say: If I were to recommence my life, I could not seek anything better.

It is between that departure and this point of arrival that the most brilliant phase of your career is placed. Your discoveries followed one another like improvisations. The composition of ethers was unknown, you analysed them; you enunciated the law of substitutions and of the conservation of chemical types; a constant preoccupation brought you frequently to the atomic theory, that fundamental base of chemistry; and you furnished, for measurement of the density of vapours, a method so simple and so perfect that it is easy to the most unskilful; we know what light it has thrown on the study of organic compounds. But it belongs not to me to speak of your innumerable researches. The scholar may not arrogate to himself, without irreverence, the right of praise or of criticism; in presence of the teacher, he has only the right of respect.

But it is permitted him to remember, and who does not remember, the charm and the marvels of your teaching at the Athénée, at the École Polytechnique, at the Sorbonne, at the École de Médicine, at the Collége de France, at the École Centrale? Everywhere that you have appeared, and you have appeared everywhere, youth and ripe age have been drawn, held, charmed, carried away, to such an extent, that it may be said that you have even rendered more service by the vocations you have decided, than by your own proper works.

Fifty years ago, this Academy opened her gates to you; she has intrusted to you since, and ever congratulates herself for it, the formidable heritage of her illustrious perpetual secretaries. The French Academy has seated you in the chair of Guizot, a professor like yourself; but we have not been therefore jealous. They honoured you, and we did not lose you. Then comes the moment when preoccupations of another order have been imposed by your very renown; you have resigned yourself to those duties which enlarged your *rôle*, because your authority was necessary, because science mixes with all, because chemistry addresses itself to the lighting, sanitation, hygiène, and all the industrial requirements of a large city.

Circumstances have now set you free from manifold cares, and restored you to sciences and to letters. These possess you wholly; and whether it be art or industry, physics or chemistry, electricity or astronomy, it is to you people apply, it is your authority they seek. They find you ever ready for work, ever equal to the most difficult missions. When one recapitulates the work you have accomplished, the services of every kind you have rendered, the discoveries you have made, the lectures you have given in all the chairs, the literary works you have written, the ideas you have sown—all this existence, in fine, which has never known rest, one is astonished that you have not taken more than half a century to fulfil so large a programme; and when one has the happiness of seeing you and hearing you, one marvels that a half-century of labour without truce has still left you so much of youth to expend. It is because, of all human passions, that of study is the most healthy, because it leaves to the organs all their force, to the mind all its serenity—for it is wisdom.

Enjoy, my dear teacher, enjoy these fruits; all the good things that come from God have been given you without stint; genuine happiness, a health which nothing has affected, hearty good will towards all, a mental vision which has not ceased to grow; and all human recompenses have come to be superadded; an authority which makes itself felt and survives all *régimes*, a respect which disconcerts envy, and the affection of your fellow members which has prompted the gift of this medal: it is merely a small fragment of gold, but it will be precious to you, because it is amalgamated with our gratitude.

M. Dumas then spoke as follows:—

Mr. President and my dear Fellow-Members: Since my earliest steps in the way of science, the Academy has been to me the object of a reverence so profound that I cannot receive, without the most lively emotion, the inestimable present with which she honours the close of my career.

As far back as sixty years ago she gave a kindly attention to the work of my youth; half a century ago she received me into her bosom; and since then she has not ceased to accord to me marks of her esteem and of her confidence; nothing had prepared me, however, to think that among my fellow members many should wish even now to call themselves my scholars. Of all the testimonies to which an old teacher might lay claim, the secret has been found of offering that one which is dearest to his heart. Your kindness overwhelms and confounds me!

Ah, my beloved scholars, I go back often enough to these thirty years of an apostolate, which has not been sterile, thanks to the talents of disciples like you; but I believed the remembrance of it to be buried in the tomb of companions in the fight, whom we have lost, or to have passed from the memory of those who survive them. These prelections, then, of another time, of a time so happy, are still not forgotten, since you have wished to recall, in a durable way, on this medal, impressions that are ordinarily apt to be soon attenuated or even extinguished.

You are right! The Professoriate must be honoured, because speech is a power; because from the height of his public chair the professor fulfils a sacred mission. His loyal and penetrating conviction warms hearts, and raises minds towards the disinterested regions of the Ideal. He reflects the present state of science, like a faithful mirror, he prepares the discoveries of the future, he revives the grand traditions of a glorious past. Opening his whole heart and all his thought to his auditors, he teaches them to love the truth, to respect genius, to cherish the fatherland, and to serve it well.

Whoever has found himself surrounded by attentive youth, taking fire at the accents of the teacher, vibrating to his emotions, hastening full of faith towards the conquests indicated to its ardour, that man, believe me, has known the noblest enjoyments of the human soul.

But stay, there is a greater joy still; it is that experienced in seeing oneself outstripped by those to whom one formerly showed the way. This joy you have caused me to taste every day. May you, for the honour of French science, and for the moral greatness of our dear country, you who are of more value than I, have in your turn scholars who surpass you in genius, and equal you in heart.

Mr. President, and all of you my dear Fellow-Members, receive once more the profound expression of my grateful sentiments; the medal which I receive from your hands will be piously preserved by my family as the dearest of souvenirs of my existence, and by my descendants as the most honourable of titles of nobility.

THE METEOROLOGICAL OBSERVATORY ON BEN NEVIS

THE importance of high-level stations in any satisfactory handling of the scientific and practical problems of meteorology which have now come prominently to the front, is everywhere recognised, and accordingly in almost all civilised countries such stations have been established, and their number is steadily increasing. On the continent of Europe, many of the more salient positions available for high-level stations are already occupied in France, Spain, Italy, Switzerland, Austria, Hungary, Germany, and Russia; and as regards other countries, the United States, Mexico, India, and our Australian colonies, have also established stations at great elevations, in an energetic prosecution of this important department

of meteorology. Singularly enough, Great Britain alone stands aloof from participation in the general movement, and notwithstanding the heavy responsibility which her geographical position and vast pecuniary interests and resources impose upon her, none of the mountains that rear their heads in the very tracks of the storms which sweep over Europe from the Atlantic, is yet occupied by either observatory or station for systematic and continuous observation of the weather, the highest station in these islands being Dalnaspidal, which is only 1450 feet above the level of the sea.

At high-level stations near the equator, where temperature varies but little throughout the year, atmospheric pressure, which may be regarded as measuring the mass of air overhead, is subject also to very small variation. Thus at Bogota, in South America, 8727 feet high, where the mean temperatures of January and July are respectively 57°·2 and 56°·2, the normal atmospheric pressure is 22·048 inches and 22·058 inches. Let us look now at the results obtained at Pike's Peak, where a first-class meteorological observatory was established by the United States Government about ten years ago, at a height of 14,151 feet above the sea. Mr. Henry A. Hazen, in a recently published paper on "The Reduction of Air-pressures to Sea-level at Elevated Stations," shows that the normal pressure on Pike's Peak is 0·632 inch less in winter than in summer. The difference is mainly due to the low temperature of winter as compared with that of summer; the reason being that the atmosphere in winter being condensed by the cold, sinks below the summit of the mountain, thus giving a lower pressure there. Now since a lowering of the temperature implies a proportionate condensation, or greater massing of the atmosphere in its lower strata, with a corresponding diminution of pressure in the upper regions, it necessarily follows that at considerable heights in the northern hemisphere the normal pressure is relatively higher in equatorial regions during the winter months, as compared with any other season of the year, than in higher latitudes at the same heights; and that generally the diminution of the normal pressure in the upper regions is in proportion to the lowness of the temperature of the lower strata. From this state of things it results that, during the colder months, the upper atmospheric currents flow northwards in greater volume, velocity, and persistency, bearing with them the higher temperature and humidity of lower latitudes. It is doubtless from the disturbing influences thus called into play, particularly the disturbing influence of the aqueous vapour from the Atlantic, that the notoriously stormy weather of the winters of North-Western Europe is to be traced.

But the fluctuations of pressure at great heights in the atmosphere are not merely seasonal changes following the annual march of temperature through the year; they also follow the changes of temperature which occur from day to day, notably those great and striking changes of temperature which accompany storms. Now it is the investigation of these changes, together with changes in the humidity, cloudiness, and motions of the atmosphere, in their relations to the cyclones and anticyclones of Europe, with the stormy and settled weather that respectively accompanies them, which give to meteorological observations made on Ben Nevis their international significance.

The observations made during the summer of 1881 on the top of Ben Nevis, in connection with the Scottish Meteorological Society, by Mr. Wragge, with an enthusiasm, physical endurance, and undaunted devotion to the work beyond all praise, have now been to some extent discussed, with the result that they amply bear out the strong opinion here advanced of their great value in forecasting weather. The time was sufficiently extended for the determination of the approximate normal differences between observations at the top of the Ben and at Fort William, near sea-level. During the unsettled weather of the summer of 1881, departures from the normal values, and these departures often large, were of frequent occurrence. Now the remarkable and frequent differences from the normals thereby disclosed in the vertical distribution of atmospheric temperature, humidity, and pressure in the aërial stratum between the top of Ben Nevis and sea-level, taken in connection with the weather that followed, give the strongest grounds for the assurance that observations made on the top of Ben Nevis would contribute invaluable aid, if directly wired to London, in framing forecasts of weather for the British Islands and North-West Europe generally. The observations also threw no little light on several controverted points respecting the movements of cirrus clouds, upper currents, and the time when the centres of storms reach higher and lower levels respectively.

The observations were resumed last summer on a more extended scale, the new observations embracing a more complete investigation into the varying states of the atmospheric stratum between the top of the mountain and the sea, by a string of intermediate stations at different heights, and by a very elaborate and carefully worked out system of ozone observations. The weather of 1882 differed materially from that of 1881, and when the observations of 1882 come to be discussed, they will doubtless yield new results in the further extension of our knowledge of weather phenomena. Among the new results may be mentioned the remarkable observations with the hygrometer in the second week of August and at the equinox. The most striking of these were the observations of September 21, when the dry and wet bulbs on the top of the mountain read as follows:—

			Dry	Wet				Dry	Wet
			°	°				°	°
9	a.m.	...	49·1	39·4	10·30	a.m.	...	51·9	39·0
9·30	,,	...	49·5	39·7	11	,,	...	51·1	37·6
10	,,	...	49·4	37·9	11·30	,,	...	53·7	41·4

the barometer at Fort William being high at the time and nearly steady. No such relatively warm and dry air was recorded at Fort William where during the time the temperature was only from 1°·9 to 4°·6 higher than that of Ben Nevis, instead of the normal difference 15°·7. It is instructive to note that these hygrometric states of the atmosphere were observed on the top of Ben Nevis, during, or more strictly speaking, towards the termination of a rather protracted and heavy storm from the north, which rolled huge breakers on the beach of the Moray Firth, and poured down deluges of rain on the high northern slopes of the mountain range stretching from near Foyers to Huntly, which flooded the rivers to an unusual height. The unwonted warmth and dryness of the air, and the deluges of rain that fell immediately to the northward, warrant us in classing the singular phenomena recorded by Mr. Wragge on the top of Ben Nevis on the morning of September 21, as quite analogous to the föhn of Switzerland. If the supposition be a correct one, the difference between the two classes of phenomena is, that whilst the föhn of Switzerland has its origin in a saturated atmosphere discharging its superabundant vapour in deluges of rain on the southern slopes of the Alps, and after crossing these mountains, descending the northern steeps of the mountain-range as a dry warm wind, the föhn of Ben Nevis had its origin in the highly saturated air, which, advancing from the North Sea, discharged its vapour on the higher slopes looking down on the Moray Firth, and after ascending to some height, thereafter blew down on Ben Nevis as a descending wind, characterised by a dryness and relative warmth rarely felt at lower levels. The value of these observations from their important bearings on the theory of storms and other atmospheric movements, cannot easily be over-estimated by the meteorologist, and it is important to note that the observations

at none of the lower stations gave indications of the ascensional and descensional movements of the atmosphere to which attention is here directed.

We observe from a circular we have before us, signed by the Duke of Richmond and Gordon, President of the Scottish Meteorological Society, that the Society has obtained from Mrs. Cameron Campbell of Monzie, a suitable site for the proposed observatory on the top of Ben Nevis, that the grounds and buildings are to be invested in the Royal Society of Edinburgh, and that the charge and management of the observatory will be in the Council of the Scottish Meteorological Society, in conjunction with two representatives of the Royal Society of Edinburgh, and one representative of the Royal Society of London, the representatives of the former Society being Prof. Tait and Prof. Chrystal, and that of the latter Sir William Thomson.

It is satisfactory to learn that a good beginning has been made towards raising the 5000*l.* required to establish the observatory, by a number of noblemen and gentlemen, who have intimated handsome subscriptions to the fund. Since, however, a large sum remains yet to be subscribed, we earnestly hope that in the interests of science the remaining balance of the 5000*l.* will soon be subscribed, so that next summer may see the Ben Nevis Observatory an accomplished fact.

NOTES ON THE GEOLOGY OF HONGKONG

WRITING in 1843, Dr. Abel determined the main structure of the island to be of basaltic trap, granite, siliceous and schistose rock. Mr. Kingsmill in 1865, in his excellent papers on the Geology of the Kwangtung Province, was the first to notice the trachytic porphyry of Victoria Peak (1823), the summit of which overlooks the town. This trachytic rock has been apparently forced upwards through the granite after the overflowing and partial hardening of the trap on the west side of the island. It was Mr. Kingsmill also who explained the nature and formation of the pseudo-boulders, with which the island is so plentifully covered. Towards the extreme south-east, near Cape d'Aguilar, these pseudo-boulders assume very large dimensions, and their weather-beaten aspect proves that the chemical action of water and plants, which forced them from the parent rock, occurred a long time ago. Indeed the island must have undergone great changes in course of time; the hill beyond Shekko, for instance, must have been originally nearly or quite as high as Victoria Peak, whereas its present elevation is not more than 500 feet. The rapid action of the heavy rains and rich vegetation is nowhere more apparent than in the high hill (directly back of the peak from which the colony takes its name) known as the Hog's Back, or High West. Its eastern slope is literally covered with pseudo-boulders, rendering the ascent from that side not a little dangerous, and in the rainy season large masses of rock are borne down into the valley beneath.

Now that the population of the island has increased, amateur geologists and mineralogists have become tolerably plentiful, and frequent excursions are made, hammer in hand, to the less known and wilder portions of the island. In this manner traces have been found of not a few minerals and several interesting rocks. Silver has been observed in small quantities, also galena, lead, and iron pyrites; slate near Aberdeen, syenite and dolorite on a cliff overlooking that one-time piratical *rendezvous*, Saiwan, feldspar and grey mica abundant.

One of the most interesting finds is that of molybdenite, near the village of Sau-ki-van. Molybdenite, molybdenum glance MoS_2, was not known hitherto to be among the mineral products of China. Germany, Sweden, and Cornwales are the chief localities for this rare mineral, and it has been found in several parts of the United States. The South China specimens show all the well-known characteristics of European molybdenite—colour, lead-grey, streak the same; thin foliated hexagonal plates, closely resembling graphite; flexible, non-elastic laminæ, H. = 1·2, G. 4, 5. A local chemist corroborated the determination by analysis, and found the composition to be—

Sulphur	= 40·0
Molybdenum	= 60·0
Molybdenum sulphide	= 100·0

It will be seen from this analysis that there is a slight decrease in the quantity of sulphur, compared with European molybdenite. Dana gives the composition of American molybdenum sulphide as follows:—

Sulphur	= 41·0
Molybdenum	= 59·0
	100·0

The mineral was found in small lumps imbedded in the granite.

F. WARRINGTON EASTLAKE

Hongkong, November

TRANSIT OF VENUS, 1882—*BRITISH EXPEDITIONS*

AN operation which requires for its success the collection of nearly simultaneous astronomical observations over widely separated portions of the earth's surface must always be liable to great risks of failure. These risks may be diminished by a careful selection of stations, and an increase in their number; but they can never be entirely removed.

The telegrams already received show, however, that the British expeditions have been most fortunate; and the success of the work is now assured.

This is not the proper place for a technical discussion of the different methods which may be adopted for the determination of the sun's distance from a discussion of observations of Venus in transit; but it is desirable that some facts should be stated which may enable the reader to form some conception of the strength of the method which has been relied upon in the organisation of the British expeditions, and the probable accuracy of the sun's distance which may be deducible from a careful discussion of the observations which have been collected.

On December 6, 2h. 20m. G.M.T., the sun was distant from the earth about 90,620,000 miles, whilst at the same time Venus was distant only about 24,330,000 miles. The ratio of these two numbers is very accurately known, but the expression of either of these two distances in terms of any unit of length which is directly known to us, as a mile, is a point of great difficulty on account of the small dimensions of our earth, of which the diameter is only about 7912 miles, in comparison with such distances as those of Venus and the sun.

The greatest possible displacement of Venus, as seen projected on the sun's disc from any two places on the earth's surface is only about a twenty-ninth part of the solar diameter. It is from such displacements that the relation between the distances of Venus and the sun and the separation of the observers, which is known in miles, is established; but the maximum displacement is never practically available.

These displacements may be measured in many different ways: we can take photographs of the sun's disc at the different stations, and afterwards measure from the photographs the distances between the centres of the planet and the sun, as seen at the different stations; or the distances between the centres may be directly measured with a heliometer or any equivalent instrument; or we may avoid the difficulties and errors