OUR ASTRONOMICAL COLUMN.

COMET 1910*a*.—A number of observations, with drawings and photographs, of comet 1910*a* are published in the March number of the *Bulletin de la Société astronomique de France*. Among others, M. Quénisset describes the observations made at the Juvisy Observatory, where photographs of the comet and its spectrum were taken, and drawings made, between January 21 and February 12.

A photograph taken on January 29 shows the secondary tail extending to some distance from the nucleus on the south side of the main tail, with which it formed an angle of about 25°; on this date the main tail was estimated to be longer than 62 million miles. The fan-shaped extension towards the sun is also shown, and extended to some 8′ from the nucleus, its northern edge showing the concave form discussed by M. Sola.

Comte de la Baume Pluvinel reports that the spectrograms show the nucleus sharply defined in the two principal radiations of the cyanogen band at λ 388, and an intense image of the comet was produced in the hydrocarbon band near λ 472. Between these, the nucleus and tail give a continuous spectrum which presents several condensations, the interpretation of which is still under investigation.

The observations made at the Lick Observatory are recorded in Bulletin No. 174, and show that considerable changes took place in the spectrum between January 19 and 31. The comet was first seen on January 19 as a fan-shaped cloud several times as bright as Venus at its maximum brilliancy, and spectroscopic observations showed the D lines bright, against a background of sky spectrum; D_2 was seen to be much stronger, and to extend further than D_1. The comet, having considerably decreased in brightness, could not be seen the next day, and a great storm prevented further observations until January 26. It was then seen that, in addition to the D lines, the regular cometary bands were present. On January 27 the same features were recorded, and an additional brightening was seen just to the right of D. A photograph of the spectrum showed a great similarity to the spectrum of comet 1907*d*, as photographed by Dr. Campbell, the continuous spectrum being relatively weak as compared with the bands. Observations made on January 31 showed that the D lines and the red condensation had disappeared, and that the spectrum of the tail was continuous, extending to a distance of 1° from the head.

On February 1 and 2 spectra were photographed with a prismatic camera, and show that the light of the tail is practically all within the visual region, extending towards the violet but a short distance beyond λ 467. Dr. Wright suggests that it may be due to sodium vapour rendered fluorescent by the intense sunlight; this assumption might also account for the faint band seen on the red side of the D lines.

Dr. Albrecht also made spectroscopic observations with a newly designed grating spectrograph of high dispersion attached to the 36-inch refractor. The resulting photographs, on January 27, show the D lines, D_1 being not more than one-third the intensity of D_2. The light from a sodium flame was employed as a comparison spectrum, and measures made of the radial velocity of the comet, which was found to be +66·1 km., and is believed to be trustworthy within 2 or 3 km. Dr. Albrecht suggests that such observations might be useful in determining the orbit of a comet in rare cases, such as the present, when it is difficult to determine accurate positions. Subsequent observations showed that between January 27 and 30 the intensity of the D lines must have decreased ten-fold.

Photographs taken by Messrs. Merrill and Oliver cover the period January 26 to February 1, and show the general changes and details well, but no sharp narrow streamers and bright knots or condensations are anywhere indicated.

In No. 610 of the *Astronomical Journal* Prof. Barnard reports that cloudy weather prevented photographs being taken at the Yerkes Observatory during the period of the comet's greatest brilliancy, except on January 21 and 24, when fair negatives were obtained. A photograph taken on February 3 shows the extension beyond the head, towards the sun, to be 12′ long. This extension is a prolongation of the southern edge of the main tail, and is shown on all three photographs taken on that date.

A further continuation of Dr. Kobold's ephemeris is given in No. 4393 of the *Astronomische Nachrichten*, and shows that the comet is still moving very slowly northwards through Pegasus, the position for March 17 being 22h. 27·6m., +16° 32′. An observation made by Herr Pechüle on March 6 gave corrections of os., +0·5′, and showed the magnitude to be about 9·5.

HALLEY'S COMET.—Numerous photographs of Halley's comet have been secured, at the Lick Observatory, with the Crossley reflector and other instruments. The negatives taken on December 11, 12, and 13, 1909, show the coma and faint traces of a cone-shaped tail; as the angle made by lines from the comet to the earth and sun, respectively, was, on that date, less than 2°, this indicates a fairly well-developed tail. A photograph secured by Mr. Olivier with the Crocker telescope on January 28 shows a tail nearly 1° long. On a negative taken with the Crossley reflector on February 4 a very fine, sharp, stellar nucleus, less than 5″ in diameter, is seen, and the tail appears as a narrow, sharply defined cone; but similar photographs secured on February 10 and 11 show an entirely different form of tail, the narrow quiescent cone having given way to a tail having several fine streamers radiating from the head; the two longest streamers are straight, and can be traced to a distance of 20′ from the head, while the most southerly one is curved. These changes are also shown on the photographs taken with other instruments, where the tail can be traced to a distance of 40′, and doubtless indicate a sudden burst of activity during the first week in February (Lick Observatory Bulletin, No. 174, p. 183).

PIDOUX'S COMET.—It now appears probable that the report of the discovery of a new comet at Geneva was a mistake. A plate exposed through clouds on February 20 showed a **V**-shaped nebulous form near Halley's comet, and before the identification of this object could be completed, the news arrived that a new comet, in the same position, had been discovered at Cardiff. A plate exposed on February 14, on the same region, showed no trace of the object, but a similar form was seen on the edge of a plate taken on February 16; but on a photograph taken at Heidelberg on February 10, which covers the region where, according to calculation, the alleged comet should then have appeared, there is no trace of any such object. As no control plate is available, the existence of the reported comet cannot be confirmed (*Astronomische Nachrichten*, No. 4392).

THE INTERNATIONAL AËRO AND MOTOR BOAT EXHIBITION.

THIS exhibition opened at Olympia on March 11, and will continue until March 19. The Society of Motor Manufacturers and Traders, Ltd., supported by the Aëro Club of the United Kingdom, are responsible for the organisation, and deserve commendation for the fine collection of machines on show. It will be remembered that the first exhibition of this kind, organised by the same society, was held last March. Great advances have been made in flying machines during the interval, and the fact that British makers do not intend to be left behind will be evident to anyone who visits Olympia this week. A pleasing feature of the present exhibition is the almost entire absence of "crank" ideas, especially in the full-size machines shown. Such are almost inevitable in any collection of models, but even the model section contains many fine examples of thoughtful design and skilful workmanship.

Monoplanes comprise by far the larger number of machines in the exhibition. Apart from any inherent advantages of this design, such as space occupied, convenience in dismounting and packing for transit, and lightness, there is no doubt that its popularity, both with makers and buyers, is owing to Blériot's flight across the Channel last summer. There are twenty monoplanes, nine biplanes, and one triplane, all of these being full-size machines. In addition, there are two balloons, a dirigible, and a large number of engines and accessories shown separately, as well as motor-boats and launches. In practically every case it is evident that the brains of a skilled engineer have been brought to bear on the design and construction.

Profiting by past experience in metal propellers and their dangers, most of the propellers shown are constructed of wood, built up so as to secure the grain everywhere running straight from tip to tip. A few makers are bracing the lattice girder forming the main frame in the monoplane type with wood in preference to piano wire, although the use of the latter for bracing is still general. In several cases piano wire has been abandoned for bracing the wings, the preferable material for this purpose being light stranded wire rope and flat steel ribbon.

The engines are generally of the fixed cylinder type, although a few rotary engines may be observed. Water-cooling is more usual than air-cooling. In biplanes the engine and propeller are usually situated behind the pilot; in monoplanes these are generally in front of the seat, although in the case of the Petre monoplane the propeller is at the extreme rear of the machine, and is driven by a tubular shaft from the engine which is placed behind the pilot; but few makers warp or alter the inclination of the main wings for steering or for stability; in most cases ailerons are fitted to biplanes, and in the monoplane type the tails are made movable for vertical and horizontal control. Practically all wings are double surfaced. More firms are paying attention to the matter of reducing the number of levers required for control. For example, in the Humber machines all control is effected by a single steering wheel mounted on a pillar which can swing, and the steering-wheel spindle is capable of axial as well as rotary motion in the pillar. These movements independently operate all the control; there are no foot or hand levers.

It is exceedingly gratifying to notice the large number of British-built aëroplanes; some sixteen of the total machines on show have been built entirely in this country; of the engines shown separately, by far the greater number are British-built. There is no doubt that a great awakening to the possibilities has taken place among our engineers, and that no efforts have been spared during the past autumn and winter to develop the manufacture of flying machines. Many of these British machines have been tested, and when we possess, as no doubt we shall before the coming summer is over, a reasonable number of British pilots having experience with the machines, we shall be able to regard this country as no longer behind in this important industry. The limitations of space forbid us noticing particularly any but a very few of the machines in the exhibition.

Of machines shown by members of the Royal Aëro Club, one of the most interesting is a Short Wright biplane, the first of its kind built in England, and belonging to the Hon. C. S. Rolls. This machine has flown about 100 miles, and has won many prizes. In general design it closely resembles the machines used by the Wright Brothers. There are twin screws, chain driven; the dimensions are 40 feet by 28 feet by 8 feet. Another Short biplane is shown belonging to Mr. J. T. C. Moore-Brabazon. This machine measures 45 feet in breadth, 28 feet in length, and 8½ feet in height. The weight of machine complete, with aviator and in flying order, is 1500 lb.; the actual lifting surface is 450 square feet. The machine is fitted with Short's patent front elevators and balancing planes, and has their system of trussed girder skids. Twin propellers are fitted running in the same direction; this is the first time this principle has been adopted, and has proved to be very successful. A front vertical rudder has been substituted for one in the rear for directional steering. The speed is about 48 miles per hour, and the machine has made a large number of flights, that of March 1, 1910, being of 32 minutes' duration in covering a distance of about 25 miles. This machine won the 1000*l.* prize (*Daily Mail*) for the circular mile, all-British made. A monoplane built by Messrs. Holland and Holland, and belonging to Mr. B. Nicolson, is also shown.

Messrs. Short Bros. also show a new biplane built for the Hon. C. S. Rolls. The engine is a Green four-cylinder, 105 mm. by 120 mm. bore, giving 38 horse-power at 1200 revolutions per minute. The lifting surface is 270 square feet, and the weight complete is 700 lb. In the annexe is a Sommer biplane, also owned by the Hon. C. S. Rolls. This machine is fitted with a Gnome engine (rotary). Messrs. Humber, of Coventry, show three monoplanes of their own manufacture. The workmanship and finish of these machines are beyond reproach. Messrs. A. V. Roe and Co. are represented by a triplane of all-British make. This machine is 20 feet long by 20 feet span, and is 9 feet high. The main planes, and also the tail, consist of three planes arranged one over the other, the total supporting surface being 320 square feet. The weight without motor and fittings is 150 lb. All the planes are under control, so that the angle of attack can be adjusted from the steering wheel, and the main planes can be warped. The seats for the pilot and one passenger are behind the main planes, and the engine and propeller in front. Machines of this type have made frequent flights with a motor of 9 horse-power only, and start quickly, often in twenty yards.

Messrs. Blériot have three of their models No. XI. cross-Channel type of monoplane in the exhibition. These machines are fitted with a three-cylinder Anzani motor giving about 25 horse-power; bore, 105 mm.; stroke, 130 mm.; weight in full running trim, 60 kilograms. The propeller is made of layers of French walnut, of diameter 2·1 metres, and weighs 4½ kilograms only; its speed is from 1200 to 1700 revolutions per minute. The monoplane measures about 25½ feet across the wings, and is about 26 feet long; the sustaining surface is about 14 square metres. The total weight of the machine is about 300 kilograms, including the pilot and fuel for a two-hours' run. The speed is about 68 kilometres per hour, and the machine can lift and sustain in flight about 22 kilograms per square metre of supporting surface, *i.e.* about 5 lb. per square foot.

Messrs. A. Darracq and Co. show the latest type of Farman biplane. The length is 39 feet, span 32½ feet, height 11 feet 4 inches. The supporting surface is 480 square feet, and the weight without engine is 1050 lb. A Chauviere propeller 8½ feet in diameter is placed at the rear of the main planes. The motor on the machine shown is a 50 horse-power Darracq four-cylinder horizontally opposed; bore, 130 mm.; stroke, 120 mm. The cylinders are water-cooled, and the weight, with oil and water pumps and carburettor, is 242 lb. The machines are made under the personal supervision of Mr. Henry Farman at the Châlons Camp, in France.

The Demoiselle machine of Mr. Santos-Dumont shown at the Clement-Bayard stand attracted great attention. This is claimed to be the smallest, lightest, and fastest aëroplane in the world. The length is about 20 feet, width about 18 feet, supporting surface 110 square feet, weight 242 lb. with a two-cylinder water-cooled motor. The radiators are arranged close up under the wings, one on each side of the main frame. The horizontal and vertical planes forming the tail are rigid as regards one another, but the tail can turn as a whole on vertical and horizontal axes for controlling directional and elevating steering. Another interesting exhibit at this stand is the engineer's cab of the dirigible Clement-Bayard. We noted in the engines shown at this stand the care which had been taken to lock all nuts and fastenings so as to prevent them becoming loose.

A Grégoire Gyp monoplane shown by the Fiat Motors, Ltd., did not arrive until ten o'clock on Friday evening. It is interesting to know that the machine was ready for exhibition shortly after eleven o'clock on the same night, showing the ease with which the monoplane type can be erected. The Phœnix Radial Rotary Motor Co., Ltd., show part of a twelve-cylinder rotary engine under construction for Mr. Cody.

The Motor Supply Co., Ltd., show an Avis type monoplane built by the Scottish Aëroplane Syndicate of London. This machine is entirely of British make, except the 30 horse-power Anzani engine. The machine is of the non-lifting tail type, 27 feet wide and 27 feet long. The main planes have a surface of 160 square feet. The weight without motor is 280 lb.; the weight of the motor complete is 150 lb. Messrs. Mulliner, of Long Acre, show a monoplane of entirely British make. This machine has an improved system of warping the trailing edge, combined with the action of a non-lifting type of elevator and a rudder at the rear. Messrs. Mann and Overtons, Ltd., of Pimlico, show a monoplane of the Santos-Dumont type. An English-built monoplane is shown by Messrs. R. Lascelles and Co., Ltd., and an all-British biplane by

Messrs. George and Jobling; both these machines possess interesting features in the matter of control. There are also monoplanes by the Star Engineering Co., Ltd., of Wolverhampton, and by Handley Page, Ltd., of London.

It is quite impossible to deal adequately with all the points of interest in the exhibition. That its success is assured, and that its effects will be far-reaching, are evidenced by the large numbers of visitors, most of whom appeared to be keenly interested and full of inquiries.

EXPLORATIONS IN THE GLACIER TRIBUTARIES OF THE SHAYOK RIVER, KASHMIR TERRITORY.

IN the *Times* of December 21, 1909, reference was made to certain discoveries by a party consisting of Dr. E. G. Longstaff, Dr. A. Neve, and Lieut. A. M. Slingsby in the Kashmir Himalaya. The *Geographical Journal* of November, 1909, also had an article, based upon an account of the tour, written by Dr. Neve in the *Times of India* of September 4. A few remarks concerning the addition to Himalayan geography referred to in these communications may be of interest.

The topography of this part of Baltistan requires explanation; if the atlas sheets are examined, it will be seen how very few trigonometrical points are to be found east of longitude 77°. They are much fewer than in the portion of Baltistan I had to survey on the Lower Shayok and Indus, and the branches of the Shigar tributary of the latter river. The difficulties of penetrating into these out-of-the-way valleys were very great, and it was almost a superhuman task for Mr. Ryall and other assistants to produce, in the limited time given them, a better or more accurate idea of its geographical features. Very few of the glaciers were followed up, or can be followed up, so their sources were merely sketched in by eye from a distance. Very many tributaries are inaccessible, either from their rocky, wall-like sides, or the stream being too deep and rapid to ford, there being no bridges, or the means of making them. Thus the topography can only be classed as rough reconnaissance. The Saichar valley and its glacier was not ascended far, if at all, and even the distance and size Mr. Ryall assigned to it some twelve miles N.W. from Saichar would in nature appear to be its total length; it probably has a bend, and if straight a distant ice fall, or a local narrowing might give the appearance of a watershed. I have not heard of Mr. Ryall for very many years; if he is still living he would be able to tell us whether he ascended the glacier to any distance. His field book, if it is to be found, would give much information as to where he went. There would be his boiling-point observations, and the notes he made in it.

There can be no absolute accuracy in the topography at the head of the Kondus Valley, south-east of Snowy Peak K. This valley, I would point out, is well worthy of further exploration, because it is possible some high point on its eastern side could be reached from which a view would be obtained of the higher portion of the newly-discovered Terim Glacier and the snowy range which bounds it on the north-eastward. Concerning the Terim Glacier extension of the Saichar, the discovery alters the position of the main range, which may be taken as fairly well laid down up to lat. 25° 30′, long. 77° 30′. North of lat. 35° 30′ up to about lat. 35° 45′ and long. 77° has certainly to be mapped. This is some forty-five to fifty miles in length, and lies fifteen miles or more further to the north and eastward. It is to be hoped that Colonel Long, the present Surveyor-General of India, will see his way to depute one or two of his best officers to extend the triangulation, fix more points, and accurately lay down this corner on a plane table—an attractive, delightful summer's work for someone.

That very high peaks in this corner, lying to the east of K2 and Gusherbrum, escaped the view of the triangulators when they were observing at the principal stations of the Indus River and Changchenmo series is not surprising. The high mass between the head of the Nubra River and the Shayok, 20,000 to 22,000 feet, would hide much. From trigonometrical stations east of Leh, the same portion of the main water parting is shut out by another lofty mass 22,000 to 25,000 feet, dominating the Shayok Valley on its northern side.

The Shayok series was a very short one, the stations of observation did not extend to lat. 35°, and from the two highest stations, Ajanliung, 19,903 feet, and Telthep, 19,705 feet, overlooking and south of the Shayok Valley, peaks at the head of the Saichar Glacier would not be visible owing to the intervening mountain masses.

A point of interest is the great length of the Terim Glacier, estimated at forty-four miles, next its position and direction, in connection with the trend of the ranges in Ladak and the mountain area both to the eastward and westward. This great glacier, as described, would appear to occupy a blank on the map, and, like a piece of a puzzle, exactly where it might be expected to fit in. This the topography at the head of the Saichar Glacier and the line of the main water parting did not previously indicate on the atlas sheet.

A valuable compilation was published in 1907, viz. "A Sketch of the Geography and Geology of the Himalaya Mountains and Thibet," by Colonel S. G. Burrard, R.E., F.R.S., superintendent Trigonometrical Survey, and H. H. Hayden, superintendent Geological Survey of India. In 1883—presidential address, Geographical Section, British Association—I made an attempt to bring the remarkable parallelism of the mountain ranges into some sort of systematic sequence from the plains up to the loftiest parts of the Himalayan chain. Correctness in detail was not to be expected over such an extended area, yet it is some satisfaction to find the general principle underlying my plans and sections has been accepted by officers of the Trigonometrical and Geological Surveys. My Shayok Kailas range they call the Kailas; for my Mustakh axis, which I considered one of the most important, they adopt that of Karakoram; but I am now inclined to think, from what Dr. Longstaff reports, that yet another well-marked elevated range is indicated by an extension of Younghusband's Aghils, on the northern side of the Oprang Valley, continued to Longstaff's new peak, 27,610 feet, about long. 77° and lat. 35° 30′ (*vide Geographical Journal*, January, 1910, p. 65). I am doubtful if this assigned position is correct, for on the atlas sheet it is close to the head of the glacier called Sherpi Gang, in the Kondus Valley. The position long. 77° 20′ and lat. 35° 40′ given in the *Times of India* would appear to fit in best with the general account. The Karakoram pass and watershed lie some forty miles to the north-east of the Saichar Glacier, and must therefore fall on a still more northern axis of elevation, running in the direction of the Lingzhithang plain, and quite distinct from my Mustakh one.

From Leh the direction of the Ladak axis or range is indisputably to the south-east, and it leaves the Pangkong Lake and Rudok well to the north, but the west and east wrinkling exhibited in the ranges much further to the north has not been so definitely established owing to the absence at many points of geological data to link them up; this is particularly the case with the Karakoram pass and the country north of the Changchenmo range.

The topography of this area leads me to notice what is written in the above-mentioned work by Colonel Burrard and Dr. Hayden, part ii., p. 100:—"Even the great Karakoram peaks themselves seem to follow two alignments. The Masherbrum peaks and peak 63 or K12 (table v. of part i.) surmount a ridge parallel to that on which the peaks of K2 and Gusherbrum stand, and at a distance of ten miles from it." This feature can thus be explained.

The Masherbrum ridge westward from K6, 25,119 feet, the peak which the Duke of the Abruzzi ascended to 24,583 feet last summer, represents, together with the Mustakh Pass granite axis, one main broad line of elevation. The Baltoro Valley occupies the trough scoured by its glacier along the strike and junction of the stratified rocks of the Masherbrum side, which originally lay up against the granite, and may very possibly have been once continuous over it. The southern Masherbrum ridge is, in fact, only a secondary feature, the result of denudation.

I cannot say for certain what K2 is composed of—probably not granite, more likely of the metamorphic and stratified series coming in on the north of the axis. This may be explained in more detail.

The stratified rocks, schists and slates, limestones and sandstones, a series of enormous thickness, composing the