

MINERAL PRODUCTION OF CANADA.

THE preliminary report on the mineral production of Canada during the year 1915 has just been issued by the Canadian Department of Mines, and it is satisfactory to find that upon the whole the output shows a marked improvement upon the previous year. Amongst the metals the only decrease to be noted is in the production of silver, which amounted to 28,401,735 ounces, as against 28,449,821 ounces in 1914, so that the decrease is quite insignificant, and is less than the decrease in 1914 below 1913; it will be found that Canada contributes just about 13 per cent. of the world's total silver production. The gold output for 1915 was 916,076 ounces, as against 773,186 ounces in 1914; it may be noted that only about one-third of the gold production now comes from alluvial, and that although the production is less than it was when it was mainly derived from the easily-won alluvials of the Klondyke, the output is now increasing steadily. The copper output for 1915 is more than 102½ millions of pounds, constituting a record for Canada, and showing an increase of 35 per cent. as compared with the previous year.

Nickel is not being smelted in Canada on any scale worth mentioning, the bulk of the Canadian nickel production being exported to the United States and to Great Britain in the form of matte; the estimated quantity of nickel was 68 millions of pounds, again constituting a record, and being an increase of 50 per cent. on 1914. Seeing that Canada is the world's chief producer of nickel, it is a matter for regret that Canadian nickel refineries have not yet been established, and it is to be hoped that the Commission appointed last year to investigate this matter may find some effective means of rendering Canada independent in this respect.

The production of pig-iron in 1915 was 913,717 tons, an increase of 16½ per cent. above that of 1914, whilst the total steel output amounted to 1,020,335 tons, an increase of 23 per cent.; it is interesting to note that this item includes 5626 tons of steel produced in electric furnaces. Of the non-metallic products, by far the most important is coal, of which the output, 13,209,371 tons, shows a small decrease, namely, about 3 per cent., below that of the previous year. It may be added that the decrease in Portland cement and other structural materials, which was so marked a feature of the 1914 returns, has continued in 1915. Whilst all the above returns are stated as provisional, it is very rare that the final returns, when completed, differ in any important respects from those given in the preliminary reports.

NEW ASPECTS IN THE STUDY OF JUNGLE LIFE.

A VERY realistic description of the abundance and variety of animal life in the tropics is given by Mr. C. W. Beebe in *Zoologia*, vol. ii., published by the Zoological Society of New York. Mr. Beebe has had a wide experience of jungle-life in many lands, and hence his latest experiences in Brazil have the greater value, though his stay there was confined to a few days in the neighbourhood of Para. Abundance of species and a relative fewness of individuals, he remarks, are pronounced characteristics of any tropical fauna. This was abundantly confirmed during the trip now under discussion. He quickly discovered that more was to be obtained by watching particular trees which afforded special attractions in the form of vividly coloured fruit than in aimless wandering.

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From one such tree during the space of a week of intermittent watching he obtained no fewer than seventy-six species. His notes were not confined to birds.

Some of Mr. Beebe's most interesting observations are indeed those which relate to arachnids, insects, and the great land-snail, *Strophocheilus*, which was apparently eagerly sought by kites. His notes on *Acrosoma spinosa*, an exceedingly spiny, gaudy spider, the lurking place of which was in the centre of its web near the ground, will probably provide material for controversy as to the value of "warning coloration." "Its scarlet, yellow, and black coloration," he remarks, "seemed to indicate an unsavoury mouthful, and it was correspondingly slow to take alarm." But as it "hung upside down the brilliant colours of the upper side of the body [were] . . . completely hidden. When the creature was alarmed it dropped to the ground. . . . The moment it touched land it slipped under a leaf. . . . When caught in the hand it at once turned upon its back and feigned death." Thus no use whatever seems to be made of the "warning coloration"; on the contrary, the utmost care seems to be taken to conceal these tokens of inedibility. A "protectively coloured" species, *Epeira audax*, lived much more closely up to its traditional behaviour. When alarmed it would leave its web and seek safety by clinging to "mossy or lichened bark," with which its coloration harmonised so completely that "the eye had to search carefully to rediscover it each time it sprinted to safety."

Just before leaving a brilliant idea struck Mr. Beebe, and one which it is to be hoped will henceforth be followed, wherever possible, by all who visit the forests of the tropics. Filled with regret at leaving the scene of so many wonders, he suddenly bethought him to fill a bag with four square feet of jungle earth, and this was examined minutely with a lens while on board ship on the voyage home. For days and days the search went on, the captures being sorted out and placed in spirit. An amazing wealth of life was thus obtained, remarkable for its variety of form and coloration. The latter aspect again raises interesting problems concerning the precise significance of coloration. Among the captures thus made were representatives of two genera of ants new to science. There can be no doubt that important discoveries in regard to the animal life of jungle earth would accrue if this example of Mr. Beebe's were generally followed in the future. W. P. P.

EYESIGHT AND THE WAR.¹

(1) *The Army Sight Test.*

AS the subject of refraction is our text this evening it is only meet that we should remember the enormous debt we owe to Donders, the great Dutch ophthalmologist, the centenary of whose birth will be celebrated in Holland as soon as the war is over.

One of the subjects that Donders threw light upon was myopia, or short-sight. In his classical work on refraction, published in 1864, he showed that the myopic eye was the over-developed eye, the too long eye, contrasted with the under-developed, the hypermetropic, or too short, eye.

Now myopia has been the *bête noire* of the War Office for very many years—thousands of young men, otherwise eligible, have been rejected for the Army because of myopia. The myope is useless without his

¹ Abstract of a Friday evening discourse at the Royal Institution delivered on June 9, by Dr. Ernest Clarke.

glasses, and the War Office has, up to the present, set its face against the wearing of glasses. The reasons which existed formerly, although, of course, quite inadequate now, were that we had a very small Army, and a sufficiency of officers and men could always be counted on, besides which, this small Army was mostly employed abroad, and then chiefly in the tropics, and lost or broken spectacles could not easily be replaced.

Not only must a myope wear glasses for distance, but he must wear them for near work—that is, *always*. It was the old treatment of wearing them for distance *only* (because he could see so well without them for near work) that we now know was the cause of the increase of the myopia, an increase which sometimes led to complete blindness.

When a myope does any near work without glasses he converges unduly; this means excessive pull on the internal recti muscles, which in their turn pull on the tunics of the eye, which leads to the eyes lengthening antero-posteriorly, which means that the eye becomes more short-sighted. This increase of myopia again causes more convergence, and so a vicious circle is produced.

(Lantern slides were here exhibited showing the harmful changes produced in high myopia, viz. atrophy of the choroid and retina, hæmorrhages at the macula, and retinal detachment.)

If the eyes are thoroughly tested under atropine or homatropine and the full correction given to be worn *always* they are thus made normal, undue convergence ceases, as the work can be held further from the eyes, and the ciliary muscle is made to work normally, and the progress of the myopia is stayed. Out of 532 myopes watched by me over a period of five years, all of whom were fully corrected, only *four* progressed to any appreciable extent.

In the Army we can get rid of the difficulty of replacing lost or broken glasses by having an oculist and one or more working opticians attached to every "centre" with a register of the glasses worn in that centre, and once we have this as part of the Army equipment we can replace an effete sight test, which judges only the uncorrected vision, by the Continental plan of estimating the value of a man's vision when corrected.

By the accompanying table we see that the highest amount of myopia we allow is about 2.5 D., whereas abroad 6 or 7 D. pass easily.

A strong argument showing the inadequacy of our present system is that men will pass in easily who, from the visual point of view, may be far worse than those rejected. A high hypermetrope, for instance, at twenty, will pass the present test easily, but some years later he has to use up the whole of his accommodative power in correcting his distant vision, and later still he even loses the power of correcting this, and so he must have glasses for distant and near vision, whereas the myope of 5 or 6 D., or more, will be able to read without glasses when he is a hundred years old!

It is true that at present a portion of the scheme suggested above is being adopted, but we want to see it in its entirety and for all time, and that in future the wearing of glasses will never be considered a disability in the Army.

Although myopia is the chief visual cause that keeps men out of the Army, high hypermetropia and astigmatism also do so, and the majority of cases can be made absolutely normal with suitable glasses.

(2) *Eyestrain.*

We now pass to the important subject of *eyestrain* as it affects our soldiers.

There are three chief causes of eyestrain:—(1) Low errors of astigmatism; (2) low anisometropia; (3) small want of balance in the external muscles of the eye.

(1) *Astigmatism.*—Large errors take care of themselves. The craving for distinct vision leads the possessor to have the error properly corrected, but he is generally totally unconscious of the presence of a small error, as the ciliary muscle, by producing an astigmatism of the lens—the inverse of that of the cornea—corrects it with the result that his vision is so perfect that he is quite annoyed with the physician he is consulting for some functional nerve trouble, if he suggests that the eyes are at fault. It should be remembered that there is not a single *functional* nerve trouble that may not be caused by eyestrain. The great prevalence of astigmatism is shown in the

Table showing the Visual Standards for Recruits in the Chief European Armies. (Paterson and Traquair.)

	Amount of short-sight (myopia) allowed.		Standard of corrected vision.		Remarks.
	Combatants.	Non-combatants.	Combatants.	Non-combatants.	
GERMANY	6.5 D. For Landsturm no limit if standard of corrected vision attained.	—	1/2 in better eye. Other eye may have minimal vision. For Landsturm vision = 1/4. If one eye has vision = 1/2 the other may be blind.	—	Vision with glasses (corrected vision) counts.
AUSTRIA	6 D.	Above 6 D. no limit if standard of corrected vision is attained.	Group 1, 1/2 in each eye. Group 2, 1/2 in one; 1/4 in other.	1/4 in one; 1/10 in the other.	Vision with glasses counts.
FRANCE	7 D.	Above 7 D. no limit if standard of corrected vision is attained.	1/2 in one eye; 1/20 in the other.	1/4 in one eye; 1/20 in the other.	Vision with glasses counts.
ITALY	7 D.	—	1/3 in each eye, or 1/12 in one eye if the other has 1/12 (full vision).	—	Vision with glasses counts.
GREAT BRITAIN	No amount specified, but according to vision required highest amount possible is about 2.5 D.	No amount specified, but according to vision required highest amount possible is about 2.5 D. in better eye and 3.5 D. in worse eye.	No correction allowed for general service. Uncorrected vision must be 1/4 in each eye, or 1/4 in the right eye with 1/10 in the left.	Uncorrected vision must be 1/4 in better eye, 1/10 in worse eye. The better eye may be the left.	Vision without glasses counts. For home service, garrison service, and garrison service abroad glasses are allowed within unspecified limits.

accompanying table, where, out of 5000 eyes, 4303 were found by me to be astigmatic:—

2500 individuals whose sight after correction was normal and who had no disease of the eyes.	1. Same refraction in both eyes. (657)	a Emmetropia (see Presbyopia below) ...	9
		b Hypermetropia ...	63
		c Myopia ..	22
		d Astigmatism	
	2. Refraction different in the two eyes (Anisometropia) ...	Hypermetropic	438
		Myopic ...	113
		Mixed ...	12
			1843
			2500
	5000 eyes (as above) ...	Emmetropia ...	56
Hypermetropia ...		425	
Myopia ...		210	
Astigmatism ...		4303	
		5000	

Of the 2500 individuals 961 were presbyopic, and only 9 of these were emmetropic.

(2) *Low Anisometropia.*—When the difference between the two eyes is small, impulses can pass from the brain to one ciliary muscle to correct this defect. In the above table, out of 2500 individuals, no fewer than 1843 had “odd” vision.

(3) *Want of Balance between the External Muscles.*—When small in amount impulses can pass to one muscle to preserve the balance and so avoid diplopia.

In all these instances of eyestrain this extra work means an enormous unnecessary waste of nerve energy going on all the waking hours, and it becomes imperative to stop this waste in all cases where a large amount of nerve energy has already been lost, which occurs from the effects of *high explosives* on our soldiers.

At the time of the explosion the “wind pressure” is so great that I have recorded a case² where, without being hit by any foreign body, an eye was completely destroyed through detachment of the retina by wind pressure. This wind pressure is followed by a high vacuum, which may be so great that in one case I saw at the King George Hospital the eye had been evulsed. Such effects show how the soldier’s nervous system can suffer. Nerve energy is lost—as after a bad railway collision—“virtue” is knocked out, and it becomes imperative to conserve all the energy that is left, and we must therefore remove the eyestrain if it is present. At the King George Hospital our resident ophthalmic medical officer, Dr. Harwood, is keenly alive to the ill-effects of eyestrain, and almost miraculous have been some of the cures by simply putting the invalid into glasses. The neurasthenia following head injuries can often be cured in the same way, and we had one very marked case as an example of this. The man, aged thirty-eight, was hit on the head while lying in his dug-out at Gallipoli by a wet sand-bag falling 8 ft. He was not rendered unconscious, but could not stand or walk. After about six weeks he was admitted into the King George Hospital. His symptoms all the time had been inability to stand or walk, constant headache and giddiness, inability to read or even look at the light, with rather sluggish memory and mental faculties—no treatment had succeeded. Dr. Harwood put the eyes under atropine, when there was an immediate improvement. He was given glasses correcting 0.25 astigmatism in one eye and 0.37 in the other. Within a few hours of getting the glasses he was reading, and within a week he could stand and walk, and his headache and giddiness had disappeared.

² *Medical Press and Circular*, December 29, 1915.

In many cases where wounds had remained sluggish, the nerve energy required for the healing processes being used up by eyestrain, a suitable pair of glasses immediately proved a remedy.

When there is a want of muscle equilibrium the correction of the astigmatism generally removes it, and in bad cases of head injuries, when testing the patient was impossible, Dr. Harwood has obtained excellent results by simply bandaging up one eye. The testing has to be very carefully done, always under a cycloplegic, and the ophthalmometer is a most invaluable instrument for estimating the astigmatism, even 0.12 D. being recorded.

(The ophthalmometer and its working were here explained.)

(3) *Presbyopia.*

We have been reviewing the effects of the war on combatants; we now turn to the effects produced on those of us who are disqualified by age to take an active part.

We have been considering defects of the eyes due

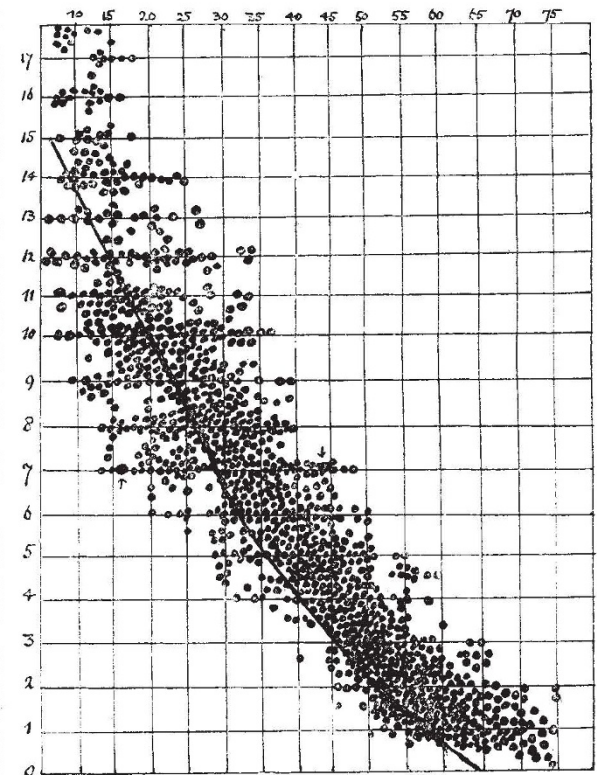


FIG. 1.—Variation of accommodative power with age. 1200 cases.

to their shape, and have seen how prevalent these defects are; yet some eyes (it is true very few) are normal. Now there is a defect that attacks *all* eyes if the individual lives long enough, viz. presbyopia, or old sight. It may not be manifest, and the individual may be quite unconscious of it, but nevertheless no eye, after about the age of forty-five, escapes it. It is a senile change, and is, as Donders observed, no more a disease than is grey hair.

At the beginning of life the crystalline lens is nothing more than a little bag of semi-fluid jelly. By making the lens thicker we can focus for near objects. This is done by the ciliary muscle, and chiefly by that portion of the muscle which surrounds the lens and acts like a sphincter. Tscherning’s theory of the accommodation which states that the lens is squeezed

by the circular portion of the ciliary muscle and made to bulge in the centre explains all the clinical phenomena, which the old theory (Helmholtz's) failed to do. The aberration which the central bulging would cause at the margin of the lens is masked by the contraction of the pupil, which always accompanies normal accommodation; thus the accommodative power depends rather on the "squeezability" of the lens than the power of the muscle. Now this "squeezability" of the lens becomes less as the lens tissue becomes firmer. I have known in a young child the accommodative power to be as much as 20 D., whereas it is rare to find anyone above forty-five with an accommodative power higher than 4 or 5 D. Donders gave us a diagram showing the gradual loss of accommodative power through age, *i.e.* through the sclerosing of the lens, but he only examined 150 cases, and included in these some latent hypermetropes, so that he reckoned the accommodative power per age lower than it really is.

The diagram (Fig. 1) was prepared by me from 1200 cases, all of which were first made normal by correcting their defects. Donders's *mean* line is marked, and it is seen that it coincides practically with my minimum line from the age of thirty. From my table the presbyopic point may be said to be arrived at between ages forty-five and forty-eight; in other words, the emmetrope, or those made emmetropic by correction, must at that age have increased help for near work.

Age	Minimum	Mean	Maximum
7-10	9	14	18
10-15	7	12	18
20	6	10	14
25	5.5	9	13.5
30	4.5	7.5	12
35	4	6.5	10
40	2.5	5.5	8.5
45	2	4	7
50	1	3	6
55	0.75	2	5
60	0.50	1.75	4
65	0.50	1.5	3
70	0.00	1	2

In the above table made from my diagrams there is seen to be a great difference between the maximum and minimum. What is the cause of this difference? If a person has more accommodative power than the average it means that he is younger than his years, and if less, older.

Among the many causes of premature senility, which a lessened accommodative power implies, the following are the chief:—

(1) *Alimentary Toxaemia*.—As amply shown by Sir William Arbuthnot Lane. In these cases I have found the lens to be a very delicate index.

(2) *Eyestrain*.

(3) *Worry, Anxiety, Sorrow, and Overwork*.—This war has hastened the onset of presbyopia, and increased it rapidly in those already presbyopic, throughout England, and probably throughout Europe. The only preventive treatment is peace, but until that comes we should conserve all the nervous energy we have and not waste it.

Intestinal toxæmia should be removed by the surgeon or physician. Eyestrain should be prevented; if there is any defect besides the presbyopia (and it must be remembered that simple presbyopia is very uncommon, only about 1 per cent. of presbyopes) it must be corrected, and the invisible bifocal glasses, which correct the distant vision in the upper portion and the reading in the lower, give the best result. If two

separate glasses are worn they are not changed when they should be. The presbyopic period is just that time of life when it is most important to conserve all possible nerve energy. Responsibilities, worries, and anxieties are probably at their maximum, and we have not yet reached the callousness of old age!

Finally, for our own sakes and also for those around us, we should not make the most of our troubles; we should not go out to meet them, nor let "to-day's strength bear to-morrow's loads."

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE Board of Education has issued a circular (961) stating that with a few alterations the Regulations for Technical Schools, etc., in England and Wales (Cd. 7996) will continue in force for the school year 1916-17. The special regulations for grants in aid of instruction for men serving with the colours are withdrawn, as it appears from the returns of the work done during the past winter that there is now little demand in camp for classes of an educational character.

THE Weardale Lead Company is establishing two mining scholarships, each of the annual value of 60*l.*, in connection respectively with the Royal School of Mines and Armstrong College, Newcastle-upon-Tyne, with the object of combining university training with a year's practical work calculated to advance a student in the knowledge of mining engineering. The scholarships are to be known as the "Richardson" and the "Cameron," after two directors of the company.

THE first award of the annual prize of 40*l.* founded by the Earl of Cromer, and administered by the British Academy, for the best essay on any subject connected with the language, history, art, literature, or philosophy of ancient Greece, will be made before the end of 1917. The competition is open to all British subjects under the age of twenty-six years on October 1, 1917. Intending competitors must send the title of their proposed essay to the Secretary of the British Academy, Burlington House, Piccadilly, on or before December 1, 1916. The essays on approved subjects must reach the Academy by, at latest, October 1, 1917.

THE current issue of the *Reading University College Review* is concerned almost exclusively with the affairs of the college. It includes the sixth revised list of present members of the staff, past and present students, and present servants of the college who are serving with the Forces or in the French Army. The numerous notes which begin the review serve as an excellent record of the various developments in the activities of the college. Among these, the extension of domestic training may be mentioned. A scheme has been sanctioned for a diploma course in domestic subjects extending over two years, and for a certificate course extending over one year. The aim of these courses is to train girls of good secondary education to manage an institution, household, or home with practical efficiency and intelligence. Instruction in poultry-keeping has been inaugurated, and the work of the department of horticulture is being extended.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, August 14.—M. Paul Appell in the chair.—C. Richet: The conditions which influence the average monthly deviation of the birth-rate. In countries with a high birth-rate (more than 350 per 10,000) the mean monthly deviation of the birth-rate