the possibilities of meteor showers at the time. For different values of $1-\mu$ he finds that possible collisions may occur at May 19·442, 19·115, and 18·892. The corresponding radiants of possible small showers are near η Piscium, ρ Piscium, and β Arietis.

In the supplement to No. 4407 of the same journal a telegram from Prof. Pickering announces that Dr. Wright, at Lick, photographed the spectrum on April 29, and found the sodium D lines bright; this is announced as a recent development. An observation by Prof. Frost and Dr. Slocum on April 14 showed a distinct continuous spectrum for the nucleus, with no trace of bright lines or bands.

THE SPECTRA OF COMETS.—Further laboratory results bearing on the nature of cometary spectra are published by Prof. Fowler in a paper appearing in No. 6, vol. lxx., of the Monthly Notices.

Among other things, it is now shown more definitely that the tail spectrum is produced by an oxide of carbon, probably the monoxide. With sufficient density this compound gives the "Swan" spectrum, the most common feature of cometary spectra, whilst at very low pressures —0·01 to 0·005 mm.—the "tail spectrum" is developed. The addition of a trace of nitrogen introduces the cyanogen bands into the high-pressure spectrum, and the kathode bands of nitrogen, such as were found in the spectrum of the tail of Morehouse's comet, at the lower pressures. Hydrocarbons are regarded as variable constituents of comets because the characteristic band at λ 431 is only an occasional feature of their spectra.

The anomalous spectrum of Brorsen's comet, as observed by the late Sir William Huggins in 1868, is explained by supposing that it resembled the "tail spectrum," the differences of wave-length not being beyond the probable limits of error. If this is the true explanation, it appears that the heads of comets vary considerably in density, that of Brorsen's being about the same density as the tail of Morehouse's.

A new high-pressure (100 mm.) spectrum of carbon monoxide was discovered during the research, and it is suggested that the presence of this in cometary spectra is indicated by the anomalous positions of the carbon bands observed. Thus the blue carbon band in cometary spectra often occurs at λ 468 instead of at λ 473, the position of the brightest head; the superposition of the brightest band of the new spectrum, at λ 4679, would account for this.

Some interesting deductions as to the nature and the illumination of comets' tails are made on the assumption that the actual conditions are comparable with those obtained in the laboratory experiments. For example, it is shown that to come within permissible limits of mass the tails must be hollow, or must be made up of attenuated sheets or streams. The illumination is probably of electrical origin, but whether the negatively charged particles producing it proceed from the head of the comet or from the sun is still an open question.

OBSERVATIONS OF SOUTHERN NEBULÆ.—The positions and brief descriptions of five southern nebulæ are published by Mr. Innes in No. 2 of the Transvaal Observatory Circulars. One of these objects, in R.A. 16h. 49m., dec. $-40°$ 36′ (1875), is very diffuse, and covers 10′ in declination and 3m. of R.A.; its position was determined from a plate taken with the Franklin Adams star camera. Cometary, planetary, and ring nebulæ are also included.

OBSERVATIONS OF THE AURORA.—In No. 3, vol. xxxi., of the *Astrophysical Journal* Prof. Barnard gives the details of all the observations of auroræ made by him during the period 1902–9. There are many points of interest too numerous to mention here, but it is evident that such carefully recorded data will prove extremely useful in discussing the probable relation of auroræ with solar outbursts, &c. Prof. Barnard outlines a scheme for systematic observations by observers some miles apart which would result in determinations of the height, &c., of specific auroræ. A tabulated statement of his results shows September and February to be months of prolific auroræ, but, as he points out, September is the month of clear skies, and the prominence of February depends largely upon the year 1907. July and December are especially low. There are indications of a maximum during 1907–8–9.

BRITISH SCIENCE GUILD.

FIRST ANNUAL BANQUET.

THE Right Hon. Lord Strathcona and Mount Royal presided at the first annual banquet of the British Science Guild, which was held at the Royal Institute of Painters in Water Colours, Piccadilly, W., on the evening of Friday, May 6. Amongst those present were the Right Hon. Lord Blyth, Col. Lord Kesteven, Sir Thomas Barlow, K.C.V.O., F.R.S., and Lady Barlow, Sir David Gill, K.C.B., F.R.S., Sir Norman Lockyer, K.C.B., F.R.S., and Lady Lockyer, Sir Alfred Keogh, K.C.B., and Lady Keogh, Sir Frederick Pollock, Bart., Sir William Ramsay, K.C.B., F.R.S., Sir Boverton Redwood and Lady Redwood, Sir Philip Watts, Sir Aston Webb, C.B., R.A., and Lady Webb, Sir William White, K.C.B., F.R.S., and Lady White, Colonel Sir John Young, C.V.O., Sir Henry Trueman Wood, Prof. Perry, F.R.S., Dr. W. N. Shaw, F.R.S., Prof. W. D. Halliburton, F.R.S., and Mrs. Halliburton, Mr. and Mrs. Carmichael Thomas, Mr. Roger W. Wallace, K.C., and Mrs. Wallace, Dr. A. D. Waller, F.R.S., and Mrs. Waller, Mr. A. Bruce Joy, Mr. Dugald Clerk, F.R.S., and Dr. F. Mollwo Perkin (honorary secretary).

After the Royal toasts, proposed by the chairman, "The Peace Organisation of the Empire" was proposed by Sir William Ramsay. He regarded it as a great honour to propose that toast—a toast given there for the first time. All he could do, perhaps, was to put before them some platitudes. He knew how little he knew, and he thought he knew a great deal when he had found that out. If he talked, therefore, in platitudes, he would be no striking exception to the rule. It was, he continued, generally supposed that science was something abstruse and abstract. It was not so. It was common sense, and common sense, as they all knew, was one of the rarest of commodities. What one learnt as one grew older was how little one knew about anything. How complex the simplest things were! His attention, he continued, had been turned to physical problems where the things he dealt with were comparatively simple. He had been working on the questions of liquids and gases—things more simple than social or economic problems; and yet those ideas, simple as they were, did not often find simple expression. He instanced the case of "the square of a temperature," which, like many other such phrases, conveyed no definite idea to anybody. If that was so in simple physical science, how much more complex were the problems that faced the social reformer. In this complex world of ours he (Sir William) had the utmost difficulty in making up his mind which of two political candidates was the one to vote for. He wished that Mr. Haldane, their president, had been there to illuminate that subject. It might even be desirable, continued Sir William, to get an elector like himself to vote against both candidates—to say that neither deserved his confidence; and if they could only get a sufficient number to vote like that, then no one at all would be returned to Parliament. Men of science, continued Sir William, had a uniform mode of procedure. They had a problem suggested to them which they thought worth investigating. They ascertained what had been done before on the subject, and then proceeded to try an experiment on a very small scale. The next stage was to try the experiment on a larger scale, and if that also promised well they might be encouraged to erect a large plant and increase it to the maximum of its production. Now, he asked, did they do that in politics? He thought not. The analogy was a close one. The problems which confronted the manufacturer were very much the same as the problem which confronted the Government. They both wanted to produce an article in demand. They had a permanent staff in both cases, and they wanted to provide an article that would meet with public approval. Men were constantly improving—at least if they were not progressing they were retrogressing, as it was impossible to stand still. In chemical manufacture what was chiefly wanted was—brains. A well-known manufacturer declared that brains were indigenous to Cambridge, and that he only wished he could get a number of Cambridge men to work on the lines he would suggest. That was exactly the Government's difficulty too. Mr. Haldane recently stated he had made the discovery that not only in Parliament, but in other places, there were brains, and that there were persons who, if they would, could solve those complex problems which were so costly, and yet for which one had to find some immediate solution. Now the intelligent manufacturer—just as a Government does—provides himself with a permanent staff to keep things going; but, further than this, he brings in other people in order to consult with them if anything goes wrong, or if he has reasonable grounds for believing he can make an improvement. The person thus consulted receives a retainer, perhaps—gets so much a year and so much a job. "It is suggested," continued Sir William, "and I think it is an admirable notion, that the same plan which has proved itself successful in helping our manufacturers should be applied by the Government. There is an enormous number of people in this country who could be got by a very small retainer indeed, or perhaps feel honoured by being chosen, and when required they would be at hand to help with their advice."

The question of dirigible balloons threatened our naval supremacy, continued Sir William. What was the best way to destroy them? The natural way was to project a shell at them; but our mechanical art had not grown so perfect as to enable us to time the explosion of a shell to the thousandth part of a second, while, on the other hand, the substance of the balloon would be too soft to explode the shell by concussion on contact with the balloon itself. "I was asked," Sir William proceeded, "what was the best way to destroy those balloons, and I made several suggestions. I am perfectly willing to put any suggestions I have at the disposal of the Government for the benefit of my country, and I am sure there are hundreds of thousands in the same position who are able and willing to do something for the benefit of this country without pay." Concluding, Sir William said that the practical solution of that problem was that there should be consultative committees formed in all branches of inquiry appertaining to the national welfare, and he saw no reason even why such parties called in for consultation should not be paid just as the ordinary consultee was paid by the manufacturer when called in to tender advice. The appointment of a large number of such consultative bodies, call them what they wished, would be of inestimable advantage to the nation in solving many of the complex problems which were so baffling to the ordinary advisory resources of a Government dependent practically altogether upon its permanent staff.

Mr. Frederick Verney, M.P., responding in the absence of Sir William Mather, said it was most interesting to hear a man of science speaking on politics. He heartily agreed with Sir William Ramsay in his main contention that the Government would be immensely helped and rendered far more efficient if they had at their disposal and took advantage of the enormous amount of latent wisdom which only required to be called forth to be put at the service of the country. If England could boast of one thing more than any other nation, there was one thing which we might safely say, and that was that in no other country was so much and so good unpaid work done to-day as was done in England. It was not so desirable to increase that work as to render it more efficient for the Empire at large, and he did not believe any member of the House of Lords or House of Commons would be against that proposal. Certainly no one in England would have welcomed more warmly Sir William Ramsay's proposal than Mr. Haldane himself, as there was no statesman who had shown himself more eager to avail himself of all the science put at his disposal than the Secretary of State for War. In any case, if there was any consolation for people to be killed scientifically, they would have abundance of chance of it in due time, and in the next great war he was afraid they would have too much of it. There was one essential difference between politics and science. In politics they had nothing but uncertainties to deal with, but in science they had perhaps something tolerably certain to deal with. In politics one had to deal with human nature—with character—and thus the uncertainties of political life were the hardest to foresee and the most difficult to deal with; and the man who could fight his way through the uncertainties of politics, and could do something for the good of the nation at large, deserved well of his country, and merited the name of British statesman.

Sir Alfred Keogh, K.C.B., also responded to the toast. As to the application of science to methods of government, he was glad to hear allusion made to their distinguished president, who was the great exponent of that idea. Regarding the possibility of war with Germany, we were at present engaged in real warfare with her, but that war was being waged in the laboratories of the two countries. The German nation deserved scientifically all the admiration we could give to it. It had recognised the relation of science, not only to industries, but to methods of government and the general education of the community. The great disadvantages in this country were that our rulers and governors did not appear to be acquainted with the fact that they had at their elbow men who, over and over again, would help them in all the problems they had to solve.

Sir William White, K.C.B., F.R.S., in giving the toast "The Armed Forces of the Empire," said that that toast was not a novelty, but although he had known it by many titles, it always meant the same thing—namely, that, as British citizens, they desired to honour and remember those who gave or were ready to give their lives for the service of the country and of the empire. Behind "the armed forces of the empire," he reminded them, lay the principle of personal service, and whatever else we could give, there was one thing we could all give to our country and empire, and that was personal service. In modern times war was a very complex thing. The day had passed when personal courage alone and readiness to do or die were an assurance of victory, because nowadays so much depended upon the equipment of war, in the perfecting of which every branch almost of art and science was laid under tribute; but although the material was important, it required the man and mind to utilise it; and when the man and mind were employed in competition with others struggling for victory, it was in the highest degree important that those who served in our armed forces should be equipped mentally, scientifically, and in every way possible so as to give the fighting unit an honest chance. Those were matters, however, which depended upon the central administration, and if it was not conducted on scientific lines, then there was little hope of that object being fulfilled.

Col. Sir John Young, in responding, concurred with the proposer of the toast in regard to the importance of science to the efficiency of the naval and military forces. He was glad to say that in Mr. Haldane, at any rate, true scientific principles have had a friend who understood thoroughly the job he had to accomplish.

Sir Boverton Redwood proposed the toast of "The British Science Guild in Greater Britain." Some misconception, he said, existed still as to what the guild really was. Many people thought it was only an addition to previous learned societies. He reminded them that the British Science Guild was not a scientific society in the ordinary acceptation of the term, but was an organisation intended primarily to bring about the adoption of scientific methods in all matters of daily life, and incidentally to promote and foster the study of science by people who were not what might be called "scientific people." The term "science," however, frightened and repelled many, although it had been defined over and over again as the organised application of common sense. He cordially endorsed Sir William Ramsay's opinion that the attention given to that organised application of common sense was lamentably lacking in many quarters, from the Government downwards. Now, that state of things must not continue if the British nation was to hold its dominant position amongst the nations of the world. The British Science Guild had shown them already what ought to be done, and how to do it, and it was not only in this country that there was scope for its work. From its inception there had been a gradually increasing number of members in Greater Britain beyond the seas, and that was an exceptionally good feature of the movement. Already some action had been taken in the direction of organising those members, and branches or committees had been formed with that object in Canada and Australasia. The effect of that was to stimulate the interest they took in the guild and to bind them to the common body, and generally they had evidences that there was the opportunity for great benefit from the work of those branches in the empire beyond the seas.

The chairman, in responding, gave an interesting account of the remarkable progress of Canada since the visit of the British Association in 1884. Lord Rayleigh had, in allusion to that visit, described Winnipeg as the only city he knew where they ploughed up their streets to make them level. To-day Winnipeg had streets as good as those in London, and was thoroughly equipped in up-to-date institutions and modern conveniences of every kind. It was perfectly useless, he continued, for the unemployable, who could not or would not work, to go to Canada. There they would be absolutely lost, because everyone in Canada was a worker, but they gladly welcomed the genuine and willing worker in Canada, which was really as much England as was the Mother-country.

Sir David Gill, K.C.B., F.R.S., also responded, and said that in dealing with science and its application to practical affairs, there was not the least doubt that the temperament of men of science had been somewhat of a drawback in forcing scientific facts and principles upon the attention of mankind generally, as the man of science was apt to think he had done all he could do when he had found out scientific truths. He seemed to require something to aid him in forcing upon unwilling Governments that information which they were too ignorant to apply to national needs.

"The Guests" was proposed by Sir Frederick Pollock, Bart., and responded to by Mr. Roger W. Wallace, K.C., after which Sir Aston Webb, C.B., R.A., gave the toast of "The Chairman," to which the latter gracefully responded, thus concluding the proceedings.

CLIMATOLOGICAL REPORTS.

THE director of Chemulpo Observatory (Dr. Y. Wada) has issued the mean annual results of the valuable meteorological observations made at the Japanese stations in Corea in 1906–7 (see NATURE, April 1, 1909). The following are some of the results of air-temperature and rainfall for 1907:—

Station.	Chemulpo	Fusan	Wonsan	Mokpo	Song-chin	Yongamp
Latitude, N. ...	37° 29′	35° 6′	39° 9′	34° 47′	40° 40′	39° 56′
Longitude, E. ...	125° 32′	129° 3′	127° 26′	126° 22′	129° 11′	124° 22′
Mean max.... ...	15·1°	17·5°	16·8°	17·7°	13·2°	13·4°
Absolute max. ...	34·6	32·5	37·5	32·7	32·0	32·9
Month	VIII	VIII	V	VIII	VI	VII
Mean min. ...	7·2	9·8	6·0	9·8	4·1	4·3
Absolute min. ...	−14·5	−8·4	−18·1	−8·2	−21·4	−24·3
Month	XII	II	II	II	II	XII
Adopted mean ...	10·8°	13·6°	10·3°	13·1°	8·2°	8·6°
Total Rainfall ...	667·3	1021·2	1576·5	811·6	627·3	1029 6

The instruments and method of observation are the same as those at meteorological stations in Japan; temperatures are given in centigrade degrees and rainfall in millimetres. The mean temperature was practically normal, but the rainfall fluctuated considerably; the data for the normals for these stations only go back to March, 1904.

The report of the Mauritius Observatory for 1908 shows that the mean annual temperature, 73·6°, was practically normal; the absolute maximum was 89·1°, minimum 53·8°, maximum in the sun's rays 166·2°, on November 12. The rainfall, 62·43 inches, was 14·5 inches above the average of 1875–1908, but for the whole of the island, obtained from reports from sixty-five stations, the mean was 90 inches, being 7¾ inches above the average. Six cyclones occurred over the South Indian Ocean; during one, between February 28 and March 4, very heavy rainfall occurred over the whole island, ranging from above 45 inches at Curepipe to 9 inches at Port Louis; the tracks of three of the cyclones have been determined. Ninety-four photographs of the sun were sent to the Solar Physics Committee, and particulars of fifty-four earthquakes were sent to the seismological committee of the British Association.

The report by Mr. Iyengar of meteorology in Mysore for 1908 embodies the daily and monthly means for the second-order stations at Bangalore and Mysore, and the 8h. a.m. observations, with their monthly means, at the third-class stations at Hassan and Chitaldrug. Over the province, as a whole, the temperature of the year was practically normal; April was the warmest, and December the coldest, month. The absolute maxima and minima were 102·1° at Chitaldrug (in May) and 50·1° at Hassan (in December). The rainfall was deficient and very unequally distributed, the defect varying from 13 to 43 per cent.; in November and December there was practically no rainfall.

The report issued by the Egyptian Survey Department on the rains of the Nile Basin and the Nile flood of 1908 states that during that year rainfall was measured at eighty-eight stations in the Nile Basin, while that recorded at 118 other stations in neighbouring regions was studied in connection with the meteorological conditions of north-eastern Africa. On the whole, rainfall was deficient to the south of the equator, and the country between the Victoria and Albert lakes seems also to have received less rain than usual. On the Bahr el Jebel the annual fall was usually in excess, and in the plains of the Blue Nile some months were wetter than usual. The tables show the monthly and annual rainfall for 1908, and the means for other years so far as data are available. We have previously referred to the flood of 1908, which again reached its normal value after a series of nine low floods. An interesting chapter on earth movements at Lake Victoria is added to the report.

The report of the chief of the U.S. Weather Bureau for the fiscal year ended June 30, 1908, shows that the important work of that department has been carried on with great activity. The tables, which extend over some 390 pages, include, *inter alia*, observations made twice daily during 1907 at twenty-nine stations selected to cover as nearly as possible all sections of the United States showing distinctive climatic features, monthly and annual summaries at 188 stations, and records of excessive rainfall in short periods at stations furnished with self-registering gauges. In our issue of October 21, 1909, we directed attention to several matters referred to in the administrative report, from an advance copy published in the annual summary of the *Monthly Weather Review* for 1908. We may add that this report states that the officials of the Bureau are encouraged in giving popular lectures with the view of eradicating superstitions prevailing with regard to the weather, and that instruments and charts are now exposed in kiosks at various suitable places. The instruments comprise special forms of maximum and minimum thermometers, air thermometer, hair hygrometer, thermograph, and a special type of rain-gauge with dial indicator.

The "Meteorological Year-book" of the Deutsche Seewarte for 1908, which has recently been published, contains the results of observations at ten stations of the second order, hourly observations at Hamburg, Wustrow, Memel, and Borkum, and storm statistics at fifty-seven signal stations in the North Sea and Baltic whenever a gale was experienced over a considerable area, embracing not fewer than three of the stations. The appendices include the hourly means of wind velocity at Pillau (a seaport in eastern Prussia) for the period 1899–1908. The mean monthly values exhibit a minimum in July (4·09 m.p.s.), rising gradually to a maximum (6·29 m.p.s.) in December, and gradually decreasing again to the minimum.

From an excerpt from the "Bavarian Meteorological Year-book" for 1909 we learn that registering balloon ascents made at Munich in connection with the international scheme for the investigation of the upper air were not so successful as in some previous years, owing to unfavourable weather conditions and loss of the instruments used. Nevertheless, eighteen successful ascents were made, and the results have been very carefully discussed. Among the several interesting features shown by a preliminary summary of the results for the years 1906–9 we may refer to the mean altitude and temperature at the beginning of the upper inversion, arranged according to seasons, which were found to be as follows:—winter, 10,650 metres, −61·5° C.; spring, 9870 m., −54·9°; summer, 11,770 m., −57·2°; autumn, 11,790 m., −58·2°. The mean monthly tables show that the lowest altitude of the "stratosphere" was in March and the highest in August. An extraordinary increase in altitude, practically without change of temperature, occurs from April to May, viz. from 9470 to 11,050 metres; but owing to the few and unequal number of cases available, the results deduced can only be accepted with caution.

The first part of a series of valuable contributions to the