

looked with unusual interest through such a catalogue received from "the well known Chinese Scientific Book Depot, 407 Hankow Road, Shanghai." According to the title-page of the catalogue, the works described have been translated or written by Dr. John Fryer; and as there are nearly two hundred of them, covering the whole fields of natural and physical sciences, we confess to a reverential feeling for Dr. Fryer's marvellous industry and encyclopædic knowledge. The translations are mostly based upon standard English or American educational books, and are arranged into five series. There is the "outline" series, for general reading and elementary instruction; the "handbook" series, for more advanced students; the "temperance physiology" series, the "magazine" series, adapted for school reading books; and the "Imperial Government" series, consisting of treatises, which together form a valuable encyclopædia. As the avowed object in publishing the works is the higher education and intellectual enlightenment of the Chinese nation, we echo the hope that the use of the translations will continue to extend wherever instruction in scientific subjects is given in the Chinese language.

THE additions to the Zoological Society's Gardens during the past week include two White-shafted Francolins (*Francolinus leucocephalus*) from North-east Africa, presented by Lord Lilford; two Nilotic Crocodiles (*Crocodilus niloticus*) from West Africa, presented by Mr. J. A. McDiarmid; four Hispid Lizards (*Agama hispida*) from South Africa, presented by Mr. J. E. Matcham; an Australian Fruit Bat (*Pteropus poliocephalus*) from Australia; a White-fronted Amazon (*Chrysotis leucocephala*) from Cuba, purchased.

OUR ASTRONOMICAL COLUMN.

A NEW VARIABLE STAR OF THE ALGOL TYPE.—Dr. E. Hartwig announced in the middle of September that the star B. D. + 15° 3311 (R. A. 17h. 53m. 36s., Decl. + 15° 8' 47" 2, 1900) was a variable of the Algol type. He afterwards determined the period to be 3d. 23h. 49m. 32s. 7. (*Astro. Nach.* 3260). It appears, however, that Dr. S. C. Chandler discovered the character of the star's variability at the end of July, and communicated his discovery to several other observers, who confirmed it. The star was assigned the notation 6442 Z. Hercules about the middle of August, the period having previously been determined as 3d. 23h. 50m. Prof. Duner has found that the minima follow each other at unequal intervals of forty-seven and forty nine hours. There appears to be a secondary minimum which occurs a few hours previous to the time midway between two successive primary minima.

THE POLAR CAPS OF MARS.—Several sketches of Mars, made at the Juvisy Observatory, by M. Antoniadi, accompany a paper by M. Flammarion in the current *Comptes-rendus*. The figures show clearly the slow diminution of the snow-caps of Mars during the summer of the planet's southern hemisphere. The summer solstice occurred on August 31, and the planet was kept under observation from June 1 to November 1. The following are the results of the measures of the diameters of the cap at the south pole of Mars, on different dates:—

Dates.	Areocentric arc.	Diameter in kilometres.
June 1 ...	65°	3900
" 15 ...	50	3000
July 1 ...	42	2520
" 15 ...	35	2100
August 1 ...	30	1800
" 23 ...	15	900
September 27	11	660
November 1	5	300

ENCKE'S COMET.—Prof. M. Wolf has found Encke's comet upon a photograph taken on October 31, that is, a day before Dr. Cerulli's observation, noted last week (*Astr. Nach.* 3262). The comet has been observed by M. Perrotin, and is said to be at the extreme limit of visibility of the twenty-eight-inch refractor of the Nice Observatory.

NO. 1307, VOL 51]

STATISTICAL ACCOUNT OF FRENCH FORESTS.¹

M. DAUBRÉE, the Director of the French Forest Department, has recently published a statistical account, up to the end of 1892, of the French forests which are managed by that department; and as these forests, especially in the northern and central parts of France, greatly resemble those which might be grown in the United Kingdom, and of which some badly-managed examples are still to be found, a short notice of this work will be interesting to those who wish to know what are the possibilities of economic forestry at home.

The areas of the forests in question are as follows:—

	Acres.
Belonging to the State	2,691,165
" communes and public establishments (hospitals, colleges, &c.) ...	4,738,637
Total	7,429,802

Or 11,609 square miles, one-eighteenth of the total area of France, which is about 207,100 square miles.

No account is here taken of the private forests in France, which contain about 20,813 square miles, so that the area of all the forests in France is 32,422 square miles, or 15½ per cent. of the area of the country.

Of the 7½ million acres of forest managed by the State, 18 per cent. of the State forests and 3·6 per cent. of the communal forests are classed as unproductive or not stocked with trees.

A larger proportion of the State forests is unproductive because the State is constantly acquiring waste lands in order to prevent denudation of mountains by torrents, or the encroachment of sandy dunes; whilst land belonging to the communes, &c., which is not fit for reforestation, is not generally handed over to be managed by the State Forest Department.

Twenty excellent maps are attached to the report, and are differently shaded so as to show the distribution of the forest area among the different départements, according to ownership; mode of management (coppice, coppice-with-standards, high-forest); annual degrees of productiveness—in material (cubic metres per hectare); in money (francs per hectare)—and also in oak and coniferous timber.

From these maps and the statement which precedes them, it may be readily seen that the State forests are most extensive north of Lyons, and especially in Lorraine, Bourgogne, Isle de France, Normandy, le Bourbonnais, and that in these provinces there are scarcely any unproductive areas, which chiefly occur in the south of France. The communal forests are also chiefly in the east of France, or bordering on the Pyrenees and in Corsica; this distribution depends on political and not on natural causes, for the climate of the west of France is very favourable to forest growth, and this region contains some magnificent State forests and large areas of forests in private hands. As regards the mode of treatment, the State forests are distributed as follows:—

	Percentage of total area.
Simple coppice	2·5
Coppice-with-standards	29·2
" under conversion to high forest ...	16·8
High-forests	51·5

The simple coppice belonging to the State is chiefly situated in the south, where the State shares in the produce with certain communes, or the inhabitants have rights to fuel, which prevent any improvement in their treatment, and they are generally composed of *Quercus flex*, which yields tanning bark, and firewood rather than timber.

Coppice-with-standards is applied to large forest areas bordering on Belgium, and to another series of State forests stretching from the Jura towards Paris. These forests are generally situated near large towns or the northern coal mines, and find a ready sale for their somewhat branchy timber and underwood, as building material, pit-props, firewood, &c., provided their rotations are long enough to exclude a large supply of charcoal wood, for which the demands are being gradually restricted.

A large area of coppice with-standards, which is remote from large towns and the coal mines, is being converted into high forest, to increase the supply of timber as compared with firewood.

¹ Statistique des forêts soumises au régime forestier, Anné 1892. Extrait du Bulletin du Ministère de l'Agriculture. Paris: Imprimerie Nationale, 1894.

More than half the area of the State forests is already under the high forest treatment, and consists chiefly of highly-productive silver-fir and beech forest in the Vosges; forests of *Pinus Laricio* and *Pinus Pinaster* in Corsica, which only yield poor returns on account of the frequency of forest fires; beech forests in Normandy with a small proportion of oak, and extensive oak forests on the Loire and its tributaries, where beech is kept subservient to the principal species. The maritime pine forests of the Landes and Gironde yield large quantities of resin and turpentine, as well as inferior timber, pit-props, &c.

The communal forests are distributed as follows:—

	Percentage of area.
Simple coppice	14.7
Coppice-with-standards	53.2
" under conversion to high-forest	1.0
High-forests	31.1

The communal simple coppice areas chiefly supply fuel to villagers, and consist mainly of *Quercus Ilex* in the south, and of common oak and other species in the Ardennes and lower slopes of the Alps, near the villages and below the coniferous forests of the higher zones.

Coppice with-standards is the commonest mode of management of communal forests, and is distributed chiefly in the temperate regions of hills and plains of the north-east of France, and little of this area is being converted to high-forest, as the people do not care sufficiently for the benefit of futurity to sacrifice a considerable part of their present revenues.

The high forests belonging to communes, &c., are chiefly situated in the Vosges, Jura, Alps, Pyrenees, and in Corsica, consisting chiefly of conifers mixed with beech.

Detailed tables are given regarding the yield of the forests in material and money.

Thus the production of the forests during the year 1892 was as follows:—

	State forests.	Communal forests, &c.
	c. feet.	c. feet.
Wood	96,051,592	169,275,133
	cwt.	cwt.
Cork	2,300	6,100
Bark for tanning	283,000	463,000
Crude resin	37,800	16,300
Total value	£846,144	£1,321,804
	at 25 fr. = £1	

The average annual production per acre of the wooded area of the forests is as follows:—

	c. feet.	s. d.
State forests	43½	9 5
Communal and other forests... ..	37	5 10

It is evident that the State forests yield more wood, and of a better quality, than the communal forests.

Leaving out the Departments of the Seine and Corrèze, where the production in quantity of material and money is abnormally high, the areas of State forests in these Departments being inconsiderable, the forests of the Vosges head the list with an annual yield of 7.136 c.m. per hectare, equivalent to 101 c. feet per acre, and worth £1 3s. 4d.

This return is exceeded in value, though not in quantity, by the forests of the Doubs, where there is much oak grown as well as silver-fir, and the yield is 5.867 c. metres per hectare = 84 c. feet per acre, and worth £1 7s. 5d. an acre.

The productiveness in different classes of material of the different forests are as follows:—

STATE FORESTS.

Broad-leaved Species.

	Percentage of yield.
Timber { Oak 20 in. in diameter and above	5
{ Do. less diameter	5
{ Other broad-leaved species	6.1
Poles	3.8
Firewood	57.1

Conifers.

Timber { Exceeding 20 in. in diameter... ..	9.4
{ Less than "	5.3
Poles	0.6
Firewood	7.7

The proportions of the yield of broad-leaved and coniferous timber is as follows:—

	Percentage.
Broad-leaved... ..	77
Coniferous	23

It is noted that the broad-leaved species yield 74 per cent. of firewood, while the conifers only yield 33 per cent.

In the communal and other forests the production is as follows:—

	Percentage.
Broad-leaved	81.3
Coniferous	18.7

And the percentage of firewood in the former case is 86 per cent., whilst for the coniferous forests it is 25 per cent. These forests are less productive in timber, and especially in timber exceeding 20 inches in diameter, than the State forests, which accounts for their reduced money return.

If we omit the large sum of £99,300 spent in 1892 on planting-up dangerous mountain sides and regulating the beds of mountain torrents, and £8,400 spent on fixing shifting sands, the cost of maintenance of the whole of the productive forests referred to in 1892 was £397,080, or about 1s. 2d. per acre, which must therefore be deducted from the yield of the forests to determine their net revenues per acre.

The following is a complete statement of the French forest charges for 1892:—

Establishment	£231,800
Forest schools	6,880
Works of improvement in the forests	58,000
Mountain <i>reboisement</i>	99,300
Fixing shifting sands	8,400
Working plans and fellings	16,000
Management of <i>chasses</i> which are not leased	2,000
Taxes	72,400
Law and other charges	10,000
	£504,780

Of this amount £41,268, or about 2d. an acre, is refunded to the State by the communes and public establishments for the management of their property.

W. R. FISHER.

THE PROPERTIES OF LIQUID ETHANE AND PROPANE.

A COMPREHENSIVE study of the properties of these primary hydrocarbons in the liquefied condition has been made by Dr. Hainlen in the laboratory of Prof. Lothar Meyer at Tübingen, and an account of his work will be found in the current issue of *Liebig's Annalen*. Owing to the greater ease with which it undergoes liquefaction, propane was first investigated. The hydrocarbon was obtained in a state of purity by means of the admirable method of preparation discovered in the same laboratory in the year 1883 by Köhnlein, which consists in heating propyl iodide with aluminium chloride in a sealed tube to 130°. After subjection to this temperature for twenty hours the tube was allowed to cool, and subsequently placed in a freezing mixture; while immersed in the latter it was found practicable to open it without danger or loss, the accumulated gas being readily transferred to a gas-holder over water.

In order to determine the boiling-point of propane, the purified gas was first condensed to the liquid state in a U-tube surrounded by solid carbon-dioxide. It was then transferred to the special boiling-point apparatus by evaporation and recondensation, the last traces of impurities being eliminated by this process of repeated distillation. The special apparatus consisted of a glass tube closed at the lower end, furnished with a side tube for the entrance of the gas, and with a stopper at the open end perforated for the passage of an exit-tube and a thermometer. The upper half of the cylinder was surrounded by solid carbon-dioxide, and the lower portion was protected by a mantle of badly-conducting felt. Upon the entrance of