which case at least one coefficient, according to Dr. Ryd, must be five times its probable error before it can be regarded as likely to be real.

The brochure is divided into two sections, the first dealing generally with such routine problems as the computation of the mean error, smoothing and adjustment of observational data, and harmonic analysis, with an additional chapter on secondary minima and maxima in the annual variation of the temperature, in which the author deals with the proverbial "Ice-men" of May 11, 12, and 13, and exposes the weakness of Dove's supposed proof of the reality of this legendary phenomenon. The second part deals fully with "mechanical" adjustment, factors of variation, and suggestions on the choice of adjusting formulæ, of which several are given, and a longer chapter is devoted to the working out of four concrete examples, viz, the hourly inequality of air temperature, Greenwich, 1849 to 1868; and of pressure, Greenwich, 1854 to 1873; the annual inequality of pressure, Batavia, 1876 to 1905; and the annual variation of temperature, Copenhagen, 1875 to 1910, the last being a case of partial data—only three observations at fixed hours of the day, instead of the full set.

Dr. Ryd reminds the reader that when data such as July air temperature for 20 years are entered in rows for days and in columns for years, they can not be analyzed similarly in both directions, inasmuch as the successive days are not independent, while the columns are. He also discusses at some length the "order" to which harmonic analysis, if used for adjustment, should be pushed, with hints for saving labor; but on the whole he prefers the "mechanical" adjustment with a suitable formula in the majority of cases, and thinks this method less liable to introduce new errors into a problem.

RELATION BETWEEN BAROMETRIC PRESSURE AND THE WATER LEVEL IN A WELL AT KEW OBSERVATORY.

By E. G. BILHAM.

[Presented to the Royal Society, London, Nov. 15, 1917.]

(*Reprinted from* Nature, London, Nov. 22, 1917, 100: 239.)

The water level shows a well-marked response to changes of barometric pressure at all times of the year. Under similar conditions a given increase of pressure, δp, will depress the water level in the well by an amount δu, which is proportional to δp. The value of $\delta u/\delta p$ varies with the mean level of the water, but is always negative. The validity of the equation $\delta u = a.\delta p$ was established between limits given by $dp/dt > 0.5$ mb./hr., and the value of a was determined in the case of three groups of months representing high, intermediate, and low levels. The sensitiveness of the water level to pressure was found to increase rapidly with the height of the water, the value of a for a height of 360 cm. above mean sealevel being four times as great as for a height of 200 cm. The change of sensitiveness appears to be entirely due to the change in the condition of the soil. The average value of a is 1.1 mm./mb. There appears to be no lag in the response of the well to changes of pressure, and under favorable conditions the most rapid fluctuations of pressure are shown on the water level trace.

In the original of this paper Mr. Bilham has worked out in mathematical detail careful observations similar to the more general ones discussed by the undersigned in the REVIEW for February, 1916, p. 75–76.—C. A., jr.

PHENOMENA CONNECTED WITH TURBULENCE IN THE LOWER ATMOSPHERE.

By G. I. TAYLOR.

[Presented to the Royal Society, London, Nov. 15, 1917.]

(*Reprinted from* Nature, London, Nov. 22, 1917, 100: 239.)

In a previous paper by the author it was shown theoretically that a connection should exist between the rate at which heat is conveyed into the atmosphere by means of eddies, and the amount of retardation of the velocity of the lower layers of the atmosphere behind the gradient velocity due to the friction of the ground. In the present paper the amount of the turbulence over Paris is calculated from temperature observations taken on the Eiffel Tower. It is shown that the amount is the same as that calculated from observations of the change in direction of the wind between the bottom and top of the Eiffel Tower due to the friction of the ground. The daily variation in wind velocity which depends on the daily variation in turbulence is next discussed, and it is shown that the chief characteristics of the observed phenomena of daily variation are explained, both qualitatively and, so far as is possible, quantitatively by the author's equations.

SWISS SOCIETY OF GEOPHYSICS, METEOROLOGY, AND ASTRONOMY.[1]

Under M. Mercanton of Lausanne, as chairman, a circle of the more active Swiss physicists, meteorologists, and astronomers assembled in the great physics lecture room of the University of Berne on April 28, 1917, to organize the society of the above name (Société Suisse de Géophysique, Météorologie et Astronomie) and adopt statutes in conformity with its proposed activities as a section of the Helvetian Society of Natural Sciences (Société helvétique des Sciences naturelles). The following officers were elected for 1917–1919: President, Prof. Dr. P.-L. Mercanton, of Lausanne; vice-president, Prof. Dr. A. de Quervain, of Zurich; secretary-treasurer, Prof. A. Kreis of Coire.

The first regular general meeting of the society was held September, 11, 1917, at Zurich, with an attendance of 34, out of 70 members already enrolled. The assemblage was welcomed, in the name of the Helvetian Society of Natural Sciences, by Dr. J. Maurer, Director of the Federal Meteorological Bureau, who congratulated the young society on the lively interest already awakened for it, and then retired in favor of the president, M. Mercanton.

After some discussion, the society unanimously adopted the proposal by P. Ditisheim (La Chaux-de-Fonds), a noted Swiss horologist, that the Federal Council be requested to adopt the serial *numeration* of the hours of the day, 1 to 24. This is a conscious renewal of the majority recommendation of the International Prime Meridian and Time Congress of Washington (1884), but would be only a rather tardy step for the Swiss Government. The system has been in use on the Indian railways since 1859, was legalized for Canada in 1891,[2] was actually introduced into Italy in 1893 with the adoption of Central European Time, was approved in 1895 at the London (fifth) session of the International Railway Congress, was adopted in Belgium in 1897, and put into practice by the Bureau des Longitudes (Paris) in all its publications in 1900; has been used by the French railways since July 1,

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[1] Compte rendu des séances de la Société Suisse de Géophysique, Météorologie, et Astronomie (G. M. A.) *in* Archives des sci. phys. et nat., 122ème année, 4 ème pér., Genève, 15 nov. 1917, 44: 345, fol.

[2] The system has been in actual use on the C. P. railway west of Winnipeg for many years.

1912, and in all her Postes et Télegraphes publications. In 1913 the Swiss railways requested authority to employ this numeration, and the Swiss Federal Meteorological Commission is actually employing it.

An American plea for the 24 hours' numeration was published in this REVIEW May, 1909 (**37**: 175), by C. A. Mixer, who stated that he had been using it for many years in the records of his business, as well as in his weather records, and finds it a much simpler system than the customary one.

About 15 papers were presented at this first meeting of the society, and the abstracts of those subjects most interesting to our readers will be found translated in the REVIEW for December, 1917.—C. A., jr.

Lawrence Hargrave, 1850–1915.[1]

By R. GREIG-SMITH, D. Sc.

(From his presidential address, Royal Society of N. S. Wales, May 3, 1916.)

Mr. Lawrence Hargrave was a well-known figure at our meetings, which he attended regularly even to the June meeting preceding his death on July 6, 1915, at the age of 65 years. The son of the late Mr. Justice Hargrave, he was born in England, but came to Australia in 1866 at the age of 16. Being of a mechanical turn of mind, he entered an engineering firm in Sydney, where he received the training that subsequently enabled him to construct the models and build the engines, etc., which his inventive genius designed. It was as an engineer and explorer that he first developed, and he took no small share in the early exploration of British New Guinea. He formed one of a party of adventurers who equipped the *Maria* for an exploring expedition. On her way north this unseaworthy old craft was wrecked in February, 1872, on the coast of North Queensland. A considerable number of her company were killed by the aborigines, but Hargrave was fortunate in escaping with his life and returned to Sydney. Joining a scientific expedition organized by Sir William Macleay, he sailed from Sydney in the *Chevert* in May, 1875. But too short a visit was made to New Guinea to satisfy Hargrave, who accordingly left the *Chevert* at Cape York in September. With Petterd and Broadbent he then joined O. C. Stone in an excursion inland from Port Moresby. Their discoveries in this direction are recorded by Stone in "A few Months in New Guinea." In May, 1876, Hargrave joined D'Albertis, as engineer of the *Neva*, in which they ascended the Fly River farther than any European had previously penetrated into the interior of Papüa. The hardship and exposure of this journey induced severe attacks of fever, and in September, 1876, he concluded his travels and came back to Sydney.

He worked for some years as an assistant astronomical observer at the Sydney Observatory under the late Mr. H. C. Russell, but gave this up and devoted many years to the study of aeronautics, and the success of the present-day aeroplanes is largely [?] dependent upon Hargrave's invention of the box kite. He first studied the motions involved in the flight of birds, and prepared models embodying the principles of the various movements. The success of the models convinced him of the possibility of mechanical flight, and although he did not prepare a complete machine, he was so satisfied with the result of his work that he gave his ideas on the subject to this society in August, 1884. The models which served to illustrate his papers are now in the Technological Museum, Sydney. The continuance of his investigations led him to the invention of the cellular or box kite, which he described in 1895.[2]

It is as the inventor of this kite that his name is so well known, for it has been used by practically every military nation in the world for signaling purposes and by scientists for meteorological investigations.[3] It does not follow that our aeroplanes would not have been invented but for the box kite, only it is certain that his invention hastened the evolution of the aeroplane in no small degree. It is upon his invention that other men have built and become famous.

Latterly he devoted some attention to the meaning and significance of certain rock carvings and markings on the rocks around Port Jackson and the Hawkesbuyr River.

Mr. Hargrave was of a quiet and retiring disposition, and preferred to discuss the various subjects in which he was interested, and in which he had a deep knowledge, to a small circle of friends rather than to a large audience. His familiar face will be sadly missed by those members of our society who rarely saw his favorite seat vacant at the meetings.

Frank Plummer, 1868—1918.

By G. N. SALISBURY, Section Director.

[Weather Bureau office, Seattle, Wash., Jan. 29, 1918.]

We regret to record the death of Mr. Frank Plummer, cooperative observer, at his home in Port Townsend, Wash., on January 21, 1918. Mr. Plummer established the Weather Bureau station at Port Townsend on June 17, 1897, and maintained its record unbroken for a period of 20 years and 7 months.

He was born in Port Townsend, August 17, 1868, and was the son of A. A. Plummer, one of the first white settlers there about 1850. Frank Plummer had been prominent in various ways in the life and progress of his native town, and it is gratifying to learn that his careful and valuable meteorological record, a testimonial to his unwavering public spirit, is to be maintained by his widow, Mrs. Mae M. Plummer.

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[1] *See* Jour. and proc., Roy. soc. N. S. Wales, Sydney, 1916, **50**: 3–5.

[2] *See also* Flying machine motors and cellular kites, by *L. Hargrave*. Jour. & proc., Royal soc. New South Wales, Sydney, June 7, 1893, **27**: 75–81, Plates I–IV.—C. A., jr.

[3] *See* MONTHLY WEATHER REVIEW, April, 1896, **24**: 114, and July, 1897, **25**: 312; also note on p. 22.—C. A., jr.