

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

Coloured covers/
Couverture de couleur

Coloured pages/
Pages de couleur

Covers damaged/
Couverture endommagée

Pages damaged/
Pages endommagées

Covers restored and/or laminated/
Couverture restaurée et/ou pelliculée

Pages restored and/or laminated/
Pages restaurées et/ou pelliculées

Cover title missing/
Le titre de couverture manque

Pages discoloured, stained or foxed/
Pages décolorées, tachetées ou piquées

Coloured maps/
Cartes géographiques en couleur

Pages detached/
Pages détachées

Coloured ink (i.e. other than blue or black)/
Encre de couleur (i.e. autre que bleue ou noire)

Showthrough/
Transparence

Coloured plates and/or illustrations/
Planches et/ou illustrations en couleur

Quality of print varies/
Qualité inégale de l'impression

Bound with other material/
Relié avec d'autres documents

Continuous pagination/
Pagination continue

Tight binding may cause shadows or distortion along interior margin/
La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure

Includes index(es)/
Comprend un (des) index

Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/
Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

Title on header taken from:/
Le titre de l'en-tête provient:

Title page of issue/
Page de titre de la livraison

Caption of issue/
Titre de départ de la livraison

Masthead/
Générique (périodiques) de la livraison

Additional comments:/
Commentaires supplémentaires:

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

| | | | | | | | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 10X | 12X | 14X | 16X | 18X | 20X | 22X | 24X | 26X | 28X | 30X | 32X |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

THE CANADA EDUCATIONAL MONTHLY AND SCHOOL MAGAZINE.

JUNE-JULY, 1895.

LITERATURE AND ART.

BY PROFESSOR WM. CLARK, M.A., D.C.L.

(Continued from last issue.)

IF, finally, we are asked concerning the literature of the modern languages, we have to remark, in the first place, that they were now only struggling into existence; and further that, towards the end of this century, there was born one who was to tower aloft like a beacon light among the sons of men, holding in his hand all the thought—theological and philosophical—of his age, and embodying this thought in poetry of such splendor and magnificence that he must stand for ever in the front rank of writers, beside Shakespeare and Homer. The 13th Century could have had only an honourable place in the history of literature if it had done no more than to give to the world the great personality of Dante.

Have we satisfied ourselves that the 13th century was one of the greatest in thought, in speech, and in action? What, then, shall we say of it in regard to art? The answer is difficult since there is so much to say. But one thing at least may be said without hesitation. In architecture this century was supreme—no forms of building can even be imagined more lovely, more moving, than those which prevailed from the middle

of the 13th century to the beginning of the 14th (when those styles were in vogue which we call the early pointed or early English), and the transition from this to the decorated.

Whether the pointed arch came from the Saracens, as some have thought, or whether it came from the intersection of the circular Norman arches, it possesses a charm, uniting beauty with strength, which neither the round arch nor the lintel can claim. Magnificent as the Norman often is, it is heavy and unwieldy in comparison with the light and soaring arches of the pointed architecture, which seem to direct the soul upwards, and teach us to soar heavenwards. Nor is it merely the form of the arch, but the decoration of the capitals, the exquisite carvings of doorways and windows; and on the continent of Europe, and to some extent in England, as in Westminster Abbey, and in the Seven Sisters' window at York, the rose windows over the portals and in the gables, seem to beckon us away from the turmoil of the world to the abode of peace.

To describe these buildings is impossible—to recall them is to awaken the thrill of delight which they aroused

within us, when first we stood under their soaring vaults or paced their long drawn aisles. Who can escape the charm of that perfect choir of Westminster Abbey, which even dominated the spirit of the builder of the nave, and forbid him to think his own thoughts or go his own ways." Or, again, let us think of the angel choir of Lincoln, or the Lady Chapel at York, or the Chapel of the Nine Altars at Durham, or, again, the exquisite choir at Ely—a cathedral to which, indeed, we may have recourse for examples of the best types in almost every period of English architecture. And we are but beginning. There are windows like those of Merton College Chapel in Oxford, and porches and chapels and arches and doorways, all over England, any one of which might afford occasion for a day's meditation and study.

England alone might well suffice to prove the greatness of this period in architecture; yet there are those who unhesitatingly declare that, in this respect, she must own the superiority of France. For if, because of the immense height of their interiors, the French Churches seldom present so striking an external appearance—through the comparative lowness of the towers, it must be confessed that in their portals they are beyond measure superior, and that the internal effect of their lofty pillars and arches and vaulted roofs rising to a height half as great again as the loftiest Gothic building in England, Westminster Abbey, is sometimes almost overwhelming. Westminster Abbey is 100 feet high, the nave of Amiens is more than 150, so is the choir of Beauvais, so is the nave of Cologne in Germany. Some Frenchman has remarked that from the nave of Amiens, the Choir of Beauvais, the towers of Chartres, and the portals of Reims, a cathedral absolutely perfect and glorious could be composed; and few who have looked

upon those transcendent productions of human genius will venture to dispute the dictum. The greatest part of such a building would belong to the 13th century. Of that period is the nave of Amiens and the choir of Beauvais. One of the spires of Chartres is a little earlier; and the portals of Reims are somewhat later, but they are instinct with the same spirit. To this century also belongs the mighty minster of Cologne, where man, if anywhere, feels his littleness and insignificance. May we not be thankful for the reflection that, if it was given to the thirteenth century to begin this glorious shrine, it has been the privilege of the nineteenth to complete it?

Out of the artistic spirit thus fostered in architecture sprang the no less splendid and elevating art of *Painting*. Among the leaders in this great art a first place must be assigned to Cimabue, who died in the last year of this century, whose great Madonna was borne in solemn procession by the people to the Church of Santa Maria Novella, which it was destined to adorn. After him comes Giotto, the pupil of Cimabue and the friend of Dante, whose paintings in the Arena chapel at Padua and in the city of Florence are not likely to be forgotten by any one who has ever seen them. To the school of Giotto, the school of Florence, belonged Fra Angelico, who is said to have painted as he prayed, Leonardo de Vinci, Frá Bartolommeo, and others. To the other Italian schools,—the Venetian, which came to its great flowering period in Titian; the Umbrian, culminating in Raffaele; and to the German, represented by Albert Dürer and Hans Holbein,—we can make only this passing reference.

But a few words should be said in illustration of our theme, the connexion of thought and art, in reference to the great outburst of the artistic spirit in Italy towards the close of the 15th century.

Perhaps we may say, there was something in the spirit of the age which may account for the decay of architecture and the marvellous progress in painting which alike distinguish this period. Of the facts themselves there can be no question. Without doing more than merely indicating this very interesting problem, we may at least point out that the age of the greatest Italian painters was a period of unusual intellectual and religious excitement. It was the period alike of the Reformation and the Renaissance—two movements having this in common, that they were both revolts from the dominating authority of the time—the one claiming absolute liberty of thought and action and the right to return to nature, the other claiming liberty to go back to the Bible and the earlier sources of religious truth and doctrine; yet differing very widely in another respect, that the one clung to the supernatural, the divine, whilst the other was satisfied with the world and nature. However this may be, these were two potent influences over human thought and life at that period; and it is perhaps enough that we should recommend the following up of the suggestions here offered, to those who may be interested in these inquiries. Along with this should certainly come the study of the Græco-Roman architecture of the Renaissance, a subject on which it is hardly too much to say that the artistic world is widely and sometimes violently divided.

It is with some regret that I have been forced to almost ignore the subject of music—certainly the most divine of all the arts. But something may be said on this subject in connexion with an age which is supposed to be the least artistic in modern history—I mean the 18th Century.

Mr. Frederic Harrison has taken up the defence of this, in his judgment, much maligned period, and I

will content myself with quoting some passages from his article (*Nineteenth Century*, March, 1883). He remarks:

“A century which opens with the ‘Rape of the Lock,’ and closes with the first part of ‘Faust’ is hardly a century of mere prose, especially if we throw in Gray, Cowper, and Burns, the ‘Ancient Mariner’ and the ‘Lyrical Ballads.’ A century which includes twenty years of the life of Newton, twenty-three of Wren’s, and sixteen of Leibnitz, and the whole lives of Hume, Kant, Adam Smith, Gibbon, and Priestley, is not the age of mere shallowness; nor is the century which founded the monarchy of Prussia and the Empire of Britain, which gave birth to the Republic in America, and then in France, and which finally recast modern society and formed our actual habits, the peculiar era of quakeries, bon-fires, and suicides (Reference to Carlyle).

“In the core the epoch was hearty, manly, humane; second to none in energy, mental, practical, and social; full of sense, work, and good fellowship. If its poetry was not of the highest of all orders, the century created a new order of poetry. If its art was on the whole below the average, in the noble art of music it was certainly supreme. In philosophy, science, moral and religious truth, it was second to none that went before.

“The weak side of the century was certainly in beauty, in poetry, and the arts of form. (But, he denies that it is without poetry.)

“We may (he goes on) give up architecture at once. People were so much absorbed in making their homes comfortable within, that they seemed blind to ugliness elsewhere; and if Mr. Ruskin is certain that Satan had to do with the churches of the Georgian era, there is no means of disproving it. But Reynolds remains the greatest English painter, Gainsborough and Romney have not been

surpassed in their own line ; Hogarth remains still our greatest humorist with the pencil ; Garrick is still our greatest actor ; Flaxman is still our greatest sculptor ; and it is well to remember that Turner was of the Royal Academy before the century was out. But besides all these, Crome, Stothard, Blake, Bewick, Chippendale, Wedgwood, and B. tollozzi worked in the century—and in their given lines these men have never been surpassed.

“There is another art which lies closer to civilization than any art but poetry. Music is a better test of the moral culture of an age than its painting, or its sculpture, or even its architecture. . . .

“Music is the art of the eighteenth century, the art wherein it stands supreme in the ages ; perfect, complete, and self-created. If one thinks of the paths of those great songs, of the majesty of those full quires, of the inexhaustible melody of their operas, and all that Bach, Handel, Haydn, Mozart, Glück, and the early years of Beethoven gave us, it is strange to hear that that age was dead to art. Neither the age which gave us the Madonnas and the Sistine, nor the age which gave us Reims and Westminster Abbey, nor even the age which gave us the Parthenon, did more for humanity than the age to which we owe the oratorios, and the operas, the sonatas, symphonies, and masses of the great age of music.”

It must be confessed, in view of facts like these, that some of us will have to reconsider our hasty and sweeping verdict on the eighteenth century and its productions.

In regard to the whole subject, it will need no prolonged argument to prove that we have duties alike to art and literature which is only another way of saying that we have duties to mankind and to ourselves ; since the degradation of either art or literature is both an evidence and a cause of the

degradation of society. For this reason every effort to set before men's eyes and minds elevating examples of art should receive encouragement from those who, either from the possession of wealth or from having any considerable influence with their neighbors, have special powers and opportunities in this respect. Such a duty, properly considered, would be very far-reaching. No educated man or woman, no man or woman having any pretence to education, could hold himself discharged from the performance of such a duty. What is the actual state of things among ourselves in respect to the love of literature and art ? This is a question not quite easy to answer. Certainly there are many signs that the public taste in literature and art is improving. The pictures and engravings which adorn the walls of our houses will bear favorable comparison with those of earlier times. They are now, even in humble homes, seldom coarse or vulgar. And the same judgment may, to a large extent, be pronounced on the literature which is most in vogue at the present day.

Still there are considerable deductions to be made, and I will allow Mr. Ruskin to express his thoughts on this side of the subject—only reminding you that Mr. Ruskin learnt the art of railing from his master Carlyle, and like him, is chargeable with exaggeration and caricature. In his little book “*Sesame and Lilies*” (Lect. i.), he declares that the English people of the present day have no love of literature or science or art or nature. I will select some passages from his remarks on art and literature, taking them in this order.

“I say (exclaims Mr. Ruskin) you have despised art ! ‘What !’ you again answer, ‘have we not art exhibitions, miles long ? and do we not pay thousands of pounds for single pictures ? and have we not art schools and institutions, more than ever nation

had before? Yes, truly, but all that is for the sake of the shop. You would fain sell canvas as well as coals, and crockery as well as iron. You know nothing of your own faculties or circumstances; you fancy that, among your damp flat fields of clay, you can have as quick art-fancy as the Frenchman among his bronzed vines, or the Italian under his volcanic cliffs;—that art may be learned as book keeping is, and when learned will give you more books to keep. You care for pictures, absolutely, no more than for the bills posted on your dead walls. You do not know what pictures you have (by repute) in the country, nor whether they are false or true, nor whether they are taken care of or not; in foreign countries, you calmly see the noblest existing pictures in the world rotting in abandoned wreck, and if you heard that all the Titians in Europe were made sand-bags to-morrow on the Austrian forts, it would not trouble you so much as the chance of a brace or two of game less in your own bag in a day's shooting. That is your national love of art."

Evidently we are in a bad way; and it is much the same with literature. Here is the testimony:

"I say we have despised literature. What do we, as a nation, care about books. How much do you think we spend altogether on our libraries, pub-

lic or private, as compared with what we spend on our horses? If a man spends lavishly on his library, you call him mad—a bibliomaniac. But you never call any one a horse-maniac, though men ruin themselves every day by their horses, and you do not hear of men ruining themselves by their books. Or to go lower still, how much do you think the contents of the bookshelves of the United Kingdom, public and private, would fetch, as compared with the contents of its wine cellars? The very cheapness of literature is making even wise people forget that if a book is worth reading it is worth buying. No book is worth anything that is not worth much; nor is it serviceable, until it has been read, and re-read, and loved, and loved again; and marked so that you can refer to the passages you want in it, as a soldier can seize the weapon he needs in an armoury, or a housewife bring the spice she needs from her store. We call ourselves a rich nation, and we are filthy and foolish enough to thumb each other's books out of circulating libraries."

Let us hope that these accusations are only partially true; and at any rate let us all do our own part—however small it may be—to wipe off so grave a reproach from our people by fostering to the utmost the cause of literature and art.

A WIDER BOTANY FOR HIGH SCHOOLS.

A. STEVENSON, B.A., PRIN. H. SCHOOL, ARTHUR.

BY far the greater number of the pupils of High Schools do not continue their studies beyond the primary examination. It is wise, therefore, to arrange that the character of the instruction up to this stage should have direct practical bearings so far as these can be attained without sacrificing general educational values.

Now botany is treated in our high schools for the most part only as a pure science and as a discipline for the intellectual faculties. We neglect the means which the material affords for the cultivation of taste and feelings and we ignore the applications of the study to the facts and processes of agriculture and horticulture.

But in the first place as our pupils are not beings of pure intellect there are wants in their natures which cannot be satisfied by the intellectual results of science, and knowledge alone does not suffice for happiness. Moreover by the development and cultivation of the finer feelings we may prevent the minds of our young people from being taken up with many vulgar ambitions and pitiful vanities. Next to fine literature botany is the subject on our school programme along with which can best be given some measure of esthetic cultivation. Pupils should be taught not only to understand the matter they are dealing with, but to appreciate it, that is to feel it and to enjoy it, and so to be permanently influenced in character by it. Let us cease to regard a plant as merely an aggregation or organization of cells of various forms and functions. Let us anoint our eyes that we may see that a plant is a perfection of nature, a thing of beauty and a joy forever. Truly Solomon in all his glory was not arrayed like one of these!

Nature provides a rare pleasure for all classes of people whose minds have been turned to the observation of plant life as a source of interest and happiness. We cannot do a greater service to those who are soon going out of school into any sphere of life than to develop their tastes in this direction. Let our young people learn to look more and more for their pleasures to the woods and fields and the garden.

In that delightful and refreshing book "My Summer in a Garden" the author regards a common vegetable garden not only as a source of great pleasure, but also as a real means of grace, inasmuch as time spent there tends to the eradication of certain moral defects and the development of various excellences. No doubt Mr. Warner is right. Gardening recreates

the weary brain and revives the weary soul of the careworn man of affairs either in business or in professional life. Nor does it really matter very much in many cases whether the owner of the garden gets a money value out of it equivalent to the labor and expense he puts on it. He is well repaid in satisfactions of a subtler nature than money can buy.

The lives of our future farmers, too, would be much easier and pleasanter if in their school days they could get such instruction in botany and have such a direction given to their taste and observation that new interests would be brought into their lives and new pleasures gained from the objects that surround them. For many young men leave the farms and crowd into the cities and others remain dissatisfied at home because of what seems to them the entire unloveliness of their surroundings on the farm, and of any reasonable ground for interest therein.

The elements of beauty in plants are color, form, structure and adaptation of parts. Formerly botanists were inclined to ignore, if not to despise, color because it was of little or no service to them in classification. Yet leaves and flowers and fruits do not exist for the sake of classification alone, and, in many cases, color is the chief element in their beauty and in the pleasure they give to mankind. Now, too, when we know how useful to themselves and to us the bright colors of flowers and fruits are, in contributing to fructification and distribution, our pleasure therein is immeasurably heightened.

As to the appreciation of beauty in form there is a considerable measure of esthetic cultivation to be derived from the practice of making drawings from nature of the parts of plants. To be effectual in this regard, however, the work should be better done than is usually the case at the present time.

In the study of structure for esthetic ends it is obvious that little can be done without the use of the microscope. Philosophers recognize wonder and admiration as the foundation of all human development whatsoever, and any means therefore of arousing these feelings must be regarded as of great value for educational purposes. The beauties and wonders in plant structure which are revealed by a simple lens appeal to even the dullest and lowest minds. And what a revelation of a new world—a new heaven no less than a new earth—is opened up to a pupil when he first looks through a compound instrument at a mere jagged splinter of firewood, or a fragment of onion or potato, or a leaf of the wayside weed, he has so often trodden on and despised.

A perception of the adaptation or fitness of parts increases very much our appreciation of the appearance of plants. This is not much dwelt on in our classes, and yet in the case of many plants we have little but the dry bones of the study left if we neglect to take up the exquisite interrelations of color and form on the one hand with function on the other. Moreover, nothing else is capable of arousing so deep an interest in botany as a study of the modifications that have taken place and are taking place both in form and color and in function, and of the influence of heredity and environment in perpetuating a variation when once entered upon. The introduction of the theory of evolution into high school botany classes has the same enlivening and energizing effects as it had in the scientific world outside.

Some may consider that the features of plant study so far advocated, are outside of the practical applications of the study of botany as advocated at the beginning of this paper. But it is not so. The results here to be sought are most practical. For

beauty is a use and one of the highest of uses, and the satisfactions obtained therefrom are among the most practical values in life, if not always the highest on the market.

In the second place it is obvious that great advantages would result from making our teaching of botany more practical in the ordinary sense of the word; that is, from making our class-work bear more directly upon the orchard, the garden and the farm, and the processes and results of the culture carried on there. And if we make our study not one of observation merely, but one of wide and varied experiment also, so much the better.

Opportunities for giving the teaching of botany a practical turn come frequently if one is on the look-out for them. Let me illustrate from personal experience. In my district the ash-man is a common sight. We learn that the ashes he gathers are shipped to dealers in the United States, and we see them extensively advertised in American agricultural journals as "Canada Unleached Hardwood Ashes." In seedsmen's catalogues they are quoted at \$20 a ton, and are recommended as the best of fertilizers for certain crops, as fruits, potatoes and corn. We now learn that these ashes contain plant food which the original trees obtained from the earth. We also learn that the most valuable elements of plant food present in ashes are potash to the extent of about 6% and phosphorus about 2% of the whole quantity of ashes. Now, it does not take a very sharp boy to see that if it pays the Americans to give a dollar a hundred for our ashes to fertilize their crops, it certainly is folly for us to sell them at ten cents a hundred, so long as we have anything that needs fertilizing.

Again we have been selling an immense quantity of hay for the English market during the past year. Prices

have been fair, and the uninstructed farmer looks upon the business as profitable. But we got a bulletin recently from the Ontario Department of Agriculture which shows that for every ton of hay the farmer hauls off his farm, he is taking away 25 lbs. of nitrogen, 18 lbs. of potash, and 10 lbs. of phosphoric acid, and that these materials are worth in current market values for fertilizing purposes just \$5.50, so that the imaginary profits entirely vanish, and the farmer is seen to be impoverishing himself by robbing the soil of its most valuable supplies of plant food.

We learn, too, from the same circular, that at present prices of wheat and barley, grain farming is almost as unprofitable as hay farming since the nitrogenous and mineral constituents that are taken off the farm when these are sold are worth about 40% of what the farmer receives for his crop. It strikes a country pupil forcibly, as a cheerful contrast to all this, to be shown that the farmer who is wise enough to concentrate his energies on the production of fat cattle or milk for the cheese factory, loses in soil fertility only about 10% of his receipts. But he is struck even more forcibly with the fact that the farmer who sells neither hay nor grain, nor fat cattle, nor milk but cream and cream only, (as some are now doing where creameries are located), this prudent farmer loses in soil fertility only a trivial one-tenth of 1% of his receipts for sales. For as butter contains neither potash nor phosphorus and only a very small fraction of nitrogenous matter, the butter farmer's soil is never exhausted. The cow now appears in the interesting light of a most wonderful apparatus for converting carbonic acid and water into gilt edge butter. The plants on which she lives absorb carbonic acid from the inexhaustible reservoir of the air and the cow manu-

factures it into butter globules ready for the churn.

From various sources we learn that plants require large quantities of nitrogenous matter and that soils are usually deficient in this valuable ingredient which also is exceedingly expensive to procure in its chief commercial forms of guano and nitrate of soda. But science has lately shown us that leguminous plants have the property of absorbing free nitrogen from the air and fixing it in their tissues. So now we may grow clover to gather nitrogen for us, and ploughing this clover down we have a fine supply for whatever crop we wish to grow thereafter.

In dealing with the varied conditions of plant life many useful illustrations may be drawn from the methods of scientific agriculture. Among the matters to be taken up are the advantages of drainage and of subsoiling, and the recent discoveries that flat culture is better than ridged for root-crops and for corn, and also that the evil effects of drought may largely be averted in cultivated crops and in orchards by frequent shallow culture, since by this means the top layer of soil, being kept loose and open, acts like a mulch in conserving moisture.

When we are treating of the effect of light on plants we might go on to show that in certain cases it is an economic advantage to have light excluded, either by developing and fostering an artificial habit of the plant itself as in the cabbage, or by other methods as in the celery. Most interesting of all is the fact that to get the highest percentage of sugar in the beet the tops of the roots must be kept covered with soil. The processes of pollination and fertilisation are matters of intense practical interest. The cucumber and the strawberry plant we all know, furnish fine

material for illustration. But it is not so generally known that cross-fertilization from other varieties is necessary for a good crop of some apples and pears, as the Bartlett for example, although the fertilized varieties themselves have perfect flowers. The enormous waste of plant energy in the great production of pollen by wind-fertilized plants is well shown by the results of four year's experiments with Indian corn at Cornell University. By plucking out the staminate flowers from every alternate row not only was there enough pollen produced on the other rows to fertilize all the plants but the yield of the whole was increased nearly 20%.

Darwin discovered long ago that atrophy of seeds was frequently accompanied by a gain in size and quality of fruit as a whole. It is interesting to know that it is now an object of ambition among scientific fruit-growers to develop varieties with small seeds or none. Recent triumphs in this direction are the Navel Seedless orange and the Lincoln Coreless winter pear. The proportion of pulp to seeds has been greatly increased also in raspberries and tomatoes.

Our young botanists ought to be so instructed in the principles of variation and heredity that they would be on the lookout for useful variations and know how to propagate and improve any useful variety they might observe. No more interesting or useful object could be set up before the minds of our young botanists than some achievement of this nature.

He would be a public benefactor to an extraordinary degree who should obtain a variety of Fife wheat which would mature a little earlier in Manitoba so as to escape the September frosts. It would be a benefit, too, to develop a tomato or a melon or a lima bean that would mature anywhere in lower Ontario, or a variety of strawberries that would mature

a fortnight earlier or later than those varieties we already have, and so extend the season of our enjoyment of this most luscious fruit.

The improvement of some of our wild plants offers a wide field for usefulness. Some aspiring young Canadian botanists might be encouraged to take hold of the may-apple for instance, and see what could be done with it. Most of us know what a rich flavor the fruit of this plant has and also how scarce the fruit is. If a study were made of the conditions under which the plant thrives best, by judicious culture and selection we should probably be able in time to increase the productiveness of the plant and the size of the fruit. Though we cannot do this work itself in schools, we can at least give the minds of our young people a set in this direction, so that they may do some such work afterwards.

The home is the crystal of society, the nucleus of national character, and from that source, be it pure or tainted, issue the habits, principles, and maxims which govern public as well as private life; the nation comes from the nursery; public opinion itself is, for the most part, the outgrowth of the home; and the best philanthropy comes from the fireside.
—*Samuel Smiles.*

SCHOOL-LIFE.—We fall into the habit, not a few of us, of thinking that school-life is all preparation, all grinding for an inevitable test. But in many important aspects there is a finality in the record of our school-days, and it is a poor form of education that does not take this finality into account. Seven to ten years of plain living and high thinking, an epoch complete in itself—that is the minimum of happiness and innocence to which every boy and girl is entitled.
—*The Educational Times.*

THE STUDY OF BIRD-LIFE.

BY MONTAGUE CHAMBERLAIN, HARVARD UNIVERSITY, U. S. A.

IT is a healthy sign that the present generation of readers are taking more interest in books about out-of-door affairs than their fathers did, and it is especially gratifying to bird-lovers to note that their favorites are receiving a large share of attention. This increased interest is due in part to the fact that there are more interesting guide books published now than in former years. A number of facile writers have become interested in the rocks and the plants and the birds they see, and these writers are willing to tell the people why they find these things interesting.

But a deal of credit for the increased interest in nature is due to the school teachers who have, at considerable sacrifice and without pecuniary remuneration, given their pupils instruction in field work. For it is in field work—the study of bird-life for example—that the chief interest in nature centers; and we have come to consider in these later years that study of bird-life is much more important and of much more value to the student than any other department of ornithology. Also, it is now generally conceded that field work should precede and not follow “closet work,” as classification with its attendant subjects has been aptly termed.

In closet work we learn how to place each species in its proper genus, and to group the general in families and orders; also to arrange in proper sequence the families of an order and the genera of each family, determining which is entitled to the highest rank—is the most highly developed. To accomplish this it is necessary to study the theories of classification and to become familiar with the anatomy as well as the exterior forms of each species, and of the color and markings

of its plumage, all of which can be done through the examination of dead birds or dried skins and skeletons without the student ever having seen the subject of his study while it had life.

In field work the object is to study the habits of the birds—their life history—and of the two branches of the science this is, certainly, the more fascinating. The deepest interest attaches to everything that reveals the mind, however feebly it may be developed, which lies behind the feathers; for in studying its life we discover that a bird is something more than a mere flash of light, more than a mere incarnation of song. We realize then as we never realized before that, besides the beauty of their form, the brilliancy of their plumage and the charm of their sweet and tender melodies, these tiny creatures have a beautiful home-life which places them in a sphere quite above that of mere singers—a life in which the song is but an incident—a life in which the birds inherit duties that, as a rule, they perform so faithfully and so well that many a man might take a lesson from them with profit. And their home-life awakens a deeper interest than any other phase of the bird's history, because through the relation of the birds to each other, to their mates and to their young, they present their more personal qualities and exhibit the finest characteristics of their nature. Little wonder, then, that bird-life attracts more attention and awakens a keener interest than do mere dry-as-dust subjects.

Yet I must not be understood as decrying the study of classification. It is exceedingly interesting to those who have a taste for that kind of

study. There are few studies more interesting than comparative anatomy and every ornithologist requires to know enough of the principles of classification to be able to group the birds intelligently. But classification should be given the subordinate place ; for just as human life—the actions which are moulded by man's reason, by his impulses, emotions, and aspirations—is a higher and grander theme for contemplation and profound thought than is a human skeleton, wonderful as it is, so the study of a bird's life and the influences which operate upon it deserve more attention than do a bird's bones and feathers.

Teach your students something about the facts of bird-life and they will naturally turn to classification that they may have convenient pigeon-holes for the storing and assorting of their facts. But if you attempt to instruct them in classification first, they are apt to think that ornithology consists entirely of long names that are hard to pronounce, hard to remember, and harder still to comprehend. Many a bright student who would have gained immensely—gained for himself and for his fellows—by becoming interested in natural history, has been turned from the pursuit by an unwise use of the old fashioned text-book.

Even now in some of our schools, and indeed in some colleges, the instruction in natural history subjects is confined exclusively to anatomy and classification, with some excursions into the domain of embryology. The blighting effect of such instruction is alas! too apparent. We see its influence every day in the ignorance which intelligent writers display regarding our birds.

The elementary portion of a field-naturalist's studies is not difficult to master, nor is a highly developed intellect required to insure satisfactory results. The chief requisite is natural aptitude—a talent for the work—

though this may be acquired. To gain success one should have a sensitive ear, a quick eye, a faculty for rapid observation combined with a ready perception of cause and effect, and a retentive memory. But all of these requisites can be cultivated, and many a young student is surprised at the end of his first season in the field to find how much more accurate are his ears and eyes, and how much more he hears and sees.

To accomplish much at this, as at every other undertaking, a man must have patience and energy, and above all must be deeply devoted to his work. But these, too, come with practice, and many a dull school boy turns out a keen and enthusiastic bird lover.

The best time to study the habits of birds is while they are building their nests for then they are the most active, sing most frequently, and display their most interesting characteristics.

With some of our migratory species the custom obtains for flocks of the males to arrive first, in the spring, the females appearing some five to ten days later, but most of our birds come in mixed flocks. Unless the weather is so cold and food correspondingly scarce that the struggle for existence occupies all their energies they commence their mating at once upon arrival at their breeding ground, though some pairs will have made considerable advance in this delicate business during the journey north.

In this matter of mating birds differ from quadrupeds, for among the higher order of birds, at least, polygamy is almost unknown. Each male selects a female and after inducing her to mate with him—after a courtship in which the females display considerable coquetry and demand considerable coaxing—the pair remain constant for the year at least, and with some species the pairing is for life.

The female often refuses to accept the first proposal but when she yields consent the pair at once begin nest building. In this they differ also from most quadrupeds, for while the majority of the latter seek shelter for themselves alone the birds build solely for their young.

The female of some few species of birds performs all the work of nest building, but in the majority of cases the male and female join in the work, though the female is usually the artist, and models the structures, while the male merely collects material.

Very soon after the nest is finished the first egg is deposited, followed usually by one in each successive twenty-four hours until the set is laid. In some cases the length of time between each egg is longer, and again in others the period grows shorter between each egg.

Around this question of egg laying, and the power of birds to retain their eggs or increase the number at will, there has been considerable discussion.

The complement of eggs having been deposited incubation is at once begun; indeed, with some of our native birds, particularly those that lay their eggs during the cold weather, the birds sit upon the first egg as soon as it is deposited.

In this work of incubation the female bears the burden of the labor though as a rule her mate is continually in attendance, carrying her food, singing his sweetest songs for her entertainment and taking her place when she leaves the nest. But with all his encouragement and helpfulness he cannot relieve her from much of the tediousness of her close confinement, which must be peculiarly severe to such a restless creature, for birds above all other animals delight in freedom and activity, and we are surprised to learn that their parental affection is sufficiently strong to bind

them to this self-inflicted, torturing captivity.

And without a continuance of the manifestation of this love, their offspring would die after emerging from the shell—for the song-bird's young are among the most helpless of God's creatures. The young bear from the first day of its life is clothed with a full robe of fur; the young sparrow is naked and requires the warm breast of a parent to maintain its life. The colt and the calf can suckle and nourish themselves; the baby thrush must wait until food is brought to it. The lamb can skip and frolic at birth, but the tiny warbler can neither walk nor fly, and is born blind.

The parents continue to feed the brood until the youngsters are full fledged, when they are taught to fly and afterward taught to seek food for themselves. With this last lesson parental care ceases, but as many species bring forth two broods the parents are thus kept employed all summer long. At the end of the summer they moult their feathers, which have been more or less injured by wear and weather, and the production of new plumes causing a severe tax upon a bird's energy, they remain inactive until the growth is completed. By this time the autumn has arrived, and with the first frost the insects seek winter quarters compelling the birds that prey upon them to start southward, and begin that great migration movement which surges north and south every year. They go south, we know, because their food is cut off by the cold weather, but why do they return north when the spring time opens? What impels them to leave their comfortable quarters at the south? What guides them on their journey north, often to the very grove in which they passed the previous summer?

Of these things we are not quite certain. They are among the un-

solved problems which the study of bird life presents, and which forms a part of its fascination. There is enough to be discovered about the lives of our birds to keep an army of observers busily employed for many a year to come. Not only are there

many simple facts of life history and habits awaiting discovery. Of all of our birds we have much to learn, while of some of our less abundant species we know little or nothing. There is no lack of subjects for those who desire work.

EDUCATIONAL ESSAY.

BY SAMUEL MOORE, B A , TEACHING STAFF, B C., CAN.

KNOWLEDGE : ITS ORIGIN AND AIMS.

KNOWLEDGE, which means intellectual enlightenment, may be defined as a clear perception of truth.

The word knowledge is used in different senses, and often means practical skill, which meaning, as suggested in Latin, was intended in the old maxim of Bacon, " Knowledge is power."

The history of Psychology shows that there has been much controversy between the two great schools of Philosophy as so the meaning of the word knowledge and its origin.

One school of Philosophy, called the Empirical, maintain that all our knowledge is gained from experience, that is, it has been derived by the special and general senses. The advocates of this school say that the mind of the child, when it comes into the world, is a blank sheet, upon which impressions are afterwards made.

Such teachings in the literature of Psychology are called " a posteriori."

The other Philosophical school is known as the Intuitionist, and this school claims that some of the mental facts are innate, that is, the human is so constituted naturally as to be conscious of a certain amount of knowledge prior to experience.

The teachings of this school are termed " a priori."

The history of mental philosophy has for centuries been divided into two great schools of thoughtful enquiry. Both of the above mentioned schools in philosophy have had advocates who possessed colossal minds, men who had such force of character that they made a profound impression on the thinking world. In the old philosophy the Intuitionists seem to have been the masters in the philosophical arena ; but at the present time the Empirical wave seems to predominate in speculative philosophy, due largely to the scientific advances in education lately made by the influence of the writings of Francis Bacon and J. S. Mill, who vigorously advocated the experimental and the inductive methods.

Undoubtedly both schools teach much that is true and to decide where one school of thought ends and the other begins is a very profound problem in philosophy.

The true object of the mental science is the investigation of facts connected with man's higher life, facts which are associated with the rational and thinking faculties.

It is evident to every reflective mind that by far the major part of our know-

ledge is connected with sensation and experience. The sensations and perceptions are received by the mind from the special and general senses. The sense of taste informs the mind of certain gustatory sensations, the sense of smell does the same as to odours. The sense of touch gives the mental faculties many sensations concerning the weight, roughness and smoothness of many bodies in nature.

The sense of learning makes known to the mind certain sensations of sound; that is, harmony and noises.

The sense of sight conveys to the mind many sensations which are connected with the various colors of the spectrum. The muscular sense, which is important in the mechanical arts, gives man some idea of the pressure of bodies, and such sensations are important and useful in the science of statics.

We have in addition sensations called pulmonary which are useful from a hygienic point of view; there are also sensations connected, or associated with the alimentary canal which are associated with the process of digestion.

Some psychologists say, "All knowledge takes its rise in the senses," which statement is evidently true in part. The various sensations, which are complex in character, are combined in the mind, by virtue of the laws of association and comparison. Definite knowledge is due to the law of discrimination.

Our knowledge of the existence and properties of bodies in nature is of a complex character.

Man's means of receiving knowledge may be thus enumerated, viz: (1) Sensation and perception (2) Consciousness and reflection. (3) Testimony.

Consciousness is the act of attending to what is passing in the mind at the time, while reflection is the mental process of recalling past feelings and perceptions, by comparing them to

similar ones. A very large portion of our knowledge is received on the evidence of testimony. Knowledge is handed down from generation to generation.

From the above remarks we may reasonably conclude that the greater part of our knowledge may be accounted for on experimental principles but not all, and it is just here where the Empiricists violate a fundamental principle in logic, for it does not follow that because the particular is true that the universal is true also.

As far as probability goes we may state that some facts in psychology will always remain mysteries. That higher or mysterious part of man's being, which thinks, wills, remembers, and reasons, is distinct from, and destined to survive the decay of the physical organism.

The two great means of obtaining knowledge are, observation and experiment, and from these sources we draw many inductions, inferences in the various physical sciences. Bacon recommended man to observe and investigate the various phenomena of nature, so that he might realize that "knowledge is power." Virgil, the Latin poet, has also given utterance to a similar idea in the line, "Felix qui potuit serum cognoscere causas," the translation of which is, "He is a happy man who knows the cause of things."

Knowledge has cognizance of itself, self-consciousness is a prominent factor of our mental life, self is an essential part of all knowledge. The I, or ego, is unknowable while it forms a part in every cognition. Therefore all mental phenomena cannot be explained on sentient principles, and moreover, it is difficult to explain man's love of honor, glory and truth on principles of Empiricism.

The teaching of Empirical philosophy, is true up to a certain extent, and beyond this one feels that it is

not safe to swear to the "ipse dixit" of any particular Empiricist, but like the eclectic philosopher, Horace of old, we should gladly accept what is good and true in their teachings.

The question is a practical one and which concerns us in the closing decade of the 19th century.

The true aim of education is of primary importance to both the teacher and the scholar. It is very important that we aim to attain the correct ideal, and this educational ideal should be culture and practical power, in order that our education may be complete.

It is a matter of vital importance in educational work that we combine literary culture with a considerable amount of executive or practical ability.

The aims of the teachers of the new education, represent three distinct parts: (1) Physical education. (2) Intellectual culture. (3) Moral training.

The old Latin author stated the pedagogic truth in a nutshell, "Mens sana in corpore sano," or "A sound mind in a sound body."

The physical organs and muscles ought to be responsively active to the will, and the intellect should be trained to acquire knowledge scientifically, while the moral feelings and conscience should be strengthened to carry pure

thought and feeling into practical activity, and by doing this the child will develop self-faith as a result of faith in God.

The new educational ideal bears contrast in many respects to the old programme of study, when the great majority were only taught the Three R's, reading, writing, arithmetic. The last subject (arithmetic) held a prominent place and was regarded as the "poor man's logic."

Now, according to the views of Dr. Elliott, President of Harvard College, logic and ethics should find a place on the programme of studies in the public school; that is, right thinking and right acting are primary social requirements of the new education.

It is evident from history and experience that the subject of good morals ought to be systematically taught in all educational work.

Questions of right and wrong are more frequently discussed in our social and business relations than the weather. The educational maxim "learn to do by knowing" is as true in ethics as in pedagogy.

Not until educators give more attention to the regular training of the moral sense in their pupils will teachers realize fully that "teaching is the noblest of all professions."

AMONG THE TREES WITH LOWELL.

BY MISS R. HORN, WINNIPEG.

"There is never a leaf nor blade too mean to be some happy creature's palace."

LOWELL'S admiration for the works of nature is seen in all his writings; he is par excellence a nature poet, "the very birds on the trees half forgave his being human."

"I care not how men trace their ancestry To ape, or Adam, let them please their whim, But I, in June, am midway to believe

A tree among my far progenitors,
Such sympathy have I with all the race,
Such mutual recognition vaguely sweet
There is between us."

Among these, his life-long leafy friends, the pine ranks first in Lowell's favor. How many beautiful passages we have descriptive of this, his favorite tree.

"Pine in the distance,
Patient through storm and rain,

Meeting with graceful persistence
The north-wind's wrench and strain.

Unregretful, the old leaves shedding,
That fringed thee with music before,
And deeper thy roots embedding,
In the grace and beauty of yore."

Who would not admire the picture
of the trees in their winter garb?
"Every pine, and fir, and hemlock
Wore ermine too dear for an earl,
And the poorest twig on the elm-tree
Was ridged inch deep with pearl.

Spite of winter thou keepest thy green
glory,
Lusty father of Titans past number!
The snowflakes alone make thee hoary,
Nestling close to thy branches in slumber,
And thee mantling with silence."

The poet often wandered through
the murmurous pine wood, when the
"magical moonlight steeped every
bough and cone." He watched the
growth of the trees with interest:

"And it grew like a true Northern pine,
First, a little slender line
Like a mermaid's green eyelash, and then, anon
A stem, that a tower might rest upon,
Standing spear-straight in the waist-deep
moss,
Its long roots clutching around and across.

'Twas a natural growth and grew fearlessly
there,
A true part of the landscape as sea, land and
air,
For it grew in good times ere the fashion
it was
To force up the wild births of the wood under
glass."

No tree is forgotten by Lowell; they
were indeed his friends and he did not
slight one of them. He watches the
cedar's shadow, slow and still, creep
o'er its dial of crisp gray moss, and
notices how, on Spring's approach,

"The gray horse-chestnuts little hands unfold
Softer'n a baby's be at three days old."

The ash seems to "drop her purple
forgivingly and sadly breaking not the
general hush;" the elder is "foamed
over with blossoms as white as a spray;"
while the barberry, with its sensitive,
fly-catching yellow flowers, is described
as "dropping its strings of golden

flowers." In spring, "The maple crim-
sons to a coral reef," and in autumn

"The maple swamps glow like a sunset sea
Each leaf a ripple, with its sparkling flush."

Describing the oak:

"What gnarled stretch, what depth of shade
is his,
There needs no crown to mark the forest's
king,
How in his leaves outshines full summer's
bliss,
Snow, storm, rain, dew to him their tribute
bring.
How towers he, too, amid the billowed
snows,
An unquelled exile from the summer's throne.
Whose plain unincinctured front more kingly
shows
Now the obscuring courtier leaves are gone.
His boughs make music of the winter fair
Jewelled with sleet like some cathedral front,
Where clinging snowflakes with quaint art
repair
The dints and furrows of time's envious
brunt."

To the never-unsympathizing trees
the poet carried all his sorrows.

"Pines, when you're blue, are the best friends
I know.
They mope and sigh and share your feelings
so."

"Beneath the trees,
My life-long friends in the dear spot,
Sad now for eyes that see thee not,
I hear the autumnal breeze
Wake the sear leaves, to sigh for gladness
gone."

Those dear friends, "never es-
tranged, nor careful of his soul," gave
him new hopes and aspirations.
While walking in the dateless woods,

he felt that he walked undeserted,
"But forever attended
By the glad Heavens that bended
O'er the innocent past."

Nature was his inspiration, for she
amply rewards her admirers. He who
learns from her mystic books

"His verse shall have a great commanding
motion
Heaving and swelling with the melody,
Leant of the sky, the river, and the ocean,
And all the pure, majestic things that be."

Trees were to Lowell, "Links in nature's chain of love from highest heaven let down." The druid wood seemed to stretch out its arms in blessing, and looking at the Creation the poet was drawn near to the Creator; gazing on the finite, his soul was caught up to the Infinite.

"O! Power, more near my life than I feel
self,

Even as the roots shut in the darksome earth,
Share in the tree-top's joyance and conceive
By sympathy of nature, so do I
Have evidence of Thee, so far above
Yet in, and of me!"

THOSE PRECIOUS YEARS.—We claim from our pupils those precious years; in return we must give them the inestimable boon of discipline, a force that will sustain them in the struggle, that will give them a sense of mutual sympathy, that will remind them in their darkest days, of duty, in a word, that will teach them how to live. Their second claim on us is that we shall forestall for them the waste that is implied in their learning in the punitive school of experience what it was our duty to teach them.—*The Journal of Education.*

THE CRIMINAL.

BY ST. JOHN E. C. HANKIN.

"THE thief, as we at present treat him," says an eminent modern authority on prisons, "is our costliest national luxury." This is a sorry comment on our prisons system. We have studied the question, and reformed old abuses, and made the convict's cell clean and his life wholesome and, if prisoners themselves are to be believed, preferable to that of the workhouse, and yet we have to bow to a verdict of hopeless failure. The prison does not deter, and does not convert or educate. It is enormously expensive, and yet we cannot do without it. No substitute has yet been found for it, and most of those suggested have been either impracticable or much more costly and inadequate than that which they were devised to supersede. We cannot leave our criminals unrestrained to prey upon society. We find shutting them up neither economical nor reformative. It is a riddle apparently without an answer.

First of all, let us consider in detail how the present system works. The

thief in most cases is a thief by profession. He makes his living by theft as much as a gardener does by hoeing turnips. The only difference is that gardening is a social occupation, thieving an anti-social one. The result is that your thief returns again and again to prison. While he is in durance he is plotting fresh experiments, new *ruses*, making *rendezvous* with fellow prisoners to meet on release for a daring burglary (if he belongs to the "higher branch" of the profession), or an ingenious "fake." He grows more and more experienced as time goes on, and, therefore, more difficult (and expensive) to catch. When caught he is sent to prison, meditates fresh schemes, and on a given day is released to set about them. Your thief in most cases, in fact, is an incorrigible *récidiviste*. He costs his country several hundreds a year to feed and guard and tend and catch and try. This is not satisfactory.

It is the same with men who com-

mit crimes of violence in a vast number of instances. They are Man-eaters. It is their *metier*.

The criminal is a low type physically, in some classes of crime (especially crimes of violence) mentally also. You take a man of brutish instincts and feeble intellect, and shut him up in solitary confinement. The result is that he becomes more brutish, and his intellect more feeble from lack of use. Often he becomes insane. Never can we hope to find him the better for a life diametrically opposite to everything his particular kind of diseased Ego requires.

You take a criminal who is not a professional criminal in any sense, but a man who, under sudden temptation or from passion, has committed a crime. He has stolen for bread, or killed to revenge an injury. He is an "accidental" criminal. You shut him up with professional thieves and cut-throats, and accustom him to a criminal atmosphere, and send him out an enemy of society. He becomes an anti-social being. Before, he was an ordinary law-abiding man, who yielded to the temptation of a moment. He is now a criminal by profession and a cut-throat from choice.

The last kind of case is the commonest of all cases that come before the magistrates for decision, that which terminates in the invariable formula, "Five shillings, or seven days," namely the case of drunkenness. If a man is a dipsomaniac or an habitual drunkard we send him to prison for seven days! The compulsory sobriety of that period makes him hasten to exceed the moment he is free with the result that as many as fifty convictions in a year are sometimes recorded against the same prisoner.

In all these cases our prison system is ridiculously inadequate and ineffective. The confinement and the soli-

tude tells on one kind of prisoner adversely, and makes him morbid, sullen, and sometimes melancholy or mad. Penal servitude on the other hand is to another kind merely a pleasant way to spend one's life, a peaceful retreat where meals are regular and work not over hard. Lastly, short terms of imprisonment are mischievous because they spoil the prison as a deterrent. Once a man has tasted prison life there is no longer the dread of the unknown about it, and he ceases to think of it with any particular shrinking or fear. The fact is, our system of punishment for crime is hopelessly old-fashioned, as unscientific almost as burning at the stake to cure Atheism or muttering incantations to cure warts. It is now generally admitted by all thinking men that crime is a disease just as alcoholism is a disease and lunacy is a disease. The criminal is an abnormal. He differs physically from his non-criminal brother, he is a different being. "Man is by nature a social animal," says Aristotle. The criminal is anti-social. It is a vital distinction. In some cases the disease is curable, the abnormality capable of modification, just as there are some kinds of lunacy that may be affected by medical treatment, massage, galvanic batteries, etc. In some the disease is incurable. Such is the case of very many of our professional criminals.

The question is, therefore, how to modify our treatment of the criminal so as, without great increase of expense, to make our prisons a reforming influence instead of a corrupting one, to cure the criminal instead of confirming his disease, to protect society with the least possible harm to the victims of that protection.

Beginning with the shorter sentences and taking that commonest sentence of all in England which we mentioned above, the penalty for

drunkenness, the proper treatment for the habitual inebriate is plain enough. He must be sent to a home of inebriates, to a State Hospital, not a prison. and he must be kept there till the guardians consider that there is a fair probability that he is cured. Seven days in jail never yet cured alcoholism. You might as well prescribe it for small-pox. This may sound an expensive method of treatment, but it is not really so. The present system brings the same people back week after week to prison and makes the drunkard practically the guest of the State year in, year out. It adds a heavy burden to the duties of the police, and encourages, or at least does not diminish, a most extravagant and corrupting tendency from the force of example. Anything that will cure drunkenness will be a saving of money from every point of view.

The criminal-by-accident, as we have called him, is a less important factor in the social problem. He is not really a criminal, except in name. He is not anti-social. The man who resents an insult with a blow, and so puts himself within the reach of the law, or the laborer who steals a turnip because he is starving, must not be put in the same category with the professional burglar or thief. The duty of the State with regard to him is plain. He ought not to be sent to prison at all. Some penalty there must be for such acts as these, but sending to prison is not the one to be chosen. It would be better in the long run to let such a man go scot free than send him to herd with the scum of the earth in jail. That cannot raise him morally. It will probably debase him. Some sort of a fine, either in money or labor, would meet the case; or, in less important offences, the man might be dismissed with a reprimand, or ordered to come up for judgment when called for.

The same applies to first offences.

The difficulty of dealing with first offenders has been realized for some time now in England, but not always very fruitfully. One thing may safely be said. First offenders should *never* be sent to prison to herd with more hardened ruffians. Probably they should never be sent to prison at all. The system of entering into recognizances, giving securities, and deferred judgments is the best for dealing with these cases, together with fines when these can be enforced. Some system should be devised by which a man who has no money could be fined in labor or in his weekly wages for a time. This would have a considerable deterrent effect, would cost far less than imprisoning the man, and would save him from all danger of the moral contagion of prison life. There remains then the case of the habitual, instinctive, professional criminal to be considered, and he presents the most difficult problem. At present he is a source of enormous expense. Every kind of elaborate machinery is required to protect society against him—costly prisons, detectives, police, warders, chaplains, and all the other extravagant paraphernalia which are considered requisite for dealing with this pest. He spends two-thirds of a lifetime in prison, and during that time plans the robberies of the remaining third. When he is at large he is even more expensive to the community than when he is in durance. What is to be done with him?

We hear a good deal about kleptomania at different times, and no one has quite made up his mind when theft ceases to be mere larceny, and has to be dignified by the longer name. The truth is *all theft is kleptomania* with the exception of occasional isolated acts, like that of the starving man who steals a loaf. At present, if a rich man steals something he cannot possibly want, and could pay for easily if he did, we call it

kleptomania. That is all it comes to. But kleptomania should be a much wider term than this, and should include thieving as a profession, for that is only another form of what is really a disease in either case. The rich man steals without any apparent necessity. The thief also steals without any *apparent* necessity in a vast number of cases. *Apparently*, he could earn a better living in a hundred pleasanter, more honorable, and even less arduous ways. But the choice is only apparent. He can't help himself. He *must* steal. Like the enthusiastic sportsman who shot his own retriever, he can't resist the temptation: "I would shoot my own grandmother if she rustled among the bushes like that," said the sportsman on that occasion. We don't understand it. The overmastering necessity of the thief to steal, of the sportsman to let fly at anything that moves, are almost incredible to us. "If they had exercised a little self-control!" we say. But they can't. When a leading barrister was pleading kleptomania on behalf of his client, the judge replied grimly, "That's what I'm sent here to cure." The reply just. Instinctive theft is a disease. It should be the duty of the judge and jury, and warders, and the law generally to cure it. "Punishment" in this regard is a misnomer. It is the same with the burglar and the violent ruffian, who are again and again committed to prison for the same offences. The judges are there to cure them. Only, they don't do it, because they don't know how, and they don't realize either the extent or the nature of the disease with which they have to cope. Perhaps a little more knowledge, and a little more humility, would enable them to do both somewhat better.

The criminal can be treated in two ways, from the mental and from the physical side. He is often weakly in

body, badly nourished, undeveloped. Again, he is often hopelessly dull, uneducated, untrained. In the case of those who are defective physically, it is found that good moral results can be obtained by exercise and careful bodily training. For there is no doubt that bodily health reacts on *morale*, and that certain states of the blood are likely to produce certain kinds of crime. In the case of those who are untrained intellectually, a great deal can be done by careful mental discipline, often in conjunction with more strictly medical treatment, physical exercise, baths, etc. For the habitual criminal is a creature apart. He is abnormal just as the lunatic is abnormal. He is idle, incapable of sustained effort, incapable of regular work. He must be trained carefully if those inherent faults are to be corrected. To put him in prison, as we do at present, is to court failure. You may as well keep his cell vacant and ready for him with his plate on the door. He will return with absolute certainty. Possibly, even if you attempted his reformation all your labor would be wasted, and he would be found to be incurable; but we do not give up all efforts to treat lunatics scientifically, because many never recover the use of their faculties.

There are two ways in which prison affects the criminal adversely. One has been mentioned already. The solitude and the confinement prey on the mind of the weaker sort, and not infrequently reduce them to melancholia or imbecility. This is comparatively subtle. The other way is more obvious to the lay mind. If you take an irresponsible, helpless being and place him under strict discipline, map out his way for him, rigidly arrange his hours, his meals, his exercise, you may make him an excellent automaton; *but you will never jilt him for looking after his own affairs, and regulating his own living.*

Nay, every year you keep him under that all-embracing supervision, you take the spring out of him more utterly, weaken his will, render him incapable of originating anything or shifting for himself. If a man was unfit to regulate his own affairs and showed himself unequal to the task of earning an honest livelihood before that treatment, how much less will he be able to do so after a few years. when you have accustomed him to have everything arranged for him, and to live eternally at the orders of others. You kill all feelings of responsibility, strangle all ideas of arrangement, method, and initiative on the part of the man himself by lack of use, and then, when he leaves prison you imagine he will be capable of managing his own affairs, and getting a living. It is true that to be able to rule, one must have learnt to obey, but this absolute subjection, without appeal, to an established order of things which never alters from year's end to year's end, and does not admit of the slightest variation on the part of the prisoner will certainly never send forth at the end of five or ten years a man capable of performing the duties of a citizen. What is to be done then?

One of two courses alone remains as either rational or humane. The first is a careful curative treatment of the criminal, some very elastic system which would allow every possible variation according to the particular idiosyncrasy of the patient. Such a treatment must be both mental and physical—moral is implied in both. It must tend to inculcate responsibility not to crush it, to elevate the Ego not to degrade it. Beginning by restoring the health (and therefore the vigor) of the criminal, it must carry out a thorough treatment of each individual case, and the patient must not be dismissed till, in the opinion of his medical advisers, he is cured. He must not be sent to prison for a fixed time

as a punishment. He must be sent for treatment for a specific infirmity. Only when that infirmity is overcome can he be set at liberty once more. He must be compulsorily treated for a dangerous malady. If it be said such a treatment is impossible, that the expense would be enormous, the appliances, staff, establishment needed too great for any country to afford, we should be inclined to reply that the expense after the initial outlay would be no greater than that of the present system. There would be fewer men in prison, for there would not be the constant crop of prisoners, who return again and again. And, as we saw above, many kinds of crime which are now punished with imprisonment would be disposed of in other less expensive ways. The results would be more satisfactory, and therefore indirectly would save an enormous amount of money at present wasted. For it must be remembered that our vast criminal class is absolutely unproductive. It is so much dead weight, a part of the body politic which performs no function and only preys upon the other members. Of course the treatment of the criminal—criminal therapeutics if you prefer the term—is still more or less in its infancy as a science, and, despite the elaborate investigations at Elmira, in America, remains largely experimental in character; but still a good deal is fairly well established, and much is being learnt every year. But if the objection of expense outweighs all other considerations there yet remains an alternative plan, inexpensive, humane, and rational, three characteristics which our present methods certainly cannot boast of. The *recidiviste* must be put out of the way. He is the lost dog of the human species. He must be taken to a judicial Battersea, put in the lethal chamber, and painlessly extinguished. It is no question of punishment. It is

not vindictive. It is useless to prate about justice. Society can only exist while its members conform to certain usages. The criminal, as we have seen, is anti-social. He is a perpetual menace to the community. If he cannot be mended he must be ended. If you will not cure him you must remove him. It is ridiculous to send forth a criminal again and again from prison with the fore-knowledge that his disposition is unchanged, that he is only fitted for one line by education, nature, will or want of will—namely, to prey upon society. It is not because he is wicked that he must be destroyed just as it is not because people are wicked that they are put in prison. No one pretends that is the reason nowadays. Men are sent to prison because the safety or convenience of society demands that certain acts shall not be done. It is for the good of the majority that these few should be sacrificed. They are sacrificed whether you destroy them or merely seclude them in Dartmoor or Pentonville. There is a good deal to be said after all for the Laws of Draco. "Every crime is worthy of death, and there is no greater penalty that the State can exact." Draco was a profounder legislator than his countrymen dreamed, and had he lived now might have been a most distinguished anthropologist. Persons who are hopelessly criminal by disposition, who have shown it by returning again and again to their old life of crime, persons who are palpably abnormal, or undeveloped, or incapable, persons who are hopelessly perverted morally—for all these there can be no room in this crowded world. There are some six thousand of them in our prisons at present, to all intents and purposes permanently installed. There are an enormous number in our asylums. The "criminal lunatic," as his very name implies, is an unfit person to survive. For the mere criminal

there is hope. He may, under certain treatment, become a reformed and useful member of society. But when to criminality lunacy is added, the case becomes hopeless, and death is the only solution of the problem. Further, if the criminal, while not in the ordinary sense lunatic, is found to be thoroughly irresponsible, hopelessly perverted, and mentally and physically incapable of reformation, he must be put out of the way also. He is a dangerous animal, and society must be protected against him. If it be urged that it will be difficult or impossible to certify absolutely that a man is beyond cure, then a certain number of convictions followed by sentence—say five—must be taken as evidence of a criminal disposition that cannot be successfully combated. If some one or two are thus destroyed unnecessarily, we can only comfort ourselves by the Abbot of Citeaux' cynical order—"Kill them. God will know His own."—*Westminster Review*.

A WORDSWORTH REVIVAL IN PROGRESS.—It is beyond question that there is a remarkable Wordsworthian revival in progress; the bard of Rydal and Windermere is written about and lectured about in nearly every literary centre, and is more generally read now than at any time in the last half century. This revival of interest in Wordsworth indicates that the literary world has had enough for the present of the ornate, overwrought, and oftentimes fantastic methods of later poetical writers, and desires a return to the simpler forms which he practiced with such conspicuous success. He was one of the greatest of the English poets; it was the fashion once among those who failed to appreciate his beauties, to call him dull and insipid, but it is so no longer.—*Buffalo Commercial*.

TIME TABLES *

BY MISS ANNA McLELLAN, PUTNAM.

The teacher can set no higher aim before him than that of aiding his pupils to form correct habits of thought and action, and any means that will aid in this work should be used.

The teacher who insists upon a time for everything and everything in its proper time, is not only making his own work easy, but is helping his pupils to acquire habits which will tell upon their welfare in all after life.

For want of early training in order and punctuality, many persons are always making blunders and failures. I believe a time table not only aids the teacher in doing the school work in general systematically, but also aids in maintaining proper order.

To the conscientious teacher this question is constantly repeating itself: "How can I do better work?" Especially is this true in an ungraded school. How can we overcome these obstacles, viz:

1. Too many pupils. 2. Too many classes. 3. Limited time. 4. Too little "desk" work. 5. Too little change of position. 6. Irregular attendance. I suggest the plan of making a good time table. This teaches regularity and system to the child, leaves him suitable time for study, avoids hurry, makes interruptions no serious calamity, and gives the teacher opportunity to do his best work.

In the first place, I think the classes should be reduced to the fewest number possible. Then the lessons to be prepared should be *short* and the teacher accept nothing but thorough work.

Reducing the number of classes may be done by *joining* and *alternating*. Join by taking the reader as the basis.

The same language lesson, busy work, and drawing may be taken by several classes at once.

Alternate those subjects which may be most quickly learned or readily practised in other studies, such as reading, writing, taught and practised in every branch, physiology, largely taught incidentally, and geography, an observation study.

I think it best to write out a programme of recitations, time, and desk work. I believe that some teachers have found that it paid to write the time table on the board, explain, and have the pupils copy it.

By this way they know the exact time for changing books.

I think we should not dictate to senior pupils in regard to the manner in which the study hour shall be passed. When a child has reached the Third Reader he is old enough to plan his own work. Tell him what he is to do and be sure he knows how to do it. Then leave him to find the time.

Before we spend very many days in the school-room we find that all do not need the same length of time in which to prepare a lesson, therefore the brightest pupils should be encouraged to do broader work on the same subject. Let them prepare maps, essays, illustrations, etc., for the benefit of all in recitation. I find that the amount of work done often surprises me. Each child feels that no rule will prevent his doing all of which he is capable, and that he is a free and independent worker.

*At the East Middlesex Teachers' Association 10th May, 1895.

I would say have the classes in turns, and have it understood that this order is generally to be followed. When the lessons are short and this plan carried out, the morning hour is not always given to one study at the expense of the others.

The parents too will be better satisfied, for they will not have the impression that the younger scholars are neglected. The foregoing with the following are suggestions, merely, not dogmatic rules :

1. Have primary classes first before the little ones are tired.
2. Have the arithmetic, algebra, book-keeping in the morning as early as possible.
3. Have advanced classes after recess in the afternoon, when the little folks are out of the way.
4. In alternating, have three days in the week those studies which need the most attention.

5. Don't have writing immediately after recess.

6. And don't leave out rest, music, marching or calisthenics, for in the day's work there is a certain routine which cannot be avoided, but beyond that introduce as much variety as possible. Sometimes it is wise to omit a class and rest from work, or introduce some change. When a teacher loses all interest and pleasure in her work it is time to stop and try something else. Anything is better than the drudgery that teaching becomes when the heart is not in it. And lastly, in making a time table, do not forget to set apart ten minutes for the opening exercises. I find that it pays to take time to read a good story, or have a talk with the pupils. The day is brighter for it and the children try to get in time for the story. It is possible for teachers and pupils to get very near to each other at this hour. Increased sympathy and co-operation are certain to be the result.

PRINCIPLES OR METHODS ?

PRICIPLES or Methods, which ? A city superintendent, a member of the board of education, and a visitor started out together to look at some schools. One building was inspected ; it was in fine order ; the pupils were intelligent and the whole aspect was pleasing. Another building was then visited in another part of the town ; the principal was a superior looking man, he had the head of a Kepler ; but there was a lack of order in his room and in those of most of his assistants ; the pupils had many habits that were not agreeable ; they stared at the visitors ; the work on the blackboards was scrawly, and

altogether the total effect was not pleasing.

"Now," said the superintendent, "I have shown you two distinct types of teachers. The first leans strongly to *Methods* ; the other to *Principles*—the latter is the ablest man, undoubtedly. But he neglects many essentials, in my opinion. His pupils do not write as well, draw as well, sing as well, march as well, behave as well, nor do I think he 'gets hold,' as we say, of as large a percentage of them as the other. I have been surprised at his power on a few—on his highly endowed pupils."

The conversation diverged from this point, but the two types were

alluded to several times. The representative of the board of education said: "I think I should rather send my children to the first school, for education consists very much in training to habits; there the habits of the pupils were carefully attended to—even the walking from the desk to the blackboard, the position before the blackboard, the arrangement of the figures on the blackboard, and even the mode of holding the pointer. The pupil I observed did not go on until she saw we were attending to her. All these things showed that the pupils had been trained in a method; they did their work with exactness. Possibly this tends to mechanicalness, and there is the danger, but yet there is a place for and a need of mechanicalness."

"The appearance of No. 1," said the superintendent, "is in its favor. Training into habits is necessary, but here is a question I have considered a good deal. If the pupils of No. 1 come under the sway of ideas they can make use of their habits of order, their habits of doing certain things in certain ways. If they do not enter into the ideal realm, they rarely continue long at school. I don't think the pupils of No. 1 as likely to continue at study, and go to the high school as No. 2; that is, as large a percentage."

"Why is that a result?" "Well, the mechanical teacher or the one who relies on methods—these are not one and the same, they are two classes—has rarely the imaginative element. Now the creative faculty exists in young persons and for a purpose. If we study No. 2 it will be found that the materials gained by study are welded together by the imagination. That principal is a close student, a hard worker, and those he loses are mainly from the ranks of the non-studious—those who do not like to study."

"Which pass the best examinations?"

"Those of No. 1. This may seem strange when I say that the other is the hardest working school, but in No. 2 a great deal of work is done that cannot be measured up; in the other every bit of work can be measured. The principal of No. 2 teaches a great deal outside the course of study. So that on the whole I prefer No. 2; yet a mingling or compound of both would make the ideal teacher. But my experience is that teachers divide into two classes—one that pay great attention to methods, to habits, to ways of doing things; the other to the subject matter, to mental development, to modes of thought, to character. Some of this latter class are splendid scholars, some are so careless of habits they never should enter the schoolroom."

The division of preference in these two men shows the different estimate placed by the public on teachers. One prefers those who pay special attention to habits, the other prefers those who aim at the thinking of the pupil. The lowest type of the former is the dancing master; the highest of the latter is the lecturer or preacher. The right combination of the two is the thing sought in normal schools. In most teaching a rightly chosen method is of the highest importance. It is a mistake to neglect method in teaching; the ways of the teacher make indelible impressions, as well as aid to open up realms of truth.

Some years ago a convention of teachers considered, Why do not more of our pupils go to the high school? Remember now the high school is free, and the young men and the young ladies had no pressing duties to keep them from going on with their studies. Several speakers gave their views. One thought there should be more amusement, others had a suggestion equally useless. One high school

principal, who was the most successful, was appealed to, and he said: "They must be made to feel they gain and exercise power by going to the high school." And this man was right. The successful teachers must develop power; there must be training of the right amount; and mental deve-

lopment of the right amount both of these in the successful school-room. Drill undoubtedly kills off a large percentage in the grammar school. One teacher remarked of teaching Latin, "I can drill a boy until he droops like Par-hasius' model." *The School Journal*, (N. Y.)

THE UNWRITTEN LAW OF GOD.

BESIDES the rule of duty revealed in the living oracles of God, there is a law written on the heart of man. This is antecedent to all training and instruction and springs out of the constitution of our nature. It may be confused, or ill-understood, or habitually disobeyed, but still it is there, engraven on the conscience of man by the finger of God. As Sophocles said: "It is no child of to-day's or yesterday's birth, but hath been no man knoweth how long since." Its divine origin is plain and undeniable, for how else are we to explain the fact of its continuance notwithstanding its disturbing character? There is something in man which censures and annoys him when he does wrong, however much he may be inclined to that wrong. Certainly he never planted this principle of opposition in his soul. If he were the cause of it why does he not rid himself of it? No man would endure what molests and disquiets him if he could expel it. Hence it is fair to infer that it is implanted by a more powerful hand and therefore is rooted so deeply that no human force can pull it up.

That there is this binding revelation of the law, independently of any supernatural external revelation, is expressly taught in the Scriptures. The heathen, not having any outward divine enactment, yet often do the

things which the written law demands, such as honesty, obedience to parents, kindness to the poor; and they do these things by nature, that is, by virtue of their original constitution, that with which they came into being and which is not molded by any extraneous training, culture, or other influence beyond the congenital endowments and their progressive development. Thus they have in their own nature a rule of duty and a sense of obligation. Gentiles as well as Jews, those who have a written revelation and those who have not, are alike under moral obligation and must appear before the final Judge.

The doctrine of Scripture on this point is confirmed by consciousness and by experience. Every man feels that he is a responsible being. He has the sense of right and wrong not simply in regard to outward actions but also in respect to secret thoughts and motives. The idea of obligation is inherent and inalienable, and quite independent of any revelation from the unseen world. It springs unbidden and irrepressibly from the constitution of the mind itself. A man may be unable to determine the source of his knowledge of the subject, but he is certain that it has been in him coeval with the dawn of reason, and has been increased and strengthened by the unfolding of his faculties. It is

quite impossible to ascribe his convictions to education. They spring up anterior to all influences from without because they lie at the very core of his being.

As God left not Himself without witness in the things that are made, which point to His eternal power and godhead, so neither did He leave failure of witness in the inward structure of man which demands, nay insists, that there is an original supernal law which no attacks of reason can overthrow, which no changes of opinion can alter. The common objection to this view is that men have differed, and do differ, widely in their moral judgments, the same acts being in one country or in one age denounced as crimes, and yet in another land or time commended as virtues. But this diversity so far from impairing the supremacy of conscience confirms it. For why do men form any judgment at all in the case? Why are they not wholly indifferent? Just because there is that within them which compels an opinion, even the universal

sense of right and wrong. For men, unless they were rational, could not take sides upon a given point and undertake to support their views by argument. So, then, just as reason belongs to the essence of human nature, in like manner does the unwritten law.—T. W. CHAMBERS in *Public Opinion*.

Teaching is not merely declaring truths that the teacher knows. It is making a pupil to know what he has not known, but which he needs to know. A full teacher does not necessarily make a full pupil, but a teacher has not performed his work until his pupil has gained his share of what the teacher has to impart. Herein is the difference between teaching and preaching. A preacher can preach whether any one hears him or not, but no teacher can teach unless some one is a learner through his teaching. Yet many a lay preacher occupies, but does not fill, the chair of a teacher. Every teacher ought to teach, but not every "teacher" does teach.

THE PHYSIOGRAPHY OF VOLCANOES.

BY JACQUES W. REDWAY. Editor of *Goldthwaite's Geographical Magazine*.

"A volcano is a mountain that sends forth fire, smoke, ashes, and melted rock from an opening within called the crater."

[COPY this choice excerpt word for word as I wrote it nearly twenty-five years ago. Now, accepting the fact that a volcano is not a mountain, that there is neither fire nor smoke, that there are no ashes, and that the opening within is not the crater, the definition is about correct. It is true that not so much was known at that time as at present about volcanoes, but the thing most apparent

is the fact that I knew nothing about the subject at all. Let us consider the statements, one at a time.

In the first place a volcano is not a mountain at all; it is a hole—that is, it is the channel that opens from a reservoir of superheated or molten matter situated at a considerable depth below the surface of the earth. This is the essential feature of the volcano. The ejected matter may or may not be piled about the mouth of the vent, but usually enough accumulates to build up a conical mountain, and the

latter is commonly called the volcano. Volcanoes nearly always occur in mountain-ranges, and they are rarely found elsewhere; but it is nevertheless true that they are merely an incident in mountain-structure, and are not the cause of it. The mountain-range consists of one or more folds or wrinkles in the strata of rock that are trying to fit themselves about a shrinking globe. The volcanic peak, on the other hand, is composed of substances that have fallen or gathered about the vent. They are an addition to the mass of the mountain-range, and not a constituent part of it.

Just where the *ejecta* of a volcano come from is not known, nor yet is it known with certainty what causes the sudden development of energy that constitutes the volcanic outburst. Conservative geologists, and nearly all mathematicians, reject the theory of a liquid interior so far as the earth is concerned. Moreover, the majority of geologists agree that the products of eruption may come from local reservoirs of matter heated to the point of fusion by chemical action, and that a liquid interior is not at all necessary to the existence of volcanic action. But whatever may be the source of the *ejecta*, the channel itself is the part that concerns the geographer, and this is essentially, the volcano.

Let us now examine the question of fire and smoke. Fire means combustion, and practically combustion consists of the chemical combination either of hydrogen or of carbon with oxygen. Now, it is hardly necessary to say that there is neither free carbon nor hydrocarbons within the reservoirs of volcanoes. Furthermore, there is but one instance on record in which the combustion of free hydrogen has ever been observed. But how shall we explain the glow of light that attends most volcanic outbursts? Let

us see. Occasionally, when a train of coaches is passing through a railway tunnel, there is a sudden illumination of the latter. The fireman has opened the furnace-door of the locomotive, and the light from the glowing furnace is reflected from the surfaces of millions of globules of condensing steam; every part of the funnel is illuminated by it. So it is with the volcano. Dense clouds of condensing steam and other vapors hover over the crater, and, from the under-surface of this, the glare of molten material therein is reflected. Streams of lava pour down the flanks of the crater rampart, and the light from these struggling through thick banks of sulphureous mist, is reflected from a background of inky blackness. It is this fitful glare that lends to the volcano an appearance closely simulating real flames.

The smoke of the volcano has nothing whatever in common with ordinary smoke, colour excepted. There is no unoxidized carbon, carbon dioxide, creosote, or other carbon compounds. At the least, ninety-eight per cent. of the gaseous product consists of steam; the remainder is mainly sulphur compounds and free sulphur. The steam quickly condenses to clouds, and the latter, not infrequently loaded with sulphurous acid, send showers of corrosive rain upon the area surrounding. In several Vesuvian outbursts, the corrosive acid rain has caused a greater and more widely spread damage than both lava and "ashes." The blackness of the mass of vapour hanging about the crater naturally enough suggests smoke, but it must be remembered that the white colour of a cloud mass is due almost wholly to the peculiar manner in which it reflects light and a cloud that is dazzling in its whiteness to one observer may have a forbidding lustre to another at a distance. Moreover, if the vapour has passed its first stage of condensation,

and is beginning to coalesce into mist it acquires a dark brownish-black colour, even by reflected light; and if the globules of vapour have condensed each about a nucleus of solid matter, such as dust or other floating matter of the air, the resulting cloud will be almost black. So the "smoke" of volcanoes is not smoke at all, but mixed vapours—mainly the vapour of water in various stages of condensation and precipitation.

The "ashes" of volcanic eruption are also inconsistently named. The term "ash," by common consent, is applied to the residuum of combustion. The ash of volcanic *ejecta*, however, consists of lava and other molten matter so finely divided that the particles float in the air. I have in my possession several specimens of "volcanic ash"; one from Vesuvius is so coarse that a magnifying power of eighty diameters shows it to consist mainly of the mineral obsidian, or volcanic glass; in another, the particles are so small that a one-sixth objective, magnifying about six hundred diameters, does not with any certainty reveal the character of the material. The more finely divided the "ashes" the further it is carried. In many instances such *detritus* has been carried more than one thousand miles; the substance ejected from Krakatu, in the Strait of Sunda, was carried around the earth.—*The Journal of Education, London.*

"THE TRUE TEACHER, is in sympathy with his pupils. He loves them, is interested in all they do, not only in the school-room but everywhere."—*M. E. Hadley.*

GREAT SOCIAL SYSTEMS.—We must remember how small a proportion the good or evil effected by a single statesman can bear to the good or evil of a great social system.—*Macaulay*;

FREEDOM.

Is true freedom but to break
Fetters for our own dear sake,
And, with leathern hearts, forget
That we owe mankind a debt?
No! true freedom is to share
All the chains our brothers wear
And with heart and hand, to be
Earnest to make others free!

They are slaves who fear to speak
For the fallen and the weak;
They are slaves who will not choose
Hatred, scoffing and abuse,
Rather than in silence shrink
From the truth they needs must think;
They are slaves who dare not be
In the right with two or three.

—*James Russell Lowell.*

CLEANLINESS.—The *Nineteenth Century*, for this month contains an interesting article by Lady Priestley, entitled "The Penalties of Ignorance," and dealing especially with the corruption of food, in larders and elsewhere, by the generation of micro-organisms under certain conditions analogous to those which produce septic poisoning in hospitals. The latter has been conquered by science, and she not unnaturally asks, "Why not the former?" Lady Priestley describes, with much liveliness, visits to larders or store-rooms in which, to the vexation of mistress and maid, "things will not keep." This unfortunate state of things she traces, and rightly, to ignorance of the laws of the world of micro-biological life, and after dwelling on the endless risk and loss which we suffer from this cause, she concludes by quoting a remark of Sir William Jenner to the effect that geography, history, and crochet-work form far too large an item in the curriculum of our Elementary Schools, and the doctrines of life far too small an item.

ASTRONOMICAL NOTES.

BY THOS. LINDSAY, TORONTO.

AN instance of the rapidity with which our knowledge of the solar system increases, and how, almost daily, something is added to the general stock, is within our very recent experience. Two months ago we could say no more of the rings of Saturn than that they were composed of minute bodies, this being the only constitution that could allow stability under the laws of gravitation; to-day we can add, in proof of the theory, that, in the hands of Prof. Keeler, of Allegheny, the spectroscope has given evidence indisputable, that the inner bodies composing the ring perform their revolution more rapidly than the outer particles, following Kepler's third law that the square of the periodic time is proportional to the cube of the mean distance, the particulars of Prof. Keeler's work on this line appeared in *Astrophysics* for May. Saturn is on the meridian at a convenient hour for observation during June and the retrograde motion among the stars of Virgo is quite apparent. After July 4th the motion is direct.

Jupiter is too near the sun now for good seeing; conjunction occurs on July 9th, and we need not look for the satellites until the August mornings. At the near approach of Venus in May, the weather was very unfavourable for observation. The planets are now separating at the rate of about one degree daily and when Jupiter is at conjunction Venus is at her greatest elongation east, and in the telescope a very beautiful half-moon. On the 25th of June the moon, then three days old, is in conjunction with Venus and an occultation occurs, but not until after setting at Toronto; it will be visible in the Pacific ocean.

It will be interesting to note the path of Venus with reference to Mars during June. The latter is a tiny red speck about one degree south of the brilliant evening star, on June 4th, after which both planets approach the Bee-hive cluster (Praesepe) in Cancer. Mars will be directly in the group on June 19th. A telescope of moderate power resolves the cluster into stars.

Observers will have noticed that we have now above the horizon, in the evening, Arcturus, Vega, and Spica, three of the brightest stars in the heavens. The stars in the neighbourhood of Vega are especially interesting for telescopic observation. The quadruple Epsilon Lyrae is a good test for 3-inch, and the ring Nebula, between Beta and Gamma of the same constellation, is a wonderful object, within the power of the amateur's instrument though it does not bear magnifying well.

Two occultations of small stars in Virgo occur on the evenings of June 29th and 30th.

— — —

A CHRISTIAN SCHOOL is made by the atmosphere, the general tone, the surrounding objects, the character of the teacher, the constant endeavor, the loving tact, the gentle skill by which the light and spirit of Christianity—its lessons for the head, for the heart, for the whole character—are made to pervade and animate the whole school life of the child, just as the good parent desires that they should animate his whole future life in all his manifold duties and relations as man and citizen.—*Rev. J. J. Keane.*

NOTES FOR TEACHERS.

L'Echo de Paris gets off the following joke anent a young Vouilo, eldest son of Behanzin King of some cannibal island, who has been brought to Paris to be educated and installed as student at the Saint-Pierre Lyceum. The journal states that the young savage possesses excellent parts, but it makes believe that, unfortunately, he has brought with him to Paris some of the troublesome instincts and habits which cling to his birth and race.

MASTER IN CHARGE.—Pupil Vouilo come this way.

VOUILO.—Here I am, M'Sieur.

M.—I am not pleased with you.

V.—Oh! M'Sieur!

M.—Make no protests. You know as well as I do that you have done something to be ashamed of.

V.—What! I, M'Sieur!

M.—Do not make your fault worse. I understand quite well that you have not yet become accustomed to our modes of life, and that, now and then, the results of your early training get the better of you.

V.—I am much obliged to you, M'Sieur.

M.—You have nothing to thank me for . . . but, really, you must be more careful in future.

V.—Is it because I haven't known my French History well?

M.—No! You certainly made a great blunder when you confounded Henry IV with Chilpérie, but things like that occur to everybody.

V.—Is it because I have been making pictures in my copybook?

M.—Not at all. I am a lover of the arts, and I shall never find fault with you, if you ardently give yourself up to them.

V.—Is it because I have put my fingers into my nose?

M.—You mistake me entirely.

You are the son of a King, and have the right therefore to put your fingers where you please.

V.—Then I can't think of anything else I have done.

M.—Come, try and recollect. Have you no notion of having done something wrong?

V.—No, M'Sieur.

M.—May you not, by chance, have eaten one of your school-mates?

V.—Oh! That's it, is it?

M.—You mustn't think that I am very much blaming you. In life, everything depends on the training we have received. But, the principal of this school is much put out, for he fears that, if the news of what you have done spreads abroad it will injure the credit of this institution. For this reason I am obliged to be severe.

V.—But, if you please, M'Sieur, I did it because I was hungry.

M.—I have no doubt of that, my young friend. But I must make an example. You will, therefore, as a punishment, learn for me the story of *The Wolf and the Lamb*. And, mind, don't do it again, else, next time (*severely*), I shall give you as an imposition two hundred lines.

THE ISOLATION OF HELIUM.—Lord Rayleigh, the first to isolate from the air the gas argon, whose existence was never known until last year, is now said to have made another very interesting discovery. Chemical analysis of the substances composing the earth's crust has thus far revealed nearly seventy distinct elements; and spectroscopic study of the sun has already detected the presence of more than half of them in that body. But there are indications that the sun contains a few elements which are yet unrecognized in terrestrial matter. For in-

stance, there is a line in the green part of the spectrum of the outermost solar envelope, the corona, which is thought to represent a gas much lighter than hydrogen. The substance itself is called "coronium." Nothing of the sort has been found on the earth. Again, when the spectroscopists examine the chromosphere, the layer of gas next below the corona, but lying above the luminous cloud-shell of the sun, they discover in the yellow a brilliant line. No line could be perceived at this point in the spectrum of any terrestrial substance, and hence the element thus signified was, like coronium, regarded as peculiar to the sun. Indeed, such a supposition is embodied in its name, "helium." Since the first discovery of the latter line, however, it has been recognized in the spectra of a few stars, which are also suns, but many million times as far

away from us as our own. And now comes the report that Lord Rayleigh has just found helium in a rare mineral from Norway.

This famous chemist was testing a rock specimen, according to a brief cable dispatch to the *New York Sun*, with sulphuric acid. Such tests of that particular mineral have been made before, and they always yielded a gas. Heretofore the latter has been believed to be nitrogen merely. But Lord Rayleigh perceived that it was argon; and, what is more, that some other gas was combined with it. His further investigation led him to identify it with helium.—*New York Tribune*.

Let your own discretion be your tutor; suit the action to the word, the word to the action.—*Hamlet, iii. 2.*

PUBLIC OPINION.

PROF. BLACKIE.—Since the death of Carlyle, Professor Blackie was by far the most picturesque if not powerful of Scotsmen. In influence, in genius, in accomplished work, the Professor is not to be compared with the author of "Sartor," but Blackie had talent and courage enough to give him a unique place. His originality and independence were not always appreciated, and students preparing for an examination often found him quixotical. None the less he was a potent and stimulating influence in the life of the young. An enthusiast, he knew not how to do things by halves. He did much for Celtic literature, and, indeed, for literature in general. But was as a patriot that he especially appealed to the hearts of his countrymen. He loved Burns as much as he

loved Homer; and the old Scots ballads he had by heart.—*The Publisher's Circular*.

REAL EDUCATION.

After saying that education was a subject not ordinarily prominent on a political platform, Mr. Balfour said that the common opinion about the meaning of the word and the thing was generally much too narrow. In his opinion, "education includes, and ought to include, every one of those forces, be they the forces of family affection, be they the forces of scholastic education, be they the forces of religious education, which mould the future citizen and the future man." All this is apt to be forgotten, and, in common parlance, those concerned with education are supposed to have

their interest in it "narrowed down to the limits of passing this or that standard, earning such and such a grant, carrying out, in other words, the technical requirements of a technical Code." Under his view the instruction given in church is as much a portion of real education as is the instruction given to children in school.—*The School Guardian*.

RELIGIOUS EDUCATION.—It is not so much money as faith, and skill, and earnestness that are wanting. Let the work of religious education be once thoroughly organised, and the public will regard it with less apathy. And the more thorough education of the young in spiritual things will result in much heartier support of the churches in the no distant future. If instead of lamenting the neglect of religious education, and slandering the state system, as is too generally done, those who ought to see to the training of the young in spiritual matters would set about doing the work systematically, and organizing machinery for it, it would be far bet-

ter for the churches themselves and for the Colony.—*The Schoolmaster*.

LITERATURE: Mr. Craik, the accomplished Secretary to the Scottish Education Department, in opening a new Board school in Edinburgh last week, made some pertinent and forcible remarks on education. He was, perhaps, unnecessarily severe on bookstalls, and the modern school of criticism, but what he said about the teaching of literature in schools deserves the attention of all concerned in the instruction of the young. He complained, and complained with justice, that on the literary side education is too often a mere matter of names, dates, and titles of books. "Let the teachers," said Mr. Craik, "give some knowledge, however little, of the spirit of the author, some understanding of his genius, some feeling of why it was that they did and ought to enjoy him, and why he was thought worthy of being read and remembered. Above all, let them be given an intellectual position and a standard of sound discriminating taste."—*The Publisher's Circular*.

GEOGRAPHY.

POTOSI.—The richest region of the world is probably the Mountain of Potosi. The name signifies "an eruption of silver," and is justified by the abundance of the precious metal it contains. Over five thousand tunnels and openings have been made into it, and each of these has produced gold, silver, copper, iron, lead, tin, quicksilver, zinc, antimony, or some other valuable material; but silver in by far the greatest profusion. The silver is so plentiful indeed that, though gold is present, it has been hardly worked at all, as it is more difficult to procure it by the processes

in vogue in the district.—*Schoolmistress*.

THE ATMOSPHERE OF MARS.—To sum up, now, what we know about the atmosphere of Mars: we have proof positive that Mars has an atmosphere; we have reason to believe that this atmosphere is very thin,—thinner at least by half than the air upon the summit of the Himalayas,—that in constitution it does not differ greatly from our own, and that it is relatively heavily charged with water vapor.—*Percival Lowell in the Atlantic Monthly*.

EDITORIAL NOTES.

Mr. Temple A. Robinson, who has had experience in newspaper work in England, United States of America and Canada, is Business Manager for THE CANADA EDUCATIONAL MONTHLY. This magazine has felt the need of

such a man for years. We bespeak for Mr. Robinson, a hearty welcome by our friends, *his office* is at No. 5 York Chambers, Toronto Street: he will be pleased to meet any of our friends at his office.

SCHOOL WORK.

SCIENCE.

(J. B. TURNER, B A., EDITOR)

I.

BOTANY.

THE following description of the *Geranium maculatum* is by Miss Clara A. Cowan, a student in the Hamilton Collegiate Institute preparing for the coming Primary Examination. It is given here as a model, not necessarily perfect, of what is required of candidates who write on this examination.

ROOT—Kind, fibrous. Color—brown. Origin, secondary; duration, perennial.

The plant has an underground stem, and from this the rootlets are sent off all along its length. This stem is short and new buds are present on it.

STEM—Exogenous, herbaceous, erect, round, ridged, hairy, green, 1 ft. in height, and strong scented.

LEAVES.

CAULINE

RADICAL.

| | | |
|------------------|------------------------------|-------------------------------|
| Position..... | Cauline..... | Radical. |
| Arrangement..... | Opposite..... | |
| Insertion..... | Petiolate..... | Petiolate. |
| Stipulation..... | Stipulate..... | |
| Division..... | Simple..... | Simple. |
| Venation..... | Palmately net-veined..... | Palmately net-veined. |
| Outline..... | Deeply lobed, 5-7 parts..... | Deeply lobed, 5-7 parted. |
| Margin..... | Crenate..... | Crenate. |
| Apex..... | Acute..... | Acute. |
| Base..... | Divided..... | Divided. |
| Surface..... | Hairy, ridged beneath..... | Hairy, ridged beneath, |
| Color..... | Green..... | Green above, lighter beneath. |

INFLORESCENCE—Flowers in a sort of compound umbel, in pairs, and determinate. Flowers about an inch across, and symmetrical.

Axillary; peduncle 3 in. in length, hairy; pedicels short, with 4 small leaflike attachments at the base.

II.

The following are review questions on Chapters XXII XXVIII in the High School Chemistry:—

1. (a) Describe the preparation and state the properties of hydrochloric acid.

(b) How can the volumetric composition of hydrochloric acid be determined?

2. Express by means of equations the reactions which occur in the preparation of chlorine.

3. (a) Explain the bleaching action of chlorine and give experiments in support of your explanation.

FLORAL SCHEDULE.

| ORGAN. | No. | COHESION. | ADHESION. | REMARKS. |
|-------------------------------|-----|------------------|----------------|--|
| Calyx Sepals.... | 5 | Polysepalous.... | Inferior..... | Cover with soft white hairs, 3 nerved, imbricate in bud, awned, awns separated in bud, sepals closely overlapping, more hairs on outer 3 than other 2. Linear, same length as petals in bud, regular, alternate with petals, persistent. |
| Corolla Petals.... | 5 | Polypetalous.... | Hypogynous.... | Imbricate in bud, whitish in bud with purple streaks, regular, entire, much larger than sepals in the open flower, claw bearded, limb broad, petals purple. |
| Stamens, Filaments, Anthers.. | 10 | Polyandrous.... | Hypogynous.... | Versatile, introise, anthers large, filaments slender, twice as many as petals, anthers white in bud with purple streaks around margin, two rows, 5 in each; filaments united slightly at the base and broader than at the upper end, outer row of stamens shorter than inner and lower on the receptacle. |
| Pistil Carpels.... | 5 | Syucarpous.... | Superior..... | Upper part of styles slender, lower part united, ovules 2 in each cell, but there is only 1 seed formed in each cell, lower part of 5 styles attached to a long beak and curling upward in fruit. |

(b) Compare its action as a bleaching agent with that of sulphur dioxide.

4. Explain by equations what occurs in each of the following :

(a) Chlorine is passed over slaked lime and sulphuric acid added to the product.

(b) Chlorine is passed through a solution of potassic hydrate.

(c) Hydrogen sulphide is added to bromine water.

(d) Chlorine is added to starch paste and potassic iodide in solution.

(e) Strong sulphuric acid is added to potassic iodide.

(f) Phosphorus is treated with iodine and the product shaken up with water.

(g) A mixture of calcic fluoride and sand is treated with heated sulphuric acid and the gaseous product passed through water.

(h) Chlorine is passed over a strongly heated mixture of sand and carbon.

(5) A vessel is known to contain a solution of chlorine or hydrochloric acid. Give three methods by which you would determine which it contains.

6. Distinguish between chlorides, bromides and iodides.

7. Describe the preparation of phosphorus and give equations representing the reactions which take place.

8. Give the preparation of phosphine with equation ; also give the equation representing its combustion.

9. Compare the compounds of phosphorus with those of nitrogen.

10. State the reasons for considering the air a mixture of gases and not a compound.

SENIOR LEAVING TRIGONOMETRY.

By PROF. N. F. DUPUIS, QUEEN'S COLLEGE, KINGSTON

(Concluded from last issue.)

4. (a) Let $P = a + b$ and $Q = a - b$. Then $a = \frac{1}{2}(P + Q)$ and $b = \frac{1}{2}(P - Q)$. But $\cos(a - b) - \cos(a + b) = 2 \sin a \sin b$.

$$\therefore \cos Q - \cos P = 2 \sin \frac{1}{2}(P + Q) \sin \frac{1}{2}(P - Q).$$

(b) Prove that $\cos 5^\circ - \sin 25^\circ = \sin 35^\circ$.

$$\sin 35^\circ + \sin 25^\circ = 2 \sin 30^\circ \cos 5^\circ.$$

But $\sin 30^\circ = \frac{1}{2}$, and the result follows.

5. In any triangle prove that

$$(a) \frac{\sin A}{a} = \frac{\sin b}{b} = \frac{\sin c}{c} = \frac{1}{2R}$$

Let ABC be a triangle inscribed in a circle and let BD be the diameter of the circle. Then the $\angle BDC = \angle A$; and $\sin BDC = \frac{BC}{BD} = \frac{a}{2R}$.

$$\therefore \frac{\sin A}{a} = \frac{1}{2R} = \frac{\sin B}{b} = \frac{\sin C}{c} \text{ from symmetry.}$$

$$(b) \frac{1 + \cos(A - B) \cos C}{1 + \cos(A - C) \cos B} = \frac{a^2 + b^2}{a^2 + c^2}$$

Since in any \triangle the sum of the angles is π , $\cos C = -\cos(A + B)$.

\therefore The numerator of the left reduces to $1 + \cos(A - B) \cos(A + B)$;

which again reduces to $1 - (1 - \sin^2 A + \sin^2 B)$ or, $\sin^2 A + \sin^2 B$.

∴ The left-hand fraction becomes $\frac{\sin^2 A + \sin^2 B}{\sin^2 A + \sin^2 C}$, which = $\frac{a^2 + b^2}{a^2 + c^2}$ by 5(a).

6. (a) Find an expression for the area of an n -sided regular polygon.

Let s be a side of the polygon, θ be the angle at the centre subtended by a side, and p be the apothem. Then $p = \frac{s}{2} \cot \frac{\theta}{2}$, and the area of one of the triangles included by two radii and a side is $\frac{s^2}{4}$.

∴ The whole area = $n \frac{s^2}{4} \cot \frac{\theta}{2} = n \frac{s^2}{4} \cot \frac{\pi}{n}$

The area might also be found in terms of the perimeter, or of the circum-radius, etc.

(b). Show that $2R + 2r = a \cot A + b \cot B + c \cot C$.

Remembering that $\frac{a}{2R} = \sin A$, etc., we divide through by $2R$ and obtain: $\cos A + \cos B + \cos C = 1 + \frac{r}{R}$

But $\cos A + \cos B + \cos C = 1 + 4 \sin \frac{A}{2} \cdot \sin \frac{B}{2} \cdot \sin \frac{C}{2}$ by a known theorem; and $\sin \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{bc}}$, etc. And this expression becomes,

$$1 + 4 \sqrt{\left\{ \frac{(s-b)(s-c)}{bc} \cdot \frac{(s-c)(s-a)}{ca} \cdot \frac{(s-a)(s-b)}{ab} \right\}}$$

$$= 1 + \frac{4\Delta^2}{sabc} = 1 + \frac{4\Delta}{abc} \cdot \frac{\Delta}{s} = 1 + \frac{r}{R} \quad \text{q. e. d.}$$

7. From a station, B, at the base of a mountain, its summit, A, is seen at an elevation of 60° ; after walking one mile towards the summit up an incline of 30° with the horizon to another station, C, the observer finds the angle BCA to be 135° ; find the height of the mountain.

Evidently the elevation of the summit as seen from station C is 75° .

Let h be the height of the mountain, and x be the distance from B to the foot of the perpendicular let fall from the summit.

Then $h \tan 60^\circ$; and going to station C, $h - \sin 30^\circ = (x - \cos 30^\circ) \tan 75^\circ$. And substituting for x , $h - \sin 30^\circ = (h \cot 60^\circ - \cos 30^\circ) \tan 75^\circ$;

$$\text{whence } h = \frac{\sin 30^\circ - \cos 30^\circ \cdot \tan 75^\circ}{1 - \cot 60^\circ \cdot \tan 75^\circ}$$

Otherwise as follows: $\angle BAC = 180^\circ - (135^\circ + 30^\circ) = 15^\circ$.

Then $BA : BC = \sin 135^\circ : \sin 15^\circ$

$$\therefore BA = BC \cdot \frac{\sin 45^\circ}{\sin 15^\circ}$$

$$BC \cdot \frac{\sin 45^\circ \cdot \sin 60^\circ}{\sin 15^\circ}$$

Both of these solutions give the same result upon substituting the values of the functions, namely, the height = $\frac{1}{2}(3 + \sqrt{3})$, or 2.366 + miles.

8. (a) Prove that $\log_a \sqrt[m]{m} = \frac{1}{k} \log_a m$, and that $\log_a N = \frac{\log_a N}{\log_a b}$

1st. Let $a^p = m$. Then by definition $p = \log_a m$

And $a^{p/k} = m^{1/k} = \sqrt[k]{m}$. ∴ $p/k = \log_a \sqrt[k]{m}$. Whence $\frac{1}{k} \log_a m = \log_a \sqrt[k]{m}$.

2nd. Let $b^x = N$. Then $x = \log_b N$. Also take logarithms to base a .

Then $x \log_a b = \log_a N$. And substituting for x , $\log_b N \cdot \log_a b = \log_a N$.

$$\text{Whence } \log_b N = \frac{\log_a N}{\log_a b}$$

(b) Find $\sqrt[14]{242447}$, given mantissa $\log 24244 = .3846043$, and diff. for 1 = 179. $\text{Log } 242447 = 5.3846043 + \frac{7}{10} \cdot 179 = 5.3846168$.

Dividing this by 14 gives .3846155, and the number answering to this logarithm is 2 4244C +

9. (a) Given $b = 927.3$, $c = 519.6$, $A = 73^\circ 18'$, find B and C, having given $\log 407.7 = 2.6103407$, by $1446.9 = 3.1604385$

$$\left. \begin{array}{l} L \cot 36^\circ 39' = 10.1331709 \\ L \tan 20^\circ 57' = 9.5830435 \end{array} \right\} \text{Diff. for } 1' = 3782.$$

Being two sides and the included angle given, the proper formula is

$$\frac{b+c}{b-c} = \frac{\tan \frac{1}{2}(B+C)}{\tan \frac{1}{2}(B-C)}$$

But $b+c = 1446.9$ and $b-c = 407.7$; and $\frac{1}{2}(B+C) = 90^\circ - \frac{1}{2}A = 53^\circ 21'$ and the complement of this is $36^\circ 39'$.

The logarithmic formula is: $L \tan \frac{1}{2}(B-C) = \text{cog}(b-c) + L \tan \frac{1}{2}(B+C) + a.c.\log(b+c) = 2.6103407 + 10.1331709 + 6.8395615 = 9.5830731$.

Whence $\frac{1}{2}(B-C) = 20^\circ 57' 4'' 7$. And $\frac{1}{2}(B+C) = 53^\circ 21'$.

$\therefore B = 74^\circ 18' 4'' 7$. $C = 32^\circ 23' 55'' 3$

(b) Given b , c , and C , show how to solve the triangle, indicating when and how an ambiguity may arise.

Discuss geometrically, the possible ambiguity. Fundamental formula $\frac{\sin B}{\sin C} = \frac{b}{c}$. $\therefore \sin B = \frac{b}{c} \sin C$. Or, logarithmically, $L \sin B = \log b + L \sin C + a.c.\log c$.

If $b < c$, then $B < C$ and $2B < B+C < \pi$. $\therefore B < \frac{\pi}{2}$ and is determined by its sine. If $b = c$, then $B = C$ and is determined. If $b > c$, then $B > C$, and $2B > B+C$ which is $< \pi$

\therefore All we know about B is that it is greater than a quantity which is $< \frac{\pi}{2}$, and as far as its sine is concerned B may be $> \frac{\pi}{2}$ or $< \frac{\pi}{2}$. This forms the ambiguous case.

The ambiguous case cannot be intelligently discussed, geometrically, without a figure.

CONTEMPORARY LITERATURE.

The complete novel in the June *Lippincott* is unusually fresh and stirring in its interest, being a romance of Spain in the time of the Peninsular war. The author's name is Benito Perez Galdos. A little lyric of peculiar sweetness and delicacy is that entitled "Robin," by Ella Gilbert Ives. Among other interesting matter may be mentioned an article on "Improving the Common Roads," by J. G. Speed.

Two Canadians figure in the issue of June 1st, of *Littell's Living Age*, Miss L. Dougall, of Montreal, is represented by a charming little tale called "Young Love," while Mr. Arthur J. Stringer, of London, Canada, contributes a short poem in which are united felicity of expression and beauty of thought.

"The Lottery Ticket" is the title of a serial by J. T. Trowbridge which is running at present in the *Youth's*

Companion. As all of this writer's stories, it is admirably told and will do good, but its charm is rather modified by an uncomfortable sense of retribution which pervades the tale. Mary Toppan Wright has a cheerful little story entitled "Three Fires at Redmont," which will prove most attractive to girls.

The best of the series given by Robert Grant so far is that in the June number of the *Scribner's* on the "Use of Time." So much common sense is rarely found in such an attractive form. Meredith's "Amazing Marriage" bears out the meaning of its title in noble style. There are not many latter day heroines so pleasing and wholesome as Carinthia. Miss Goodloe's stories of girls' college life are certainly interesting, but we doubt if their tendency is wholesome, the present one, which treats of "A Western Girl at an Eastern College," is rather better than its predecessors.

A new serial, "The Luck of the Pendennings," by Elizabeth N. Bellamy is begun in the June number of the *Ladies' Home Journal*. It will go to the heart of the great majority of those young women who read it. The *Home Journal* is singularly happy in its discernment in this respect. "The Career of a Baltimore Girl" is the story of the unfortunate Madame Bonaparte and is by Harper L. Langdon. Dr. Parkhurst contributes an article on "Women without the Ballot.

Gilbert Parker's serial "The Seats of the Mighty" grows in strength and interest in the instalment given in the June *Atlantic*. Rarely has the portraiture of Canadian history been better done. The second of Percival Lowell's excellent papers on "Mars" is given; in this the Water Problem is considered. "Rosita" and "Through the Windows" are short stories. William Sharp contributes "Some Reminiscences of Christina Rossetti."

The "Decline in Railway Charges" will be discussed in the *Popular Science Monthly* for June, by Henry T. Newcomb. In view of the fact that this decline has steadily reduced the profits that railroads yield to investors. Mr. Newcomb believes that the future will require considerable economies such as may be brought about by the practical consolidation of lines.

The *Illustrated London News* of June 8th contains the usual interesting pictures and notes on the events of the day, describing fully the "Royal Visit to Warwickshire and the Military Tournament at the Agricultural Hall." Marion Crawford's story "Adam Johnson's Son" seems to be approaching a climax.

Most amusing and graceful is W. D. Howells in his "Tribulations of a Cheerful Giver," published in the June *Century*; there is to be a second one in July. "The Princess Sonia," by Julia Magruder, is, as before, illustrated by Gibson and gives with great insight the bond of peculiar friendship which exists between some women. Mr. Josiah Flynt contributes another of his remarkable papers on "Tramp Life;" this time the scene is in the British Isles. A new writer has arisen in the person of Mr. Chester Bailey Fernald. Those who have read his story of "Chan Tow the High Rob" cannot fail to predict for him a humorous and successful career.

The readers of *Macmillan's Magazine* must regret that such an unusual story as the "Hérons" seems to be approaching a speedy conclusion. Will not the name of the author be given? Such modesty on the part of the writer and reserve on the side of the publisher seems strange in our newer country. A somewhat startling short story is that entitled "The Editor of the Cuodrilla. Canadians will be especially interested in "A

Soldier's Journal," which gives an account of the English occupation of Quebec immediately after 1759.

We are glad to receive another volume of the *Cambridge Bible for Schools and Colleges*. It is on the Psalms; and the general Editor, Prof. Kirkpatrick, of Cambridge, is also the editor of this book. Books II. and III. of the Psalter are the text, including Psalms xxii. to lxxxix. The introductions include, besides a general introduction, short discussions on the "Titles and Authorship of the Psalms," "Growth of the Psalter," "Hebrew Poetry," the "Messianic Hope," etc. The notes, as readers of the Cambridge Bible are well aware, are always exceedingly satisfactory, and the learning and research brought to this task by Dr. Kirkpatrick and others, is much appreciated by those fortunate enough to possess these books. [Cambridge: At the University Press.]

Brief biographies of Chaucer, Spenser and Sydney, written by Gertrude A. Ely, form the first volume of *English Men of Letters for Boys and Girls* (New York and Chicago: E. L. Kellogg and Co.) Charles Lamb's remark is quite apropos at present: "When everybody is talking about some new book, go and read an old one." Boys and girls can have no reading better than the lives of such men as these.

MacMillan's Elementary Classics. Xenophon's Anabasis. (London and New York: MacMillan & Co.) The Editor of the latest number of this excellent series is the Rev. J. H. Hall, M.A., Assistant Master at Westminster School. The edition is remarkably complete, containing, besides full notes, and good vocabulary, several introductory essays, maps, etc., and, like the editions of Books III. IV. V. VI., in the same series and by the same editor, is suitable for somewhat advanced classical pupils. The

editor has consulted recent German and English texts and has produced an edition which will be found thoroughly satisfactory.

A recent number of *Heath's English Classics* is an excellent annotated edition of Burke's speech "On Conciliation with America." The editor is Mr. A. J. George, of Newton, Mass. (Boston: D. C. Heath & Co.) Another good number, also edited by Mr. George, is "Webster's First Bunker Hill Oration."

Manual of Home Made Apparatus. (New York and Chicago: E. L. Kellogg & Co.) Prof. Woodhull of the Teacher's College, New York City, has given in this little hand-book, brief, clear and comprehensive directions for making apparatus for experiments in physics, physiology, and chemistry. Home-made apparatus is often the most satisfactory and durable.

Messrs. Moffatt & Paige (London, Eng.) have published a *Pupil Teacher's Course for the First Year*, containing many good exercises on Grammar, Composition, Music, and Arithmetic.

Heath's Modern Language Series. Fleurs de France. By Camille Fontaine, Director of French Instruction in the High Schools of Washington, D. C. Boston: D. C. Heath & Co. Fifty short tales, chosen from good French authors, and edited by Mr. Fontaine, form a pleasing number of *Heath's Modern Language Series*. The French, as Mr. Henry James and Mr. Brander Matthews have both told us, excel in short stories.

School Classics. Erasmus. Selections from the Conloquia. Edited by Victor S. Clark, Chicago University. Boston: Ginn & Co. This book is intended to be used for supplementary reading in Latin classes. The notes and vocabulary are both good, the text very well printed, and the introduction on the life of Erasmus appropriate and interesting.