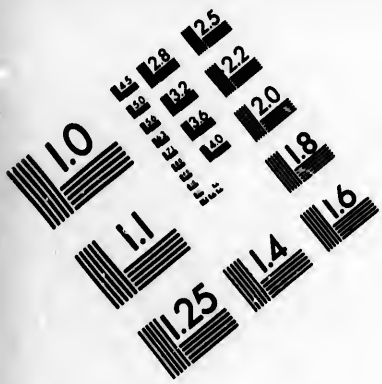


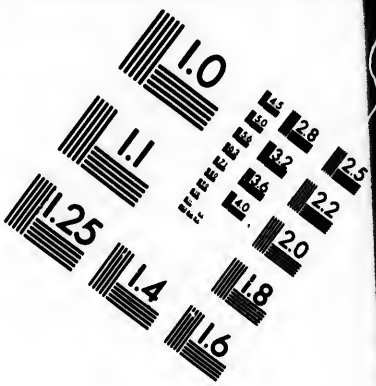
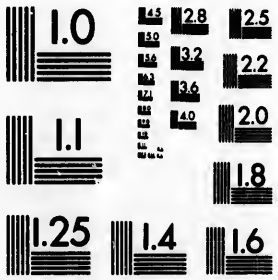
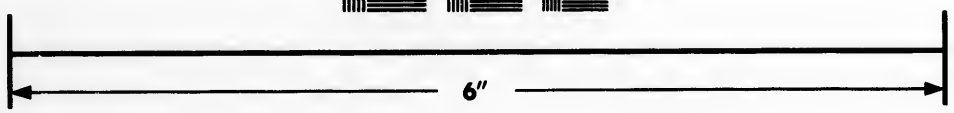
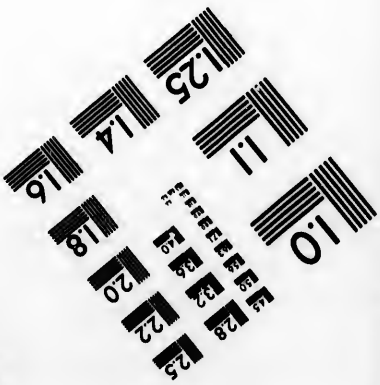


IMAGE EVALUATION TEST TARGET (MT-3)







Photographic Sciences Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

Technical and Bibliographic Notes/Notes techniques et bibliographiques

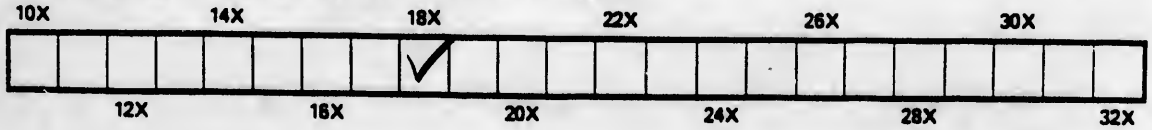
The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

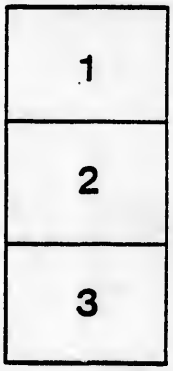
- ☐ Coloured covers/ Couverture de couleur
- ☐ Covers damaged/ Couverture endommagée
- ☐ Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- ☐ Cover title missing/ Le titre de couverture manque
- ☐ Coloured maps/ Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- ☑ Bound with other material/ Relié avec d'autres documents
- ☐ 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
- ☐ 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.
- ☐ Additional comments:/ Commentaires supplémentaires:

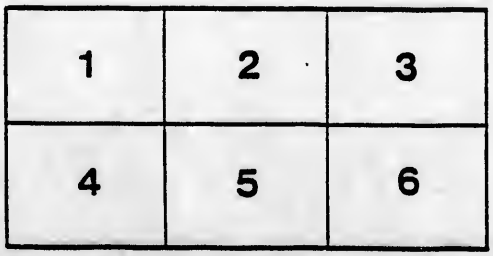
L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués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

- ☐ Coloured pages/ Pages de couleur
- ☐ Pages damaged/ Pages endommagées
- ☐ Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- ☑ Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- ☐ Pages detached/ Pages détachées
- ☑ Showthrough/ Transparence
- ☐ Quality of print varies/ Qualité inégale de l'impression
- ☐ Includes supplementary material/ Comprend du matériel supplémentaire
- ☐ Only edition available/ Seule édition disponible
- ☐ Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image/ Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

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







ON MUSEUMS

AND

OTHER CLASSIFIED COLLECTIONS, TEMPORARY OR PERMANENT, AS INSTRUMENTS OF EDUCATION IN NATURAL SCIENCE.

BY HENRY SCADDING, D.D.

[*From the "Canadian Journal."*]

ON MUSEUMS

AND

OTHER CLASSIFIED COLLECTIONS, TEMPORARY OR PERMANENT, AS INSTRUMENTS OF EDUCATION IN NATURAL SCIENCE.

BY HENRY SCADDING, D.D.

Read before the Canadian Institute, January 13th, 1871, as the President's Address for the Session 1870-71.

So many persons had the advantage of examining for themselves the Great Exhibition at Paris in 1867, and such full accounts and profuse illustrations of its contents and surroundings were everywhere to be seen, that it seemed for a long while very much like an impertinence whenever any one proceeded to offer, in any formal way, additional observations on the subject.

It was, I remember, some vague feeling of this kind that induced me to refrain from committing to paper and reading to the Institute, during its session of 1867–8, an abstract of a variety of memoranda made in the Exhibition, and some of the thoughts which could not but be stirred within one by a spectacle so marvellous as that Exhibition undoubtedly was: it seemed foolish to imagine that there was any point in relation to a scene so palpable and accessible to every one, that had not already been well and sufficiently remarked upon.

A considerable interval, however, has now elapsed; and the events of the intervening time have, in the general mind, thrust back the occurrences of 1867 into comparative oblivion. Moreover, some of the most recent of those events have created the probability that such another very perfect international gathering will not again be witnessed for some years to come.

It may consequently be an act less out of place, and of less presumptuous seeming at the present instant, than in some way it appeared to be in 1867, for any one who imagines he has anything to say on the subject, to indulge for a few moments audibly in his recollections of, or deductions from, a display which was so unique, and the witnessing of which could not but form an era in his experience.

I have therefore ventured on this occasion—no other easy subject readily suggesting itself—to offer to the Institute, after all, some of the casual and, as I fear even now it will be deemed, rather unimportant, annotations and ideas, which I did not think it worth while to occupy their time with in 1867–8.

One desire which I found myself haunted with, on returning home fresh from a brief—too brief—inspection of the marvellously diversified, but beautifully classified contents of the Paris Exhibition, was to impress upon all with whom I held any communication, and especially on young Canadians about to travel, the practical, self-educating *use* to which they might put their visits to Great Britain and the continent of Europe, where access is so easy to grand and extraordinary assemblages of objects, industrial, scientific and artistic, either temporary, like the successive international expositions, or permanent but constantly augmenting, like the national museums to be found in capital cities and university towns.

For the most part, I fear, such collections are approached by the tourist, from Canada as from elsewhere, in a light and trivial spirit—are gazed at simply as displays of so many singular, or beautiful, or very useful objects.

But the doctrine which I longed to impress, and which I of course at the same time knew to be neither novel nor abstruse, was, that in the mind of every one about to enjoy the advantage of access to a great classified collection of objects anywhere, there should be a pre-arranged scheme of examination; a certain intention; a definite aim and object: there should be, if practicable, some especial subject of study, or a particular point in some especial subject of real interest to the observer, on which additions to his store of knowledge were sincerely desired. Then, at once, the great museum or other large classified assemblage of objects—although access to it could be had only for a few days, or even for a few hours—ceases to be a mere show or plaything, and is transformed into a gallery of illustration—a delightful and precious instrument of self-education; a means of mental expansion, intellectual

enrichment, and positive increase of personal competency, in whatever sphere of duty the observer may be acting.

And the subject which, amongst a host of others, I thought might conveniently have a large amount of light thrown on it by such extensive collections as those to be met with at the present day in Great Britain and on the continent of Europe, was Natural Science, in some one or other, or all, of its divisions, of Mechanical Philosophy, Chemistry and Physiology.

Natural Science is a subject which is now more or less attended to in all our schools, I believe; but of course only its most elementary principles are expounded there; and the appliances for illustration are, of necessity, circumscribed and meagre.

A few days, or even hours, judiciously spent in some such collection as that which was to be seen in the Universal Exhibition at Paris, by a youth familiarized with and interested in the elementary principles of Natural Science, might be productive to him of results of life-long importance. Not only, in a general way, would his mental view be likely to be widened, but his profession or career might be happily decided by an extra impulse there given to a taste, tendency or talent; and a hint, or idea, caught from things and processes then for the first time seen, might lead in practice afterwards to fame and riches, and to the increase of a country's resources.

With the hope that even a rapid *sketch* of that collection may, here and there, contribute slightly to like positive results, I now proceed with my proposed annotations, purposing to add afterwards a brief notice of the Museum at Oxford, and of one or two other kindred establishments.

The Champ de Mars in Paris, the plot of ground on which the Exhibition of 1867 took place, is an area of 103½ acres. The whole of this space was required for the purpose, and fifty acres more in the island of Billancourt, a few miles down the Seine. In Billancourt the agricultural objects were to be seen, and experiments in scientific agriculture were performed. Here competitive experiments with ploughs and other instruments worked by steam were carried on, exhibiting the comparative effects of animal and machine labour, and showing the possibility of the application of mechanical force to cultivation even on a small scale. Here were machines for drill-sowing and reaping in operation. Grass was cut, turned over and raked, and made up into heaps, by machinery. Here was a miniature dairy-farm, on which

economical processes for the preparation of food for cattle were going on; and the manufacture of butter, cheese, oil, cider and *piquette*, a kind of sour wine made from unripe grapes, and much drunk by the peasantry of France. Modes of preparing different manures were shewn. The basket-maker, the cooper, the wooden-shoe maker, the farrier, the blacksmith, were all plying their respective trades, aided by the most ingenious mechanical contrivances.

Incessant communication was maintained with the island of Billancourt by rail and steamboat.

Of the 103½ acres contained in the Champ de Mars, the Exhibition building itself, or Palace proper, covered 31½ acres (153,194 square yards). The space outside the Palace was styled the Park. An innumerable multitude of buildings were here to be seen in every variety of form—kiosks, pavilions, châlets, churches, chapels, bell-towers, schoolhouses, barracks, temples, palaces, huts, Tartar wigwams, theatres, stables, windmills, bath-houses, conservatories; with several real lighthouses, one of them 220 feet in height, displaying at night the electrical light. The edifices just spoken of were scattered about most promiscuously, as it might seem; but each had its relation to one or other of the exhibiting nations, and each gave shelter to and conveniently displayed some special product or products of that nation, natural or artificial. Although at the first glance the paths leading to these buildings seemed labyrinthine enough, by the aid of a plan no great difficulty was found in threading one's way to any desired point.

Very conspicuous in the western portion of the Park, on the avenue leading towards the Military School, was one object which quickly fixed the eye, and which even in 1867 was regarded as ominous. This was a bronze equestrian statue of King William of Prussia, raised aloft on a high pedestal, of colossal dimensions, and crowned with laurel. Towering up to a height of twenty-five feet, it seemed to dominate the western portion of the Park. It was in jest likened at the time to the fatal Horse which found its way into the heart of Troy. It was little imagined that the comparison was destined to be so nearly exact as it has proved. Another ominous Prussian object, in another place, filling every beholder with awe, was the so-called Krupp gun, a cast-steel breech-loading cannon, weighing with its carriage 141,062 lbs. To enable this monster to reach Paris, the railway bridges in some places were strengthened. A multitude of other kindred implements of destruction accompanied it. Sorrow and shame, and indignation, could

not but be stirred by the reflection that such, after all, were the *ultimæ rationes* of European diplomacy. Rossini's hymn, too, composed for the occasion of the distribution of the awards at this Exhibition, and there rendered with orchestral accompaniments and appliances of the grandest description, wound up, ominously, as was observed at the time, with the tolling of bells and the booming of cannon.

But to proceed. The Palace itself, the Exhibition proper, was a structure of iron, having the appearance of being an ellipse in outline, but in reality it was a square, with semicircles attached to the north and south sides. Its circumference measured just a mile. The whole was only of one storey. Fatigue in visiting its parts was thus diminished. To examine cursorily the contents of the Palace, it was necessary to perform the circuit of it at least eight times. It was divided into zones or bands, concentric, so to speak; and these zones or bands were cut into sections by passages radiating from the middle area of the building. Each of these radiating passages had a distinguishing name. Associations unthought of in 1867 would now attach to some of the titles on the French side of the Palace, as, for example, Rue d'Alsace, Rue de Lorraine. The central area of the building was a beautiful ornamental garden-plot, with flowers, fountains, and an abundance of statuary in marble. Its dimensions were 460 by 180 feet. In the middle of the garden was a pavilion or temple, in which centred, of course, the apices of all the areas occupied by the several nations, bounded respectively by the radiating passages and segments of the elliptical circumference. The use to which this temple was put will be presently mentioned.

To one passing through the zones or bands, the objects exhibited appeared arranged according to the place of production of each; but to one passing up or down the radiating passages, the same objects appeared arranged according to the nature of each. This was an ingenious and very interesting contrivance.

Nine-tenths of the east half of the building was occupied by France, the remaining tenth by Belgium and the Netherlands.

The west half was occupied, largely, by England and her Colonies; by the States of North and South America; by Spain and her colonies; by Russia, Austria, North and South Germany; and, in slips, narrow as compared with the spaces occupied by the other nations, by Switzerland, Portugal, Greece, Denmark, Sweden, Norway, Italy, Rome,

the Danubian Principalities, Turkey, Egypt, China, Japan, Siam, Persia, Tunis and Morocco.

The place of Canada in the great industrial, scientific and artistic Cosmos was discoverable, but not immediately obvious. Australia, I remember, asserted itself much more decidedly, and showed greater individuality. And herein a fact is symbolized. Australia, as a great region of the Greater Britain, is much more accurately realized, I think, in the common mind of the mother-country, and of Europe perhaps, than is Canada. Canada lies in the shadow cast by the great pyramid thrown up, or being thrown up, on its southern side, and is but dimly seen. It is still, to a great extent, thought of, not as a vast region filled or filling with millions of English-speaking workers, emigrants from the British Islands, but as a French colony in the military occupation of Britain. Even at the Exhibition in Paris, prominent objects to be seen in the Canadian slip, as well as the names of several of the Canadian commissioners, served to perpetuate the impression in regard to Canada to which I have alluded.

But again to proceed: The temple or pavilion in the midst of the central garden contained specimens of the coins, weights and measures used in the countries enumerated, those of each country respectively being placed in the apex of the section occupied in the elliptical area by that country.

The first circuit of the Palace by the passage next to the central garden was made through what was entitled the Gallery of the History of Labour. This was a classified museum of the archæology of each country. A means of judging of the progress made in the successive centuries by each country, in industry and art, was thus afforded. To this collection the choicest and most curious objects were sent from the public repositories in each country; and it is supposed there had never before been presented at one view such an assemblage of the relics of past ages.

It will give an idea of this remarkable gallery if I set down the subdivisions in the French portion of it, an analogous classification being adopted, so far as was practicable in the space occupied by the other nations. French archæological objects were arranged under the heads of—Gaul before the use of metals; Independent Gaul; Gaul under the Romans; The Franks to the Coronation of Charlemagne (A.D. 800); The Carlovingians, from the beginning of the 9th to the end of the 11th century; The Middle Ages, from the beginning of the 12th century to

Louis XI. inclusive; The Renaissance from Charles VIII. to Henry IV. (1610); The Reigns of Louis XIII. and XIV. (1610 to 1715); The Reign of Louis XV.; The Reign of Louis XVI. and the Revolution (1774 to 1800). In the parts of this gallery devoted to the early portion of the mediæval period, splendid manuscripts and illuminations constituted a striking feature. The identity of style observable in the illuminations of certain very ancient Persian or Arabian manuscripts here shown, and those which decorate the productions of the Greek and Latin monasteries, was very curious to notice.

In the Swiss portion of this gallery were to be seen innumerable relics of the famous primitive lake-villages, built on piles, which have recently been discovered, and which Arthur Helps has endeavored so pleasantly in his *Realmah* to rehabilitate and people with a wise and understanding set of inhabitants. These remains were referred to ages of stone, bronze and iron. Pictures reproducing these ancient Swiss villages were also displayed.

The next circuit of the building to be made was through the Gallery of Fine Arts. Each circuit, of course, became larger as one advanced outward. This gallery was filled with paintings, drawings, sculptures in groups, single figures, busts and medallions; drawings and models in architecture, engravings and lithographs. Vela's *Napoleon Mourant* was ever surrounded by a throng, watching the figure as though it were a flesh-and-blood reality. The *Columbus revealing America* of the same artist, a colossal group, was especially interesting to persons from the Canadian side of the Atlantic. *An Episode of the Deluge*, by Luccardi, obtained the highest prize in sculpture, with the Cross of the Legion of Honour added to it—a fine group, representing a father and mother and infant child, the waters just reaching them.—Whilst engaged in making memoranda on the spot of several special coins in a fine ancient collection in the Italian section, I noticed close at hand the quiet *hist!* of the police, indicating that one was being watched. The special coins pencilled down on this occasion, as not having been seen before, were, I find, a Livia as Justitia, a Livia as Pietas, a Manlia Scantilla, a Lucilla, a Paula, an Orbiana, and a Galeria Valeria; with a Pupianus, a Balbinus, and a Romulus Augustulus.

Again we passed round through the building. Now it was through a gallery bearing over its entrances the inscription—The Materials of the Liberal Arts. These were found to be paper for printing purposes and all purposes; letter-press and printed books; book-binder's work;

drawing materials; applications of drawing and modelling to the useful arts; photographs; musical instruments of all kinds; medical apparatus and surgical instruments of all kinds; things defined to be "instruments of precision, and material for teaching the sciences," that is, astronomical and land-surveying instruments, theodolites, &c., thermometers, barometers, hygrometers, maps geological and otherwise, and plans in relief. Especially noticeable among "printed books" were magnificent large-paper copies of Louis Napoleon's Life of Cæsar, a production likely to be classed hereafter among the curiosities of literature, its author and his position at the time of its composition being considered.

One always knew when he had completed the circuit of the building by finding himself again in the grand vestibule, a wide and noble passage leading straight from the principal entrance of the Palace to the central garden; a passage usually thronged with a mixed multitude, and itself supplied with objects of interest, as, for example, a succession of magnificent specimens of prize plate, won in England by French horses. At several points along the middle of this passage were circles of seats or divans. A vacant spot on one of these was often anxiously watched for in vain by the wearied investigator.

Proceeding again still outwards, we entered the next gallery. This was styled the Gallery of Furniture; in French briefly *Mobilier*. This term included an immense variety of things: furniture literally, of the most elaborate description; inlaid woodwork, picture frames, paintings on wood, tapestries, carpets, crystal, ornamental glass, window glass transparent and opaque, pottery, cutlery, silver and gold ware, works of art in bronze, silver and iron, watches, chronometers, clocks, heating and lighting apparatus, objects in morocco, brushes, products from woody fibre, &c. Among articles of furniture exhibited was "the cradle of the Prince Imperial." On coming suddenly upon this object, I remember thinking its display here a slight overtax on the public curiosity. A resplendent dinner set in silver gilt, the property of the Emperor, duly arranged on a long dining-table, was also exhibited.

The gallery into which we next passed had the inscription "Vêtement" over it—"Clothing." Here, in addition to articles of dress of all kinds and in every grade of magnificence, we find cotton, hemp and flax fabrics in infinite variety, silk tissues, combed and carded wool, lace, muslin, embroideries, artificial flowers, caps, hats of straw and all other customary material, head-dresses and shoes, precious stones,

enamels, engraved jewellery. Here also were portable fire-arms, travelling apparatus and toys. Life-size and life-like figures, carefully dressed in the costumes of different countries, and of various provinces of different countries, literally "from China to Peru," were set up in divers places within this gallery. The large groups of real precious stones of every name, and of jewel-sets in every variety of form, contributed, not only by numerous manufacturers, but by imperial, royal and other personages in different parts of Europe, were quite fairylandish in character. Here, for one thing, was to be seen the Sancy diamond, once the property of our James II., and sold by him to Louis XIV. for £25,000. In another place I remember a cluster of unwrought emeralds, shown as found in a Russian mine—a number of long, thick, six-sided crystals, of a pure green colour, bristling out irregularly from the sides of a great block of the whitish matrix in which they had been formed.

Another gallery was now to be examined. This was entitled the Gallery of Raw Materials; in French "Matières Premières."

This, though the least showy, was possibly the most instructive of all the galleries to the student. Here the observant traveller, with a design of increasing his practical acquaintance with the products and applications of Natural Science, would have reaped a rich harvest. Here, if the visitor had the time, he could be deliberate, and be but slightly disturbed; for generally speaking the crowd was not great in this zone of the Palace. Here were collections and specimens of rocks, minerals and ores, ornamental stones, marble, serpentine, onyx, hard rocks, refractory substances, earths and clay, sulphur, rock salt, salt from salt springs, bitumen and petroleum, specimens of fuel in its natural state and carbonized, compressed coal, metals in a crude state pig-iron, iron, steel, cast steel, copper, lead, silver, zinc, alloys, products from the washing and refining precious metals, gold beating, electro-metallurgy, objects gilt, silvered or coated with copper or steel by galvanic process, products of the working of metals, rough castings, bells, wrought iron, iron for special purposes, sheet iron and tin plates, iron plates for casing ships, copper, lead and zinc sheets, manufactured metal, blacksmith's work, wheels, tires, unwelded pipes, chains, wire-drawing, needles, pins, wire work, and wire gauze, perforated sheet iron, hardware, ironmongery, edge tools, copper and tin ware, other metal manufactures. Such a detail as this of objects, spread over only a very small portion of the Gallery of Matières Premières, gives an idea

of the enormous multitude of matters and things displayed; in the midst of which nevertheless reigned the most perfect order, making examination and study quite possible. Without again being as specific, it will suffice to say, that after these products of mining and metallurgy just named, came products of the cultivation of forests and of the trades appertaining thereto. Then, the products of shooting, fishing, and of the gathering of fruits obtained without cultivation. Then, agricultural products (not used as food), easily preserved; which included among other textile materials, such as raw cotton and hemp, the cocoons of silk worms. Then came chemical and pharmaceutical products. Then specimens of the chemical processes for bleaching, dying, pointing and dressing. Then leather and skins, including gut work. The whole of the Russian department was redolent of Russia leather.

We reached now the sixth gallery, which was nearly a mile round and of extra dimensions. This was the Gallery of Machines, of apparatus and processes employed in the common arts.

All along its middle space was a slightly raised platform, on which appeared a forest of cast-iron with a plentiful undergrowth of the same material; mechanisms great and small applied to every human purpose, most of them busily in action. Here were railway apparatus, telegraph apparatus, civil engineering apparatus, architectural apparatus, navigation and life-boat apparatus.

I subjoin an extract from my memoranda:—

"I next undertake the outermost gallery, that of Machines. This is nearly a mile round: it ought to be journeyed through twice for even a cursory view of it, as there is a highway on each side of the central roped-off space in which for the most part the machines are placed, while there is a vast display also of objects round the whole of the sides of each of the passages opposite to the central enclosed space. This part of the building is about twice the height of the interior zones, to give room for machine-structures of considerable altitude when set up. The restless sound of innumerable machines at work is immediately to be heard; their movements also strike the eye; the smell of oil and oily steam salutes the nostrils, but only faintly; the furnaces, the generateurs de vapeur, are placed at intervals outside. Entering as before on the French side I notice a gigantic trophy of iron and steel bars ready to be converted into anything. I pass cannon, fire-engines, looms for all fabrics at work, steam-engines of an endless variety of construction, circular saws, brick-making machines, gigantic organs here and there pealing out grand music occasionally amidst the confused machine-babel, steam-pumps bringing in actual rivers of water, distilling apparatus, sugar-making apparatus, models of ships-of-war with their machinery of propulsion. In Prussia,

cannons—one monster weighing fifty tons; revolving cannon; ambulances; a triumphal arch of imitation marble. In England, locomotive engines; donkey engines; printing presses; electric printing presses; wood-cutting machines; carding machines for wool, cotten and flax; lanterns for lighthouses; coaches; hat-making, sugar-plum-making and sewing machines. Near one of the entrances to this gallery I noticed a gilded pyramid representing the gold produced from the mines of Victoria, in Australia, in fifteen years, viz., 1851–66; its base, 10 feet square; its height, 63 feet; its solid content, 2,081 cubic feet; value represented, one hundred and fifty millions sterling. In the Australian compartment was a model of a £10,000 nugget."

The outermost circle of all was the Gallery of Food and Drinks: Aliments et Boissons. This gallery was open to the Park all round the exterior wall of the Palace. A projecting verandah-roof extended out over the whole of it. Underneath, in addition to a scientific display behind glass of all sorts of substances in any way connected with the edible and the potable, there was a series of real restaurants, one after the fashion of one nation another after the fashion of another. These establishments were usually thronged, and the scenes presented in a promenade round the whole of the exterior of the Palace were those of a well-peopled Parisian boulevard.

Of the wonderful Park in the midst of which the Palace stood, I have already briefly spoken. I may add that a meandering stream, a cascade and a lake, all artificial, gave variety to its French portion. Also two immense aquaria are specially recalled, one of salt water, the other of fresh, underneath which the visitor might go and see a variety of strange fish sporting above his head as though he were at the bottom of the sea.

A magnificent velum or tapestry awning, green in colour and sprinkled over with golden bees, had a grand classic effect, stretched over the whole of the wide avenue leading from the entrance gate by the Seine up to the principal entrance to the Palace, sustained at regular distances by lofty poles bearing long pendant gonfalons.

Though the Palace with its innumerable satellite appurtenances quickly vanished like a vapour, records of its existence and system were made. The story of its beautiful exemplification of law and order in the midst of an unparalleled multiplicity remains; and that, as I have already hinted, may serve in instances here and there to assist a thoughtful youth to methods by means of which he may, if he will, divide and conquer the domain of human knowledge, and especially that province of it which is occupied by Natural Science and its practical applications.

The career of Napoleon III., the originator of the spectacle which rendered 1867 so memorable, will doubtless hereafter be employed, after the traditional fashion, to point a moral and adorn a tale. He will be one more conspicuous instance of the instability of human greatness. He will be parallelled perhaps in sentimental strain with Crœsus. Solon had said to Crœsus, when displaying to him his magnificence as King of Ionia, "No one while he lives is happy." When in the grasp of Cyrus, Crœsus recalled with groans this saying of Solon. The oracle had said to Crœsus, "Go up against Persia, and thou shalt destroy a great empire." He went up accordingly, but with the fate that has befallen Napoleon. With reason did he, when in durance, send to ask of Apollo if he were not ashamed of having encouraged him, as the destined destroyer of the empire of Cyrus, to begin a war with Persia, of which such were the first fruits; and with equal reason did Apollo reply, "When the God told him that if he attacked the Persians, he would destroy a mighty empire, he ought, if he had been wise, to have sent again and inquired which empire was meant, that of Cyrus or his own." Again, *mutatis mutandis*, the words of Crœsus to Cyrus might be addressed by Napoleon to William of Prussia, "What I did, O King, was to thy advantage, and to my own loss. If there be blame, it rests with the God of the Greeks, who encouraged me to begin the war. No one is so foolish as to prefer to peace war, in which instead of sons burying their fathers, fathers bury their sons. But the gods willed it so." And this convenient shifting off from human shoulders of the burden of responsibility would probably be accepted with complacency by the Prussian King.

The words, however, of Napoleon III., which in connexion with the Exposition of 1867, I was purposing to quote, when this digression was induced, were these:—"The Exhibition of 1867," he said, in the really noble address which accompanied the delivery by himself of the medals to the successful exhibitors, "will, I hope, inaugurate a new era of harmony and progress. Assured that Providence blesses the efforts of all those who, like ourselves, wish to do good, I believe in the final triumph of the great principles of morale and justice, which, by satisfying all legitimate aspirations, can alone consolidate thrones, elevate the people, and ennoble humanity."

These words, heard now amid the dreadful echoes which every hour reach us from what was beautiful and comparatively prosperous France, have a strange and hollow sound. They may, in spite of appearance,

yet prove true, although the issue may be brought about otherwise, than as the speaker imagined. The most acute of men are often at fault in their foresight. When the "Emperor of the French" pronounced these noble words, he was surrounded by a group such as may possibly be never seen assembled together again. On his right hand sat the Sultan himself, Abdul-Azziz-Khan; there sat also the heir apparent of England, the heir apparent of the Netherlands, his own son, the heir apparent of France, the Prince of Saxony, Prince Teck, the Duke of Cambridge, the Duc d' Aosta. On his left were to be seen the heir apparent of Prussia, the heir apparent of Italy, Prince Hermann of Saxony, Prince Napoleon, the Duke of Leuchtenberg, Mohammed-Mourat-Effendi, Abdul-Mamid. Behind him and the Empress were arranged, besides a number of Princesses and Duchesses, the eldest son of the Sultan, the brother of the (so-called) Tycoon of Japan, Prince Lucien Murat, Prince Joachim Murat, Prince Achille Murat, Prince Napoleon Charles Bonaparte, with the great officers of imperial France and the suites of the foreign Princes.

All of this assemblage, with thousands of others present, applauded the exalted ideas of Louis Napoleon at the moment doubtless with sincerity; and all anticipated possibly as little as the speaker himself the bewildering collapse which was about so swiftly to ensue.

Nevertheless no thoughtful person familiar with the history of man in the past can doubt of the progress of man in the future. That progress will no doubt still be beset with impediments, as usual; but its rate may, in the age which is close at hand, be accelerated.

Unparalleled disasters have fallen upon Europe. *Quidquid delirant reges, plectuntur Achivi*, has proved true again, and this time on a scale more gigantic than ever. On a scale more gigantic than ever have the many been made to suffer by the few. The rivalry, the ambition, the caprice of rulers have brought lamentations, and mourning, and woe into every household of the ruled. Will not the very enormity of the desolations created hasten the day when nations, peoples and languages will effectually secure themselves against an evil so dire? Through the reaction which is sure to ensue on the termination of the existing most lamentable condition of things, is it not reasonable to hope that peace and happiness, truth and justice, will more rapidly and widely prevail among men in the immediate future, than they have done in the past?

I now ask you to transport yourselves in imagination from the City of Paris to Oxford.

The Oxford Museum (the New Museum, as it is there called) is contained in a range of buildings 236 feet in length, of the style of the 13th century, and situated in a large airy park. The Canadian is at once struck by a certain resemblance which it bears to University College, Toronto. In the interior of its central part is a fine quadrangle, a perfect square, each of the sides 76 feet in length. This quadrangle is roofed over with glass. Around this square is a series of rooms, four of them fitted up for lectures, with flights of seats descending down to a table for the lecturer. One of the lecture-rooms is for chemistry, another is for experimental philosophy, another is for mineralogy and geology, and the fourth is for medicine. The other rooms are Professors' work-rooms, store-rooms, sitting-rooms, apparatus-rooms and laboratories; in the anatomical part of the building I observed a Macerating-room; to the chemical portion of the building there are attached balance-rooms. Almost detached outside, at one corner is the principal laboratory, a reproduction of the Abbot's Kitchen at Glastonbury. This almost separate building, circular, with conical roof, helps the general resemblance to the Toronto University building, although its position is towards the right and not towards the left. The circular laboratory at the Toronto University is, by the way, not a reproduction of the Abbot's Kitchen at Glastonbury; but, less appropriately, of the Round Church at Cambridge, commonly called St. Sepulchre's, built after the pattern of the Church of the Holy Sepulchre at Jerusalem. Round the whole of the interior quadrangle of the Museum at Oxford runs a corridor or arcade sustaining a gallery or upper corridor. Double rows of slender metal columns sustain the lofty glass roof. On the left as you enter are the anatomical and physiological collections; on the right the mineralogical collections. In the middle, on each side of the central passage, are zoological collections. Along the side opposite to the entrance are palæontological collections.

Round three sides of the upper corridor are also rooms as below: the whole of the front side is taken up with a library and reading room, the latter containing the more recent books, the scientific transactions and periodicals. On the left is a very spacious general lecture room; also an anatomical lecture room, with professor's and students' sitting-rooms. On the right is another lecture room, and rooms for an astronomy professor and a geometry professor. There is also up here an entomological museum with a curator's room.

The general contents of a great college of science, so to call it, like the building just briefly described, can be conceived, and I shall not enter into many particulars. It should be said, however, that the Oxford Museum contains the collections of the celebrated Professor Buckland, and is rich in its palæontological department. The extinct forms of life that have existed on the globe are here seen, so far as their remains have been found, in a connected series; specimens in abundance of the palæozoic, mesozoic and cænozoic fossils. Here are veritable plesiosauri (not casts), veritable icthyosauri, megalosauri, pterodactyles, deinotheria, elephantes primogenii. There is also a very striking collection, as it seemed to me, of beautifully prepared skeletons (all properly articulated and set up in easy natural attitudes) of beasts, birds, reptiles and fish; the interior bony framework of each creature as marvellous to behold as its outward presentment when clothed with flesh and adorned with feathers, hair or scales.

There is one feature in the interior of the museum which possesses great interest. The series of pillars which support the lower and upper arcades subserve a scientific purpose. They are, all of them, geological specimens on a large scale systematically arranged. The shafts on the west side are respectively, grey granite of Aberdeen, red granite of Peterhead, porphyritic grey granite from Cornwall, green syenite from Leicestershire, pale-reddish granite from Argyleshire, red granite of Ross in Mull. On the north side the shafts are, Devonian limestone from Torquay, mountain limestone from Cork, mountain limestone from King's County, green serpentine from Galway, mountain limestone from Limerick, mountain limestone from Cork, Devonian limestone from St. Mary Church, and so on all round the lower quadrangle; and again all round the upper gallery, the shafts of the columns follow in order of geographical age and succession; in all 125 columns.

Moreover the elaborately carved capitals of these columns, together with a series of sixty corbels built into the walls, also elaborately carved, are made to illustrate systematically the vegetable kingdom. On them are sculptured, in such order as may assist the memory, and with such attention to their natural aspect as may satisfy the botanist as well as the artist, specimens of all the genera of plants and flowers. The capital of the column of porphyritic grey granite, for example, mentioned a moment ago, is formed of leaves of the date-palm; the two adjacent corbels of leaves of the fan-palm; the three together illustrate the palmaceæ. Again, the red granite column from Ross in Mull, and its

two accompanying corbels, present specimens of the Liliaceæ, viz., the yucca, the aloe and the lilium, tulipa and fritillaria. The capital of the mountain limestone column from Limerick, and the two neighbouring corbels, exhibit wheat, barley, oats, Indian corn, sugar cane (with sparrows thereon), rice and canary grass, with buntings and canaries and quails thereon; these to illustrate the gramineæ. The Filices are represented by the capital of Devonian limestone from St. Mary Church, and the adjoining corbels, which consist of ferns, the hart's tongue, lastræa cristata, scolopendrium vulgare, blechnum boreale, and the mallow. The capital of a column of black serpentine from the Lizard in Cornwall, and two corbels, are devoted to the Dioscoraceæ, being sculptured over with small-leaved bryony, black bryony, and elephant's foot.

Another feature in the architecture of the Museum is very interesting, and possibly peculiar to itself: the elaborate and very ornamental ironwork in the spandrels that branch out from the metal pillars sustaining the glass roof; is made artistically to represent the foliage of the following thirteen trees: chamærops humilis, carica papaya, acer pseudo-platanus, tilia europæa, tussilago farfara, æsculus hippocastanum, cocos nucifera, musa paradisiaca, quercus robur, platycerium alcicorne. musa cavendishii, juglans regia, caryota urens.

One more feature must be noticed, which, to myself at least, afforded infinite pleasure: all round the quadrangle, against the piers of the arcade, there were arranged full-length life-size figures of the following world-famed scientific worthies, finely conceived and exquisitely sculptured in white stone: Aristotle, Hippocrates, Euclid, Galileo, Bacon, Newton, Leibnitz, Harvey, Davy, Priestley, Watt, Linnæus.

Altogether, the Museum at Oxford was a very fascinating place. With its library, reading room, lecture rooms, appointed lecturers, varied apparatus, and studied ornamentation, it seemed more like an institution in Plato's Atlantis, or More's Utopia, than a thing of the present day. It was a beautiful realization of a true *Μουσεῖον*—of a home of the Muses; of those of the Nine, at all events, who preside over the departments of Natural Science and Medicine.

Since 1850, much encouragement has been offered at Oxford to the study of Natural Science. After the lapse of seventeen years, I expected, in 1867, to find the number of those who were applying themselves with enthusiasm to the subject to be large; but I was surprised to find it to be still comparatively small. The *vis inertiæ* of

the old system, which practically excluded Natural Science, is very great; and although rewards are now offered in the University, as also of late too in most of the old endowed schools, for proficiency in the subject, the majority of those who preside over ancient educational institutions do not heartily recommend the subject to the attention of the youth under their charge. In 1861, out of 295 who took their B.A. degree, 45 had been students in the Natural Science school; of whom 13 only were classed, and 32 passed. In 1862, 335 were graduated; 41 of these were Natural Science students, 12 of whom were classed, and 29 passed. In 1863, 317 obtained B.A. degrees, 8 were classed in Natural Science, and 14 passed. In 1864, 281 graduated; of whom 10 were classed and 9 passed in Natural Science. In 1865, out of 276 B.A's, 12 were Natural Science students, of whom 10 were classed and 2 passed. In 1866 the numbers were: in Literis Humanioribus, 258; in Scientiâ Naturali, 8; of whom 7 were classed and 1 passed. In 1867, 295 graduated; 14 in Natural Science, of whom 9 were classed and 5 passed. Thus we see the number of those who have sought distinction in this department of study has been fluctuating and never large, considering the intrinsic interest and practical value of the subject, the opportunities and facilities offered, and the rewards to be obtained. Several of the Colleges have scholarships for the best candidates in Natural Science. Miss Burdett Coutts has, in recent times, founded so-called Geological scholarships, for which the examinations include Physiology, Chemistry and Experimental Physics. Every year a Travelling scholarship, worth £200, for three years, is obtainable, on what is called Dr. Radcliffe's Foundation, by the best candidate among those who have taken a first class in Natural Science, and who purpose entering the medical profession.

As to the qualifications of successful candidates in the school of Natural Science at Oxford, from passmen a general acquaintance with the principles of two of the three subjects of the course, viz., Mechanical Philosophy, Chemistry and Physiology, is required; and familiarity with a special subject in Mechanical Philosophy, as Hydrostatics, Pneumatics, Light, Heat, &c. From classmen a certain knowledge of all the three branches is required, to which must be added a more extensive acquaintance with one or other of the three, including a special subject in that branch for more minute examination. A classman, for example, may take up Physiology as his principal subject, and Osteology as the special subject included under that head. Of Mechanical Philosophy

and Chemistry, he would only be expected to have a good general knowledge. Under Mechanical Philosophy, it may be proper to add, are included Mechanics, Hydrostatics, Pneumatics, Acoustics, Light, Heat, Electricity and Magnetism. In Chemistry great stress is laid in the final examination on Analysis. A knowledge of some part of Organic Chemistry is required, as, *e g.* the Alcohol series. When Mineralogy is offered as a subject, some special branch, such as the optical properties of crystals, must be studied. Classmen in Physiology are required to exhibit skill in dissection. Special instruction on this subject is given by a professor or lecturer in the University, styled Lee's Reader in Anatomy. The present occupant of this important lectureship is Mr. Barclay Thompson, a brilliant alumnus and graduate of the University of Toronto. Special subjects that are taken up for examination under the head of Physiology are, as has been already said, Osteology or Odontology; one of the functions, as circulation; the functions of any group of animals, as, *e.g.* fish or molluscs; the nerves; Ethnology also, Botany, Geology and Palæontology.

Another famous museum at Oxford is the Ashmolean, built in 1679. The portion of its contents really useful for scientific illustration has been removed to the new museum just now described. The remaining objects constitute simply a collection of mixed curiosities. In the basement of the Ashmolean are deposited the celebrated Arundel Marbles. The inscription over what was originally the principal entrance of the building is "Museum Ashmoleanum: Schola Naturalis Historiæ: Officina Chymica." The term "Naturalis Historia," as used by Elias Ashmole, included of course, what we now understand by Natural Science, just as the renowned Natural History, so-called, of Pliny is in fact a cyclopædia of the Natural Science of Pliny's age.

In the University of Cambridge since 1848 there have been, as at Oxford, instituted special examinations for honours in Natural Science. The system of study pursued previously at Cambridge involved the necessity of attention to many branches of Physics. The examination for honours in the Natural Science Tripos at Cambridge requires an acquaintance with the following subjects:—Human or Comparative Anatomy, Physiology, Chemistry, Mineralogy (excluding the Mathematical part of Crystallography), Botany and Geology. In a calendar that happens to be at hand I observe valuable papers set at the Natural Science Tripos Examinations by the Professors of Chemistry, Mineralogy, Botany, Anatomy and Geology, and the Regius Professor of Medi-

cine, viz., Profs. Cumming, Miller, Henslow, Clark, Bond, Sedgwick and Paget. I give one question from each of these papers. In the paper on Chemistry it is asked "If nitric acid is decomposed by voltaic electricity, in what direction are its elements separated?" In the paper on Mineralogy it is required to "Enumerate the systems of crystallization in which double refraction has been observed? Describe the situation of the optic axis or axes with respect to the figure of the crystal in the pyramidal, rhombohedral, prismatic and oblique systems?" In the paper on Botany the examinee is required to "Describe the diseases in wheat termed ear-cockle and ergot." In the paper on Comparative Anatomy it is asked "Have any of the ringed worms true joints?" In the paper on Physiology it is asked "What appears to be a principal office of the pancreatic fluid according to Bernard? By the selection of what species of mammal for his experiments was he enabled clearly to distinguish between the action of the bile and that of the pancreatic fluid during life?" In the paper on Geology it is asked "What evidence have we for a 'glacial period?' Assuming its existence as a fact in the history of the earth, how do we fix its geological date?" In the "general paper" we have the queries:—"How do we discover the mean density of the earth?" "What are the indications of its primeval fluidity?" "What are the present indications of an increasing internal temperature?" "State some of the modern theoretical investigations bearing upon the question of the actual internal fluidity of the earth, and the results derived from them."

The Fitz-William Museum at Cambridge is not peculiarly adapted to the necessities of the Natural Science student. It is a magnificent collection of sculptures, paintings and books. Institutions that help to the attainment of honours in the Natural Science Tripos at Cambridge are the Anatomical Museum, the Geological Museum, the Mineralogical Museum and the Botanical Garden.

It would be superfluous to attempt a sketch of the British Museum in London. In a collection so extensive and so scientifically arranged the devotee of any speciality in Natural Philosophy will of course find what will delight and instruct him. I will only add for the benefit of any who are interested in meteors and aerolites that here they may see and closely examine many hundred of these petty but eccentric and not unformidable members of our system. After contemplating thoughtfully the aspect, size and weight of several of these stray vagrants from the outer space, all of which must be well-authenticated

or they would not be deposited here, no one can fail to regard with increased curiosity the so-called shooting stars to be seen every night in the heavens, but especially the November and August showers; and no one can fail to feel in an intensified degree thankful that disaster to cities and men from the impact of such masses on the Earth is so rare.

In the north gallery of the Museum are between two and three hundred specimens of meteorites, classed as aerolites, siderolites and aerosiderites. The first are meteorites, containing from the most part various silicates, interspersed with isolated particles of nickeliferous native iron and meteoric pyrites. The second are meteorites, consisting of nickeliferous native iron in a more or less continuous or sponge-like state, cavities in which are charged with silicates. The third are masses of native iron, generally nickeliferous, and containing phosphides of nickel and iron, carbon and other substances. One found in Yorkshire weighs 45lbs. 8oz.; one found in Tennesee weighs 60lbs.; one found in Oldenburg, in Germany, weighs 77lbs.; one found at Parnallee, in India, weighs 134lbs.; one found at Tolucca, in Mexico, weighs 173lbs. 9oz.; one found at Tucuman, in the Argentine Republic, South America, weighs 1,400lbs.; finally, one found at Cranbourne, Australia, weights 8,200lbs.—The so-called Blacas collection, purchased by the British Government in 1866, for the sum of £43,000, consisting of antique gems, cameos, coins, Roman plate, bronzes, painted vases, frescoes, and defensive armour, may also here be examined. It has its name from the Royalist French Dukes of Blacas. The number of engraved gems, cameos and intaglios which it contains is about 800. It has also some fine specimens of ancient phaleræ or horse-ornaments—large silver plaques, with crescents appended.

Other scientific collections in London are the Museum of Economic Geology; the Royal Society Museum; the Museum of the Royal College of Surgeons; the Soane Museum; the India House Museum; the Linnæan Society Museum; the Horticultural Society Gardens; the South Kensington Museum; the Botanic Garden at Kew, where there is a grand palace of glass, 360 by 90, filled with palms. Here also is to be seen the gigantic lily, named the Victoria Regia. The wonderful Crystal Palace at Sydenham, with its surrounding domain can be put to scientific use in many ways by those who pay their visit with that intention. Some life-size models of the animals of the palæontological class, seen in the open air in their proper habitat, in the act of crawling up the green bank of a breezy lake give a vivid im-

pression of the shape and magnitude of those now extinct forms of life. The Palace at Sydenham is a perpetuation of the Universal Exhibition Building of 1871, only greatly extended and enlarged.

The felt utility of the great temporary assemblages of objects at international and universal exhibitions, as instruments of education, has been a stimulus to the improvement of museums, and has led to the establishment on a large scale of permanent exhibitions scientifically arranged.

Adjoining the Horticultural Gardens at Kensington there have just been erected magnificent permanent exhibition buildings, 550 feet in length; and close by them is to be seen the beautiful Rotunda or Colosseum, entitled the Royal Albert Hall of Arts and Sciences. It is elliptical in form, its axes being 219 and 185 feet. A beautiful external feature of the building is a band or frieze six feet six inches in length carried round its whole circuit, 794 feet, towards the top, crowded with groups emblematic of the arts and sciences and industries, executed partially in colours in terra-cotta. The subjects are agriculture, astronomy, geology, workers in wood, and stone, and iron, music, poetry, construction, sculpture, and applied mechanics.

This vast elliptical building, with a spherical roof of glass, has not yet been opened: it has been built by the commissioners of the Exhibition of 1851, out of a portion of the proceeds of that exhibition. It will assuredly be one of the most striking architectural objects in London, and will be one more of the scientific institutions containing collections, which the studious visitor from Canada will earnestly desire to examine.

Altogether it will be seen that at the present time there are very many appliances by means of which science in all its branches, especially natural science, can be thoroughly illustrated and made intelligible and interesting to every inquiring mind. If the communities of English-speaking countries do not steadily advance in their acquaintance with the facts and laws exhibited in Natural Science, it will be very surprising. Still no doubt patience will be required. Where the so-called masses have been for centuries neglected, as, for example, in Southern Britain, where, astounding to narrate, a comprehensive scheme for elementary popular education did not exist until last year, several decades must pass before the laws, the beneficent laws of Nature are known and consciously obeyed among the classes at the base of the social fabric. It will be a happy state of things when throughout a community

from its apex to its lowermost stratum each successive generation, by availing itself of the facilities conveniently placed within its reach, at an early moment possesses itself of the acquisitions of its predecessors, thus securing leisure to itself for new enquiries, having in view the extension of the domain of practical science.

The world stands amazed at the rapid progress made in civilization and material improvement by the colonies planted in Australia, New Zealand, British Columbia, Canada and the continent of America generally. That rapid progress is due to the fact that the colonists, settling in those regions, started from the point which the old communities from whence they issued had attained in science and civilization. They carried with them the results and experiences which had accumulated in the course of past human history. Had it been required of our colonists that they, like their remote fathers, should pass literally through a flint era, a bone era, a bronze era, an iron era, the continents of Ameri[illegible] and Australia, the islands of New Zealand, Van Dieman's Land, and a score more places that might be named, scattered over the surface of the globe, would not be presenting at this day the scenes which they now do present—scenes which, for evidences of human culture, industry, taste and art, begin to rival those which, a few years since, were supposed to be the special characteristics only of lands whose annals reach back centuries in the past.

Now, each successive generation of men should enjoy a privilege analogous to that which the colonists of Great Britain have enjoyed. Each generation should start on its career, consciously equipped with the practical science which has accrued up to the moment of its setting out.

And in a similar manner, should not each individual youth in a modern community start in his career with a like outfit? Ought not Education to mean this—the indoctrination of each successive crop of youth with at least the elementary principles of all contemporary ascertained human knowledge, with a view to practical purpose in subsequent life? Would not Education, if it signified this, and was this, be the means of saving a great number of human beings from a great deal of blind, aimless action, and from a great number of blunders and mistakes, and so be the means also of economising a great deal of the world's precious time? Should not each generation of our youth be as a colony swarming off from an old, well-constituted and wise state, carrying with it, in germ at least, the knowledge and experience of the

parent community, and starting from the point to which that had managed to attain? Especially in respect to the subjects to which in this address particular reference has been made—the subjects commonly embraced under the term Natural Science—should not an adequate indoctrination of the young be secured?

It is one of the chief distinctions of the era in which we live, that Nature has been, to an extraordinary extent, interpreted—not interpreted fully: work in that direction remains to be done in the generations that will succeed us—but interpreted in very many respects; and so interpreted as to make clear certain consequent duties on the part of man, as well as certain practical advantages to be enjoyed by man in virtue of an acquaintance with that interpretation.

It is discovered, and is universally confessed, that throughout Nature laws reign. These laws does not every sane man confess to be laws of God? It becomes then even a matter of religious obligation to inculcate a knowledge of those laws so far as is practicable and suitable in the education of the young, independently of expediency; independently of the efficiency, personal happiness and economy which accrue when a man's line of action is habitually in the line of those laws; and of the failure, personal misery and waste which are inevitable when his line of action is habitually athwart the line of those laws.

To come back again then to the particular thesis with which this address has been occupied in the main, the place and function of museums and other classified collections in a system of education, popular or abstruse, are clearly seen. The admirable order which objects, simple and complex, raw and wrought up, are therein made to take, even to the eye, impresses in a powerful manner the reign of law in Nature; and they enable the student of Nature, professional or amateur, to make, with immense convenience and great rapidity, personal examinations advantageous to his own enlightenment and advancement in knowledge and skill, which would otherwise be all but impossible for him to make.

I have offered the advice that our youth, who at school or college have received instruction in the first principles of Natural Science, should make a specific use of the great Collections which in so many quarters they will discover in their tour in Great Britain and on the continent of Europe. I have advised that a scheme or plan should be beforehand decided on, to be closely followed during the days or hours which they are able to devote to such collections.

Visits to Boston, Philadelphia and Washington might in like manner be utilized.

The Geological Museum at Montreal should be deliberately and minutely examined Laval, at Quebec, also contains scientific treasures.

Our own University Museum at Toronto is of course familiar ground already to our young lovers of Natural Science. It will be found a good antepast to the feasts that await them on their visits to larger establishments. It presents some good studies in ornithology and entomology. I wish our own small Museum, connected with the Canadian Institute, were richer in objects, but it is not wholly to be despised. The formation of a "Provincial Museum" was one of the objects to be promoted by the establishment of the Canadian Institute. The first section of our constitution reads as follows:—"The Canadian Institute has been established by Royal Charter, for the purpose of promoting the Physical Sciences, for encouraging and advancing the Industrial Arts and Manufactures, &c., effecting the formation of a Provincial Museum, and for the purpose of facilitating the acquirement and the dissemination of knowledge connected with the surveying, engineering and architectural professions."

When an institution like the University of Toronto establishes a Scientific Museum on a good scale by the side of an humble collection like that which the Canadian Institute, with only limited resources, has been enabled to make, the latter necessarily becomes somewhat insignificant. Nevertheless there is a field which our Museum might occupy. It might be made a repository of Canadian archæological and historical objects. The collections in the Normal School buildings, Toronto, exist expressly for educational purposes, and repay a studious examination. Barnett's Museum, at the Falls of Niagara, is by no means a common-place repository of objects. Some very fine genuine Egyptian mummies may be seen there. Our annual Provincial Exhibitions might also be utilized by a student visiting them with definite intention and purpose.

Now, I desire it to be observed, that in all that I have thus far said, I have not supposed for a moment, that Natural Science is to be the sole subject-matter of instruction or study in a system of Education. I have only been insisting that in a system of Education adapted to modern men, Natural Science must have its due place.

I think morals and religion are legitimate developments of man's being, and are subject to Divine law. I believe therefore that these

ought to be included amongst the matters with which Education, somewhere or other in its programme, concerns itself. I think History and the wise and beautiful Thoughts of men in all ages should be subjects of study in a system of Education. Have we not a hint of this in the fact that the written Records which we accept as Holy Writ, as a Divine Revelation, consist of History—of Thoughts exalted, nay, inspired?

I do not dream that Language is to be abandoned in a system of education. That too is now seen to be a human development subject to natural law, *i.e.*, Divine law. It must continue therefore to be a study as it has been in times past, but now a more intelligent study than formerly, as being a positive science, far-reaching, wide-spreading. It will even possibly still hold its own as one of the chief instruments in the training of the very young, for is there not by a Divine arrangement a special aptitude in every infant mind for language? What is more marvellous than the mastery which a little child acquires over its native tongue or any tongue which it hears familiarly spoken?

The laws of mind too, being really laws, Divine laws, brought out into view by a comparison of human experiences, must continue to be taken up, in their elements, in every complete course of education.

But what we inculcate is this, that in addition to all these subjects, at the present time it is expedient, it is reasonable, it is devout, to assign a high place in schools to the knowledge which will help a youth from the very beginning of his career to a true view of the Earth on which he lives, of its constituent parts, of its relations as a member of the Universe. It is expedient, it is reasonable, it is devout, to assign a high place in education to the knowledge which from the beginning of his career will help a youth to soundness and suppleness of body and mind; which, throughout life, will render him, consciously, an interested and skilled worker in his place in the great Whole; and as such, a happy man, going on his way rejoicing, singing and making melody in his heart.