

made from the 1874, and the remaining 446 from the 1882 transit. Taking each series of measurements of each transit separately, and applying the corrections of Leverrier's tables,

Transit of 1874 Dec. 8	$\Delta\alpha = + 4''.69$	$\Delta\delta = + 2''.30$
„ 1882 Dec. 6	+ 9''.13	+ 1''.99

he obtains the following values for the parallax—

Transit of 1874	$\pi = 8''.873$
„ 1882	$\pi = 8''.883$

Both the above numbers are subject to the mean errors $\pm 0''.062$ and $\pm 0''.037$ respectively, and are computed in the first case from 307, and in the second from 444 measurements.

By taking now the two series together, and finding the most probable number, he obtains the following result subject to the two adjoined errors—

$\pi = 8''.880$
Mean error = $\pm 0''.032$
Probable error = $\pm 0''.022$

A comparison of the above results with those of other observers, taking the transits of 1874 and 1882, may be gathered from the following list—

Transit 1874.		Transit 1882.	
Harkness	8''.888	Auwers	8''.883
Todd	8''.883	Cornu	8''.86
French measures ...	8''.88	Harkness	8''.842
Stone	8''.88	Faye	8''.813
Auwers	8''.873	Todd	8''.803
Tupman	8''.81		
Airy	8''.76		

PHOTOMETRIC OBSERVATIONS.—The *Publications of the Potsdam Astro-Physical Observatory*, No. 27, contains a series of photometric measurements made by Dr. Müller at a station on the Sântis, situated 2500 metres above sea-level, with a Zollner's photometer. The observations extend over two months, and they show that the form of the curve of extinction from the zenith to a point very near the horizon is satisfactorily represented by Laplace's Theory. But a comparison of the curves calculated separately for the various days of observation shows considerable differences, which approach and even exceed 0.4 of a magnitude near the horizon. The superiority of the Sântis station over Potsdam as regards conditions of atmospheric transparency is very striking. For a star in passing from the zenith to an altitude of about 2° has its light diminished nearly by a whole magnitude more in the plain than on the top of the mountain. From the observations, according to Laplace's Theory, the loss of light produced by the atmosphere in the zenith at Sântis is about 12 per cent. ; or, in other words, a star viewed from a point above the atmosphere would appear brighter by about 0.14 of a magnitude. Since the corresponding value for Potsdam is 0.2 magnitude, it follows that the absorption produced by a stratum of atmosphere between sea-level and a height of 2500 metres amounts to 0.06 magnitude. Before this value, however, can be accepted as definite, simultaneous observations of stellar magnitudes must be made at stations lying closer together than the two between which the comparison is instituted.

THE PAMIRS.

AT the meeting of the Royal Geographical Society on Monday the paper read was on a recent journey across the Pamir by Mr. and Mrs. Littledale. In introducing the paper, Mr. Douglas Freshfield made some remarks on the subject generally.

The Pamir or Pamirs (Mr. Freshfield said)—for Pamir is a generic term, the different strips of tableland are distinguished by separate names—is a vast tableland averaging 12,000 feet in height and 200 miles in length by 120 to 150 miles in breadth, ringed by a rough horseshoe of mountain ranges, and intersected by snowy ridges and shallow trenches that deepen westwards, where the streams of the Oxus descend towards Bokhara. The numerous photographs taken by Mr. Littledale exhibit a characteristic type of landscape:—tent-shaped, glacier-coated ridges, bare heights naked of verdure and shorn of forests by

the bitter winds and frosts, desolate bituminous lakes; a region where for the most part there is neither fuel nor fodder; an Engadine of Asia, with nine months winter and three months cold weather; the home of the wild sheep, the summer haunt of a few wandering shepherds; nomads' land if not no man's land. Long ago Marco Polo described it well. That is the scene of Mr. and Mrs. Littledale's adventures; that is the region where the emissaries of three nations are now setting up rival claims. "The half-way house to heaven" is a Chinese appellation for the Pamirs. "Cœlum ipsum petimus stultitiâ" our and the Russian soldiers and diplomats may now almost say of one another. For the tales of summer pastures of extraordinary richness, told to Marco Polo and repeated to Mr. Littledale, refer, so far as they are true at all, only to isolated oases. The country in question cannot feed the caravans that cross it; far less could it sustain the baggage animals of an army on the march. No one in his senses could consider that in itself the Pamir is a desirable acquisition. Any value it may have is in relation to adjoining lands. From the north there is comparatively easy access to it from Russian Turkistan. From the east the Chinese and their subjects climb up the long ascent from the Khanates, and pass through easy gaps in the encircling horseshoe of mountains on to the portions of the tableland they claim. From the south, a route which seems from Mr. Littledale's experience to be anything but a military route, leads over glaciers, passes, and through well-nigh impassable gorges into Gassin and Chitral, and so to Kashmir. To the south-west easier routes, little known or little described as yet, lead into the wild regions of Kaffiristan and Afghanistan. We do not here deal with politics, but we do deal with the geographical and cartographical facts on a knowledge of which politics and policy ought to be—but unfortunately for our country have not always been—based. Certain portions of the Pamir have been more or less closely attached to Afghanistan. The Amir lays claim to Wakhan, Chignan, and Roshan, tracts stretching along the sources of the Oxus. It is obvious that England will claim an interest in these, but probably, owing to the deficiencies in exact knowledge of the geographers of Cabul, we have not as yet formulated publicly our claims.

In 1873 the Russian Government, at the time of their advance to Khiva, undertook never to pass the Oxus. Shortly afterwards, Sir Henry Rawlinson argued with great force that the Murgabi, the stream that cuts the Pamirs in two, and not the Pandja, which flows along their southern skirts, was the true and proper source of the Oxus. Seven years ago, in the negotiations which followed the Penjdeh incident, the negotiators deliberately left this portion of the frontier out of their calculations.

Why, undeterred by the experiences of which that entertaining traveller and Anglophobe, M. Bonvalot, had lately given so alarming a picture, should an Englishman and his wife cross this desert? Mr. and Mrs. Littledale are eager in the pursuit of rare game. They were old travellers; they had sojourned in the forest wildernesses of the western Caucasus; they had, on a previous occasion, penetrated Central Asia. A pair of horns were to them what a bit of rock from a maiden peak is to others.

And lastly, why did Mr. and Mrs. Littledale go from north to south? Why did they, being English, make Russian territory their starting-point? Thereby hangs a tale. Because our Anglo-Indian Government prohibits all independent travel in its trans-frontier lands. Something may be said for this course, but it does not stop there. It also gags its own official explorers. It carries yearly farther and farther the policy deprecated by Sir H. Rawlinson in this hall, when he said: "Russia deserves all honour for her services to geographical science in Asia. I only wish I could say as much for ourselves as regards our own frontiers."

No one, least of all the Council of this Society, would ask for the publication of any tactical information our military authorities desired to withhold. But the military authorities go along with us in asking for an intelligent censorship in place of a wholesale system of suppression of the mass of knowledge, general and scientific, acquired by the servants of the State in our frontier and trans-frontier lands. We believe, and the Council have represented to H.M. Government, that the present practice is not in accordance with the existing official rules, that it was intended and has been ordered that expurgated copies of all official reports of public interest should be given to the public. They hope that the departments concerned will before

long be instructed to give practical effect henceforth to any such instructions that may exist, and thus that the forward march of English power may once more, as it should, be accompanied by a general advance of scientific knowledge.

Leaving Samarcand early in May, Mr. and Mrs. Littledale drove in Russian post-carts up the beautiful valley of the Syrdaria, which reminded them in parts of the Vale of Kashmir, as far as Osh, the last post-station. Here they organized their caravan for their great adventure, the crossing of the Pamirs into Kashmir. They had the advantage of previous experience of Central Asian travel, and of the cordial assistance of the Russian Commandant, Colonel Deubner, who could hardly have done more for the travellers had they been his own nearest relatives. After much hesitation from the difficulty of obtaining any trustworthy information as to the state of the Alai passes, they selected the Taldik, 11,600 feet, before crossing which, they left behind the last tree and bush they were to see until reaching the valley of the Gilgit.

Crossing the Alai plateau they proceeded by the Kizil Art Pass to Karakul Lake. Thence their route led over passes of 15,500 feet, in sight of the great Mustag Atta to the Murgab or North Oxus, which they struck at 12,300 feet, their correct elevation between the Alai and Sarbad. Another pass of 14,200 feet led over the Alichur Pamir—where *Ovis poli* horns lie about in hundreds—to the Boshgumbaz Valley. The pass of the same name was found impracticable. Mr. and Mrs. Littledale made a long detour to visit the Victoria Lake, one of the sources of the South Oxus, for purposes of sport. Thence they turned eastwards and crossed by the Little Pamir Lake into the Valley of Wakhan. When near Sardab they met with their first misadventure, and this was the encounter with the troops of our ally the Ameer. The civil authorities detained Mr. and Mrs. Littledale for many days, and only let them go at last grudgingly, and after having despoiled them as far as they could without open robbery.

ELIZABETH THOMPSON SCIENCE FUND.

THIS fund, which has been established by Mrs. Elizabeth Thompson, of Stamford, Connecticut, "for the advancement and prosecution of scientific research in its broadest sense," now amounts to \$26,000. As accumulated income will be available in December next, the trustees desire to receive applications for appropriations in aid of scientific work. This endowment is not for the benefit of any one department of science, but it is the intention of the trustees to give the preference to those investigations which cannot otherwise be provided for, which have for their object the advancement of human knowledge or the benefit of mankind in general, rather than to researches directed to the solution of questions of merely local importance.

Applications for assistance from this fund, in order to receive consideration, must be accompanied by full information, especially in regard to the following points:—

(1) Precise amount required. Applicants are reminded that one dollar (\$1.00 or \$1) is approximately equivalent to four English shillings, four German marks, five French francs, or five Italian lire.

(2) Exact nature of the investigation proposed.

(3) Conditions under which the research is to be prosecuted.

(4) Manner in which the appropriation asked for is to be expended.

All applications should reach, before December 10, 1891, the Secretary of the Board of Trustees, Dr. C. S. Minot, Harvard Medical School, Boston, Mass., U.S.A.

It is intended to make new grants at the end of 1891.

* * The trustees are disinclined, for the present, to make any grant exceeding three hundred dollars (\$300); decided preference will be given to applications for smaller amounts.

(Signed) HENRY P. BOWDITCH, President.
WILLIAM MINOT, JR., Treasurer.
EDWARD C. PICKERING.
FRANCIS A. WALKER.
CHARLES-SEDGWICK MINOT, Secretary.

List of Grants hitherto made.¹

1. \$200, to the New England Meteorological Society, for the investigation of cyclonic movements in New England. [*American Meteorological Journal* for 1887, and May 1888.]

¹ The results published are given within brackets.

2. \$150, to Samuel Rideal, Esq., of University College, London, England, for investigations on the absorption of heat by odorous gases.
3. \$75, to H. M. Howe, Esq., of Boston, Mass., for the investigation of fusible slags of copper and lead smelting. [*Trans. Amer. Institute of Mining Engineers*, Feb., 1890.]
4. \$500, to Prof. J. Rosenthal, of Erlangen, Germany, for investigations on animal heat in health and disease, [*Sitzungsber. K. Akad. Wiss.*, 1888, 1309-1319; 1889, 245-254. *Arch. Anat. u. Physiol.*, Suppl. 1888, 1-53.]
5. \$50, to Joseph Jastrow, Esq., of the Johns Hopkins University, Baltimore, Md., for investigations on the laws of psycho-physics. [*American Journal Psychology*, 1890, III., 43-58.]
6. \$200, to the Natural History Society of Montreal, for the investigation of underground temperatures. [*Canadian Record of Science*.]
7. \$210, to Messrs. T. Elster and H. Geitel, of Wolfenbüttel, Germany, for researches on the electrization of gases by glowing bodies. [*Sitzungsber. K. Akad. Wiss. Wien.*, xcvi., Abth. ii., 1175-1264, 1889.]
8. \$500, to Prof. E. D. Cope, of Philadelphia, Penn., to assist in the preparation of his monograph on American fossil vertebrates.
9. (Withdrawn.)
10. \$125, to Edw. E. Prince, Esq., of St. Andrews, Scotland, for researches on the development and morphology of the limbs of Teleosts. ["Inaugural Dissertation," Pp. 24, Pls. II., Glasgow, 1891.]
11. \$250, to Herbert Tomlinson, Esq., of University College, England, for researches on the effects of stress and strain on the physical properties of matter. [*Philos. Magazine*, Jan., 1890, 77-83.]
12. \$200, to Prof. Luigi Palmieri, of Naples, Italy, for the construction of an apparatus to be used in researches on atmospheric electricity.
13. \$200, to Wm. H. Edwards, Esq., of Coalburg, W. Va., to assist the publication of his work on the butterflies of North America. ["Butterflies of North America," 3rd Series, Part V.]
14. \$150, to the New England Meteorological Society, for the investigation of cyclonic phenomena in New England.
15. \$25, to Prof. A. F. Marion, for researches on the fauna of brackish waters.
16. \$300, to Prof. Carl Ludwig, for researches on muscular contraction, to be carried on under his direction by Dr. Paul Starke. [*Abhandl. math. phys. Classe K. sächs. Ges. Wiss.*, xvi., 1890, 1-146, Taf. i.-ix.]
17. \$200, to Dr. Paul C. Freer, for the investigation of the chemical constitution of graphitic acid.
18. \$300, to Dr. G. Müller, for experiments on the resorption of light by the earth's atmosphere. [*Publicationen Astrophys. Observ. Potsdam.*, viii., 1-101, Taf'n II.]
19. \$300, to Prof. Gerhard Krüss, for the investigation of the elementary constitution of erbium and didymium. [*Liebig's Annalen*, Bd. 265, 1-27.]
20. \$50, to Dr. F. L. Hoorweg, for the investigation of the manner and velocity with which magnetism is propagated along an iron bar.
21. \$150, to Mr. W. H. Edwards, to assist the publication of his work on North American butterflies. ["Butterflies of North America," 3rd Series, Part VIII.]
22. \$250, to Dr. Ernst Hartwig, for researches on the physical libration of the moon (see Grant No. 27).
23. \$200, to Prof. Charles Julin, for researches on the morphology of Ascidians.
24. \$250, to Prof. M. Nencki, for researches on the decomposition of albumenoids by microbes. [*Arch. Expt. Path. Pharmak.*, xxviii., 311-350, Taf. IV.-V.]
25. \$200, to Prof. Carl Frommann, for researches on the minute organization of cells.
26. \$300, to Edward Atkinson, Esq., for experiments on cooking, to be carried on under the direction of Mrs. Ellen H. Richards. [*Proc. Amer. Assoc. Adv. Sci.*, 1890.]
27. \$250, to Dr. Ernst Hartwig, to continue the work of Grant No. 22.