be related to the duration of life of an Apis, since many different periods are recorded for that. But by reducing the dates of the enthronement of Apis as given by Brugsch and Lepsius in the Egyptian reckoning to the Julian chronology on the basis of the fixed Sirius year, the significant fact was discovered that such enthronement always took place on the day of the full moon. Since Apis is known to be the visible representation of Osiris, and the latter is identified with the full moon, it is reasonable to suppose that the Apis-period of $9125 = 25 \times 365$ days was purely astronomical, and that the name was derived from its connection with the full moon and Osiris.

OBSERVATIONS OF THE PLANET MARS.—A telegram transmitted by Prof. Pickering to Prof. Krueger, and printed in *Astr. Nach.* No. 3241, reads as follows:—"Holden telegraphs: Bright projection of Mars terminator like that previously observed at Lick Observatory and seen several mornings, best seen June 28 near Polar Cap, Ganges seen double."

THE JACKSON-HARMSWORTH POLAR EXPEDITION.

THE private Polar Expedition led by Mr. F. G. Jackson, and financed by Mr. A. C. Harmsworth, sails from the Thames to-day, July 12, on board the steam-whaler *Windward*, for Franz Josef Land, calling *en route* at Archangel.

Many of the equipments of the expedition were exhibited to a select party at an "at home" given by Mr. and Mrs. Harmsworth at the Grafton Galleries on Friday evening, and on Monday last a number of visitors were shown over the ship in the Shadwell Basin, when the special arrangements for the expedition were more fully explained.

The staff which has been finally selected by Mr. Jackson to accompany him on his projected land journey in the far north includes the following:—Mr. Albert Armitage, second in command, a young officer of the P. and O. Company's service, who is a practical navigator and trained in astronomical and magnetic observations; Dr. Kettlits, medical officer; Captain Schlosshauer, a merchant skipper; Mr. Fisher, curator of the Nottingham Museum, as scientific collector; Mr. Burgess, who has had some previous Arctic experience, and will act as cook; Mr. Childs, who undertakes mineralogical work and photography; and Mr. Dunsford, who, like Mr. Jackson and Mr. Armitage, has a knowledge of surveying. Some friends of the explorers sail with the party, intending to return from Archangel.

Several previous expeditions have acquired some knowledge of the natural conditions of Franz Josef Land, and it is confidently expected that game, in the shape of bears, seals, and birds, will be abundant. Accordingly a complete outfit of sporting guns, rifles, harpoons, &c., is being taken. The expedition is, however, fully provisioned for four years with the most highly condensed and thoroughly preserved foods obtainable. Much reliance is placed on the fresh bear and seal meat, expected to be shot, for the prevention of scurvy, but Mr. Jackson also proposes to use port wine as a specific. The use of alcohol and tobacco, which has recently been entirely discarded in Arctic work, is one of the peculiar and probably not unpopular features of the present attempt on the Pole.

The arrangements for travelling include boats for crossing open water. One of aluminium, measuring 18 feet by 5 feet, weighs only 150 lbs., and can carry twenty people; it is made in three sections for convenience of transport on sledges, and each section will float by itself. A similar copper boat, weighing about 200 lbs., is also carried, and three light wooden Norwegian boats. A fast steam-launch, appropriately named the *Markham*, is expected to be of service if it is found possible to proceed from the base for some distance by sea, or up Austria Sound.

Eighteen sledges of exceptionally light and strong construction, each calculated to carry 1000 lbs. weight if necessary, are taken; these are to be drawn by Siberian dogs or ponies. There are three collapsible tents, and suits of Samoyed clothing for use in winter, the cumbrous-looking garb of these Siberian nomads being considered better adapted for rough work in bad weather than the tighter-fitting costume of the Eskimo pattern. The scientific instruments carried are perhaps the finest that have ever been taken into the far north, the extensive use of aluminium ensuring a lightness and strength never before attained in Arctic exploration.

After landing the exploring party in Franz Josef Land about the end of August, the *Windward* will return to England, if possible, and sail again next year with fresh supplies.

The whole cost of the expedition is estimated at £25,000.

ANNUAL REPORT OF THE PARIS OBSERVATORY.

ON the 3rd of March of this year, M. Tisserand presented his report to the Council of the Observatory regarding the state of the Observatory during the past year. In his preliminary remarks he refers briefly to the work in course of execution. Under the direction of Le Verrier, great attention was concentrated on the meridian service, which comprises observations of the sun, moon, planets, asteroids, and the revision of the catalogue of Lalande. Extra-meridian observations of comets and small planets have been made with the equatorial in the west tower, and M. Wolf has been occupied in astro-physic researches. An important work in hand is that of publishing a catalogue of the Observatory, based on all the values of the meridian observations made from 1837–1881, while special researches on the R.A. of fundamental stars have been undertaken, and on the declinations, after methods proposed by M. Lœwy. The equatorial service has been enlarged by the addition of another coudé, which instrument is devoted to the observation of planets, comets, systematic measures of double stars and nebulæ, and will be occupied in future with the study of the most interesting variable stars.

With regard to the work in hand, M. Tisserand says that there is enough "assuré pour plusiers années." In remarking on the great preponderance of meridian work, he refers to its considerable importance in astronomy, furnishing as it does the constants for calculating the positions of planets and stars. Photography, he says, gives the means of determining exactly the positions of small stars on a cliché with relation to a certain number—say a dozen—of reference stars; but the positions of these last-mentioned ought to be measured by meridian instruments.

The movement relative to the lengthening of the railroad has been making great headway, and already the means of protection suggested by the Council have been commenced, notably that of the *mur d'isolement* constructed near the tunnel.

Let us take a rapid survey of the work done with each of the separate instruments as reported by the head of each department.

Large Meridian Circle.—Besides general transits observed, it was attempted to correct the catalogue of polar distances of fundamental stars, in continuing zenith distance measures of stars with the adopted latitude. A series of sixty stars, six times observed, showed that the corrections agreed very satisfactorily among themselves, and harmonised well with those furnished by the normal catalogue of M. Auwers.

Simultaneous observations have also been made to correct the ephemerides of the *Connaissance des Temps* and the latitude, while active researches have been started for finding out the causes of the inequalities. With reference to the "flexion horizontale," the instrument has remained firm, the mean value given by the collimators being $-0''\cdot68$, those for the three preceding years being $-0''\cdot54$, $-0''\cdot73$, and $-0''\cdot66$.

Meridian Instrument, Gambey.—The work started in May 1890, of correcting catalogue R.A.'s of fundamental stars, has been continued, and the corrections found are "faibles et bien concordantes," as shown from the following few values:—

Stars.	1890. s.	1891. s.	1892. s.
θ Virginis	+0·03	+0·03	+0·02
25 Canes Venatici ...	−0·03	−0·12	−0·14
m Virginis	+0·07	+0·06	+0·03
T Virginis	+0·09	+0·06	+0·04
Arcturus	+0·07	+0·05	+0·04

Circle of Gambey.—Employed exclusively for researches on the variation of latitude; 127 nadir distances of polaris were measured, of which 101 were direct, and 26 by reflection.

Cercle Méridien du Jardin.—During the earlier months this instrument was used for the determination of polar distances of fundamental stars and for latitude, by methods of M. Lœwy. A minute determination of the inclination of the horizontal thread of the instrument was also made, and also the influence of personal equations in the cases of stars near the pole, M.

Renan having installed in front of the eyepiece a prism which reversed the direction of apparent movement of the stars, either in right ascension or declination.

The "Supplément à l'Histoire Céleste de Lalande" is undergoing revision, and the positions of 2250 stars are required to be re-observed, each three times by meridian observations. Since April 1893, sixty series, comprising about 1000 stars of the catalogue, have been obtained.

The *résumé* of the meridian observations made during the year shows that the instruments were by no means idle, no less than 17,248 observations having been made. The *résumé* of the planets observed during the same period gives the total number as 556.

Equatoriaux Coudés.—The large equatorial has been receiving several alterations and additions, and it is hoped to maintain the position of a fixed or movable star on the same part of a photographic plate with an approximation of 0″·2 nearly. The small coudé has been the means of effecting the complete measurements of 186 double stars, besides some observations of minor planets, comets, occultations, &c.

The Equatorial in the West Tower.—This instrument is under the direction of M. Bigourdan, who, with M. Faye, were away observing the total eclipse of the sun at Sénégal. During their stay there, fifteen lunar culminations for longitude and four series of observations for latitude were made, besides meteorological observations and four independent determinations of the relative intensity of gravity. The solar observations, among other things, consisted in observing the four contacts, and searching round the limb of the sun for any small bodies that might be visible.

The observations made with the equatorial above referred to consisted of measurements of 280 double stars, besides those of comets, occultations, &c.

The equatorial in the east tower, under M. Callandreau's direction, has been devoted chiefly to observations of minor planets.

In the departments where photography is employed, MM. Henry have obtained, among other results, 169 clichés for the catalogue of the *Carte du Ciel*, twenty-nine large clichés of the moon, enlarged directly eighteen times, these latter marking "un progrès très sensible sur les résultats obtenus antérieurement."

The "Bureau des Mesures des Clichés du Catalogue," under Mdlle. Klumpke's supervision, is now supplied with two machines. The total number of stars measured in the twelve months amount to 27,750; of these 26,831 were measures of stars, 343 measures of double stars, and 32 planetary measures.

The meteorological observations and the hour service have been regularly continued, the latter without any failure during the entire year.

In the spectroscopic department, M. Deslandres has been continuing the researches on the sun and stars; but much time was devoted to the preparations for the observations of the total eclipse of the sun last year. The results obtained during the eclipse consisted of twenty-two photographs of the corona. Some of the negatives show luminous jets from the corona extending to a distance of two diameters. The ultra-violet spectrum of the corona has been traced up to the limit of the ordinary solar spectrum, and in addition fifteen lines have been observed in the new region. In the researches concerning the rotation of the corona, it has been found that one of the negatives shows the spectra of two points of the corona, situated at the extremity of an equatorial diameter and 10′ from the solar limb, placed side by side. The bright H and K lines of calcium present a slight displacement corresponding to a difference of velocity of 5 to 7·5 kilometres. M. Deslandres admits that the solar corona is animated with a motion of rotation, the angular velocity of which corresponds with that of the sun.

Other spectroscopic work being continued is that of the study of the radial velocities of prominences and stars.

THE CHEMISTRY OF CLEANING.[1]

As a great city grows, and the agglomeration of struggling humanity increases, such questions as the disposal of sewage and other waste matter rise from comparative insignificance into problems of almost insurmountable difficulty; and whilst we are able to put the burden of cleansing our towns upon the urban authorities, the responsibility of keeping our homes and bodies in a condition of at least sanitary cleanliness devolves upon the individual, and a knowledge of the causes of dirt and the methods by which it can be removed, cannot be regarded as devoid of interest, or at any rate utility.

Before we can cleanse, we must have dirt to remove, and this prime factor of our subject naturally must claim our first attention.

Dirt has been variously defined: a great statesman has spoken of it as "matter out of place," poets have christened it the "bloom of ages," whilst more matter-of-fact individuals have been content to look upon it as something which causes an infinite amount of trouble in the household, and leads to the consumption of much soap and water. If, however, we divest our mind of prejudice, and approach the subject of dirt from a scientific point of view, we shall find a silver lining to the grimy cloud, and shall have to admit that a wondrous store of interest is to be found in the dust with which the housemaid wages perpetual war, and which when glued by nature to our skins, requires special methods for its removal.

Observation shows that in our town houses, only a very short interval of time is needed to cause a considerable deposit of dust upon any horizontal surface, whilst vertical surfaces and draperies, especially if their surface be rough, also accumulate a considerable quantity, although of a lighter and more finely divided kind. We also find that this dust is borne to its resting place by the air which penetrates from the outer atmosphere, and that its deposition is caused by the comparative condition of rest insured to it by the absence of wind or violent currents.

The presence of these air-borne particles of solid matter can be made visible in any town by allowing a beam of sunlight or a ray from an electric lantern to pass through the air of a darkened room. If the room be filled with air previously filtered by passing it through cotton wool, the beam of light is invisible until it strikes the opposite wall; but if the air be unfiltered, the path of the beam is mapped out by the suspended matter reflecting and dispersing portions of it, and so becoming visible to the eye as "the motes in the sunbeam."

The heavier the nature of the particles, the more quickly will they settle, with the result that the dust on horizontal surfaces, such as the tops of sideboard, piano, and mantel-board, may be expected to differ somewhat from the lighter form, which has continued to float until contact with vertical surfaces has brought it to rest.

These particles of dust are composed of matters of the most varied nature, and will be found, when collected, to consist partly of mineral and partly of organic substances, namely, siliceous and carbonaceous matters, hair, epidermis from the skin, pieces of vegetable fibre, pollen from various plants and grasses, the sporidiæ of fungi and bacteria.

The heavier portions of the dust are found to contain ground-up siliceous matter, pulverised by traffic in the road; small particles of salt carried inland by winds from the sea, together with sulphate of soda, with other impurities of a local character. If a sample of dust be collected and carefully ignited, the organic matter will be burnt away, and any ammonium salts volatilised, whilst the mineral portion will be unacted upon; and in this way it has been shown that more than one half of the suspended matters in the air are of organic origin, a large portion of this organic matter consisting of germs which are capable of setting up fermentation, disease, and decay.

It is only within the last few years that the importance of the work done by the solid particles of dust floating in the air has been recognised, and it is to Pasteur that we owe the knowledge that these germs set up the various processes of organic decay.

Pasteur collected the lightest portions of dust, which are left floating in the air after the heavier portions have settled down, by gently drawing air through a plug of soluble collodion cotton; and after he had collected sufficient dust in this way, he dissolved the cotton in a mixture of alcohol and ether, and examining the residual particles under the microscope, was able to show the presence of a large and variable number of organisms obtained from the atmosphere.

He also found that solutions of sugar mixed with beer yeast, and left exposed to the air, rapidly decomposed. If, however, the solution was kept in contact with air, that had been previously heated, it would remain unchanged for months, but de-

[1] A lecture delivered at the London Institution, by Prof. Vivian Lewes.