70·5 per cent. The healthy areas are in the open plains, the hyperendemic areas at the foot of the mountains, where shade produced by forest, jungle, long grass, scrub, etc., exists, and (3) the endemic area with intermediate conditions. These data illustrate also the great value of malaria surveys before recommendations based simply on general principles are carried out.

Guinea-worm prevails to the extent of as much as 4 per cent. in some of the Indian jails. In a certain Bombay village over a third of the Cyclops in the village well contained larvæ, but the villagers put all the usual obstacles in the way of improving the well and their health.

Vol. v. contains an extremely interesting method of classification of Anophelines based on the distribution of "spots" on the wings; three main groups, Proto-anopheles, Deuteroanopheles, and Neoanopheles, are easily separated.

The problem of the mode of dissemination of kala-azar is still *sub judice*; the balance of opinion favours the bed-bug as the agent. It has occurred to the writer as a not impossible hypothesis that perhaps this and some other diseases are not insect-man-insect diseases, but insect-man diseases only, *i.e.* the infecting agent is inoculated into man from and by an insect, produces its ill-effects, but is not further transmissible.

As regards the destruction of rats in plague prophylaxis, we have the merits of two methods put forward, viz.: (1) phosphorus, made up in attractive balls containing less than 3 per cent., and (2) hydrocyanic acid gas. This last kills not only rats but fleas, and its only drawback appears to be its very poisonous character. Its detection, however, is an easy matter, viz., by means of a paste which forms with it prussian-blue. The amount requisite is $\frac{1}{2}$–$\frac{3}{4}$ of an ounce of potassium cyanide per 100 cu. ft. It has many advantages over the sulphur dioxide or carbon monoxide methods.

There are many other subjects, such as vital statistics, water filtration, that we have not alluded to, but one would refer those who wish to obtain a general idea of the scope of these important conferences to the summary contained in the *first* volume. We ought to end with a word of congratulation on the splendid work that is being done. J. W. W. S.

ORNITHOLOGICAL NOTES.

IN the February number of *British Birds* Miss M. D. Haviland continues her account of ornithological observations made in the delta of the Yenisei, dealing in this instance with the little stint. So fearless during the nesting season were these birds that it was with difficulty they were kept far enough away from the camera to admit of the taking of a satisfactory photograph; and a brooding cock captured by the author in her hands, when released returned to the young. In six out of eight instances the sitting birds were cocks, but whether both sexes take their share in incubation was not ascertained.

The distribution of birds in Ceylon, in relation to recent geological changes in that island, forms the subject of an article by Mr. W. E. Wait in *Spolia Zeylanica* for December, 1914. (vol. x., part 36). A large proportion of the resident birds, especially in the Kandyan provinces and the wet zone of the low country, are of a Malabar type; but in the north and north-west there is a nearer affinity with those of the Carnatic. Of the peculiar species, the greater number pertain to the Malabar type of the fauna, and have their headquarters in the wet zone, but there are also a few with a Himalayan or Malay *facies*, although none of the Carnatic types. As the theories advanced by the author to explain these peculiarities in distribution are confessedly tentative, quotation seems unnecessary.

In the *Zoologist* for February Miss W. Austen records the appearance of a flock of about thirty long-tailed tits in a garden at Maida Hill on October 1, 1914, an occurrence which the editor believes to be altogether unprecedented.

To the January number of the *Auk*, and likewise to *Blue-Bird* for the same month, Dr. R. W. Shufeldt contributes a note on the last survivor of the American passenger-pigeon, which died in the Cincinnati Zoological Gardens on September 1, 1914, at the age of twenty-nine years. Immediately after death the body, packed in ice, was forwarded to the National Museum at Washington, where the skin was carefully removed for preservation, doubtless in the study series. Before this took place a photograph of the head and neck was taken and coloured with Japanese tints from the specimen; this photograph, after the insertion of an artificial eye, being reproduced in colour in the aforesaid issue of *Blue-Bird*.

R. L.

NOTES ON GLASS.[1]

A CERTAIN amount of experimental work on glass-ware of various kinds has been carried out recently at the National Physical Laboratory, and it may be of interest to make known some of the results.

Chemical investigations have for some years been dependent on German glass; the publication of the analyses and of test results may, it is hoped, lead some English firms to produce articles which may replace those of German manufacture.

The first table gives the analyses of some thermometric and chemical glass-ware.

Analyses of Thermometer and Chemical Glass-ware.

	Thermometer Glasses		Schott and Gen., Jena		Chemical Glassware		
	Jena 59^{III}	Jena 16^{III}	Original	"New"	Resistance "R"	Kavalier's Bohemian	Thüringen
Silica	72·86	66·58	66·74	64·60	68·00	76·02	74·36
Alumina	6·24	3·84	2·77	6·24	2·32	0·64	0·90
Lime...	0·35	7·18	0·28	tr.	4·80	7·38	9·40
Zinc oxide ...	—	6·24	8·28	10·43	2·40	—	—
Manganese oxide	tr.	0·28	0·65	tr.	0·14	tr.	tr.
Ferric oxide ...	tr.	tr.	tr.	tr.	tr.	tr.	tr.
Lead oxide ...	—	—	—	—	—	—	—
Soda (Na_2O) ...	9·82	14·80	8·99	9·71	10·17	7·60	14·83
Potash (K_2O) ...	0·10	tr.	0·08	tr.	1·82	7·70	0·14
Boric anhydride.	10·43	0·91	7·18	8·70	5·53	—	—
Magnesia	0·20	0·17	4·50	0·32	5·04	0·30	0·16
Arsenious oxide.	—	—			0·24		
	100·00	100·00	99·47	100·00	100·46	99·64	99·79
	*	*		*			

Analyses made with an asterisk have been made at the N.P.L. The other analyses are taken from a paper by Walker in the Journal Am. Chem. Soc., xxvii., 865, 1905.

(Bohemian and Thüringen glass is now rarely used in chemical work, but the analyses given are of the best material of that class.)

Resistance of Various Chemical Glass-ware to the Action of Chemical Attack.

The table below, taken from the work of Mylius and Foerster on this subject, gives the action of

[1] From the National Physical Laboratory, February, 1915.

various chemical reagents on glass used for chemical purposes (for analyses, see foregoing table) :—

Beakers.

Type of Glass.	Water. 20°	Water. 80°	H_2SO_4	NaOH	Na_2CO_3
"R" ...	0·0054	0·0144	0	41	23
Jena ...	0·0071	0·0035	0	53	19
Bohemian	0·118	0·219	5	37	49

Flasks.

Type of Glass.	Water. 20°	Water. 80°	H_2SO_4	NaOH	Na_2CO_3
"R" ...	0·0128	0·0128	0	51	26
Jena ...	0·0063	0·0057	0	63	24
Bohemian	0·093	0·255	11	52	70

The figures are in milligrams per sq. dcm.

The solutions, viz. 2N.NaOH and N.H_2SO_4 were allowed to act at 100° for six hours, and 2N.Na_2CO_3 for three hours.

The Jena glass used was probably of the composition given in the first foregoing table under description "Original." This glass is now not used, but has been replaced by the new Jena glass, an analysis of which has been made at the National Physical Laboratory. Soon after the introduction of this new Jena glass by Schott and Gen., viz., in 1910, some tests were made at the National Physical Laboratory. A special feature of the new glass was its increased resistance to attack; this was brought about by long exposure to sulphureous gases. The tests on the glass before and after such treatment are given in the table below. Several kinds of vessels were tested, and the results for all were substantially the same.

Tests made at the N.P.L. in 1910 on "New" Jena Glass.

Mark: (1) Vessels had received no annealing.
(2) Vessels had received ordinary annealing.
(3) Vessels had received special annealing in sulphureous gases for thirty-six hours.

Beakers.	Milligms. Na_2O per sq. dcm. given up to water at 20°C. in 1 week.	Milligms. Na_2O per sq. dcm. given up to water at 80°C. in 3 hours.
1 ...	0·0022 ...	0·0045
2 ...	0·0032 ...	0·0047
3 ...	0·0019 ...	0·0040

In the following table the figures give the loss in weight in milligms. per sq. dcm. after the treatment stated.

Beakers.	3 hours with 2N NaOH at 100°C.	3 hours with 2N Na_2CO_3 at 100°C.	6 hours with N H_2SO_4 at 100°C.
1 ...	51 ...	9 ...	nil.
2 ...	51 ...	8 ...	nil.
3 ...	55 ...	7 ...	nil.
Conical Flasks			
1 ...	63 ...	8 ...	nil.
2 ...	60 ...	11 ...	nil.
3 ...	71 ...	10 ...	nil.
Flat-bottomed Flasks			
1 ...	62 ...	8 ...	nil.
2 ...	71 ...	8 ...	nil.
3 ...	79 ...	6 ...	nil.

There was a small improvement as regards resistance to the attack of water, but no improvement to the attack of alkalies. Since its introduction this type of glass-ware has been used in the National Physical Laboratory and has given every satisfaction.

It is well known that alkaline fluids attack glass very markedly, and for that reason in chemical analyses prolonged contact is avoided. To do this is not always possible, *e.g.* in the estimation of zinc and manganese, especially in silicate analyses. It is necessary in the estimation of these metals to employ solutions containing alkaline chlorides and ammonium sulphide, and to allow the solutions to stand at a rather high temperature (50–60° C.) for sometimes as long as twelve hours. In these circumstances the glass is invariably attacked, and although no quantitative experiments have been made with the Jena glass, the resistance to the attack of these solutions is certainly not as good as with the alkaline solutions in the absence of chlorides and sulphides. In view of the fact that glass flasks have to be used for this purpose, it seems desirable to devise a test, in addition to the tests usually carried out, to determine the ability to withstand the joint action of alkaline chlorides and sulphides.

The new Jena glass examined at the National Physical Laboratory in 1910 possessed in a very high degree the ability to withstand sudden change of temperature. A glass flask filled with molten paraffin wax at a temperature of 250° C. broke when placed suddenly in water at 15° C., but only after successfully standing such a test at slightly lower temperatures.

Another question which is engaging attention is glass for miners' lamps, incandescent chimneys, steam gauge tubes, and other purposes in which a gradient of temperature is established between the inside and outside.

Analyses of some of these glasses are given in the following table :—

Analyses of Lamp Glasses.

	Jena Incandescent Gas (Schott & Gen.) Best Quality.	Miner's Lamp Glass. German Make. Mark A [1] B.	Miners' French Lamp Glass (Yellow).	Miners' French Lamp Glass (Colourless).	Austrian Lamp Glass "Sun Brand."
Silica...	73·88	74·28	51·26	54·92	76·78
Alumina	2·24	3·24	6·90	1·28	0·72
Lime...	tr.	tr.	tr.	tr.	6·52
Zinc oxide ...	tr.	tr.	7·16	0·82	—
Manganese oxide	tr.	tr.	tr.	tr.	tr.
Ferric oxide ...	tr.	tr.	tr.	tr.	tr.
Lead oxide ...	—	—	27·54	34·93	—
Soda (Na_2O) ...	6·67	6·73	tr.	2·08	11·14
Potash (K_2O) ...	tr.	tr.	2·67	4·54	4·74
Boric anhydride.	16·48	15·02	3·97	—	—
Magnesia	tr.	tr.	tr.	0·20	0·24
Arsenious oxide.	0·73	0·73	—	0·99	—
Antimony oxide.	—	—	0·50	—	—
	100·00	100·00	100·00	99·76	100·14

It appeared, however, from Hovestadt's book on glass, and other information, that the additional strength of the German glass was conferred on it in great measure by its heat treatment, and tests were made to investigate the state of strain in the glass.

For this purpose the following glasses were examined :—

(1) A miner's lamp chimney of white glass of German manufacture.

(2) A miner's lamp chimney of yellow glass of French manufacture.

(3) A piece of "Durax" tubing as used for chemical purposes.

From each of these tubes two rings of about 1 cm. depth were prepared by making transverse cuts across the tubes; the plane surfaces of the rings were optically polished. One ring of each specimen had a piece cut out so that the ring was free to spring. Other

pieces were prepared for the determination of the refractive properties of the glasses.

The three open and three complete rings were examined in plane polarised light for strain. The examination showed that in both rings of the French glass, and in the open ring from the German lamp chimney, the amount of strain was negligible. In the unbroken ring from the German chimney there was very decided strain. Strain was also present in both rings of the "Durax" glass, the unbroken ring of this material showing much more pronounced strain than any of the other rings. The appearance presented by the rings when examined in the dark field is a very strong and sharp black circular line in the middle of the glass with a decided black cross upon it, and the rest of the ring either white or milky.

The character of the strain present in the unbroken ring from the German chimney was determined by distorting the ring into an elliptical form by compression between two points at opposite ends of a diameter of the ring inclined at 45° to the plane of polarisation. By this means the milkiness could be made to disappear entirely from the regions about the diametrical plane perpendicular to the line of compression, but the strain in the neighbourhood of the points of compression was increased. This shows that the strain is relieved by an increase in the curvature, and augmented by a reduction in the curvature; in other words, the inner layers of the ring are in a state of tension, and the outer layers in a state of compression. The fact that in the open ring the strain throughout is practically entirely relieved suggests that these chimneys are made in one operation, and not by the combination of layers of material at different temperatures. It is evident that with the distribution of strain in the cold state indicated above, the chimney will tend to be relieved of strain when there is a radial temperature gradient throughout its substance with the outer surface cooler than the inner surface.

With the "Durax" tubing there is in neither ring freedom from strain. In the open ring the strain becomes worse on altering the curvature in either direction. Perhaps this indicates that the tube is built up of layers of the same or different materials, but brought together with one layer decidedly cooler than another. The presence of a thin white band in the substance of the glass may also indicate that the tube has been built up in the way suggested. An examination of all the rings in ordinary light showed the presence of striæ likely to prevent the formation of really sharp spectrum lines in the determination of their refractive properties. This expectation was fully borne out by the appearance of the lines in the refractometer. No indication was obtained that any tube consisted of more than one type of glass, but the want of sharpness in the lines was sufficient to obscure the difference between glasses of very nearly identical optical properties. The results obtained in these measurements are as follows:—

	n_D	$n_C - n_F$	ν
German chimney ...	1·4795	0·00729	65·8
French chimney ...	1·5748	0·01313	43·8
"Durax" combustion tubing	1·5156	—	—

The *optical* glasses which resemble the above in refractive properties are, for the German chimney one of the new "Fluor Crowns," for the French chimney a light flint, and for the "Durax" tubing a hard crown.

Experiments were made to determine possible variations in the strained condition of lamp chimneys due to internal heating and resulting temperature gradient across the glass.

Coils of wire were wound round a cylindrical metal core, the whole enclosed in asbestos paper and fitted closely (without mechanical strain) into the ring of the chimney examined. A thermo-couple was introduced between the lagging and the glass to enable the temperature of the latter to be determined on the passage of a current through the heating coil.

French Chimney.—This was initially when cool without strain. On heating up strain was found to develop progressively as the temperature rose, and there is no evidence that at any temperature the strain declines to a minimum again.

German Chimney.—When cool and at uniform temperature this showed very decided strain in the shape of a central ring and cross. On heating up the ring the strain was relieved, but the glass is never *entirely* freed from the strain as evidenced by a complete absence of the stauroscopic figure. The tendency is rather for the central dark ring to move outwards and to be replaced eventually by another ring moving out from the inner surface of the glass ring. There is nevertheless a decided minimum effect, *i.e.* minimum strain, obtained when the temperature of the inner surface of the glass ring is about 150° C. (±20°). The temperature gradient across the glass is such that in the steady state the temperature of the outer surface of the lamp, corresponding with the above internal temperature, is roughly 70°, within the same limits of accuracy. Excessive heating above these limits results merely in producing a more pronounced strain.

A further chemical analysis of the inner layers confirmed the view that the German miner's lamp chimney is of a single material.

The incandescent lamp chimneys are very thin and optical examination is not possible, but it appears fairly certain that in their case also the extra strength is attained by some process whereby the outside is chilled before the interior cools down. It seems possible also that the extra heat-resisting qualities of certain beakers, flasks, etc., of German glass may be due to the converse process, the interior being chilled previously to the exterior. All these glasses appear to be of the borosilicate type, such as is used for the well-known thermometer glass 59^{III}, but with somewhat more boric anhydride; the chemical glass contains zinc oxide, which is absent from the thermometer glass.

As already stated, the object of these notes is to put such information as is available before English manufacturers in the hopes of encouraging some of them to take up the manufacture of some of these glasses.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

DR. R. TRAVERS SMITH has been appointed to the chair of materia medica, therapeutics, and pharmacology in the school of surgery of the Royal College of Surgeons in Ireland.

THE will of the late Mr. W. E. Allen, chairman of Messrs. Edgar Allen and Co., Ltd., of the Imperial Steel Works, Sheffield, who died in Jnuary last, provides that two-fifths of the residue of his property after the payment of numerous bequests to charities and employees, shall be given to the University of Sheffield, to be applied as to 5000*l.* to the Applied Science Department, and as to the balance, in the discretion of the University Council, in founding Edgar Allen scholarships or exhibitions for students of that University, of whom one-half shall be sons of workmen earning daily or weekly wages or foremen of workmen or managers. The gross value of the