} 5'$, making several subsidiary trips right and left of Austria Sound, on which he travelled, and which separates the two main divisions of Franz-Josef Land into Wilczek Land and Zichy Land. Finally a third short expedition was made to the north-west to M'Clintock Island, and on May 20, 1874, all necessary preparations having been made, the good ship *Tegetthoff* was abandoned. No other course was open to the commanders, if they did not want to run the risk of perishing along with their greatly enfeebled crew. By sledging and boating, a painful, wearisome, and slow progress southwards was made, so slow that in two months they

were only nine miles from the ship, with a rapidly diminishing stock of provisions, though tobacco and water seem to have been the greatest wants; Payer says you could not have then done a man a greater favour than ask him to a pipe and a glass of water. Fortunately the open water was met with in about 78° N., and with little difficulty the wearied party rowed and sailed southwards along the west coast of Novaya Zemlya, until finally rescued, on August 24, by a Russian fishing-vessel at Cape Britwin. On September 3, all except poor Krisch, the engineer, who died of consumption and was buried on Wilczek Island, reached Vardö, not much the worse of their extraordinary experiences.

This bald outline of the course of the expedition can give one no idea of the intense interest which the detailed narrative assumes in the pages of Lieut. Payer. With the hand of a true artist, with pen and pencil, he sketches

the life of the apparently forlorn party from day to day, with such clearness, and force, and sympathy that the reader becomes familiar with the peculiarities of each individual, and feels towards him in the end like an old acquaintance. The ways and characteristics of the very dogs, Jubinal and Sumbu and Pekel, and the rest, are sketched in a manner that would delight the heart of the author of "Rab and his Friends." While the work only pretends to be a general account of the expedition, it contains much of scientific value. Most of the scientific results yet remain to be published, though from time to time papers by Weyprecht, Höfer, and others appear in Petermann's *Mittheilungen*, containing elaborate discussions of the various scientific observations; we published some account also of the scientific results in three articles in NATURE, vol. xi. p. 366, *et seq.* Of Franz-Josef Land itself the author, by drawings, descriptions, and map, conveys a satisfactory idea. It is evidently an archipelago of about the size of Spitzbergen, stretching from about 80° to at least 83° N. lat., but how far from east to west is not ascertained. Running north and south, on each side of Austria Sound, are two main stretches of land, Wilczek and Zichy Lands, broken up, the latter especially, by many deep fiords, and with many islands in the channel between them. Payer got as far north as Cape Fligely, in 82° 5' N., and from that saw land stretching northwards to 83°, Petermann Land, and another coast-line far to the west, King Oscar Land. The land, as might be expected, is a barren one, with mountains 2,000 to 5,000 feet high, and glaciers of such size, as argues that the country must have very considerable breadth. In many parts, and as far north as Payer went, animal life, bears and seals, and thousands of Arctic birds in great variety, abound; during the whole time of the expedition's sojourn fresh meat of some kind was seldom lacking. At Cape Fligely open water was met with, but it was only an extensive ice-hole or "polynia;" the idea of an "open Polar Sea" Lieut. Payer does not for one moment entertain. Distinct recent traces of foxes and even of hares were seen in some places, but no actual specimens were met with. Under the summer-sun, Lieut. Payer is of opinion, numerous streams will rush down the mountain sides, and some of the valleys be clothed with verdure. But for most of the year there is nothing but barrenness and ice and snow; the land is, of course, uninhabitable, and no trace of human beings was discovered. The islands are evidently volcanic, and reminded Lieut. Payer geologically of the rocks of North-east Greenland. Brown coal was found and coarse-grained dolerite abounds. But for details as to the appearance, the geology, the fauna, and flora, and other characteristics of Franz-Josef Land, we must refer the reader to the work itself. It would certainly be interesting to know more of this discovery, and perhaps means may yet be found to gratify a justifiable curiosity. The discovery of this group of islands greatly favours the theory of those who maintain that the Arctic basin is mainly an archipelago, and after all, our own expedition has found nothing that seriously weakens the theory.

From a scientific point of view the first chapter is probably one of the most important in the work. Lieut. Payer has evidently made a thorough study of ice in all its phases, both by means of direct observation (and both in the Novaya Zemlya seas and on East Greenland he has had ample opportunities for this) and by extensive reading of the works of previous explorers. In this first chapter are given the results of this investigation, the characteristics of ice of all kinds—field-ice, pack-ice, hummocks, icebergs, and other forms—in a more systematic and thorough manner than we remember to have seen before. Many popular delusions he demolishes, and writes with an accuracy and fulness that must be satisfactory to those who have had no opportunity of studying ice-forms for themselves. Icebergs, he tells us, with long, sharp-pointed peaks, like those exhibited in numerous

illustrations, have no real existence. It is only fragments of field-ice, raised up by pressure, exposed to the action of waves and the process of evaporation, which are transformed into fantastic shapes. Icebergs are of a pyramidal or tabular shape, and in time they are usually rounded off into irregular cones. Altogether this chapter on ice is exceedingly instructive. The masses or thickness of floe-ice depends, he shows, not on age alone, but on several influences, pressure being one; so that the enormously thick ice met with by our own expedition does not need to be regarded as a remnant of the last glacial epoch, but due probably to unusual pressure, and the heaping of one mass upon another.

The year 1871, we have said, was in the Spitzbergen seas a great contrast to 1872, while 1874 again was as open as 1871. One of the most interesting, and in some ways instructive passages in the work, is where Lieut. Payer describes the fearful pressure to which the ship was subjected as she drifted northwards. For months these poor men had nightly to rush from their bunks on to deck ready to abandon the ship, which they expected to see every moment crushed to splinters. Payer's descriptions of the appearance and the agonising noises accompanying the ice-pressure are most impressive. The ice was comparatively smooth when first the ship entered it, but shortly the party were startled, when forced to rush on deck by the dreadful sounds which awakened them, by seeing the whole field crushed together, broken up, the pieces piled on the top of each other and lying at all sorts of angles, not unlike, indeed, the description given by Capt. Nares of the "Palæocrystic ice." Is not this, possibly, one more proof that the sea to the north of Robeson Channel was in an exceptional condition last spring? That we are almost entirely ignorant of the laws that regulate the movements of the ice in these regions is evident; no two successive years are alike, and the condition of one part cannot be inferred from that of another. In that very June, 1872, when the *Tegatthoff* was beset so far south on the Novaya Zemlya side, the *Polaris* pushed north with ease to 82° 16' by the Smith Sound route, and could have gone further; and this year, when our own ships have had a life-and-death struggle with palæocrystic ice, whalers have been cruising and making easy discoveries between 81° and 82° N., on the Spitzbergen side. If any satisfactory results are to be obtained concerning these Arctic regions, is it not evident that the only means to obtain them is by the establishment of permanent stations all round? This is the conclusion to which Lieut. Weyprecht, one of the commanders of this expedition, has been driven. By the by, we would recommend Payer's description of the results of ice-pressure to geologists who desire to have a forcible illustration of the results of pressure in changing the configuration of a surface.

In these introductory chapters the author gives many valuable directions as to the equipment and conduct of Arctic expeditions, and, it may not be amiss to state, expresses his complete approval of M'Clintock's method of constructing and fitting sledges. We recently referred to the suggestion of the use that might be made of ballooning in Arctic exploration; Lieut. Payer thinks that valuable results might be obtained by means of a captive balloon. As to the Gulf Stream, he gives little ground for believing that it extends much beyond Spitzbergen; indeed he thinks that the wind was the main cause of the drift of the ship; though Baron von Willersdorf, who has discussed some of the results of the expedition, thinks it probable that there exists a sea-current in the seas between Novaya Zemlya and Franz-Josef Land; that at any rate its existence cannot positively be denied, although the prevailing winds may produce similar phenomena. He also thinks there is a great probability that the ocean stretches far to the north and east beyond the eastern end of Novaya Zemlya.

The crew of this expedition was a mixed one—German,

Slavonic, Italian, Norwegian, and English being spoken, though all orders were given in Italian. It was well selected, and the ships equipped according to the most approved directions, but still scurvy broke out, though apparently not to so serious an extent as in the case of the *Alert* and *Discovery*. Fresh meat was abundant, and everything known to prevent or counteract the disease, but it broke out in both winters, the men improving during spring. Payer is distinctly of opinion that a judicious use of alcohol is a preventive, but evidently the real cause of this scourge of Arctic explorers has yet to be found out. The lowest temperature met with was a little over 40° R., though the general temperature was much milder. No one suffered seriously from frost bites, though they were common. The single death was due to consumption.

The conduct of the expedition by its two leaders, and the behaviour of officers and men, were all that could be wished. Observations in meteorology and magnetism, on the Aurora (of which there were many magnificent displays), geology, biology, and other departments of science were regularly and carefully made, and will no doubt gradually find their way into the general body of scientific knowledge and deductions. Unfortunately, many of the specimens, geological and zoological, had to be left behind with the ship. On the whole, this expedition is one of the most satisfactory in its conduct and results of all that have gone out to gather knowledge in these inhospitable regions, and Lieut. Payer has written its story in a style not surpassed in fascinating interest and scientific value by any of those old narratives that are still the delight of all who love to read of the adventures of daring men. The translator has had a hard task before him in putting the narrative into English dress, but he has succeeded, we think, completely; while retaining an unmistakable German flavour, the English version is thoroughly idiomatic and readable.

OUR ASTRONOMICAL COLUMN

THE NINEVEH SOLAR ECLIPSE OF B.C. 763.—In the Rev. A. M. Sayce's notice of the discoveries of the late Mr. George Smith amongst the Assyrian inscriptions in the British Museum (*NATURE*, vol. xiv. p. 421), reference is made to a solar eclipse in the month Sivan, which has been fixed to the year B.C. 763, June 15 (not in *May*, as printed in the notice quoted). The following are elements of this important eclipse—which has so direct a bearing upon the Assyrian chronology of the period—deduced upon the same system of calculation adopted for other ancient eclipses previously alluded to in this column:—

Greenwich Mean Time of Conjunction in R. A., B.C. 763, June 14, at 19h. 9m. 25s.

R. A.	...	...	...	...	73	9	43
Moon's hourly motion in R. A.	...	...	...	...	39	56	
Sun's "	...	...	...	...	2	34	
Moon's declination	...	...	...	...	23	10	10 N.
Sun's "	...	...	...	...	22	53	4 N.
Moon's hourly motion in decl.	...	...	...	...	0	54	N.
Sun's "	...	...	...	...	0	17	N.
Moon's horizontal parallax	...	...	...	...	60	9	
Sun's "	...	...	...	...	0	9	
Moon's true semi-diameter	...	...	...	...	16	24	
Sun's "	...	...	...	...	15	25	

The sidereal time at Greenwich noon was 4h. 57m. 47s., and the equation of time 8m. 4s. additive to mean time. Hence the middle of the eclipse fell at 19h. 8m. 52s., and the following would be points in the line of central and total phase:—

Longitude	...	35	14 E.	Latitude	...	30	59 N.
"	...	40	2	"	...	32	58
"	...	43	35 E.	"	...	34	19 N.

Sir George Airy places the Pyramid of Ninrud in long. 43° 20' 8" E., and lat. 36° 6' 1". Calculating directly for this

point from the preceding elements we find a very large partial eclipse—

Beginning June 15 at	h. m.	7	52 A.M., local M.T.
Ending	" "	10	23 " "

Greatest phase at 9h. 8m. A.M., magnitude of eclipse 0.987.

The breadth of the zone of totality in the longitude of Ninrud measured upon the meridian was 2° 5', whence it appears that this point is distant by calculation about 50' outside the northern limit, but at this remote period a very small alteration in the value of the moon's secular acceleration employed would suffice to bring Ninrud within the total eclipse, and it has been inferred that the eclipse was probably total at the station of the Assyrian Court, from the circumstance of the inscription referring to the phenomenon being underlined in the Assyrian Canon or register of annual archons at Nineveh, although there is no interruption in the official order of the Eponymes.

The discovery of the record of this eclipse was first announced by Sir Henry Rawlinson, in *May*, 1867.

THE COMET OF 1652.—This comet, which was observed for about three weeks only, is stated by Hevelius and Comiers to have equalled the moon in apparent magnitude, a fact pointing to a near approach to the earth. At present we have only the elements given by Halley in his "*Synopsis Astronomiæ Cometice*," which were calculated upon the observations of Hevelius, extending from December 20, 1652, to the 8th of the following month, published in the scarce volume of his "*Machina Cœlestis*." From this orbit the following positions and distances result:—

12h. G.M.T.	R.A.	Decl.	Distance from the Earth.
1652, Dec. 12	... 124 43 ...	- 59 18 ...	0.2275
16	... 96 19 ...	43 42 ...	0.1515
18	... 81 52 ...	27 2 ...	0.1308
20	... 69 50 ...	- 6 2 ...	0.1314
1653, Jan. 8	... 33 28 ...	+ 48 50 ...	0.5627

So that the comet's least distance from the earth was about 0.13 of the earth's mean distance from the sun, and the real diameter of the cometic nebulousity rather less than 110,000 miles.

THE BRIGHTNESS OF JUPITER'S SATELLITES.—In connection with a recent reference in this column to M. Prosper Henry's direct comparison of the brightness of Jupiter's satellites with that of Uranus, it may be mentioned that Dr. Engelmann of Leipsic, in his memoir "*Über die Helligkeitsverhältnisse der Jupiterstrabanten*," taking the star 132 Tauri as 5.3 in magnitude found the respective magnitudes of the satellites

I.	5.52	II.	5.70	III.	5.32	IV.	6.28
While a reduction of light-comparisons by Prof. Auwers between November, 1858, and May, 1860, gave							
I.	6.43	II.	6.59	III.	5.87	IV.	6.76

BIOLOGICAL NOTES

THE PROGRESS OF EMBRYOLOGY.—The value of Dr. Dohrn's Zoological Station at Naples has never been more conclusively demonstrated than by the publication, in a recent number (July, 1876) of the *Archiv für mikroskopische Anatomie*, of a series of researches by Dr. Bobretzky, of Kiew, on the development of certain forms of Gastropods. The systematic search for embryonic forms which is carried on under Dr. Dohrn's superintendence has enabled Dr. Bobretzky to publish a memoir of great value, illustrated by a hundred figures. His skill and success have been previously attested by his excellent researches on the development of the crustacean genera, *Astacus*, *Palæmon*, and *Oniscus*; and he has now passed with equal good fortune into the Gastropod group, dealing with