WILEY

The Use of Balloons in Geographical Work

Author(s): A. Berson

Source: *The Geographical Journal*, Vol. 7, No. 5 (May, 1896), pp. 541-544

Published by: geographicalj

Stable URL: <http://www.jstor.org/stable/1773998>

Accessed: 27-06-2016 10:02 UTC

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at
<http://about.jstor.org/terms>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Wiley, The Royal Geographical Society (with the Institute of British Geographers) are collaborating with JSTOR to digitize, preserve and extend access to *The Geographical Journal*

seems to be no *à priori* objection; a theory upon which it would be out of place to offer any detailed criticism until the mathematical physicist decides that its life is to be spared.

NOTE TO SKETCH-MAP OF THE UPPER KUYUNI, BRITISH GUIANA.*

By Lieut. GODFREY-FAUSSETT, R.E.

[THE following note from Lieut. Godfrey-Faussett, dated "St. Lucia, W.I., April 2, 1896," will explain the sketch-map of the upper Kuyuni river, published in the present number of the *Journal*.]

"I have the honour to enclose herewith a sketch of the upper waters of the Kuyuni river, British Guiana, from the point (Akarabisi) where it begins to be the present boundary between British Guiana and Venezuela to a few miles above Yuruan. The traverse was taken by me with a prismatic compass last January, when sent up the Kuyuni by the British Guiana Government to Yuruan. The traverse was corrected by observations of latitude and longitude taken some time previously by Mr. McTurk, the magistrate of the district, and a surveyor by profession. It will be seen that the course of the river varies very considerably from the Government map, especially above Ekereku."

THE USE OF BALLOONS IN GEOGRAPHICAL WORK.

By A. BERSON.

At the meeting of the Berlin Gesellschaft für Erdkunde on January 7, Herr A. Berson read a paper on "Geography and Ballooning." The use of captive balloons for obtaining extensive views over unexplored regions becomes greatly restricted in marshy districts, on account of the difficulty of carrying the heavy cylinders of compressed gas, used for inflating the balloons; but wherever river transport in vessels of any size is available, as in the basin of the Congo or Amazon, the question assumes a very different phase. A small captive balloon of about 8800 cubic feet can raise a car containing one or two persons, and enable them, from a height of say 1600 feet, to survey many square miles of country. Still, even in the tropics the loss of gas from a properly made balloon is small, at least during the dry season, and the number of gas cylinders taken need not be large. On board ship, especially in the polar regions, such balloons may be even more serviceable, and it is greatly to be regretted that Nansen was at the last moment prevented from carrying out his intention of adding them to his equipment.

The employment of free balloons for purposes of this kind can only be seriously thought of when the prevailing winds are sufficiently constant to afford a reasonable prospect of landing in a region where provisions and stores can be obtained, or where the expedition can be brought to a satisfactory conclusion. The author, from his experience in thirty-eight ascents at all times and in all weathers, is of opinion that the expedition arranged by Andrée and his companions has little chance of success, and, indeed, is the most risky venture ever undertaken by explorers. He

* Map, p. 576.

agrees with a large number of meteorologists in believing that there is no definite proof of climatic conditions being favourable. We know but little about the winds prevailing between Spitzbergen and the pole, and of the region between the pole and 70° N. latitude—a stretch of about 1350 miles—we know absolutely nothing, either in the direction of Eastern Siberia or North-Western America. It is further obvious that the atmospheric circulation in the belt of moving depressions round the pole cannot be favourable to a journey of from 2000 to 2500 miles. As to the still greater difficulties of practical ballooning, which come first in any question of possible success, the author has found journeys of 180 to 300 miles, with balloons up to 160,000 cubic feet, enormously difficult during rain or snow, and below the rain-cloud level it is impossible to maintain a straight course for longer time. Crossing even a narrow arm of the sea is always difficult; the celebrated French aeronauts L'Hoste and Mangot, after crossing the English Channel several times at its narrowest part, perished in an attempt to reach England from the mouth of the Seine, near Quillebeuf, on a perfectly clear day. The distance direct is only about 80 miles, and in the direction of the prevailing winds, towards Weymouth, 125 miles, but they were never heard of again, although in the most frequented waters in the whole world. In the present state of practical ballooning, Andrée's polar expedition is little better than wilful suicide.

Special departments of geographical science may benefit indirectly by the use of balloons. We can scarcely imagine, for example, a more stimulating and instructive lesson for the student of geo-morphology than a bird's-eye view of a large tract of country, in which he can study at leisure the form and structure of river systems, mountain masses, or depressed areas.

The contributions made to our knowledge of the physics of the atmosphere by the recent balloon ascents at Berlin are of interest to the geographer as well as the meteorologist. Fifty ascents were made in free balloons, and twenty-five in captive balloons, with the primary object of revising and extending the results obtained by James Glaisher thirty years ago. The work developed itself along three lines, corresponding to the chief directions of progress since Glaisher's time. Meteorology has since then been raised to the position of a physical science by the introduction of the synoptic method; the recognition of the fundamental importance of ascending and descending currents has transformed its leading problems into questions of the dynamics of the atmosphere; and last, but not least, improved instrumental methods, founded on truer principles, have seriously modified the results of observation. Geographers and cosmographers are, however, chiefly interested in two atmospheric agencies of the first rank—the motion of the air and its temperature.

The numerous ascents in which observers took part—five over 19,500 feet, one over 26,000 feet, and one over 29,500 feet, the greatest elevation yet attained—have added greatly to our material. We have shown conclusively that the progressive decrease in the rate of fall of temperature with increased height, and consequent approximation to a uniform moderately high temperature at the upper limits of the atmosphere, which was deduced by Glaisher, must be ascribed to defective observation, and chiefly to the faulty protection of the thermometers from the greatly increased solar radiation. Under all conditions and at all seasons, it was found that at high elevations the rate of fall was not only as great, if not greater, than at intermediate levels, but even, for the most part, at the lower levels; and in the open atmosphere, at elevations of about 26,000 feet, much lower temperatures were met with than had been supposed possible since Glaisher's time. At 25,600 feet readings of 35° to 36° Fahr. below zero were recorded, against Glaisher's 4° Fahr. below zero; and at 30,000 feet $54\frac{1}{2}^{\circ}$ Fahr. below zero; giving an average rate of decrease of 0.49° Fahr. per 100 feet, compared with Glaisher's 0.10° Fahr. These

figures agree with the results of experiments recently made in France with balloons carrying self-registering instruments, which gave 90° Fahr. and 101° Fahr. below zero at 49,000 and 59,000 feet respectively; and we are led to surmise that the temperature near the upper limits of the atmosphere must approach much nearer to the absolute zero than has been hitherto believed, the rate of fall in the higher layers answering the so-called adiabatic conditions, which require it to be 1° Fahr. in 182 feet.

Another important result obtained, again contrary to that deduced from Glaisher's defective observations, was that at a height of 16,000 to 20,000 feet the temperature of the air is but little affected by seasonal or diurnal variations, or even by changes in the conditions of weather and cloud; while at 26,000 it is, to a great extent, independent of all these influences. We need only mention, in passing, the proofs of the occurrence of excess of temperature in the middle layers between 5000 or 6000 and 13,000 feet, and of a regular inversion of the temperature gradient in winter and at night, extending to 3500 or even 6000 feet; there is more geographical interest in the information received from the journeys of the "Humboldt" and "Phoenix" as to atmospheric currents. It has come out, in the first place, that the known increase of wind velocity with height is more general and greater in amount than was supposed; and, further, that the frequent exceptions to the occurrence of this phenomenon are apparently limited to layers between 5000 and 10,000 feet, a mixing of currents often taking place at 10,000 to 12,000 feet, although at still greater heights the normal increase is resumed. This increase was at times extraordinarily great, as, for example, in a clear, almost calm September day, when, at a height of 3000 to 10,000 feet, the wind velocity was scarcely $6\frac{1}{2}$ miles an hour; between 13,000 and 20,000 feet it was over 35 miles an hour. The little pilot balloon "Cirrus," which reached a height of between 50,000 and 60,000 feet, covered the distance from Berlin to Jazyny, between Wilna and Minsk, about 566 miles, in six and three-quarter hours, or at an average rate of 84 miles an hour.

The preponderance of westerly winds at high levels, already known from observations of the movements of cirrus clouds, was confirmed; and the deflection to the right, required by theory, was also established, for the pilot balloons showed a course from west to east or north-west to south-east much more frequently than from south-west to north-east, the direction of the prevailing winds at the surface. It was, at the same time, very evident that the amount of the deflection, the height at which it began, and the whole manner in which it took place depended largely on the position of the pilot balloon with reference to the general distribution of pressure. Near an area of high pressure, the wind, blowing gently out of the anticyclone at the surface, increased somewhat in strength, but at an average height of 3000 to 8000 feet it died away altogether, and above that a current from a nearly opposite direction was suddenly entered, which increased in force only slowly until a height of 13,000 feet was reached, and blew towards the centre of the barometric maximum. The inverted exchange of air between cyclones and anticyclones at high levels belongs to this class of phenomena; the inflowing current is already apparent at 6500 feet, and is sharply divided from the outflowing current under it. Within areas of low pressure, on the contrary, after the comparatively rapid variations of the first few hundred feet, the regular deflection in the wind direction comes in only very gradually, and even at great heights the air is still flowing parallel to the isobars or but slightly towards the higher pressures, hence the return current to the anticyclone must apparently, in this case, ascend to much greater elevations. These observations seem to show that the detached anticyclones which disturb the general atmospheric circulation of these latitudes extend to a

much smaller height above the Earth's surface than the vortices of our cyclones, which are, in a certain sense, only secondary offshoots from the great sub-polar depression.

THE MONTHLY RECORD.

THE SOCIETY.

The Society's Educational Prizes.—The following candidates for Queen's scholarships, under the Education Department, were successful at the December examination in obtaining the prizes for proficiency in geography offered by the Society. **MALES.**—*Prizes of £2 each:* Edgar G. Carder, Richard R. Dobson, Fred. Farrar, Robert J. Finch, Stanley R. Hewitson, John S. James, Thomas M. Jeffreys, James Morrison, John P. Mullineux, John Russell, James W. Stokoe, Claude E. Warner. *Certificates:* George A. Barrett, Sherwin Chase, William Chick, George Clark, William A. Cooke, John W. Dean, Charles Frith, William C. Goodson, William G. Hawker, Ernest E. James, William D. Lloyd, Sydney Manion, Walter H. Nickson, Frederick W. Pratt, James H. Sedgwick, William Sedgwick, Douglas V. Sidaway. **FEMALES.**—*Prizes of £2 each:* Amy E. Adams, Alice E. Chapman, Susannah Chirgwin, Florence G. Clark, Margaret A. Hunter, Florence Prescott, Rhoda E. Smith, Eleanor E. Smye. *Certificates:* Lilian M. Cooke, Jessie Harding, Bertha Ward.

EUROPE.

High-level Meteorological Station in the Balkan Peninsula.—The meteorological service organized in the Austro-Hungarian dependencies in 1891, which at the end of 1894 had already seventy-seven stations in operation, including three of the first order and six of the second, has received an important addition by the opening of a high-level observatory on the Bjelašnica, a chief peak on the dividing range between Sarajevo and Mostar. The position of the observatory is in lat. $43^{\circ} 42' N.$, long. $18^{\circ} 15' E.$, elevation 6780 feet. This is the first high-level station in the Balkan peninsula, and as it is situated on a "true peak," it may be expected to yield results of extreme interest. From the first year's work, a summary of which is to be found in the February number of the *Meteorologische Zeitschrift*, it appears that one of the chief difficulties to be met is the immense deposit of ice-crystals on the instruments, similar to that experienced on Ben Nevis and on the Brocken. The observatory is in telephonic communication with Sarajevo, 5350 feet below.

The Ship Canal at the Iron Gates.—According to information received from Buda-Pest, the waters of the Danube were admitted to the ship canal at the Iron Gates on March 1. The canal, of which some account has already been given in the *Journal* (vol. i. 1893, p. 243), is cut through the dyke crossing the bed of the river, on the southern or Servian side. Its length is about 2 miles, width 260 feet, and depth 10 feet. The Danube is accordingly henceforth navigable for the largest river steamers, even at its lowest, from Vienna to the Black Sea. The formal opening of the canal for traffic is fixed for September 27, and the ceremonial is to form part of the Hungarian commemoration festival.

The Protection of the Hallig Islands.—The Prussian Government has resolved to begin works for the protection of some of these islands, which act as