

Dr. R. Bell

Geo. C. Survey, Ottawa

VOL. I

No. 2

*601/n/m/11-150/11
Q. V. A. U.*

QUEEN'S QUARTERLY

OCTOBER, 1893

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PUBLISHED FOR THE COMMITTEE BY
THE NEWS PUBLISHING HOUSE
KINGSTON, CANADA

SINGLE COPIES, 30c.

PER ANNUM, \$1.00

QUEEN'S QUARTERLY,

PUBLISHED JULY, OCTOBER, JANUARY AND APRIL,

UNDER THE AUSPICES OF ALUMNI AND FRIENDS OF QUEEN'S UNIVERSITY, KINGSTON, CANADA.

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The School of Mining opens on October 9th, 1893.

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QUEEN'S QUARTERLY.

VOL. I.

OCTOBER, 1893.

No. 2.

All articles intended for publication, books for review, exchanges, and all correspondence relating thereto—should be addressed to the editors, Box A, Queen's University, Kingston, Ontario.

THE NATURE AND SPHERE OF POLITICAL SCIENCE.

ALTHOUGH from one point of view Political Science is quite a new development, yet from another it is but the revival of an old line of thought which found its most complete expression in the *Politics* of Aristotle.

Before they suffered political extinction, the Greeks and Romans had brought the social and legal sides of Political Science to a very advanced point. But, from that time down to the dawn of the modern era, such a science was rendered practically impossible through the absence of the conditions on which it depends. As a living branch of study it implies this first condition, that the well-being of at least a considerable section of the community should be recognized as the basis of government and law. Where law and authority are expressed in the arbitrary commands of a despotic ruler Political Science cannot flourish. True, there were writers on certain elements of the subject during, and immediately after, the Middle Ages; but they produced, for the most part, mere echoes of the earlier writings, quite out of harmony with the conditions of their time. Only one new question arose to disturb the philosophic calm of all those troubled centuries, the question as to whether the emperor or the pope should exercise the supreme authority in the state. This was the occasion of the only two political works of any conse-

quence during the whole period. *Of the Government of Princes*, by Thomas Aquinas, and the *De Monarchia*, by Dante, represent the best that was written on each side of the controversy. Yet the original elements in these productions are interesting mainly as showing how difficult it was, under the existing political and social conditions, for even the best minds of the age to produce anything worthy of serious thought. Only when we come to the time of Machiavelli, at the beginning of the sixteenth century, do we find something original and at the same time scientific. Freely accepting the position that the good of the ruler is the main object of government, he proceeds to set forth the conditions necessary to this end. Yet, taking, as he does, a liberal view of the good of the ruler, he comes round to the position that in most respects it coincides with the good of the subject. His real interest, as his writings abundantly show, is the good of the subject, and his general conclusion is that the wise ruler, looking to his own interest, will find it best served in respecting the interests of his people. In his theory of government, so far as it is worked out, everything is approached from the point of view of the ruler. The same point of view prevails in all the subsequent developments of Political Science down to very recent times. Thus, in the writings of Bodin, Spinoza, Hobbes and Locke, two chief questions claim attention,—the nature of sovereignty and the authority of law. In such a science there could be little room for social or economic elements, hence we find them receiving very scant and subordinate treatment.

The economic side, however, was at the same time finding a modest development of its own under quite another patronage, yet always from the point of view of the sovereign. Modern Economics, as a special science, finds its origin in public finance. It arose from the efforts to reduce taxation to some sort of system and to place it upon a sound basis. Thus the first economic writings are little more than treatises on taxation, or the ways and means of raising the government revenue.

At the beginnings of modern nations the functions of government were very limited. They consisted in little more than the keeping of a rather uncertain peace, and the administration of a somewhat uneven justice. The government revenues were practically the personal revenues of the sovereign, drawn largely from

his own private estate, and rather arbitrary and uncertain as to the amount obtained from other sources. Experience gradually proved that the systematic and regular levying of moderate contributions produced much more revenue in the long run, than the arbitrary and irregular levying of large contributions. The introduction of system in the raising of revenue was partly the cause and partly the consequence of a growing recognition of the claims of the people upon the government. Thus it came to be recognized that, in order to insure a good revenue, it was wise policy to promote the prosperity of the people. Tracts began to be written on the best means for increasing the general prosperity with an eye to the ultimate increase of the revenues. Following along these lines, chiefly in France and England, the modern science of Economics was gradually built up. Thus, from the nature of its origin, Political Economy came to be concerned entirely with the question as to the greatest possible increase of wealth, first with reference to special rulers, then with reference to the subjects of these rulers, and finally, with reference to individuals in general, wherever they come under the ordinary commercial conditions of the civilized world.

We thus see how these two branches of what was, under the Aristotelian treatment, one science, came to be separated, in the modern world, into two sciences apparently quite independent of each other. This separation has serious disadvantages. On the one hand, an exclusive consideration of the central government and its functions tends to give to it a power and importance which it does not, and should not possess. It prevents the central government from being seen in its true perspective with reference to the other organs of society. On the other hand, to take as the basis of an independent science the subject of wealth and the best possible means for its production and accumulation, produces a tendency to regard wealth as in itself a kind of final object. Smith and Mill were not in this respect so rigid as many of their followers. With later economists the desire for scientific exactness has led to the greatest possible exclusion of all considerations as to the proper use of wealth. There is, it is true, in Political Economy an element which admits of rather precise treatment, namely the conditions necessary for the production, exchange and distribution of wealth. It is altogether desirable

that this element should receive definite and separate treatment. But it is not so desirable that this treatment should be elevated to the position of a separate science. If we could regard the production of wealth as we do any ordinary chemical or biological processes in nature, there would be no objection to make the study of its conditions a separate science. But the getting of wealth implies the using of man as one of the agents to that end, and we have constantly to ask to what extent this is justified. Thus the question of the production of wealth becomes but a subordinate part of some other subject concerned with the ulterior objects of men in society.

The defects of the previous treatises on the political and economic sides of our subject were not serious in their own day. Most of the defects are due to the very great changes which have since occurred in political and commercial relations.

The structure of the modern civilized world compels us to regard all social matters from the point of view of the people. We have to regard governments as instruments of the people, not the people as instruments of government. In fact we must look upon governments as simply one set of organs, among many others, through which the people seek to realize themselves. But this changed point of view must of necessity lead to a change in the treatment of economic and political relations. It requires also the definite recognition, in any scientific treatment of society, of that important social region which lies between the production of wealth, on the one hand, and the administration of government on the other. Within this region we find a multitude of organs, most of them of rather recent growth, through which the community expresses an interest in special phases of its progress. Here we find most of the local and municipal institutions. Here, too, are all those associations for the furtherance of philanthropic, religious, educational, artistic, literary and scientific interests; and all those partly economic, partly political organizations, such as boards of trade, chambers of commerce, labourers' and employers' unions, mutual benefit societies and a host of others of lesser note, each in its own way giving expression to collective, as distinguished from merely individual interests. Each of these, according to the range of its influence, is as much an organ or channel through

which society expresses its capabilities and seeks its realization as is the central government itself.

Again, in recognizing the central government as only one, though as yet the most important, of social organs, we must observe also that the limits which confine it have no necessary reference to the other organs. The central government is, from the nature of it, confined within a definite territory, which constitutes the country of a nation. Most of these national limits are quite arbitrary, having been fixed more by accident and the fortunes of war than by their natural fitness to serve as dividing lines between nations. Yet, so long as international jealousy and hatred prevailed, so long as communication, trade, legal rights and personal protection were impeded or denied as between countries, the range of the other social organs, though having no necessary connection with territorial limits, was yet largely determined by them. Now-a-days, with the removal of many of these impediments, and the decay of that patriotism which glorifies war and sees in every foreigner an enemy, the religious, professional, educational, artistic, literary, scientific, commercial, labour and other social organizations are rapidly losing sight of mere territorial limits and are bringing into union on quite other grounds all those, wherever found, who have special interests in common. Thus there has come to be less exclusiveness between kindred nations of the present day than there used to be between kindred municipalities. While the previous Political Science was more or less strictly national in its range, modern Political Science is required to be international or cosmopolitan. It must, at least, have regard to all those nations which are associated in a kindred civilization, and whose citizens are powerfully influencing each other in economic and social, as well as strictly political matters. In a word, the social conditions, means and aims of *civilization* constitute the sphere of modern Political Science. We are compelled to go considerably behind the science of wealth, on the one hand, and considerably beyond the science of government on the other. We have to ask many previous questions with regard to the nature of man as a social being and the circumstances in which he is placed, and we have to ask many ultimate questions with regard to the final aims and objects of society,

In determining the nature of man's capabilities and conditions, and in determining the range of his possibilities in the physical, intellectual and moral spheres, we have to depend upon the results of other studies both scientific and philosophic. On the economic side there is a close relation with the results of the physical sciences ; on the social side our subject joins hands with Ethics, while on both sides it depends on History.

As, between physics and chemistry, or between chemistry and physiology, there is a border land which is common to both, but which is approached by each from different points of view, so, especially between Ethics and Politics there is considerable common ground, but it is approached by each from a different standpoint. Ethics regards this ground mainly from the point of view of individual conduct and motives. Politics regards it from the point of view of collective needs and purposes. All political and social problems have an ethical basis, just as all physiological questions have a chemical basis. But that which makes the problem distinctively political or social, rather than ethical, is an entirely additional element with laws and conditions of its own ; just as that which makes a question physiological, rather than chemical, is an entirely new element with new laws of which Chemistry knows nothing.

The special study of organized society will require us to consider what the aims and objects of such a society must be. These may be summed up in the general statement, that it aims at securing for its members a continually developing civilization. Farther, as this civilization must be open to the whole people the individuality of each person must be respected as well as the individuality of nations. But this is not an individuality of isolation and independence. It is just because society requires of the individual to forget himself as a mere individual, and to identify himself with social objects and purposes that it can make so much of him in the end, and give to him a new and infinitely richer individuality which is the common product of the whole world. The same applies to every organization within society, including nations themselves. Of course this requirement is not always met. Many individuals and social organs take up as final what is but a narrow and mean fragment of the great social well-being, and thus fail to obtain that fuller individuality which a civilized com-

munity makes possible. Even our existing social organization puts at the service of most of its members a wonderful range of resource. Thus it is literally true, even on the material side, that the daily comforts of an average civilized man may represent the co-operation of more than a million of his fellow beings; while the making a civilized man of him may represent well nigh all the higher efforts of civilization in all ages.

After determining the objects of an organized society, we have next to ask what are the means and instruments by which these objects are to be attained. These will be either material,—depending on physical properties and forces,—or spiritual,—depending upon mental, moral, religious or æsthetic conditions. We have to consider, then, how each of these means is to be adapted and applied to its purpose. We do not go far before finding that the sum of the material means of civilization practically constitutes wealth. Wealth is simply the sum of all those material means which people are anxious to get in order to realize their aims and objects. The study of the conditions necessary to the most efficient production, exchange and distribution of wealth constitutes Political Economy. Thus we see exactly where this department fits into the general science of society. It is the science of the material means for the development of civilization. Where this is fully recognized the folly of taking wealth, which is only the first stage towards the goal, for the goal itself, becomes rather manifest. Having considered the material means of civilization we have next to consider the spiritual means. These on their social side are represented by the various organs, lesser or greater, through which society expresses itself or seeks to promote special objects. With reference to these the chief questions are,—how do their objects harmonize with the general objects of society; what are the elements which they contribute; are these elements worthy of the social energy and means which they absorb; are the organizations well or ill suited for the work which they have to perform? With the technical details of each we are not specially concerned. The most important of all these organizations—the State—must receive a corresponding share of attention. And here, as elsewhere, our science must make free use of the results

of other special departments of study, such as Law, constitutional and general History, &c.

A word or two, finally, as to the method of study suitable to our subject. Where the facts of a science remain unchanged, the only requisite is a systematic classification of them, and an explanation of their relations to each other. The facts remain constant, our knowledge of them develops. In Political Science not only our knowledge of the facts, but the facts themselves, are constantly developing. Yet, since the development is not arbitrary, but constitutes, in the main, a progress, we are able to determine certain definite principles in it. In the variable element incident to progress temporary questions must receive special treatment in accordance with the circumstances and conditions of their time. But, though the results may become obsolete with a change in conditions, they may be none the less scientific and accurate while the conditions continue. Thus the object of Political Science as a subject of study is not to supply definite and final solutions for all social questions. The great variety in social relations and the constant changes to which they are subject, render this method useless. Our method must be to discover and point out, first, the more fundamental ideas which guide the progress of society, next, to show how the secondary principles are related to these and the relative importance which they possess, and finally, we must exhibit the use of these in dealing with special concrete questions, where we have to take particular note of individual facts and details as well as of general principles. We have to develop an intelligent and comprehensive point of view, and a well-balanced method of approaching and dealing with social relations, which will keep our minds as alive as possible to all sides of a question, and prevent us from rushing into absoluteness and finality in the settlement of questions which relate only to passing phases of progress.

When pursued in the spirit here indicated, Political Science cannot fail to be of the greatest value as an organ of education; whereas if regarded solely with an eye to concrete results and working formulæ in political tactics, it must be without doubt the most useless study on which a student can waste his time. Nothing can be made of Political Science except through the de-

velopment of independence and originality of thought, openness of mind, and the capacity of mental adaptation to new facts. A training begun on these lines, in connection with such a subject, will find no break in its development even in the busiest life; for we are all forced to deal, rightly or wrongly, with economic, social and political questions.

ADAM SHORTT.

TIME RECKONING.

1. *Uniform non-local Time* by Sandford Fleming, C.M.G., M. Inst., C.E., F.G.S., F.R.G.S., Engineer in Chief Canadian Pacific Railway, &c. (Printed for private use.) London, 1876.
2. *Temps Terrestre, Memoire per Sandford Fleming, C.M.G., &c.* Paris, 1878.
3. *Proceedings of the Canadian Institute*, July 1885. Toronto, 1885.
4. *Time-Reckoning for the Twentieth Century*, by Sandford Fleming, C.M.G., &c. Smithsonian Report for 1886. Washington, 1889.
5. *Documents regarding the Unification of the hour, and the Legalization of the new mode of measuring time.* Printed by order of Parliament, Ottawa, 1891.

THE above publications, among others on the subject, refer to the remarkable movement begun about fifteen years ago for the establishment of a better system of daily time-reckoning. This system, wherever, and as far as, it has now been carried out into use, has already greatly facilitated the ever-increasing means of extended communication by Railroad and Telegraph, and is fitted when its principles are yet more fully acted on, to be of still farther essential service both to the transaction of ordinary business, and to science. The origin and progress, therefore, of the efforts made for its adoption are too important not to call for our special notice.

The improvement in the Calendar introduced by Julius Cæsar, with the corrections since made, have left no room for

variation or confusion in our ordinary reckoning by tropical years and their parts. It has been far otherwise, however, with our notation of time by its lesser but fundamental unit, the mean solar day. Every city and town on this continent and over the globe, but a few years ago, had its different hour, minute and second of the day, and often a different day, at the same moment of absolute time. Instead, moreover, of the simple method of numbering the hours continuously from one to twenty-four the rude division of the ancients into 12 A.M. and 12 P.M. was universally retained, and to add to these sources of inconvenience and ambiguity, the Astronomical day had been made to differ from the Civil day, the former beginning twelve hours before the latter, and phenomena and results in Astronomy, Meteorology and Navigation were recorded and calculated sometimes in terms of the one day, and sometimes in terms of the other.

The difficulties and inconveniences arising from these causes, and the want of some uniform system in our daily time-reckoning, have been more and more forcibly brought into view by the rapid growth of railway, telegraph and steamship communication during the last fifty years. They were not so soon felt, nor are they so thoroughly realized, in countries of comparatively small extent as in the British Isles, though there also they exist and have been provided against. The necessity of a change has been most urgently experienced on continents like North America and Europe, or extensive areas like British India. There the vast, and still increasing, number of long lines of railroad and other means of communication has made it evident that the mode of reckoning by local time, until lately everywhere in use, is attended with serious hindrances, and liability to derangement, in the transaction of the ever widening intercourse and commerce of the world. In the United States and Canada, for example, ten years ago, 140,000 miles of railway were run on as many as 75 different local times, and the difficulties thus occasioned in making proper connections, without annoying delays and mistakes, and with due security of life and property, became so great that railway and telegraph directors were at length constrained to seek for a remedy.

As early as 1863 the subject had attracted the attention of Mr. Sandford Fleming, C.E., C.M.G., now Chancellor of Queen's

University. As Chief Engineer, appointed conjointly by the Imperial and Provincial governments, he was then occupied with the survey and construction of the Intercolonial Railway. The main line, extending 678 miles from Halifax to Quebec, connected at the latter city with the Grand Trunk stretching westward to Sarnia about 660 miles farther, and forming with it a continuous journey by rail of 1,338 miles from the Atlantic to Lake Huron. The principal places, Halifax, St. John's, Quebec, Montreal, Kingston, Toronto, London and Sarnia, besides other points on the route, kept each its own time, so that, if the line were to be run by their different local times, the Conductor would have to alter his watch at every new point of departure, until the terminus at Sarnia was reached. Separate time tables also for each city of the arrivals and departures of trains would be required. Such constant changes, and the obvious inconveniences thus resulting would of course be intensified on the completion of the Canadian Pacific Railway from Montreal to the Pacific which was shortly afterwards begun, and of which also Mr. Fleming was appointed Chief Engineer. In such circumstances, becoming more and more impressed with the necessity of adopting another mode of time reckoning, he was led to propose a system which would not only get rid of all these difficulties but would afford a complete solution of the problem of one uniform daily time notation throughout the world.

The system which he proposed was first published and fully explained in a pamphlet printed for private circulation in London, Eng., in 1876, and another to the same effect in French, printed in Paris in 1878, during the "Exposition Universelle." The views presented by him in these publications, displaying as they do his lucid and comprehensive grasp of the whole subject, have called for no essential alteration since either by himself or by the eminent theoretic and practical men by whom they have been with signal unanimity welcomed and endorsed. They were soon afterwards, in the winter of 1878-79, brought under the notice of the Canadian Institute, by whose Committee, as we shall see, the first important step was taken for their being submitted to the consideration of a number of scientific bodies in other civilized countries in Europe and America.

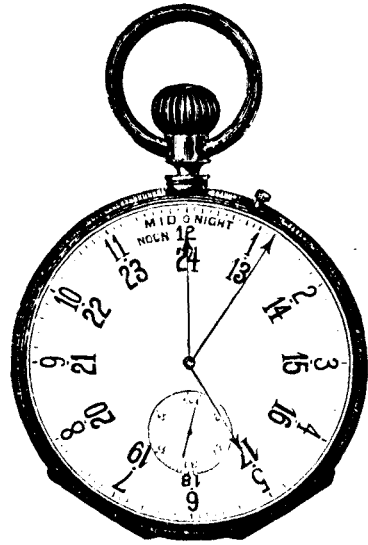
The system proposed by Mr. Fleming was, that the earth's surface being divided into 24 zones or lunes by meridian lines distant from each other by 15° , or one hour, the time for the regulation of the operations of railways and all ordinary business within each intervening area should be that on the nearest meridian line. In this way, in the intermediate space, good clocks and watches would move synchronously, would shew the same hours, minutes and seconds at any moment, and the complications arising from the necessity of having continual reference to ever varying local times would be altogether done away throughout one twenty-fourth of the surface of the globe. At the Equator, for example, for upwards of 1,000 miles, and at the Latitude of Kingston for about 730 miles, the conductor and the passengers on a train would have no need to shift the hands of their watches at the several places on their way, they being all adjusted to the time at one of the Standard Meridians, in the case of Kingston that of Long. 75° W. The manifest and great convenience for general business purposes, also, would be secured of all public clocks and watches everywhere on the route and keeping the same time. In passing from one meridian to another, west or east, the only change required would be to set the hour hand back or forward one hour, no alteration being required in the minute and second hands. It was further proposed by Mr. Fleming, that the altogether unnecessary division of the day into 12 A.M. and 12 P.M., which was fitted only to lead to confusion and mistakes, as experience had shewn them to be, should be ignored, and that the hours should be simply reckoned from 1 to 24. These proposals, utopian as at first they appeared to not a few to be, and insurmountable as seemed the difficulties in the way of their being acted on, it will be seen in the sequel, have already been accepted and carried out into practical effect over large portions of the globe, and proved of the most essential benefit to the working of lines of intercommunication in every direction, and business and intercourse of every kind.

The establishment, however, of this uniform reckoning of daily time over each twenty-fourth part of the earth's surface, constituting what we are now accustomed to term "Standard" time, highly advantageous as it is, was not all that Mr. Fleming advocated and had in view. He regarded it as but a step, though

a most useful one, to the adoption for many scientific, if not immediately for all, purposes of one uniform system of time reckoning everywhere throughout the world to be known as "Universal" or "Cosmic" Time, by which all clocks and watches in every quarter of the earth should be regulated by the time at one meridian alone instead of that at each different separate meridian, and should shew at every instant of local Standard time the same hour, minute and second of one Universal day. In this way the difficulties to which we have alluded would, it is evident, be at once completely removed. But which should be the Meridian where this common day of the world should be taken to begin? Mr. Fleming clearly saw that the difficulties in the way of the substitution of Standard for mere local time were all ultimately referrible to there not having been hitherto any common and recognized initial meridian for daily time as the meridian of Greenwich has been generally recognized as the initial or zero meridian for longitudes. He was, therefore, next led to propose the fixed zero meridian for time as most suitable to be selected that one which is 180° W from Greenwich, at mean noon on which the "Universal" day should be held to begin, and from which the meridians should be counted westward from 1 to 24. For passing, as it happens, almost wholly through the Pacific Ocean, touching only a small part of Kamschatka, and therefore running counter to no national prepossessions and susceptibilities, the various civilized nations might after mutual conference well agree to its adoption.

To illustrate the application of these principles to the indication by our time pieces of both standard and universal time simultaneously on the same dial, let us take for instance a watch shewing our standard time now regulating business throughout a wide extent of the Eastern United States and Canada, or that of the 17th hour meridian or 5 hour west from Greenwich. When it is mean noon on the Anti-Prime meridian of 180° W, or the beginning of the Universal day, it will of course be 12 mid-night, or the beginning of the Civil or Prime day at Greenwich, and when 5 hours afterwards, as the earth revolves on its axis, it is 12 midnight or O of the Civil day with us, *five* hours of the Universal day will have elapsed. If then we have our clocks and watches with dials as in the annexed figure, without any change

whatever in the internal works of the time-piece, with the first 12 numbers of the Civil day round their outer edges, and the remaining 13 to 24, to prevent crowding of the numbers, on the inner circle below, and fix another hour hand for Universal time on the central pipe of the minute hand ; so that it points to 5 when the hour hand for Standard time points to 0 or midnight, we shall evidently, as the hour hands revolve together, have given us at the same moment the corresponding hours, minutes and seconds at once, of the Standard Civil day,



of the Universal day proposed by Mr. Fleming, and of the Greenwich Civil day. When the Standard time hour hand points to 1 in the morning of the Civil day the hour hand of the Universal day will point to 6 shewing that six hours of that day have passed, and so on. By an easy adjustment of the hour hands in like manner for each different meridian, time-pieces will furnish both times at every particular moment when required. Until new dials like that above are generally introduced, which is much to be desired, the dials of the watches in common use may be adapted to shew Standard time continuously during 24 hours by a very simple and inexpensive device employed by the Canadian Pacific Railway on their line.

By the time reforms proposed by Chancellor Fleming, of which we have thus endeavoured to sketch an outline, we not only obviously secure the Standard time for each meridian, but a Standard time for the whole world, in which events from year to year, everywhere and of all kinds, may be recorded in the hour, minute and second of the one common day of their occurrence, and from which the date of all events in past and present history may be exactly determined.

Let us now state as briefly as possible the history of the progress of the movement. Since the first announcement of his views Mr. Fleming in a number of papers and addresses has continued to advocate them with singular ability and success. He has also done very much in various other ways for their promotion, and especially by his influential efforts in the several International Conferences on the subject of the most eminent scientific men in America and Europe, to which the system of time reckoning which he has proposed has led.

His efforts from the beginning and since have met with able and efficient collaborateurs, to whose cordial aid very much credit is due. The first active step in favour of the system was taken, as has already been alluded to, by the Canadian Institute of Toronto of which Mr. Fleming was a member, in 1879. Strongly impressed with the importance of two "remarkable" papers by him read before that Society during the winter of 1878-79, one on "Time-reckoning," and the other on "The selection of a Prime Meridian to be common to all nations in connection with time-reckoning," the Council of the Institute addressed a Memorial to the Governor-General of Canada, the Marquis of Lorne, requesting him to transmit Mr. Fleming's communications to the Imperial Government, in order that they might be brought officially under the notice of as many representative learned societies, and distinguished scientific men, as possible, both in Europe and in America.

His Excellency kindly acceded to their request, and in forwarding the papers to these scientific authorities he invited them to communicate to him their views as to the proposals therein set forth. Among the replies soon afterwards received were two of the greatest weight in their favor, those from the Royal Society in London, and from the celebrated Astronomer, M. Otto Struve, Director of the Observatory at Pulkova. The Royal Society, while pointing out the obstacles from long established usage to its general acceptance, signified its decided approval of the scheme. Mr. Struve declared his thorough agreement with its adoption. Communications to the same effect were also received from leading scientific men in Germany, Spain, Holland, Belgium and Italy.

Meanwhile, on this Continent, the subject had also been discussed in the Metrological Society of New York. An exceedingly valuable report of its Committee on standard time by its Chairman, Professor Cleveland Abbe, in May, 1879, and published in the following year, entered fully into the impediments felt in railway operations in the United States from the want of a uniform system of time, and proposed, like Mr. Fleming, to substitute for the varying local times the times at meridians each 15° apart, or if it were thought preferable, the time at one standard meridian for the whole United States. The Society, thereupon, passed a resolution declaring that absolute uniformity of time was desirable, and that the meridian six hours west of Greenwich should be adopted as the national standard to be used in common on all railway and telegraph lines, to be known as "Railroad and Telegraph Time."

Copies of Mr. Abbe's report, and additional papers by Mr. Fleming, were in 1880 also transmitted by the Marquis of Lorne to the different learned Societies in Europe, and further contributed to bring the proposed system of time reform under the notice of the civilized world.

At the meeting of the Association for the reform and codification of the Laws of Nations at Cologne in 1881, at which Dr. Barnard, the delegate from the United States took an active part, the question of the regulation of time according to the new system was discussed, and resolutions of approval passed. In the same year it was again fully considered, and resolutions passed in its favor by the International Geographical Congress at Venice. Mr. Fleming, who was there, present as delegate from the Canadian Institute and the American Metrological Society, then took occasion to suggest the appointment of an International Conference on the subject to be held at Washington, and was warmly seconded by gentlemen representing the Government and scientific Associations of the United States. The President of the Congress having communicated the resolutions to the Italian Government, Prince Teano on its behalf undertook to conduct the official correspondence. An important discussion on the question followed at the meeting of the International Geodetic Association in Rome, in 1883, when the utility of one uniform daily time reckoning was recognized, and a special Inter-

national Conference for the establishment of a general agreement on initial meridians for longitude and time recommended.

While the movement was thus gaining ground in Europe it continued to be actively prosecuted on this Continent, and steps were being taken for paving the way to its being put into practical operation without delay. At a Convention of the American Society of Civil Engineers in Montreal in 1881 the subject was brought before it by Mr. Fleming, and a committee of five leading men engaged in the management of railways, together with Prof. J. E. Hilgard, General Superintendent of the United States Coast and Geodetic Survey, and Professor Egleston of Columbia College, was nominated to examine the question, of which Mr. Fleming was appointed Chairman. This Committee at the next meeting of the Society unanimously reported their entire approval of the scheme proposed, the mean times at each of the twenty-four meridians to be used as standards for local time, and cosmic or universal time to be employed in chronology, astronomy, navigation, meteorology and ocean telegraphy, and generally on all observations non local in character. The American Society of Civil Engineers, and especially its committee has ever since rendered its powerful support to the scheme by papers in its published proceedings explaining its objects and advantages, and by its active aid in carrying it out into practical realization. With the latter purpose in view, a circular signed by the Secretary to the Society, containing eleven questions on the subject to which categorical replies were invited, was sent to "the leading men in railway direction, either as general managers, superintendents or engineers, and to men of scientific attainments throughout the United States and Canada."

At a convention of the Society held in Washington in 1882, numerous replies were received and reported on, shewing that the system proposed as to both standard and cosmic time was generally and heartily approved. The Society thereupon resolved to petition Congress to take the matter into consideration, and was seconded in its efforts by a similar application from the American Metrological Society. Joint resolutions of the Senate and House of Representatives followed in July, 1882, authorizing the President of the United States to call an International Conference to meet in Washington "for the purpose of

fixing upon a Meridian proper to be employed as a common zero of longitude, and standard of time reckoning throughout the globe."

During the interval preceding the meeting of this international conference, a convention of Railway Managers, held in Chicago, after some preliminary meetings, resolved without delay to run their lines by standard instead of local time, and on Nov. 18th, 1883, the change throughout the United States and in Canada was made "without any appreciable jar, and without a single accident occurring." The first great step towards putting the system into general operation was thus successfully attained, and in 1884 the American Society of Civil Engineers were encouraged to direct their efforts to obtain also the proposed reform of the notation of the hours of the day. With the view of ascertaining definitely the opinions of railway managers in the United States and Canada on the question, a correspondence was entered into between them and the Secretary of the Society. Replies were received before the close of the year from the representatives of 60,000 miles of railway of whom 98 per cent were in favour of the change from the 12 a.m. to 12 p.m., according to the old division of the day, into 24 continuous hours. Since then no less than 403 presidents, managers, superintendents, and engineers in all, representing an aggregate length of railway of about 140,000 miles, have sent in replies in favour of the proposed change; shewing that its adoption would be as easy, as it would be beneficial in its results.

It is not surprising therefore, that Mr. Fleming should thus express his gratification at the practical realization so far already effected, of the aims of his own unwearied exertions, and of those who took an active part with him in their prosecution; "Six years ago when the subject was first discussed in the Hall of the Canadian Institute, there were probably not a few who viewed the propositions then submitted as merely fanciful theories. Others, who did not refuse to recognize their bearing, entertained the feeling, that many grave difficulties presented themselves to the feeling, that many grave difficulties presented themselves to interfere with any successful attempt to reform or modify usages so ancient as the computation of time. What are the facts to-day in 1885? Twelve months have passed since an important change in the reckoning of railway time was made with general approval

throughout the length and breadth of North America; a revolution in the usages of sixty millions of people has been silently effected and with scarcely a trace that it has happened; and that proceeding has been followed by events of equal importance."

On the 1st October, 1884, an international conference on the whole subject was held at Washington, and was attended, on the invitation of the President of the United States, by accredited delegates of distinguished men from twenty-five civilized nations. Their deliberations continued until the close of the month. It was manifest that a decision as to universal time was impossible without the general recognition of a Prime Meridian, therefore the Conference unanimously adopted as their *first* resolution, "That it is the opinion of the Conference, that it is desirable to adopt a single Prime Meridian for all nations in place of the multiplicity of initial meridians which now exist." After full deliberation the following *second* resolution was passed with only one vote in the negative, the delegates voting by nations.

"Resolved, that the Conference proposes to the governments here represented, the adoption of the Meridian passing through the centre of the transit instrument at the Observatory of Greenwich as the initial meridian for longitude." The above resolution was adopted by the following vote :

In the affirmative :

Austria, Chili, Columbia, Costa Rica, Germany, Great Britain, Guatemala, Hawaii, Italy, Japan, Liberia, Mexico, Netherlands, Paraguay, Russia, Salvador, Spain, Sweden, Switzerland, Turkey, United States, Venezuela.

In the negative :

San Domingo.

Abstained from voting :

France and Brazil.

In a *fourth* resolution the Conference proposed "the adoption of a Universal Day for all purposes for which it may be found convenient, and which shall not interfere with the use of local or other standard time where desirable." This resolution was passed without a single vote in the negative. The next resolution proposed in the Conference was, "That this Universal Day is to be a mean solar day, is to begin for all the world at the moment of mean midnight of the initial or Prime Meridian, coin-

ciding with the beginning of the civil day and date of that meridian, and is to be counted from zero up to 24 hours." This resolution was adopted with only two votes in the negative; and it will be observed, only puts in another form, Mr. Fleming's suggestion, for when it is noon at 180° it is at the same instant of absolute time midnight at Greenwich, or the beginning of the civil day. The time, therefore, of the universal day proposed by Mr. Fleming becomes in reality and practically Greenwich time, the time at the initial Meridian adopted as above. A *sixth* resolution was also carried without division; "That the Conference expresses the hope that as soon as may be practicable the astronomical and nautical days will be arranged everywhere to begin at mean midnight."

These resolutions were thus passed by such a body of eminent representatives from many different countries as has seldom, if ever, met together for conference on any subject.

The well-known Russian Astronomer, M. Struve, one of the delegates, in giving a report of the proceedings of the Conference at Washington, thus speaks of the high sense which he entertains of Mr. Fleming's labours in bringing about this result: "It is through his indefatigable personal efforts and writings that influential individuals and scientific and practical societies and institutes in America as in Europe have been gained to the cause." In the conclusion of his report, without losing sight of the further aim of one cosmic or universal day for all, he earnestly desires the general adoption, as soon possible, of standard time, and the 24 hour notation on the continent of Europe, as well as in America, and, with regard to making the astronomical and civil day identical, he proposes that, the way being prepared by the progress of a few years, a fitting time for a change would be on the first of January, 1900, when the instant of commencement of the astronomical day and year should in all nautical almanacs be the same as that of the beginning of the civil day and year at that date.

The impulse in favor of the new system of time reckoning given by the Washington Conference has since led to further and rapid advances towards its realization. Great Britain had already adopted the standard time of the meridian of Greenwich. The standard times of their respective meridians also now regu-

late public services and ordinary business in Sweden, Hungary, the Empire of Japan, Holland, Belgium, the States of Wurtemberg, Baden, Alsace and Lorraine, and in Prussia one of the very last speeches of Field Marshal Von Moltke in the Reichstag strongly advocated a similar change from the old system, which has since been finally approved of by the House, and come into legal operation. The 24 hour notation has made less conspicuous but still marked progress. The Canadian Pacific Railway, after a most satisfactory test trial for six months, permanently established its use in 1886 on its line, from Lake Superior to the Pacific coast and was followed soon afterward by a like proceeding on other lines in the North-West, and on the Government Intercolonial Railway. It is now also in use over the many thousands of miles of railroad in the Empire of India, and the whole of the cables of the Eastern Telegraph Company and its connections from England, through Europe and the Mediterranean to Egypt, and from Egypt to South Africa, India, China and Japan, Australia and New Zealand. A corresponding change in the figuring of the dials of clocks and watches which could, as has already been explained, without the least difficulty be made to suit the purpose, is all that is wanted to facilitate the general introduction of the 24 hour notation, and afford at the same time, as has been shewn, the means of determining universal time whenever it is desired.

In concluding our review of the origin and progress of the movement towards a uniform time reckoning, we only further note the two most recent steps in the same direction taken during the present year. The one is the transmission of a circular by a joint Committee of the Canadian Institute and the Astronomical and Physical Society of Toronto, addressed to astronomers throughout the world, inviting their opinions as to the desirability of carrying out the *sixth* resolution of the Conference at Washington, by making the astronomical and civil day synchronize from the 1st January, 1900, the first day of the new century. The object in view being to make astronomical accord with civil time at the above date, a sufficient interval would thus be afforded for a common understanding among astronomers being arrived at, and for suitable arrangements of the ephemerides which are usually prepared four or five years in advance. Still

more recently, notice has been received of an important discussion at the Postal and Telegraph Conference for 1893 on the hour zone reckoning for Australia. "The discussion at the Conference was whether they should have the reckoning by a *three* hour meridian, or by *one*, and they wisely decided on the latter," making standard time a yet nearer approach to universal time. Sir C. Todd, of South Australia, seconded by Hon. Mr. Ward, of New Zealand, was the mover of the following resolution, which was carried unanimously: "That it is desirable in the public interests that the hour-zone system be adopted in a modified form, so that there should be one time throughout Australia, viz., that of the 135th meridian, or nine hours east of Greenwich." They will thus, it would appear, have the same standard of time in Australia as has for several years been established by official authority throughout the Empire of Japan.

JAMES WILLIAMSON.

DANTE AND MEDIEVAL THOUGHT: CHANCELLOR FLEMING'S LECTURESHIP.

BY the generosity and public spirit of Chancellor Fleming a lectureship has been established, in connection with the Theological Alumni Association, on "some subject bearing upon the relations of philosophy and theology," and the present writer has been suggested by him as lecturer for the next three years. It may not be out of place to remark that there is no reason in the nature of things why only theological alumni should attend. There surely are other sons of Queen's who would find mental stimulation in a short return to their Alma Mater. Bearing this in mind, it has seemed well to choose such a subject as would be profitable to all who take an interest in "the things of the mind." Now, it need hardly be said that at the present day

it has become clear to students in all departments of thought that no subject can be adequately treated except by the historical method, or at least that fresh light is thrown upon every department of thought by seeing the present in the light of the past. The great idea of the nineteenth century is development, and it is hardly too much to say that those who fail to appreciate its importance are not likely to do more than repeat obsolete and anachronistic conceptions. In one way it may be admitted that the prominence of this idea is a sign of transition and unrest. Most of the great thinkers of the race have first assimilated the thought of the past, and have then advanced to new ideas of their own, which at once included and transcended the ideas of their predecessors; and if we had reached the stage when a new system could profitably be constructed, a similar process might be anticipated now. But, so far as I can see, the time has hardly come for a great constructive effort of thought. We have first to go back over the history of past thought, carrying with us the two ideas of the essential unity and the continuous progress of the race, before we can see clearly the direction in which a wider view of the world is to be found. This may be a comparatively humble task, but at any rate it is one that can hardly be avoided. It was under a conviction of the importance of this genetic method of investigation that a study of Luther and the Reformation was last year attempted by the members of the Theological Alumni Association, and the result showed that the method was highly profitable. It would seem natural that the enquiry should be now followed up by a similar study of the successors of the Reformers; but it was found that the Reformation, not being an isolated phenomenon but a phase in the wide process of human development, cannot be properly understood without a comprehension of the phase immediately preceding it. Hence it seems best to devote more attention to the period of the Middle Ages than was possible last year. Now Dante is, as Carlyle says, "the spokesman of ten silent centuries." He is so, indeed, in a very peculiar sense. In one way every great thinker and artist presents to his age the garnered wisdom of the past, but as a rule he presents it only from a special point of view. If he is a poet, he embodies the thought of his time in sensuous and impassioned form; if he is a philosopher, he "rends the seamless garment of

thought" with a view to finding out the elements of which it is composed: but rarely is the poet a philosopher, or the philosopher a poet. Most poets have, like Goethe, been shy of philosophy; most philosophers have avoided the presentation of their ideas in poetic form. But Dante presents the unique type of a poet who embodies in one work the substance of the whole philosophy of his time, and of a philosopher who is able to give to abstractions the fresh palpitating life of poetry. Nor is this all: for not only is the *Divina Commedia* at once a poem and a philosophy, but it embodies as well the substance of all the natural science and all the political science of the age. This no doubt makes the study of Dante a difficult and complex one. Most of us know tolerably some department of thought and have only a smattering of other departments. The scientific man, throwing his energies into the study of one aspect of the great All, is apt to find, like Darwin, that even Shakespeare is for him unreadable. The poet is not usually fond of the abstract reflection of philosophical speculation; and the political theorist is apt to neglect enquiries into the foundations of society in his eagerness to solve some pressing practical problem. Dante, on the other hand, seems to have an equal interest in all branches of human thought, and we might call his poem "divine" also in this sense, that no aspect of existence, no phase of the Divine Thought embodied in the universe, is passed over by him. To comprehend the *Divine Comedy* adequately we must therefore be prepared to give some consideration to these four points: (1) its view of the physical universe, (2) its theory of the State, (3) its Ethics, (4) its Theology. These are not its only aspects; indeed it may be thought that the most important of all has been passed over, for undoubtedly this great confession of the Middle Ages is above all a *poem*. But, while this is true, we are entitled to select those aspects of it which are germane to our own special object, and therefore we may leave to the historian of literature the appreciation of the value and form of Dante's work, or at least we can only deal with this side of it incidentally and cursorily. I hope, however, to be able to say something upon the peculiar form of the *Divine Comedy*, with its double or triple meanings and its employment of the grotesque. The form, as I hope to show, is not a "separable accident," but is bound up with

the character and substance of the thought. There is another aspect also of Dante's work which can only be dealt with slightly. The *Divine Comedy* is a spiritual autobiography of the man Dante, containing perpetual allusions to incidents in his life, and revealing what manner of man he was. It would be a most interesting enquiry, though one beset with no little difficulty, to seek for a reconstruction from his own words of Dante's earthly life and mental history; but such an enquiry would take us too far away from our purpose, and besides it has already been treated in a satisfactory way by writers to whom reference will immediately be made. The lectures will therefore be limited mainly to the four topics mentioned above, i.e., to Dante's views of Nature, Human Society, Morality and Religion.

The lectures on these topics will form only part of the work, and in some ways the least important part. Twenty years' experience as a teacher have thoroughly convinced me that general statements about an author who has not been read by the student are of very little value. Education consists in living over again for oneself the experience of the race, and the main function of a teacher is to direct his pupil to the source of the most significant ideas, and to remove from his way the various obstructions which prevent his mind from putting forth its own inherent energy. In expounding the philosophy of Mill and Kant, for example, I am in the habit of beginning in each case with the *ipsissima verba* of the writer, which are found to have a suggestiveness and power of stimulating thought that no second-hand statement of their doctrines can ever have. If we may employ a much-abused term, this is the true "inductive" method in the study of philosophy. The same method it is proposed to apply in the present case, and therefore it is expected that those who propose to attend the present course of lectures will read and reflect upon Dante's two main works, the *De Monarchia* and the *Divina Commedia*. It is always advisable to read an author in the language in which he writes, but as it is too much to expect this of every one, I would suggest as the best substitutes, Church's beautiful translation of the *De Monarchia* (Macmillan & Co.) and the well-known and perhaps on the whole the best translation of the *Divina Commedia* by Cary, which is accessible to every one. Those who read Italian will find in Scartazzini's edition, with its copious commen-

tary, all that they require. Dr. Carlyle's prose translation of the *Inferno*, with the Italian text and notes (Bell & Sons, London, or Macmillan & Co., New York) will be found a suggestive book. There is also a more recent book on the same plan, containing the whole of the *Divine Comedy*, by A. J. Butler (Macmillan & Co.). The translation of Longfellow does not seem to me very good, but its copious notes and illustrative documents will be found valuable. On the whole, however, if one has to limit himself to the smallest number of books, I should recommend Church's *De Monarchia* and Cary's *Vision*.

It is of course impossible to understand Dante without a fair acquaintance with his life and times. There are several books which supply this need more or less adequately. For one who reads German none compares to my mind with Wegele's *Dante Alighieri's Leben und Werke*. English readers will find the late Dean Church's essay on Dante (*Dante and other Essays*: Macmillan & Co.), or Lowell's essay (*Among my Books*, second series: Houghton, Mifflin & Co., Boston) the most valuable; or they may consult Scartazzini's *Dante Handbook*, translated by Thomas Davidson (Ginn & Co., Boston), or Mrs. Oliphant's *Dante*, in her *Makers of Florence* (Macmillan & Co.).

Last year several members of the Theological Alumni Association gave in papers on a particular topic suggested beforehand. This is one of the most important parts of the work, which should not be neglected. The following subjects for essays are suggested, along with a few hints as to the sources of material:

1.—DANTE'S VIEW OF NATURE.

(a) The Cosmology of Dante may be learned by reading in succession the following passages of the *Divine Comedy*: *Inferno*, xxxiv, lines 106-126; xxvi, 90-142; *Paradiso*, xxiii, 112; xxvii, 106-120; xxv, 38; ii, 127; vii, 74; xxviii, 16-97; viii, 37.

(b) Dante's way of regarding the phenomena of nature may be seen from a consideration of the passages on light, etc., cited in Dean Church's essay. Ruskin's chapter on Medieval Landscape in his *Modern Painters* (Part IV, Chapter 13) is invaluable.

2.—DANTE'S POLITICAL THEORY.

This is fully expounded by Dante himself in the *De Monarchia*. The following passages from the *Divine Comedy* should also be

carefully read : *Paradiso*, xxvi, 139; *Purgatorio*, xvi, 103; *Par.* xxvii, 139; *Purg.* xvi, 106; *Par.* viii, 115.

It will be well to read also chapter vii, on the Theory of the Medieval Empire, in Bryce's *Holy Roman Empire* (Macmillan & Co.).

3.—DANTE'S CONCEPTION OF EVIL.

This must be gathered from the whole of the *Inferno*.

A suggestive discussion of the topic will be found in Symonds' *Introduction to the Study of Dante* (A. & C. Black, London), Edward Caird's essay on Dante in his *Essays on Literature and Philosophy* (Macmillan & Co), and W. T. Harris' paper on *The Spiritual Sense of Dante's "Divina Commedia"* in the *Journal of Speculative Philosophy* for October, 1887, (Appleton & Co., New York).

4.—DANTE'S CONCEPTION OF PURIFICATION.

The proper treatment of this topic will imply a careful study of the *Purgatorio*. The books and essays just referred to will be found valuable.

5.—DANTE'S CONCEPTION OF THE HIGHER LIFE.

This will involve an examination of the *Paradiso*. Same aids as before.

6.—DANTE'S THEOLOGY.

It is impossible to do more here in the way of suggestion than to say that Dante's Theology is implied all through the *Divine Comedy*, but is most explicit in the *Paradiso*. Besides the works referred to above, the notes in Longfellow's edition supply valuable material.

JOHN WATSON.

All things are noisome when a man deserts his own true self.
I wish to miss my mark as acting well, rather than to prevail,
acting evilly.

Only in God's garden men may reap true joy and blessing.

Come, blowing softly, Sleep that knowest not pain,
Sleep, ignorant of grief,
Come gently, gently, kingly Sleep, and bless.

—Sophocles.

POSTAL REFORM.

THE most striking fact which the report of the Postmaster-General for 1892 reveals, is the immense deficit in the Post Office accounts. The net revenue for that year was \$2,652,000, but it required an additional sum of over one and a half million dollars to meet the expenditure. The net revenue did not, in fact, amount to two-thirds of the expenditure of the Department. The Post Office has for years been in a chronic state of what might be termed departmental insolvency. Can this condition of affairs be remedied? In the Department of Railways it has been this year demonstrated that by a bold stroke in management huge annual deficits can be nearly wiped out, without, we will hope, any detriment to the effective working of the Government railways or to the condition of their permanent way. Is there not room for an equally bold stroke on the part of the Post Office management? This department of the Government service ought, on business principles, be made to show a surplus.

In investigating the causes which have given rise to the deficiency, we are at the outset met with two facts—the one that huge masses of mail matter, including newspapers and periodicals, are carried either free or at a merely nominal rate, although involving an outlay to a very large sum to railways and other carriers employed by the Post Office; and the other, that the money order branch is practically unremunerative.

Whilst the public interest is served by cheap postage, it is only apparently served if the Department is thereby carried on at a loss, since this loss has to be made up by additional tariff or other imposts. In the case of newspapers and periodicals, there is no reason why they should be carried free. There is a service performed to both the publisher and the public, and that service should be paid for. If the Government sees the propriety of a duty on books where no service by it is involved, surely it is entitled to a return for the carriage of the newspapers, especially

when that carriage involves a very heavy actual outlay by it. In the one case, there is a tax on education ; in the other, a business return for a service performed. The old rate of one cent on each newspaper would perhaps be unreasonable, especially in the case of the large evening dailies published at one cent, but some fee which would more than cover the Government's outlay for transmission should be adopted. This fee would, for the convenience of collection, require to be prepaid, but it would, in most cases, reappear in whole or part in the price of the paper or periodical. Thus it is not the publisher who would have in this matter to be consulted so much as the public, and the public should not object so long as the aim is to reimburse to the Government the cost of receiving, transmission and delivery.

For twenty-one years previous to 1889, the date of the last complete returns, the average profit on each money order was only four-fifths of a cent, and, in fact, since 1882, this branch of the service has been carried on at a loss. In seeking for a reason for this, we find that whilst in 1872 the average amount of each money order was \$38, it had fallen in 1882 to \$22, and in 1892 to \$14. The obvious conclusion is that a vast mass of the money orders now purchased bring in a revenue of only two or five cents each, and that the average revenue is considerably under ten cents. For the labour involved in connection with the making out, transmission and ultimate payment of these orders, this is clearly too small a charge. Here then is a pressing reason for either raising the fee on the sums under twenty dollars, or the adoption of the postal order, which at a minimum trouble to all parties, would largely replace the smaller money orders, or the expansion of the registration system by including insurance.

Changes in our present system which might reduce the revenue would be open to objection, but those which would afford further facilities to the public, and be a considerable source of revenue without correspondingly increasing the expenditure, should meet with favour. And if some of these changes have passed the domain of experiment, and have been successfully adopted under the Imperial or the United States systems, there should be the more readiness to introduce them here. It is under these considerations that some new features in our system suggest themselves, and will be now referred to.

Postal orders form a ready means of transmitting very small sums by post and are in large use both in Great Britain and the United States. They are in form like bank bills, are in convenient amounts from 25c. to \$5, and cost from one cent upwards, according to amount. A blank is left for the payee's name, but in other respects, they are ready for use at any moment, and are paid out like bank bills, thus not entailing the loss of time to postal clerks, which the present money order does in drawing out and transmitting it, and often in paying it—a loss of time the purchaser and receiver would equally save. The advantage to the Post Office would, however, not stop here, for a relatively more remunerative scale of charges would have to be arranged for the postal orders than is adopted under the present money order system for small sums. When it is remembered that fifteen cents, and in many cases twenty-five cents, is the minimum charge made by the banks on country cheques, however small, the Department cannot apprehend difficulty in demanding a fair advance on its present scale for small sums. These postal orders should be sold to postmasters just as postage stamps are, and to prevent any possibility of alteration, the limit of any order might be made five dollars, and the amount of each order should appear more than once on its face.

It will be generally admitted that the Post Office might be made a more useful medium than it now is for the transmission of parcels, not only to the convenience of the public, but to the profit of the Department itself. The present charge on closed parcels is so high as to suggest the idea of an intentionally prohibitory rate. In Great Britain both the Post Office and the railways offer exceedingly reasonable rates, with the result that apart from the general public, the great retail houses of London, Liverpool, Belfast and other centres, and their customers all over the United Kingdom, make the most extensive use of the parcel system. The railways have a regular tariff graduated according to weight and distance, but the Post Office charges a general rate for all points within the Kingdom of six cents for the first pound weight and three cents for each pound thereafter. To illustrate the expense under our parcel system as compared with others, a 3 lb. parcel sent 200 miles would cost by English parcel post 12 cents, by English railway delivery, 14 cents, and by Canadian

Express Company, 25 cents, and in each case in the cities and towns, would be delivered at the receiver's door, whilst by Canadian parcel post, it would cost 72 cents, and the receiver probably be asked, after a day's delay, to call for it at the post office. In at least the larger Canadian cities, where the great bulk of the parcel business would be done, delivery by post office van might be readily undertaken.

An improvement has just been made in the size of the postal cards, but it is worthy of consideration whether, within certain limits of size, any card with the address confined to one side, and with a one cent stamp upon it, should not be permitted to pass through the post.

The recent further extension in Great Britain of the system of compensation for loss of registered letters, reopens the subject here. Our Canadian system is very anomalous. The fee is higher than in Great Britain, but the only security the sender has, besides his receipt, is that if the letter arrives at its destination, a receipt will be taken from the party to whom it is delivered. The Government assumes no liability whatever in case of loss, but is presumed to make some effort to trace missing letters. The increase in the fee, three years ago, from two cents to five cents, has considerably decreased the number of registered letters, showing that a large section of the public does not consider that the protection afforded warrants the larger fee now charged. In 1890, the limit of compensation given by the British Post Office for loss or damage to inland registered packets was \$50; in 1892, this was increased to \$125; and in 1893 to \$250—the maximum liability on each letter being fixed by the fee paid in accordance with a regular scale, commencing with the ordinary registration fee, which itself covers an insurance up to \$25. Every registered letter there is thus insured to at least \$25.

Now, what would our Canadian Government gain, and what risk of loss might it incur under the insurance system? A summary of the Post Office business for the past four years gives the following results:

Total registered letters	13,507,000
Affording, if at 5 cents each, a revenue of ...	\$675,350
The missing registered letters were	694
Of which there were not recovered	401
Which were alleged to contain.....	\$23,366

But this total loss included two remittances from banks, amounting to \$11,000, of their own bills which were burned in a postal car and were therefore not an actual loss to the banks concerned. These results make clear two facts—the large revenue obtainable from registration, and, the comparatively small risk of loss the Government would sustain by adopting the system of compensation. Another fact is, however, equally clear. The revenue would be largely increased by the adoption of the system as well as a great boon conferred on the public. If the ordinary registration fee insured as in Britain every letter up to \$25, not many letters containing money or valuables would be sent, as they often now are, unregistered, and if, by paying a larger fee, increased compensation, according to a fixed scale, would be obtained in case of loss, a very large number of the letters now registered would bear an increased fee. In Great Britain the maximum fee is 22 cents, covering an insurance of \$250.

It has been said that the system will entail much additional labour in the Post Office. This is not the case. The system carries simplicity with it. The ordinary books for entering registered letters would merely have one more column showing the fee paid, and therefore the limit of compensation, and the present registration sheet would be stamped with the fee as well. The production of this receipt by the sender of the letter, its comparison with the entry book, and a short official form of claim filled up and properly sworn to by the sender, should be sufficient proof in the event of loss.

The marvellous promptitude and the frequency of collection and delivery in the great cities of Britain are hardly to be expected in our less populous centres, and yet our service might be much improved in these respects. The postmen should be carried by electric car or post office van to and from their starting points, and earlier delivery thus secured; the people should be encouraged to provide letter slits in their doors in order that the postman may not be delayed at so very many houses waiting the answer to his knock; and, as letter boxes are often found to be at inconvenient distances away, all letter carriers should be instructed, as they are in Ottawa, to receive letters, when asked, and to deliver them promptly at the post office on their return from each round. Further, as correspondence goes chiefly by

the night mails, and as in our country of long distances, posting letters in time for these mails generally saves twenty-four hours, the letter boxes should not only indicate the hours of collection but that collection which ensures transmission by the night mails.

The popular impression is that the Post Office exists for the convenience and advantage of the public, and within the limits of a balance sheet showing an equality of revenue and expenditure, this impression should be correct. There can be no apology needed for asking the Department to consider improvements which the ever-growing wants of the public seem to demand.

A. T. DRUMMOND.

EXTREMES OF TEMPERATURE.

IN this age we may consider ourselves pretty well acquainted with the properties of matter as manifested at ordinary temperature, through a range extending say from 70 degrees below zero Fahrenheit to 1800 above. But it is only since the beginning of this, the last, quarter of our century that investigations far beyond these limits have given to the scientific world glimpses of two conditions;—that of matter devoid of molecular motion—so cold as to be incapable of undergoing chemical change; and on the other hand, matter under conditions which transcend those of high temperatures as ordinarily obtained, the result being a further simplification of the chemical elements. To take the last first;—the highest temperatures so far experimentally attained are those of the electric arc, and, lately, of the electric furnace. In the electric furnace temperatures exceeding 4000° Fahrenheit have been measured; and, with the intense heat thus reached, platinum and iridium have been easily obtained in the liquid condition. In the search for unity in nature, the

chemical elements have been studied, to resolve them, if possible, into some one primal matter. Prout attempted to show that the atomic weights of all the elements were multiples of that of hydrogen, and advanced the hypothesis that the elements have been formed by some sort of atomic condensation from hydrogen. The marvellously accurate investigations of Stas disproved Prout's assumption with regard to atomic weights, and his hypothesis fell to the ground. Recent researches, beginning about 1870 with those of Newlands, Mendeleeff and Lothar Meyer, and continued eagerly by a large number of chemists and physicists, lead to the conclusion that the chemical elements form a unique *system* of material species related to each other in such a way that at least under terrestrial conditions transmutation of one species into another can hardly be considered possible. But the spectroscope has enabled us to learn much about matter as it manifests itself in the sun and the fixed stars. *The Chemistry of the Sun* is the significant title of Mr. Norman Lockyer's interesting volume on this subject. When it is considered that iron, nickel, copper and platinum exist as *gases* in the atmosphere of the sun, it must be concluded that solar temperatures are so far above terrestrial that they begin to transcend our very ideas of temperature. But there are stars which have been shown to be hotter than the sun. Some stars are dusky red, others are bright white. It is natural to suppose that the latter are hotter than the former, and there is independent evidence to support this idea. It is in the white stars, then, that we may look for conditions most favorable to simplicity in the constitution of matter. The spectroscope declares that the white stars contain the fewest species of matter, and that hydrogen predominates. Thus, Prout's hypothesis reappears. The progressive simplification of spectra from the sun to the hottest star may be due to a corresponding resolution of our chemical elements into simpler kinds of matter, hydrogen being the last stage observed. Working in another direction Mr. Crookes has reached his theory of *the genesis of the elements*, according to which they have been evolved from a primal matter, *protyle*, existing under such conditions of heat and electrical energy that by the rhythmical degradation of these, the elements were formed, as it were, by successive vibrations of a cosmic pendulum.

At the excessively high temperatures which reign in the sun and the stars, chemical attraction is to a greater extent than under terrestrial conditions overpowered by the increased molecular motion; so that substances like hydrogen and oxygen exist together as elements, their combination into water being possible only at lower temperatures. It is more than likely that in the case of some stars the temperature is so high that no chemical combination is possible, and that in them matter exists only in the elementary condition. The modern theory of chemical change is based on the idea of motion of the minute particles of which it is believed all bodies are composed, A chemical change implies movements of the atoms constituting the molecules, so as to form new kinds of molecules. If the atoms are in a state of such violent motion that they are unable to cohere into molecules, then chemical combination becomes impossible. But chemical activity may be impossible from an exactly opposite cause, the *absence* of molecular and atomic motion. This leads to a short notice of the remarkable results lately obtained in producing very low temperatures,—a much more difficult thing to do than the production of high temperatures. The difficulty is inherent. It is easier to convert other forms of energy into heat than the reverse. *Facilis descensus*, etc. It is now some fifteen years since Pictet and Cailletet succeeded in condensing the so-called permanent gases. Since then, the production of low temperatures for the condensation of gases has received a great deal of attention. Wroblewski and other Russian chemists have succeeded in liquefying oxygen, nitrogen, and other gases, in considerable quantities and testing the properties of the liquids. The low temperatures necessary for this work were obtained by condensing in large quantities such gases as carbon dioxide, and then allowing them to evaporate rapidly. At the temperatures thus reached, other more difficultly condensible gases were reduced by pressure to the liquid state, and in their turn rapidly evaporated. In this way still lower temperatures were reached. The lowest temperature so far measured (these measurements are only approximate) are in the neighborhood of -380° Fahrenheit. The contrast between these and the high temperatures under discussion is not surprising when we recall the modern theory of heat. As temperature is a function of molecular motion, it is plain that

when that motion ceases in any body, that body has no heat, it is absolutely cold. It is probable that even for the most subtle kinds of matter, such as hydrogen, molecular motion ceases at a few hundred degrees below the ordinary temperatures which prevail upon the earth. Professor Dewar has lately investigated the properties of matter at these low temperatures. He has obtained liquid air and liquid oxygen by the pint. The latter is a bluish liquid which jumps to the magnet like so much iron. It boils at about -300° Fahrenheit. In maintaining these low temperatures Professor Dewar found that ordinary non-conducting materials were of no avail. A vacuum was found to be the best insulator for heat; and a globule of oxygen can be kept liquid for some time by maintaining a vacuum around it. This suggests a revision of the calculations of the sun's rate of cooling. Interplanetary space is practically vacuous, as shown by the absence of friction effects on the planets. If heat does not readily pass across a vacuum, then what has been measured as the sun's heat does not represent the total radiation of a hot body as it would radiate in air. The longer waves, non-luminous to our vision, leave the sun in smaller proportion. The sun has a greater store of heat than its radiation indicates. It must be concluded, then, that the sun is not cooling so fast as calculated. It is an interesting idea. The great luminaries of the universe are suspended in a vacuum, and, while freely radiating light, lose very slowly the less refrangible heat rays. But, to chemists, the most interesting result of these low-temperature researches is that chemical change ceases as substances approach the absolute zero of temperature (-460° F). Sulphuric acid and caustic soda lie quietly in contact with each other, and show no signs of the tremendous power of their chemism as manifested at higher temperatures. In Professor Dewar's wonderful frost-tank, matter is chemically dead.

W. L. GOODWIN.

WINCKELMANN AND GREEK ART.

PREFATORY NOTE.

WE give below some extracts from Winckelmann's essay on Greek Painting and Sculpture, which may be interesting to our readers, especially if they are read in connection with Bosanquet's valuable work on the *History of Aesthetic*, and Pater's suggestive essay on Winckelmann in his *Renaissance*. So far as we are aware this is the first time that any part of Winckelmann has been translated into English. The fame of Winckelmann (1717-68) now survives, even among his own countrymen, rather as a tradition than as the product of direct study of his writings. In his own day he was regarded with admiration and almost with reverence by men like Lessing and Goethe, and when he was treacherously murdered by a traveller, whom in childlike simplicity he had taken into his confidence, his death was regarded as a national calamity. The secret of Winckelmann's influence upon his contemporaries lay in the fact that he recalled them from the abstractions of a lifeless orthodoxy, the dead commonplace philosophy of Wolff, and the inanities of pseudo-classical art, and taught them to come face to face with the fresh life and thought of Greece as embodied in its art. Winckelmann, says Hegel, is "one of those who, in the sphere of art, have known how to supply the human mind with a new organ." Goethe is equally enthusiastic: the works of Winckelmann, he says, are "a living thing written for the living: they are themselves a life." Mr. Bosanquet felicitously remarks that, as Bacon taught us to come directly into the presence of nature, setting aside all the *idola* which hide her real lineaments from us, so Winckelmann was the first to bring us really into contact with the spirit of Greece. In him we have the beginning of that sympathetic appreciation of the past which has so greatly widened our intellectual horizon, and has made us feel our kinship with the race in a fresh and vivid way never experienced before.

J. W.

EXTRACTS FROM WINCKELMANN.

The sense of beauty is spreading more and more throughout the world, but it first began to develop under the skies of Greece. The creations of other peoples were but germs, which changed their nature and form when they were transplanted to Greece,—that land which, as has been said, Minerva chose for its mild climate as the fit home of wisdom and refinement.

The taste which the Greeks displayed in their works of art has remained peculiar to themselves. Seldom has it gone far from Greece without loss, while in remote countries it was late in becoming known. It had certainly not found its way into the North at a time when the two arts, of which the Greeks are the great teachers, found few admirers; at a time when the finest paintings of Correggio were used to cover up the windows of the royal stables in Stockholm.

The only way for us to become great, and even inimitable, if such a thing be possible, is to imitate the Ancients; and what has been said of Homer, that to understand is to admire him, is applicable as well to the artistic products of the Ancients, especially of the Greeks. We must be as familiar with them as with our friends, if we are to find the Laocoon as inimitable as Homer. When we have become really intimate with them, our aesthetic judgments will be like that of Nicomachus on Zeuxis' Helen: "Take my eyes," said he to an ignorant critic, who was disposed to find fault with the picture, "and she will seem to you a goddess."

With such eyes Michel Angelo, Raphael and Poussin contemplated the works of the Ancients. They acquired their sense of beauty at its fountain-head—Raphael in the very country where it was developed.

A statue by an ancient Roman artist will always compare with a Greek original as Vergil's Dido does with Homer's Nausicaa, which the former tried to imitate.

Connoisseurs and imitators of Greek works find in the masterpieces of Greek artists, not only nature in her most beautiful form, but more than nature, i.e., certain ideal beauties, which are formed from images existing only in the mind.

The most beautiful human form among us would perhaps be

no more like the most beautiful Greek form than Iphicles was like his brother Hercules. The influence of a mild climate and clear sky made itself felt during the early development of the Greeks, but the physical exercises to which their early youth was devoted, gave this development its noble form.

The great games were a powerful incentive to physical exercises with all young Greeks. The laws required ten months' training for the Olympian games, and that in Elis on the very spot where they were held. It was not always men who won the best prizes, but oftener youths, as is seen from Pindar's odes. To resemble the god-like Diagoras was the highest ideal of a Greek youth.

The body acquired from these exercises the large and manly outline, without any superfluous fulness, which the Greek masters gave their statues.

The school of the artists was in the gymnasia. The philosopher, the artist, went thither; Socrates to teach Charmides Autolycus and Lysis; a Phidias to enrich his art by observing the beautiful forms of these youths. There he learnt the various movements of the muscles and flexions of the body. The outlines of the body or its contour were studied from the impression which the youthful wrestlers left in the sand.

These frequent opportunities for the observation of nature caused the Greek artists to go still further. They began to form certain general notions of beauty, both of single parts of the body and of the relation of these parts to one another, which should be superior to nature herself. Their original was an ideal creation existing only in the mind.

In this way Raphael formed his Galatea, as is shown by his letter to Count Balthasar Castiglione: "Since beauty," he writes, "is so rare among women, I use a certain idea of my own creation."

The Greeks formed gods and men according to conceptions superior to the ordinary material form. In gods and goddesses the brow and nose formed almost a straight line. The heads of famous women on Grecian coins have a like profile, although in this case the artist was not obliged to work according to purely ideal types.

But the rule "to make the figures life-like, and at the same

time more beautiful," was always the highest law which the Greek artists recognized; and it necessarily presupposed the master's intention to make the natural form more beautiful and more perfect. This rule Polygnotus invariably followed.

Accordingly, when some artists assert that they do like Praxiteles, who formed his Cneidian Venus from his wife Cratina, or like other painters, who took Lais as the model for their Graces, I should answer that the Greek artist did so without deviating from the great general principles of art enunciated above, Nature supplied the artist with the sensuous beauty; his ideal sense of the beautiful with the sublime features. From the former he took the human part of his work, from the latter the divine.

The imitation of the beautiful in nature is either directed to a single object, or it collects the good points of several into one whole. The former is called making a copy, a portrait: it is the way to Dutch forms and figures; but the latter is the way to the universally beautiful, and its idealised representations. This is the path followed by the Greeks. They differ, however, from us, in this, that though they might not have more beautiful forms directly before them, they had a daily opportunity for observing the beautiful in nature, which does not always offer itself to us, and then seldom as the artist desires it.

Our country will scarcely produce as perfect a form as that of the Antinous Admirandus, and the mind can conceive of nothing higher than the divine proportions of the Vatican Apollo. All that nature, intelligence, and art were able to produce, here lies before our eyes.

I believe that by imitating these works, we might all the sooner gain proficiency in art, for we find in the one the essence of that which is scattered throughout nature, and in the other we see how far the most beautiful products of nature may be surpassed by an artist at once bold and self-restrained. We shall learn precision in conception and drawing by seeing the highest limits of human and of divine beauty here prescribed for us.

The conceptions of totality, of perfection in nature, as seen by the Ancients, will render clearer to the artist the conceptions of the partial in nature as seen by us. When he discovers the beauties of the latter, he will know how to combine them with

the absolutely beautiful; and with the help of the lofty forms ever present to him, he will become a law to himself.

Even if the imitation of nature could supply the artist with everything else, correctness of contour can certainly never be reached in this way: it can be learnt only from the Greeks.

The noblest contour combines or comprises the most beautiful parts supplied by nature, together with the ideal beauty of Greek figures, or it is rather the highest conception in both.

The line which separates a properly rounded form from one of too great fulness is very fine, and the greatest modern masters have gone too far on both sides of this sometimes imperceptible boundary. He who would avoid a pinched contour, went to the other extreme, and *vice versa*.

Of Michel Angelo alone it might be said that he equalled the Ancients, and this only in strong muscular figures, in forms from the heroic age; but not in tender, youthful forms, not in female figures, which under his hand became Amazons.

Even under the drapery of the Grecian figures, the masterly contour is prominent as the main idea of the artist, who, even in the marble, reveals the beautiful structure of the body as through a Coan robe.

By the word "drapery" is meant all that art teaches about the robing of figures and the folds these robes are made to take. Skill in this branch of art, next to natural beauty and noble outline, is the third distinguishing quality in the works of the Ancients.

The drapery of the Vestals (in the Dresden gallery) is of the highest order. The little folds flow softly out of the garment and lose themselves in it again, with a noble freedom and gentle harmony of the whole, yet without concealing the beautiful form of the body.

But this justice must be done some of the great artists, and especially some of the great painters of modern times, that in certain cases in draping their figures they have deviated from the method most usually followed by the Greek masters, without doing violence to nature and truth.

The general and distinctive mark of Grecian master-pieces is a noble simplicity and a calm greatness both in posture and in expression. As the depths of the sea remain always in repose,

however the surface may rage, so does the expression of the Greek statues show, in the midst of all their passions, a great and composed soul. This soul is revealed in the face of Laocoon, and not merely in the face, in the midst of the most intense suffering. The pain which is visible in all the muscles and sinews of his body, and which we can almost imagine that we feel ourselves, even without observing the face and other parts, simply from the painful contraction of the lower part of the body; this pain, I say, is, nevertheless, expressed without violence in the face and posture. He utters no terrible cry, as Vergil says of his Laocoon. The opening of the mouth does not permit it. It is rather a smothered sob of anguish, as Sadolet describes it. Pain of body and greatness of soul are divided and, as it were, equally distributed through the whole figure. Laocoon suffers, but he suffers like the Philoctetes of Sophocles. His anguish affects us profoundly, but we would fain have the power of bearing anguish as this great man does.

The expression of so great a soul far surpasses the most beautiful form in nature. The artist must have felt in himself the strength of mind which he imprinted upon his marble. Greece had artists and philosophers in one person and more than one Metrodorus. Philosophy lent Art a helping hand and animated her figures with no common souls.

The more repose there is in the posture of the body, the better adapted it is for depicting the true character of the soul. In all positions which deviate too much from that of repose, the soul is in an unnatural and strained condition. The soul is more vividly expressed in violent passions, but it is great and noble only in the state of unity, in the state of repose. In the Laocoon pain depicted alone would have been *Parenthyrsus*; therefore, the artist, in order to combine nobility of soul with that which was characteristic, gave to the main figure an action which came as near to the state of repose as was compatible with such extreme pain. But in this repose the soul must be characterised by traits peculiar to itself, in order to represent it as calm and yet energetic, quiet but not indifferent or sleepy.

The fine arts have their youth as well as men, and the beginning of these arts appears to have been like that of artists, who at first take pleasure only in the striking and the surprising. The

tragic muse of Æschylus took this form, and his *Agamemnon*, partly from its hyperbole, is much more obscure than anything which Heraklitus wrote. Perhaps the first Greek painters drew as the first great writer of tragedy sang.

The noble simplicity and calm greatness of the Greek statues is also the real superiority of the Greek writings of the best period, the writings of the Socratic school. It is those qualities, too, that make the pre-eminent greatness of a Raphael, and this greatness he attained by following the Ancients.

J. M.

ANIMAL BIOLOGY.

FORTY years ago, "Natural Science" included the separate science of physics, chemistry, mineralogy, botany, zoology and geology, in short, all the sciences which treated of the phenomena of nature. Twenty years ago, the phrase as used in our calendar included the last five of these sciences; and for the past ten years, it has been narrowed down to include botany, zoology and geology. The reason for these changes has been the immense increase in the subject matter of the sciences, the division of university chairs, and the appointment of additional professors to teach subjects that were formerly included in the work of one man. To-day the phrase bids fair to become expunged from the calendar. The division of Prof. Fowler's chair last year, and the appointment of a professor of animal biology, renders it necessary to drop the phrase altogether or to narrow its meaning still farther. But why not use the old term zoology instead of Animal Biology. Do the two words mean the same thing? In answer it may be said that some writers, disregarding the history

and development of the sciences, use the term biology as if it were exactly synonymous with the two sciences, botany and zoology. Others, and we think more careful writers, use these names as something more than mere sub-divisions of general biology. Biology is the science which treats of the nature and origin, the continuance and progress of life, whether that life is found in animals or plants. It is the philosophical aspect of both botany and zoology. Its study pre-supposes some knowledge of the natural history, structure, physiology and distribution of both animals and plants. It is the study of the advanced student rather than of the beginner. The generalizations of science are always based upon the widest possible knowledge of its facts, and biology which furnishes us with generalizations based upon the facts of animal and plant life, comes in naturally only after the student has acquired as much information as possible about the every day lives of animals and plants, their anatomy, physiology and relationships.

The difference in meaning assigned to the term biology by different writers is very well brought out from a study of the two following tables. The larger one is taken from Sedgewick and Wilson's *General Biology*, and the smaller one from J. Arthur Thomson's *Study of Animal Life* :

<p style="text-align: center;">"Natural History."</p> <p>Study of the real life of</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; padding: 0 5px; margin: 0 5px;"> fauna class order genus species families pairs individuals </div> <div style="font-size: 3em; margin: 0 5px;">}</div> <div style="margin: 0 5px;"> in relation to one another and to their surroundings </div> </div>	<p>"Biology"</p> <p>Generalizations as to the nature and origin, continuance and progress of life.</p>
<div style="text-align: center;"> 5. Organisms. 4. Organs. 3. Tissues. 2. Cells. 1. Protoplasm. </div> <div style="display: flex; justify-content: center; align-items: center; margin-top: 10px;"> <div style="text-align: center; margin-right: 20px;"> Study of structure (Morphological) </div> <div style="text-align: center; margin-right: 20px;"> </div> <div style="text-align: center;"> Study of function (Physiological) </div> </div> <p style="text-align: center; margin-top: 10px;">"Zoology."</p>	

<p>Biology. The science of living things; i. e., of matter in the living state.</p>	<p>Morphology. The science of form, structure, etc. Essentially statical.</p>	<p>Anatomy. The science of structure; the term being usually applied to the coarser and more obvious composition of plants or animals.</p>	<p>Botany. The science of vegetal living matter or plants.</p>
	<p>Physiology. The science of action or function. Essentially dynamical.</p>	<p>Histology. Microscopical anatomy. The ultimate optical analysis of structure by the aid of the microscope; separated from anatomy only as a matter of convenience.</p>	
		<p>Taxonomy. The classification of living things, based chiefly on phenomena of structure.</p>	
		<p>Distribution. Considers the position of living things in space and time; their distribution over the present face of the earth; and their distribution and succession at former periods, as displayed in fossil remains.</p>	
		<p>Embryology. The science of development from the germ; includes many mixed problems pertaining both to morphology and physiology. At present largely morphological.</p>	
		<p>Physiology. The special science of the functions of the individual in health and in disease; hence including Pathology.</p>	
		<p>Psychology. The science of mental phenomena.</p>	
		<p>Sociology. The science of social life, i. e., the life of communities, whether of men or of lower animals.</p>	<p>Zoology. The science of animal living matter or animals.</p>
			<p>Biology. The science of living things; i. e., of matter in the living state.</p>

The phrase, natural history, in its widest sense means much the same thing as natural science, but in the above table it bears a narrower and more precise meaning. It includes that aspect of

the study of animals in which the every day lives of animals are observed—their habits, their industries, their loves, their hatreds, their mating, their migrations, their struggles. Obviously, the natural history of animals and plants can be best studied only in field, forest, stream and sea. The field naturalist must do all his work outdoors. He must peer into ponds, peep into nests, overturn stones and boards, write down the compositions of birds, crickets and grasshoppers, in short, he must watch, wait and learn all his lessons from the animal kingdom, and not from books. It is quite otherwise with the zoologist. He has given himself up to analysis. At first in a rough and superficial way he analysed and classified. He noted outward resemblances and differences, and formed his classes, orders and species. The *Systema Naturæ* of Linnaeus was the direct outcome of this external study of animals, just as Hooker's *Flora* was the result of the systematic study of British plants.* For a time classification ran mad. Every zoologist bent all his energies towards the discovery and determination of new species. Later on, the study took a new direction. Cuvier looked beneath the outward forms of animals, began to dissect and made a study of their organs. A few years afterwards, zoologists took a further step in their analysis and found that organs were made up of tissues, that tissues were composed of cells, and cells of protoplasm. Here for the present the analysis has stopped. Protoplasm defies analysis by either the chemist or the physiologist. *Pari passu* with the study of form, the zoologist has pursued the study of function. 'What are the powers of life' was a question he was always asking himself. What are the uses of these tissues and cells and protoplasm? Thus it will be seen that every zoologist was at first both an anatomist and a physiologist, and if in recent years the latter science has lagged behind in the race, it is because the zoologist has given himself up too exclusively to the study of form.

It will thus be seen that natural history, zoology and biology are but three different aspects of the study of animal life. Every observing man is something of a naturalist; fewer are zoologists; and still fewer are biologists. All three aspects, however, of the study are essential, and it is absurd to magnify one or belittle the other. We do not include in this condemnation the Rev. J. G. Wood's good natured laugh at the morphological zoologists when

he says: "Certain dreadfully scientific persons, who call themselves naturalists seem to consider zoology and comparative anatomy convertible terms. When they see a creature new to them, they are seized with a burning desire to cut it up, to analyse it, to get it under the microscope, to publish a learned book about it which no one can read without an expensive Greek lexicon, and to put up its remains in cells and bottles. They delight in an abnormal hæmapophesis; they pin their faith on a pterygoid process; they stake their reputation on the number of tubercles on a second molar tooth; and they quarrel with each other about a notch upon the basisphenoid bone." We are all inclined to laugh at a specialist who has lost his bearings. He is like a mole, who thinks his little burrow is the world. The specialist in comparative anatomy, physiology or cytology is apt to view animal life terribly awry, and to think that the view which he takes of it is the only thing for mankind to know.

From the very nature of the study a biologist cannot be a specialist. His work is to take a general survey of the phenomena of life, to arrange them, to unify them, and to reach general conclusions. A naturalist becomes a specialist by limiting his observations and studies to some small genus or species, a zoologist specializes by studying the tubercles on a second molar tooth or some other such bewildering investigation; but a biologist cannot limit the range of his observations in any such way. His sweep of view is like that of a Newton in physics, a Lyell in geology, or a Mendelejeff in chemistry. His work is to view the facts of life in proper perspective; to show that they possess a sequence as orderly and immutable as the facts of physics and chemistry; to shew that the infinite wealth and variety of life are not inconsistent with perfect simplicity and symmetry; in short, his work is to relate the phenomena of life to one another and to the rest of human knowledge. It is the biological aspect of life which will in future be most emphasized in the arts course at Queen's, not merely because it is the philosophical one, but because it is the one which best lends itself to the purposes of a liberal education.

A. P. KNIGHT.

A GREEK TRAGEDY.

I.—THE THEATRE.

RÉCENT researches and excavations have enabled us to attain a fairly complete conception of the circumstances attending the production of the Greek Plays. In the following pages, an attempt will be made to present in popular form, briefly and without entering into the discussion of controverted points, a picture of that curious and characteristic pageant so dear to the Athenian heart, and so influential in forming the national character.

Let us suppose ourselves transported through time and space to Athens in April 441 B.C. We find in this fairest city of the world many things well worth seeing. Already the Queen of the Aegean, ruler of the waves, whose sway to use the expression of her greatest statesman, is undisputed over one of the two elements open to activity of man, is adorned in her royal robes, and is no less queenly to the eye than in the substance of her power. But for the present we must forbear to visit her fair temples and painted porticoes. We must confine ourselves to her Theatre where we intend to be present at the performance of one of those famous plays of which all the world has heard.

We have arrived at the gayest season of the year. The whole city keeps holiday for five days in honour of Dionysus—the genial wine, God-giver of release from care, giver of the vine that beautiful and delicate plant of wondrous virtue, the culture of which marks the final step in the advance of mankind to settled homesteads and civilized life. There are great doings in the town in many various ways. It is crowded with strangers from all parts of Greece; for the stormy season is over and the sea is open once more; the Peiræus is full of ships wafter thither by all the winds. Business and pleasure have attracted to the centre of the intellectual and commercial life of Hellas, not only great numbers from the innumerable islands and sea-coast towns which own the headship of Athens, but also crowds of other Greeks who throng to see the world-renowned Dionysiæ festival. Everyone is in the streets—men, women, children and slaves—enjoying themselves

in the pleasant spring sunshine. The very prisoners are set free during these days, and no one can be arrested for debt. The most perfect good humour and orderliness prevail among this crowd. All minds are attuned to the benign influences of the sacred season, to the sentiment of civic good-fellowship and common enjoyment. Any breach of the peace at this time is reckoned a capital offence.

Now it would be extremely interesting to see the numerous celebrations which are going on in honour of the God, more especially the splendid procession, said to be one of the wonders of the world. But we are concerned merely with that part of the pageant which forms its concluding and crowning feature—the representation of the new Tragedies for the festival. These have been composed by three poets chosen by the state—each competing against the others with three Tragedies and a comic after-piece called a Satyric drama, before the assembled people and judges appointed with the most elaborate precautions to exclude the possibility of corruption. These tragedies contain a lyrical element which is rendered by what is called the chorus. The chorus is carefully trained and provided with the most gorgeous dresses—the expenses of their maintenance, training, and adornment, being a compulsory burden imposed by the state on the wealthiest class of the citizens, who take it in turns. This is the part of the festival which we have come to see. Though on pleasure bent we have a frugal mind. It is better to see one thing thoroughly and intelligently than to ‘do’ a thousand in the usual superficial tourist fashion. So it will be advisable to forego the other sights, and spend our first afternoon in a preliminary visit to the theatre. Thus we shall get hold of some conceptions necessary or helpful to our understanding of to-morrow morning’s play.

We have obtained from the Archon, the magistrate in charge—since the Theatre and all that concerns the cult of Dionysus is an affair of state—permission to see the stage-buildings and properties. Quitting our inn therefore—Pandokeion they call it—the rather as it is a place which invites to the open air, we make for that conspicuous hill the Acropolis, which dominates the city with its exquisite piles of columned temples, crowned with the gleaming statue in ivory and gold of the virgin Goddess Pallas

Athene, guardian of the city. The theatre stands on the southern slope of that hill.

What a theatre it is ! It covers a hill-side, and is open to the blue sky. They say it can hold thirty thousand people. You see it is not a theatre at all in our sense of the word ; it is rather an enormous temple of Dionysus. It has to be large enough to contain the whole population of Athens, for their presence in a body is necessary to the full eclat of the God's honours. A fee is indeed charged for admission ; but it is incredibly small, and any citizen who is too poor to pay obtains it on application from the treasury. The theatre-going of the Athenians is like Christmas. It comes but once (or rather twice) a year, but when it does come there is enough of it to compensate for the rarity. They sit here from early morning till night-fall for three consecutive days hearing plays all the time without intervals for refreshments. That they bring with them together with copious supplies of sweet-meats to tide them over the duller parts of the performance.

Now let us look at the theatre. You see it divides itself naturally into three parts—the Auditorium where the people sit, the Orchestra for the chorus, behind and above that the stage with the solid stone buildings in the rear. Let us examine each of these parts for a moment or two. The Auditorium bounded and supported by that massive limestone wall consists as you see of an endless series of nearly semi-circular rows of stone seats, sloping upwards with the natural slope of the hill, and yonder in the north-east corner cut out of the living rock. Each seat is a separate stone chair ; those in the front rows beautifully and elaborately carved, deserve to be called thrones. The priests, magistrates and distinguished foreigners, guests of the Athenian people sit there. They must find them rather hard, you will say, to sit in all day long. But if you try one you will find it is as comfortable as stone can be made to be, and besides many bring cushions with them.

Now for the second part. That circular space of levelled ground in a line with the centre of the rows of seats, with an altar in the middle and a gutter to run off the rain (the building being open to the sky) is the Orchestra. The chorus occupy this space. They are practically the band who give us music between the acts, only they sing and dance to the accompaniment of a flute

instead of playing on instruments ; their song is vitally connected with the matter of the play, and they often take part in the dialogue, thus counting collectively as one of the personages of the piece. Among the many divergences of the Greek Drama from the type with which we are familiar, none is so striking and decisive as the part allotted here to this chorus. You see how they are placed so as to be the most conspicuous objects on which the eye of the spectator rests. You will find if you try that the orchestra is perfectly visible—which is more than can be said for the stage—from every point in the Auditorium, even from the extremities of these long arcs formed by the rows of seats. Now this prominent position of the chorus is a survival of an earlier state of things. Their song which is now rather an interlude—although an interlude organically interwoven with the structure of the piece—was once the kernel of the show. The dialogue on the stage, originally of the simplest character and carried on by a single actor with the leader of the chorus, served merely for explanatory parenthesis to fill in the breathing spaces in the song and dance of the latter. Gradually the relative positions have become reversed ; a second actor, then a third have been introduced ; the action of the drama developed in the dialogue on the stage has become the central interest ; the early essentially lyrical has developed into an essentially dramatic art. But from a spectacular point of view the chorus are still the central feature of the exhibition. Nor is this remarkable fact so anomalous even in a purely æsthetic light, as it might at first appear. It is not too much to say that the tragedy as a whole takes its peculiar colour from the chorus. To a large extent it is the lofty choral-song which determines the strikingly ideal tone of Athenian tragedy. The note of high religious enthusiasm, of lyrical fervour and exaltation struck in it, peremptorily excludes from the dialogue, of which it is the soul, all that is trivial and common.

The great expense of training and dressing the chorus which forms, as we have said, so prominent a feature in the spectacle falls, it will be remembered, on the richest class of the citizens who take it in turns, as they are called upon by the state. So important is the performance of this duty that the chorus-master associated with the victorious poet—it has already been mentioned that the keen interest of competition is added to the other excitements of

this show—is so definitely recognized as contributing an essential part to the victory, that his name is proclaimed along with the poet's, before the whole assembled people, when the time comes for pronouncing the judges' verdict on the plays.

It remains for us to consider the third part of the theatre, the stage. We have never seen one like this before. It is merely a long narrow platform at a great height above, and immediately behind the orchestra, with which it is connected by means of steps. It is not more than twelve feet deep. Evidently we cannot expect here those rich pictorial groups of masses of figures to which we are accustomed on our modern stages—such as Wagner has so effectively carried to a maximum in his marvellous operas. The actors must be comparatively few. As a matter of fact the poet has to content himself with three speaking actors, although these can be manipulated so as to take several different parts at various points in the progress of the action, and any number required of silent supernumeraries may be added. The actors must be few and they must stand practically in a line. That stone wall which rises behind the platform serves for attaching the painted scenes, which are of the simplest kind. A very small stock of them is sufficient. The scene is scarcely ever changed in the course of the piece; any change which does occur is indicated by the most trifling alterations, and the very same scenery often does duty for several pieces in succession. The stock scene is what we shall see to-morrow—in the centre the court-yard in front of a palace or temple marked for magnificent by its pillars and statues; to the right of the spectators a city indicated with some attention to perspective; to the left a country landscape with hills and woods. None of our paltry modern elaboration in scenic effect, or in pedantic attempts at archæological and local accuracy, is aimed at here. The Greek poets have much too fine a feeling for their art to overlay the proper interest of their plays by the prominence of such accessories.

We shall now avail ourselves of the Archon's pass into what we may call the Green-room, call up the caretaker and have a look at the dresses and properties used by the actors. We pass into the substantial stage buildings, well roofed against the weather, enter a large room and see all around disposed in orderly fashion the objects of which we are in search. Hanging on pegs

are many long splendidly coloured robes of fine and costly texture. The effect of these amply-sweeping vestments will be to give height and dignity to the figure. But what is this row of extraordinary and terrific objects lying there on the shelves? They are the tragic masks—the most peculiar part of the actor's equipment and the most foreign to our modern stage traditions. They are indeed a strange disguise for the human face divine. The mouths are wide open, the features gigantic, strongly marked and stern, the brow prolonged upwards to a portentous height, only the white of the eyes painted, great coarse hair and sometimes fierce bushy beards. It is then a drama of Brobdingnagians or the presentation of the life and adventures of Jack the Giant-Killer, which we have come so far to see? Look at these boots again, cothurni as they call them. They have soles a foot thick. Do the actors wear these too, and if so do they train for it before-hand in a long course of walking on stilts? The get up of these gentlemen must be of the most appalling character, enough to frighten the women and children into fits. Well, you must remember the vast size of the building. It is distance which lends enchantment to this view. The actor's figure to be imposing, nay, to escape being insignificant, must be made to look as tall as possible; the due proportions being retained by means of liberal padding. Hence his sweeping robes and high boots on which he must walk so deliberately and warily if he is not to come to grief; hence the prolongation of the forehead in the mask. The more important the character he represents the loftier must be his stature, for as there are no play bills, everything here is indicated to the eye. We must remember also that these tragedies have a religious purpose. The whole performance is a religious rite intended for edification like the Passion play at Ober-Ammergau. The subjects are taken from the sacred legends of the Greeks, which are to them what the stories of the Old Testament are to us; and the characters brought upon this stage are not the ordinary men and women of every day life, they are sublime beings elevated beyond the pitch of common mortality in their power to do and to suffer. Their whole appearance harmonizes with this, and though you may think the fixed and stony mask will make acting in our sense of the word impossible inasmuch as that depends above all on flexibility of facial expression, yet remember once more the size of this

building. Delicate play of feature subtly following and interpreting the shifting play of emotion, would be utterly lost here. A good mask, with the main lines of the character required, brought out in bold relief, is much the most effective thing possible under the present conditions.

We see then what we are to expect. We cannot have realism on this stage. The mirror cannot be held up to nature in the sense that we shall have anything resembling the scenes of every day life brought before us. Realism, mobility, illusion are foreign to the Greek Tragedian's conception of his religious art; incompatible with the conditions of his theatre. He cannot give us back as Shakespear does the multiform swift-changing charm of the living and moving world with its laughter and tears in that bizarre juxtaposition which reality presents. He cannot like him seize the subtle play of individual character in its most evanescent tints, the feeling moods of varying emotion. His art is simple, statuesque, deals with types rather than with individual characters. What shall we see here to-morrow as we look down from these benches? Something like this:—the chorus brilliantly dressed in the foreground; the stately though slow moving and somewhat unwieldy figures of the actors in line on the narrow stage; immediately behind, throwing these into relief, the background of the painted scene. Now this is not a picture with depth and distance, such as we know on the roomy stages of London and Bayreuth. The effect is rather statuesque. It is a brilliantly coloured frieze or bas-relief. Once for all we are among the plastic people of the world. All the products of their genius—the plays themselves as well as the setting of them, the speeches of their orators, the works of their historians, the very disquisitions of their philosophers, nay, the characters of their great men are of the plastic type; simple, clear, articulated, severely symmetrical. Why it is in the very air they breathe. You noticed how clear in this lucid and bracing atmosphere all distant objects looked as you walked though the streets. Endless vistas with the glamour of mysterious shade, yearning divinations of the infinite mystic chiaroscuro—those qualities of art and soul which Christianity and the dim humid northern forests have impressed upon a new order of development—of such things the Athenians do not dream. The indefinite, what cannot be reduced within clear

bounding lines, is the object of horror to them. As a perfect body is in their view the sufficient expression of a perfect soul, so in every region form and content must be mutually commensurate.

We may now go back to our Pandokeion and have a talk with old Pasion, our host. He is a metic, or foreign resident, who has lived in Athens the greater part of his life. As such he has no vote, but still he has caught the infection of his surroundings and takes a great interest in politics. He is a staunch Conservative and thinks the country has been steadily going to the dogs since Pericles came into power. The good man's political views are inspired by the comedies in which he takes the greatest delight. He loves the theatre for its own sake, as well as because it brings him a great deal of custom. He is always posted as to theatrical news—quite a walking Athenian Sporting and Dramatic Times—and now we learn from him that to-morrow morning the first play will probably be a tragedy by Sophocles, the son of Sophillus, called the *Antigone*. The data for his expectation were supplied a few days ago at the Odeum or Music Hall—a building near the theatre where the poets, chorus-masters and choruses for the year display themselves before the people, by way of foretaste and preliminary canter, a few days before the competition. The best thing we can do then before going to bed is to read up the Tragic History of the House of Labducus, familiar to all Athenians as the story of Abraham is, or ought to be, to us. With a part of this history the play is going to deal.

The fruit of our mythological studies is as follows: Oedipus, king of Thebes, whose terrible story we need not further look into at present has two sons Eteocles and Polynices. After their blind old father has been driven into exile, because his presence in Thebes is now regarded as a pollution, Eteocles and Polynices quarrel as to who shall reign in his stead. Eteocles, although the younger, at length possesses himself of the throne, and the elder brother is banished. He goes to Argos, marries the daughter of the king there, and uses the influence thus acquired to raise an army, at the head of which he marches against his native city to reinstate himself in his rights. Associated with him are six other leaders, who with himself are the celebrated seven that went up against Thebes—each against one of its seven gates. The Thebans under Eteocles, choose seven champions to defend their walls

against these seven. The assault is made and at every point the defenders are victorious. At one of the gates the two brothers meet in mortal combat and each falls by the other's hands. The throne of Thebes thus left vacant by the death of Eteocles passes to the male heir next of kin, who chances to be Creon the uncle of the slain brothers. Creon's first act of sovereignty is to mark his detestation of the crime of Polynices, who had turned his parricidal arms against his fatherland, by publishing a decree that while Eteocles who had fallen in defence of his native city should be buried with all honours, the corpse of Polynices should be left to the dogs and vultures. Now in order to put ourselves into the position of an Athenian audience we must realize with perfect distinctness what this decree of Creon's means to them. To a Greek there is something inexpressibly shocking in refusing interment to a dead body. A corpse belongs to the Gods of the underworld; to withhold it from them is to rob them of their due; to leave its ghastly presence in the light of heaven is to present an offence and abomination to the pure eyes of the celestial deities. Moreover such maltreatment is not only the infliction of a cruel shame on the dead man; it is also an act of substantial inhumanity to him. His fate in the next world depends decisively on whether he has received sepulture or not. Much the most terrible misfortune, as the pious Greek thinks, which can befall a man is that his body should lie unburied. Such fate means to him no less deep a horror than to the Mediæval Christian the thought of dying without having received the last rites of the Church and passing into eternity "unhousel, disappointed, unanealed." The relations of a dead man cannot be conceived to have any more binding duty, any claim upon them more urgently enforced by piety to the Gods and love to the helpless dead, than this of bestowing the last offices upon his remains. We can understand then how the Athenians will feel as to this decree of Creon's. Although Polynices had been guilty of a terrible crime in making war upon his native land, to pursue him with vengeance even beyond the grave will seem to them an impious and barbarous act. Now we read that Polynices had two sisters surviving him, Antigone and Ismene. They live in the palace under the guardianship of their uncle Creon. It is their first duty, come of it what may, to set at naught their uncle's inhuman decree.

Having thus prepared ourselves we may now go to bed. To bed indeed but alas ! not to sleep. The greater part of the night has to be devoted to the too wearing excitement of the chase. We are not sorry when the morning breaks. Soon after we wend our way to the Theatre, towards which the whole town is already streaming. Arrived there we find the enormous building, even at this early hour, nearly full. There sit in lively conversation accompanied by the most animated gestures and speaking looks with crowns on their heads in honour of the God and bright holiday garments, which glisten in the rays of the morning sun, all the Athenians with their wives, children and even slaves, as well as a great concourse of strangers. The noise of the talk is like the sound of innumerable waters or a mighty rushing wind. It is an inexpressibly moving sight this endless swaying sounding sea of human faces arising curved billow on billow far as the eye can reach ; this large family of kindred men united in common enjoyment and common worship. To think that in a very few years not one of all this multitude shall rejoice in the mild spring sunshine any more for ever !

Taking our places we look down towards the stage. Everything is as it was yesterday with two exceptions. First a painted scene has been attached to the wall at the back of the stage. It represents a palace in the centre ; to the right a town ; to the left a rural landscape with trees, rocks, and mountains. Second in the centre of the orchestra we descry a stone figure which is new to us. It is the statue of Dionysus in whose honor this mighty celebration is held. The young men of Athens who have this year come of age for military service, the hope of their country, carried it hither last night in torchlight procession with dance and song. The God it seems looks on from his place in full view of the stage at the plays performed in his honour. He is the only spectator here who never fails to keep his place through all the changing years.

But now the stentorian voice of a herald proclaims silence. The business of the day is to begin. A victim is brought out by some attendants and sacrificed on the altar in the centre of the orchestra, near which stands the statue of the God. The meeting, like all great assemblies of Athens is opened with prayer. The ministrant is the splendidly robed priest of Dionysus, whose seat

is the magnificently sculptured throne in the centre of the first row. Next the long roll is called of the subject states which recognize the imperial sway of Athens; the tribute paid by them for the year is solemnly deposited on the Altar in the orchestra—a sight visibly stirring to the patriotic pride of the sovereign people. And now a number of young men march past in full panoply. They are the orphans of fathers slain in the City's wars. Athens has adopted them as peculiarly her children; has reared and educated them from her treasury. They are now of age; ripe for repaying the dues of nurture to their mother-city, which here looks down with pride upon them as they display before her eyes, the bloom of their youthful vigour. Next the herald from the stage-platform proclaims the crowns which have been decreed by Athens herself, or by foreign states, to Athenian citizens. Each name is greeted by a tumultuous burst of applause, a majestic sound for which thunder and Niagara are weak comparisons. And now after all these preliminary ceremonies which make us realize so vividly the thoroughly national character of this gathering, we have come to the special business in hand. A trumpet sounds; the crier calls upon Sophocles the son of Sophillus to lead in his chorus.

Pasias was right. We are not going to have to wait long to hear the words of the famous poet most beloved by his countrymen, "the mellow glory of the Attic stage." But he does not as we should expect from the herald's command appear in person. It seems the formula we have heard is a mere formula, a survival from the time when the chorus with its hymn was the most important features of the performance, and the poet himself took a leading part in the presentation of his composition. The response which actually follows, is to its spirit, not to its literal terms. From the central door of the palace indicated behind the middle of the stage, two female figures emerge. Seen from where we sit their masks are quite beautiful, little as we should have thought so yesterday from our closer view of these disguises. The features are strongly marked indeed, but majestic and suggest especially that of the taller woman a princely almost god-like elevation of soul. She is Antigone; the other smaller, softer and more feminine looking one is Ismene. Antigone is the first to speak and with her speech the play begins.

CURRENT EVENTS.

It may be said that there are no Current Events during the silly season, and therefore the Review for the past quarter shall be brief.

“**W**ILLING to wound and yet afraid to strike” is still the attitude of France to all her neighbours, Russia excepted, while at home she is settling down to the acceptance of her present system of government. The elections have made havoc with every group not loyal to the Republic, and, unfortunately, with almost every man above mediocrity. With M. Clemenceau rejected because of rumours that no one believes, and M. Wilson and the Panamists elected though proven guilty of corruption, what shall be said of the average elector? Has he grown an inch since the day when the Athenian voter ostracised Aristides, because he was “tired of a man whom everybody called the Just?” France has gained no laurels in Siam, but Lord Rosebery has added to his chaplet. He drew the lines calmly where British interests would be involved, and, as the indispensable man in any Government has a free hand, all that he demanded was conceded, and then it was impossible for the French Foreign Minister to hark back, though the Paris heathen raged and revenged themselves by insulting Lord Dufferin, to whose thorough knowledge of the East they attributed the victory of the British Foreign office. “The hand of iron in the glove of silk” was never needed more, for it is about as easy to play with a bear robbed of her whelps as to diplomatize with France in her present mood.

The more she chafes the firmer becomes the German grip on the lost provinces. Her army manœuvres on the frontier were answered in kind by the Emperor William, and his good reception in Metz and Strasbourg, with all the attendant circumstances of the presence of the Prince of Naples, the passing by the Reichstag of the Army Bill, the intention of Italy to give harbourage to the German fleet, and the growing cordial feeling for the young Emperor in England, have struck home. What if Alsace and Lorraine should become German in spirit, as they are in language, before the war of revenge can be commenced? The very thought gives heart chills to the most sanguine, and in vain they try to find comfort by demonstrating their ardent affection for Russia. Notwithstanding, there will be no war this year, and, unless the unexpected happens, none for a long time to come. Russia is not prepared, and she cannot borrow. France is heaping up her own debt too rapidly to allow her to lend to an ally that is perilously near insolvency. On the other hand, the people of Germany are determined to stand by the work of Bismarck; and Italy and Austro-Hungary know that their only salvation is in a solid Dreibund. Meanwhile, what a spectacle of the absurdities of human nature is presented in the maudlin affection of the Republics of France and the United States for a Power that scarcely cares to conceal its contempt for their fundamental political principles and practice!

THE Home Rule Bill has been snowed under by the House of Lords, and Mr. Bull takes it calmly. The Bench of Bishops, twenty or thirty strong, voting against it, with a unanimity not begotten of profound thought, was almost enough to make him suspect a soul of goodness in it, but almost is not enough. Mr. Gladstone intends to have an Autumn Session that may kill him, physical marvel though he is, and, after drawing a few red herrings across the scent, to appeal to the country for another blank cheque. Will he get it? The star-gazers and monthly prognosticators say no, but the Unionists are uneasy lest Providence should hide a few aces up the sleeves of "the old Parliamentary hand." If he does get it, now that the public know how it will be filled up, a Home Ruler of longer standing than Mr. Gladstone must come to the conclusion that political sanity has departed from the British people, or that oratory in the nineteenth century is more bewitching than it was in the days of Demosthenes. The Bill is a medley of startling incongruities and the Parnellites openly, and the Anti-Parnellites silently, take it only as a lever. Mr. Gladstone's enthusiasm is apparently born of the conviction that the Act of Union was immoral, because Grattan's Parliament was bribed. The logical conclusion would be either to make the best of the Union by treating England, Scotland and Ireland alike, or to abolish it and restore to Ireland her Protestant Parliament, or at any rate a Parliament with similar powers. There would be principle and safety in either course. There is none in a Bill that promises nothing but friction and unlimited possibilities for log-rolling.

"Them's my principles, but, if they don't suit, they kin be changed," was the frank confession of faith made by a politician out West. Mr. Gladstone's diction, on the crucial question of the retention of Irish members in the House of Commons, is more refined, but not less frank. "We accepted from the country the retention of the Irish Members, and we accept from the House their retention for all purposes." This, in spite of the fact that he had declared himself unalterably opposed to what he thinks now is the will of the Country and the will of the House! In other words, "I am ready to accept anything but defeat. My conviction is that the Irish Members should be out of the House of Commons for all purposes. As that could not be carried I proposed that they be out for some things and in for others. The Whips tell me that that will be defeated, and therefore, at a day's notice to the Country, I propose that they be in for all purposes." How small the G. O. M. looks beside Mr. Cleveland!

G.

ONE can easily understand the mental confusion of many a citizen of the Great Republic when he attempts to understand the present money problem. He has been often told, in the last few years, by those who have looked into the matter, that a financial

crisis was threatened owing to the issue of too much currency in the purchase of silver. But when the crisis actually arrived he found that its chief outward symptom was an unusual scarcity of currency of any kind. Immediately the silver advocate chimed in with his "I told you so! What this country wants is not less money, but a good deal more of it;—free coinage of silver, in fact." Next, the McKinleyite raised his industrious cry to the effect that the whole difficulty was due to the threatened changes in the tariff. When we remember that the confused citizen occupies the greater part of the bench in the final court of appeal for all such cases, the ultimate issue is far from certain. One idea, however, seems to have found lodgement in the majority of influential heads, namely, that the monthly purchases by the Treasury of such large quantities of silver have something to do with the crisis, and therefore had better be stopped. This is encouraging, as it shows that when matters become pressing, intelligence has still the upper hand, even in a democracy.

The connection between an overissue of currency and a subsequent famine of it is seen to be rigid enough when once we understand the function of credit in modern commerce. About nine-tenths of the business of a country like the United States is conducted on a credit basis; checks, drafts, bills of exchange, bank credits, clearing-house transactions, etc., taking the place of currency in making exchanges. But this implies two chief conditions, namely good credit and a sound basis for currency; for all credit instruments rest upon currency, and all currency in the United States, as in most other commercial countries, is ultimately redeemable in gold. This is an extremely useful but very delicate structure, and if any considerable part of it, especially the foundation, is weakened the whole is immediately threatened with destruction. But the foundation was weakened when gold was driven out of the country, owing to the over issue of paper currency in payment for silver purchases. This soon threatened general credit, and caused the more cautious of those who knew what was likely to come, to change their bank deposits and other credits into currency, and, if possible, into gold, which they stored away in the vaults of safe-deposit companies, the modern representatives of the strong boxes and money stockings of our ancestors. The action of the knowing ones alarmed the less knowing ones, and so the crisis developed and spread, until the function of credit was very much contracted and the function of currency very much expanded. But, there being no sudden expansion of currency possible, a currency or money famine was the first result, and the suspension of a great deal of industry and commerce the second and necessarily consequent result. An over-supply of water may burst a reservoir and there may be some who will attribute the consequent water famine to a drought and others who will attribute it to an intention on the part of the city council to improve the fire department. These explanations may produce civic confusion, but will hardly alter the facts.

A. S.

THE financial depression in the United States, during July and August, was not more extraordinary than the speedy recovery, at all events in business circles. We have had new proof that no nation can be independent of the world in its finance, and proof also of the buoyancy of our neighbours and their illimitable resources. They are not out of the woods yet, for a minority in the Senate—every member of which knows that he is enthusiastically backed by his own constituents—can give a great deal of trouble. When the Silver Repeal Bill was passed by the popular House with an overwhelming majority, everyone said that the Senate would pass it in a fortnight. More than a month has gone and there is still no sign of the end. Something might be done if Mr. Cleveland would only consent to dicker, but “he is not built that way.” The country is convinced that the Sherman Purchase Act is at the bottom of the foreign distrust which causes the withdrawal of gold, and the President has therefore declared that the cause of the evil must be taken out of the way. When that has been done, it will be in order to consider whether anything is needed to give more elasticity to the currency system. The action of the Senate is making thinking men fancy that the Constitution of Statia is not so perfect as they imagined, and that it must be radically reformed. If this idea could only get into the heads of the people it would be an unmixed blessing, for the root of their Chauvinism is that “the earth revolves on its axis, subject to the Constitution of the United States.”

Though financial circles have recovered from their paralysis, industry still halts. How much of this is normal and how much is caused by the determination of protected industries to frighten the Democratic party from interfering with the tariff, it is difficult to say. By throwing nearly a million of workmen out of employment, they produce wide-spread misery, but they say to the voters of Ohio and Iowa, ‘you see the results of threatened competition with “the pauper labour of Britain,” and you can guess how much worse actual competition would be!’ The argument will influence thousands, but if it makes the Democrats false to their creed and their pledges, so much the worse for them. They will have to find another leader, and Mr. Cleveland will have to form a new party. Courage is the one thing they need, but it is also the one thing that party politicians are least likely to possess.

G.

NOT long ago Sir Hector Langevin, in a special interview published in one of the Montreal papers, gave his reasons for maintaining that the French-Canadians should prefer British rule to all others, even to that of France itself. His reasons make very interesting reading, but are a good deal less complimentary to British rule, as the Briton prides himself on it, than even the ‘perfidious Albion’ articles which appear from time to time in certain Lower

Canadian papers. The central thread of Sir Hector's argument is to the effect that British rule has preserved Quebec from all those changes which the rest of the world has been undergoing within the last century and a quarter. British rule, we may say, has acted as a kind of gem jar for Quebec, effectually preserving the purity of its dialect and the antiquity of its institutions. According to Sir Hector, Lower Canadians should be specially thankful for having been protected from the so-called progress which France has made in the state of things which preceded the Revolution. Thus Quebec, in the purely French portions of it, may be regarded as a genuine fossil specimen of the pre-Revolution period, exhibiting its distinctive economic, legal, social, religious and educational institutions and customs. But, according to Sir Hector, the Lower Canadian should be no less grateful to England for having protected his province from British and American influences as well, which are more to be feared for the present and future, as being closer at hand. He feels confident, too, that Britain will continue this generous protection; so that, if the Lower Canadians are only true to themselves and their past, which is also their present, there is every reason to hope that they may be able to preserve their ancient condition, if not to all eternity, yet easily to the end of time. Many of us have long known that such was practically the result of British rule in Quebec, but it is interesting to find Sir Hector putting it in the straightforward fashion of this interview. It helps too to explain why the Government of which Sir Hector was so prominent a member should have taken pains to put such a tax on all instruments of education and enlightenment as renders Canada absolutely unique in that respect among civilized or even semi-civilized nations. A. S.

CANADIANS are pluming themselves too much on their financial stability. The Premier tells us that in the States banks failed last summer, at the rate of one to 300,000 people, while there was only one failure in Canada to our five millions. Is he ignorant that a point of difference between the banking systems of the two countries explains our apparent good fortune? We have central banks that establish branches wherever they are likely to get business. Across the line, there are no branches. Every little town has its independent bank or banks. Thus, when the Commercial Bank in Winnipeg closed its doors, its seventeen branches had also to close. Counting these eighteen banks, our rate would be one failure to 275,000 people! Our Banking system is undoubtedly better, but bragging is a poor business, especially when there is little or nothing to brag about.

MANITOBA felt the failure of its popular local bank less than was expected, partly because no one doubted that depositors would be paid, but mainly because every one was cheered with the

prospects of a good harvest. Slowly the people are learning that the North-west is not an El-Dorado where men can pick up a fortune in four or five years. The industrious and intelligent can make a good living, and there is perhaps less room in Manitoba than elsewhere for other classes. Wheat is a sure crop only in some districts, and even in those the yield is nothing like the 40 bushels to the acre that emigration agents promise. Why should the country pay men to coax foreigners to accept from us free farms? The best agent is the successful immigrant. He sends for two or three neighbours, taking care to invite only those who are likely to succeed. They in their turn bring others. All that a Government ought to do is to secure easy access to the land, cheap transportation to the best markets and permission to trade there freely. These things attended to, the North-west will fill up, and with the right kind of people, instead of with the dead-beats of other countries, who will stay in it only long enough to give it a bad name. We have tried the 'how not to do it' policy for some time, with the result that Manitoba has not added five thousand to its population this year through immigration. The unsuccessful immigrant warns off all his old neighbours.

But, it is a glorious country and its future is sure. Pioneer settlers there, as everywhere else, have everything to learn, but the next generation builds on their hardy learned experience. "How are you faring?" I asked an old friend whom I met recently in North-Western Manitoba. "Finely, now," was the answer, "but it was heart-breaking work for eleven years. I stuck to wheat, and it looked beautiful till within a week or two of harvest, and then it was destroyed, generally by frost, sometimes by hail, gophers, drought or wet. I then tried mixed farming, stock, pigs, and horses, and am doing well." "But might you not have learned in less than eleven years that Nature did not intend to give you wheat?" "Perhaps so, but I had bought expensive agricultural implements and made all my arrangements for it, and hope whispered me to persevere." That's the story that hundreds tell. But many will not wait eleven years. They shake the dust from their feet and write to their friends to try Patagonia if they like, but by all means to give a wide berth to Manitoba.

OUR two parties are bidding eagerly for popular favour at present. The conditions of success are very simple. The independent vote must be won and it can be won only by a frank policy. Mr. Laurier has many things in his favour, but what does he mean by perpetually saying that if the interests of Canada and England conflict, he is for Canada? If the meaning is only what is on the surface, there is no need of such a wise saw. If there is something underneath, let it be told. Such phrases win nobody and repel thousands who have lost faith in the N.P., but will not unite with a party whose destination is uncertain. Besides, countries are not made by leaders who profess selfishness. We expect them to strike a high note and to suppress sectionalism. How would we take a parallel

assertion from Lord Salisbury or Mr. Gladstone? Apparently, it was not in the interest of England to quarrel with her best customer for the sake of Canada. Neither are the interests of the London furriers the same as those of the Canadian sealers. But British statesmen disdain or at any rate avoid such talk. If we are part of an Empire that gives us a controlling power in all negotiations where our interests are involved, that has always stood by us when attacked or threatened, and that has set the world an example of free trade for fifty years, where can the conflict come in? There is a fine field between the two parties for Mr. McCarthy, if he will only let sleeping dogs lie and devote his attention to dogs that are eating up the childrens' bread.

THE crowds at the Chicago Fair for the last two or three months are what we anticipated, and now wild-cat proposals are made to keep it open all winter or to resume next May. The Chicago papers may mislead the managers on this as they did with regard to the popular sentiment on Sunday opening, and then the Exposition will end like the Rhine, in marshes and mud banks. It deserves a better fate.

The most interesting feature to thousands was "The Parliament of Religions," held for weeks in the Art Institute. It was a remarkable illustration of the radical changes that have taken place in civilization within the last quarter of a century, and that foreshadow a new birth of time. Such gatherings could not have been held at any earlier moment in the history of the race, though we were told of antecedent germs. Colonel Higginson claimed that the first Parliament of Religion was held when the signing of the Declaration of Independence was signalized by a Jew walking between two Christian ministers through the streets of Philadelphia! Speakers from India put in a better claim when they told how the Emperor Akbar had assembled at Delhi men of all religions to inquire of them concerning their special doctrines. The doctors of Divinity were shocked at the Emperor's latitudinarianism. "Did he fancy that there was good in any religion but Islam? What was the need of enquiry? Such a spirit was opposed to every (Islamic) principle." So said Budaoni, who had a proper horror of enquiry and comparison. But even the Delhi Congress could not compare with Chicago. Representatives—in most cases worthy—of the three great branches of Christendom and of every Christian country sat on the same platform, and united with chosen representatives of every historic faith and civilization in the Universal Prayer and in Praise to the one living and true God! Appended to these notes is the response for Canada, made at the opening meeting.

G.

RESPONSE ON BEHALF OF CANADA TO ADDRESS OF
WELCOME, AT THE WORLD'S PARLIAMENT
OF RELIGIONS.

THE Dominion of Canada, is of recent creation, but the fact that the greatest of the World's Exhibitions is being held in the United States and in the City of Chicago proves that antiquity is not an indispensable element in national or civic greatness. That our Parliament is not for controversy but for friendly comparison reminds me that there can not be controversy where there is accurate definition ; therefore, the word Canada should be defined, and this is all the more necessary, inasmuch as its meaning has been officially changed three times within the last 120 years.

By the Quebec Act of 1774, Canada included not only the lands watered by the St. Lawrence but those great States also, whose exhaustless tribute promises to make Chicago in due time the wealthiest and most populous centre in the world. A few years thereafter, at the close of the Revolutionary War, although France and Spain, the allies of Congress, were eager that those ample boundaries should be preserved, Lord Shelburne—a disciple of Adam Smith—was Premier of Great Britain long enough to endow the thirteen States with this great West ; and the Commissioners of Congress, Franklin, Jay and Adams, received the splendid gift with joy, counted it a pledge of reconciliation as well as peace, and promised in return perpetual friendship and free trade between the mother and the eldest daughter. By this action, Canada was restricted to the regions now known as the Provinces of Ontario and Quebec. Recently, another change was made. By the British North American Act of 1867, the Maritime Provinces of Nova Scotia and New Brunswick were united federally with the interior Provinces to constitute the Dominion of Canada ; and in a few years after, the illimitable North-west, British Columbia and Prince Edward Island were added to the new Confederacy. Canada therefore now means a country bounded on three sides by three oceans, and on the fourth by the lakes and the watershed of the continent.

What has this young giant to do with a Parliament of Religions ? Does it not require all its time and energy to clear and fence its farm ? Has it yet been able to reflect, or to say a single word on the fundamental questions of thought and life ? Is it likely to offer any contribution to the solution of the mysteries which oppress man whenever he begins to reflect ?

God, who appointed the bounds of our habitation, made us the natural keystone between the old world of northern Europe and the older world of China and Japan. We are also the living link between Great Britain and the sunny lands under the Southern Cross.

We are thus the bridge between East and West, and the bond that unites the three great self-governing parts of the British Empire.

Our place in history is equally significant. Instead of violently disrupting ourselves from the past, we have gradually evolved from one stage of self-government to another. We have therefore not been obliged to sacrifice any of the inestimable treasures accumulated by our fathers, while at the same time we keep eyes and minds open to receive new teaching from this new world where everything is possible to man. Let me call your attention briefly to the meaning of these two facts.

The supposed existence of a northwest passage to the Indies was the dream that long allured hardy navigators, who believed in the earth's rotundity but had not the data for determining its size. In our day it has been found that that great northwest passage is not by sea or river but by land. We have discovered that the shortest way from the old world to Japan and China is across Canada. So, Canada feels herself now to be the link between Europe and the East, as well as the link between the great sections of our own Empire.

How is it possible for a people so situated to be parochial? How can they refuse to meet in a genial way the representatives of other religions? Across our broad land thousands are coming and going from east to west, mingling with us, and we are obliged to meet them as man should always meet man. Not only so, but on that great ocean which is the true Mediterranean and which is to be the arena of the future commerce of the world,—our sons are showing that they intend to play an important part. Our position, as the fourth maritime nation of the world as regards ocean tonnage, shows the aptitude of our people for foreign trade, and sailors owning the ships they sail are more likely than any others to learn the lesson that the life of the world is one, that truth is one, that all men are brothers and that the service of humanity is the most acceptable form of religion to the Common Father.

Therefore, we feel that we have a right not so much to receive, as to join with you in extending, a welcome to those from different nations, whose faiths are different, but whose spiritual natures and necessities are the same, in whom dwelleth that Eternal Power and Person that is the true light which lighteth every man that cometh into the world, and all of whom therefore must recognize Him, when He is rightly presented to them, even as all needles must point to one pole.

Our racial, political and religious evolution educates us along the same line as does our place in the world. Our racial evolution Parkman has described in pages glowing with purple light. He has told of the two centuries of conflict between France and Britain for the possession of this fair young continent, and he has shown that, while outward failure was the part of the former, all the heroisms and enduring successes were not with the conquerors. France gave without stint the great explorers, whose names are sown all over this continent thick as a field,—martyrs and missionaries of deathless fame, saintly women whose works do still follow them. Their blood was not lost in vast inland seas and on rugged Laurentian and

Huronian rocks. It fell on good soil and we see its permanent memorial now in a noble French speaking people, enjoying their own language, laws and institutions under a flag identified with their liberties and under a constitution that they and their fathers have helped to hammer out. Their children sit side by side in our federal parliament with the children of their ancestral foes and the only real contest between them is, which shall serve Canada best. The union of the two races and languages was needed to enable England to do her imperial work. Will not the same union enable Canada to do a like work, and does it not force us to see good elsewhere, and not least in those whom our ancestors may have thought enemies?

Our political evolution has had the same lesson for us. It has taught us to borrow ideas with equal impartiality from sources apparently opposite. We have borrowed the federal idea from you and our parliamentary, cabinet and judicial systems from Britain, and so we have formed a constitution better than that which either the mother country or the older daughter enjoys. At any rate we have made it ourselves and it fits us; and our evolution has taught us that ideas belong to no one country, that they are the common property of mankind and that we should borrow from every country that has found by experiment that they work well.

Our religious evolution has taught us the same thing. We have been enabled to accomplish a measure of religious unification greater than either the mother land or the United States has found possible. Eighteen years ago, for instance, all the Presbyterian denominations united into one church wide as the Dominion of Canada. Immediately thereafter the Methodist churches took the same step, and now different Protestant churches have appointed committees to see whether it is not possible to have a larger union, and the young life of Canada says "Amen" to the proposal.

It is easy for a people with such an environment to understand that where men differ they must be in error, that truth is the only thing which permanently unites, that every age has its problems to solve, that it is the glory of the human mind to solve or to try to solve them, and that no church or nation has a monopoly of the truth or of the spirit of the living God.

Mr. Chairman, it seems to me that we should begin this parliament of religions not with a consciousness that we are doing a great thing, but with a humble and lowly confession of sin and failure. How will you explain the slow progress and the comparative failure of Christianity? Why have not the inhabitants of the world fallen before truth? The fault is ours. The Apostle Paul, looking back on nineteen centuries of marvellous God-guided history, saw as the key to all its mazes that Jehovah had been stretching out his hands all day long to a disobedient and gainsaying people; in other words, although there was always a faithful remnant, Israel as a nation did not understand Jehovah and therefore failed to understand its own mission.

If St. Paul were here to-day would he not utter the same sad confession with regard to the nineteen centuries since Christ? Would he not say that we have been proud of our christianity instead of allowing our chris-

tianity to humble and crucify us: that we have boasted of christianity as something we possessed instead of allowing it to possess us: that we have divorced it from the moral and spiritual order of the world instead of seeing that it is that which interpenetrates, interprets, completes, and verifies that order, and that so we have hidden its glory and lessened its power? "All day long," our Saviour has been saying, "I have stretched out my hands to a disobedient and gainsaying people."

But, sir, the only indispensable condition of success is that we recognize the cause of our failure, that we confess it with humble, lowly, penitent and obedient minds, and that with quenchless courage and faith we henceforward go forth and do otherwise.

BOOK REVIEWS.

An Elementary Treatise on Modern Pure Geometry, by R. Lachlan, M.A. McMillan & Co., London and New York.

An Elementary Treatise on Pure Geometry, by John Wellesley Russell, M.A. Clarendon Press Series.

BOTH of the above works, being the product of English mathematicians, and appearing so nearly at the same time, would seem to indicate that the study of modern geometry has suddenly taken a stride forward in Great Britain. Although for many years past it has been pursued in a sort of dilettante way by the English student, English works on the subject have hitherto been rather small in number and incomplete in matter, and a student wishing to study the subject was largely under the necessity of resorting to the works of French and German writers.

It seems to the American mind very strange that this should be so, and it is difficult to know to what to attribute it unless it be to intense British conservatism, for every person acquainted with the ancient method of geometry as exhibited in Euclid and the modern methods as exemplified in the above works cannot fail to understand and appreciate the great advantage which the modern has over the ancient, both in matter and method; in fact, the ancient may be said to be characterized by particularization, while the modern makes extensive use of generalization. Some twenty years ago, the only English works available on modern geometry were Townsend's "Modern Geometry," written in a repulsive style, some sketches of work by Mulcahey, and odds and ends of the subject distributed through various papers; since that time, we have got a small but unsystematic account of the subject in Casey's 'Sequel to Euclid,' several attempts to bring it into notice by sandwiching many of its important results among the problems of Euclid, and the translation by Leudesdorf of the justly celebrated work of Cremona on projective geometry.

The books whose titles head this article are both very welcome

works on the subject of modern pure geometry, and although pursuing somewhat different lines, they cannot fail to be appreciated by the geometrical student.

Mr. Lachlan's work is plainly and simply written, and although confining himself to the line and circle, he has brought together and exhibited in a very pleasant way a large mass of beautiful and interesting geometrical fact. His book contains 282 pages and is divided into 16 chapters dealing with such subjects as 'Harmonicizm,' 'Involution,' 'Perspective,' 'Similarity,' 'Polar Reciprocation,' 'Inversion,' and 'Theory of the Cross Ratio.' It is beautifully printed, in large type and on good paper. The figures are large and plain; great numbers of exercises are interspersed throughout the work, besides a number of examples which are fully worked out for the benefit of the student.

Mr. Russell's work although employing largely the same operative methods as Mr. Lachlan's adds to these a theory of projection, and applies these processes very largely to the conic; in fact the work might almost be described as the modern geometry of the conic. Although presented as an elementary treatise, it will be found to be very full of the matter of which it treats. The student who takes up Mr. Russell's work will find it pretty tersely presented, and therefore somewhat difficult to follow, but the mastery of it will certainly put him in possession of the principal properties of the conic sections.

D.

REPORTS SUBMITTED TO THE ANNUAL MEETING OF TRUSTEES.

PHYSIOLOGICAL APPARATUS.

Another consignment of apparatus has arrived for the physiological and histological side of our work in the faculty of medicine. The chief instruments are a railway myograph, a recording cylinder, and a very fine microtome. The latter instrument was much needed in histology and pathology last winter. The total cost of this addition to the apparatus is about \$200. Two large gas cylinders have also been added at a cost of \$35, the manufacture of Messrs. Elliott Bros., Kingston. These will be used in supplying gas for the oxyhydrogen lantern, an instrument which will likely be largely used in teaching physiology and histology next session. Subscriptions amounting to \$500 have already been received for this work, but more are needed. Friends interested will kindly communicate with the Principal, the Dean, or Dr. Herald, Secretary of the faculty.

Dr. Hans Virchow, professor extraordinarius of comparative anatomy in the University of Berlin spent six weeks in the biological

laboratory of Queen's during May and June. He is a son of the celebrated Virchow of pathological fame, but in place of following in the line of the brilliant work inaugurated by his father, he has judged it best to try original work in an entirely different line. He came out to America in March at the instance of the Prussian government, and assisted in the arrangement and display of the German educational exhibit at Chicago. His own contribution to the World's Fair was an apparatus designed to facilitate the teaching of human anatomy. It enables a lecturer to elevate and display a dissection to a large class. The cadaver or any part of it may be raised, turned into any position, or lowered by merely pulling a few cords. It is unnecessary to say that it is not patented.

After completing his work at the Exhibition, Dr. Virchow threw himself with all the enthusiasm of a young scientist into an investigation of three points: (1) the eyes of *lepidosteus* and *amia*, (2) the blood supply of their head, especially of the gills of *lepidosteus*, and (3) the embryology of this same animal, especially its nitellus or yolk sack. These fish are not found in Germany. From Agassiz papers on these forms he knew that they were to be found in the St. Lawrence, and he was in Kingston only a few days when he obtained the material he sought. The eggs gave him more trouble. These he could not find anywhere along the shore, but a journey to Black Lake, N. Y., furnished him with immense numbers of the minute fry, as well as of the eggs in almost every stage of incubation. He was a proud man when he returned. For five weeks, in company with myself, he worked on his material almost night and day. Injecting, dissecting, drawing, writing, there seemed no end to the rapidity and accuracy with which he worked. On the first two points he reached satisfactory conclusions, but he had not time to complete his investigations on their embryology. This he will do after reaching home. Meanwhile he has left behind him very pleasant memories, and a substantial gift to the University of an apparatus for the artificial hatching of fish eggs.

While in Kingston he was the guest of the Hon. Dr. Sullivan, who assisted him by every means in his power.

A. P. KNIGHT.

MUSEUM.

The Curator begs to report that during the past year very few additions have been made to the Museum collections. No appropriation was granted at the last meeting of the Board for defraying expenses of collecting, and the Curator did not feel justified in incurring additional expenditure, beyond the amount necessary for current needs.

The Herbarium has been increased and improved by the mounting and labelling of a number of Phænogams, but no Cryptogams have been received for many years. Additional collections of these are now necessary for Class use.

QUEEN'S QUARTERLY.

The Mineralogical collection has been gone over and re-arranged, and many duplicate specimens have been transferred to the Science Hall. We have now a sufficient number of the common rocks of Ontario for the use of the Geological classes, but the rocks and minerals of the formations not represented in this province are greatly needed. We have almost nothing from any locality west of Sudbury. Additional collections of fossils would be gladly received.

No additions have been made to the collection of animals. The specimens which were attacked last year by destructive insects were saturated with a solution of Corrosive Sublimate and exposed to the fresh air for most of the summer, and at present there is no evidence of the reappearance of insects. Last spring a committee was appointed to consider what additional accommodation was necessary for the preservation and exhibition of specimens, for which we have not at present suitable cases. Two new table casses were recommended, but they have not been procured. A case for Insects is also necessary to preserve them from ruin. Many specimens have been already destroyed for want of a proper case.

The usual grant of \$30.00 has been sufficient to cover the expenses for paper for mounting plants, for alcohol, bottles and labels. A similar amount will be required for the present year.

I intend to visit Chicago during the summer, and would like to spend a short time collecting in the mining regions of Michigan. I could secure valuable additions to our Mineralogical department in the Museum and in the Science Hall at no great expense, and could also obtain specimens otherwise unobtainable.

It would be a source of much pleasure if the members of the Board would visit the Museum and see what we have and what we require.

JAMES FOWLER, *Curator.*

CHEMISTRY AND MINERALOGY.

During the past Session 113 students have been attending lectures in this department. Of these 61 were studying medicine, 50 were pursuing an arts course, and 2 were doing post-graduate work. With very few exceptions, the students in this department have also done laboratory work, the total number thus engaged during the year being

105. With the increased facilities afforded by the new building, the labour involved in preparing and overseeing the work for so large a number has been reduced to a minimum. It is still, however, a severe tax upon the energies of men who in addition are preparing and delivering an average of two experimental lectures a day for five days in the week. It would be advisable, when circumstances permit, to appoint a medical man to carry on the class in Analytical Chemistry (Medical), and to give a course of lectures on physiological and pathological chemistry, to form part of the senior course for medical students.

The collections of rocks and minerals have been largely increased. During the last two sessions the number of specimens has grown from a few hundred to more than three thousand. Most of these have been brought in by prospectors and mining men, and they are especially valuable as representing the mineral character of our own and the adjoining provinces. Former students have also brought or sent some good specimens. We have no means of displaying a collection of minerals, and are looking forward to the time when a suitable room can be furnished in the attic. This will enable the students to read with the specimens before them. At present, they have to content themselves with such observation as they can carry on during a lecture. Such a room could also receive the standard set of crystal models, at present not very accessible.

A good feature of the past session's work has been the constant use made of the library. The books most frequently required were put by themselves in a compartment for which a number of keys were made. Each student received a key in return for a deposit of 25 cents. The books in this department were in constant use; so much so that some of them will need to be rebound after a few sessions. The library is a very small one, and needs large additions in order to bring it up to the requirements of the work. Scientific books are expensive; and the annual allowance for my department does not go far.

In conclusion, I must mention with pleasure the admirable character of the work done by Mr. Nicol. His enthusiasm and mastery of details have enabled him to carry on his trying work with great success, and, as enthusiasm is contagious, it has been a feature of the session's work.

I enclose statement of receipts and expenditures with vouchers.

W. L. GOODWIN, *Professor.*

QUEEN'S QUARTERLY.

ORDINARY RECEIPTS.		ORDINARY EXPENSES.	
To Balance.....	\$ 49 04	To Wages	\$299 50
Allowance from Trustees....	300 00	Coal and Gas	188 35
Apparatus & Laboratory fees,	519 00	Apparatus and Chemicals	396 20
Sundries	131 66	Plumbing, Carpentering, etc.	95 61
		Balance.....	20 04
	<hr/>		<hr/>
	\$999 70		\$999 70
EXTRAORDINARY RECEIPTS.		EXTRAORDINARY EXPENSES.	
Vote of Finance Committee	\$279 85	Deficit from 1891-1892.....	\$ 67 32
		Carpentering, A Cameron	110 09
		Plumbing, Elliott Bros	47 99
		Pulley for Gas Engine, Kingston	
		Foundry	26 50
		Belt for Gas Engine, Ford Bros..	8 45
		Setting up Gas Engine, H. Youlden	11 00
		Furniture, J. Reid.....	8 50
	<hr/>		<hr/>
	\$279 85		\$279 85

OBSERVATORY.

During the past Session fortnightly lectures have been delivered in the Junior class by Professor Dupuis and myself; and weekly lectures and exercises in Theoretical Astronomy, together with the use of the instruments of observation, the Theodolite, Sextant, Transit, and Equatorial, have been given to the Senior class in the Observatory building.

The determination of the errors of the Sidereal and mean time Clocks has been regularly carried on throughout the year, and a number of observations of the more important phenomena have been made, more especially with regard to the recent oppositions of Mars and Jupiter.

The new filar micrometer, and web of wires, for the Transit, and ring micrometer for the Equatorial, have been received from Messrs. Fauth and Co., and have given me entire satisfaction. The cost, about \$90, has been almost wholly defrayed from the apparatus fees of the Department of Physics. Some small additional expenses have been incurred by repairs in connection with the shutters of the Transit room and Dome.

All the instruments are in excellent working order, and no change has been found in the perfect stability of the Transit piers.

The work required in making and recording observations would be greatly facilitated by my having the assistance from time to time of some deserving Senior Student resident in Kingston, particularly in the necessary observations at night.

All which is respectfully submitted by

JAMES WILLIAMSON,
Director of Observatory.

PHYSICAL LABORATORY.

Herewith I enclose the account of moneys spent by me during the past year. I have made connection between the dynamo in the School of Chemistry and the Physics class-room. This will be of great use when the arrangements in connection with it are completed.

Having had the assistance of Mr. Carmichael again this winter, I was enabled to invite the students of the Physics Classes to do laboratory work in the afternoons. Twenty students took advantage of this offer, a few of whom gave it up, on account of pressure of other classes. This work the students liked and appreciated. Mr. Carmichael makes an admirable Laboratory assistant, and for the special assistance needed I could not get a better.

As I reported last year, the accommodation afforded by this building is not suited for any such extension as Laboratory classes, and it has been at great inconvenience that we have carried them on these three years. Were it possible to place the Senate room at my disposal for a Laboratory it would supply present wants.

An alternative suggestion would be to fit up my present workshop, and to convert another room in the basement into a workshop. This would not be satisfactory, but it might do for a time. The only satisfactory solution of our present difficulties is to put up a new building and equip it for the Physical and Biological Departments of the University. An assistant who could give his whole time to Physics would then be needed.

D. H. MARSHALL,
Professor of Physics.

PHYSICAL LABORATORY RECEIPTS.	
To Balance.....	\$144 69
Interest.....	2 15
Apparatus Fees	299 00
Hartington's Physics, sold ..	5 60
	<hr/>
	\$451 44

PHYSICAL LABORATORY EXPENDITURE.	
Paid N. R. Carmichael	\$150 00
Dr. Williamson, for Observ- atory.....	55 00
Table for Professor Fowler.	11 00
Connecting Dymam.....	25 90
Barometers, Theomometers Hydrometers, etc., as per receipts	35 69
Balance in Bank	173 85
	<hr/>
	\$451 44

BOTANY AND GEOLOGY.

To the Board of Trustees, Queen's College:

GENTLEMEN,—During the Session just closed, the following classes have been under my care: Medical Botany, 20 Students; Arts Botany, 21 Students; Senior Science, 22 Students; Honour Botany, 1st year, 8 Students; Honour Botany, 2nd year, 2 Students; Honour Geology, 1st year, 8 Students; Honour Geology, 2nd year, 3 Students.

A larger amount of work than usual was accomplished, as many of the students were teachers and candidates for Specialist standing in Science. This class of students is likely to increase and it is therefore very desirable to secure as far as possible the necessary equipment for Laboratory work. During the year a number of the maps issued by the Geological Survey were procured and mounted for class use, but several additional ones are required to illustrate the Geological structure of the Dominion. The maps are obtained free, but cost 25 cents each for mounting. Some botanical microscopes are necessary, as each student requires one for his own use.

Our collection of Cryptogamous plants for Honour classes is now utterly inadequate. Very few Musci or Hepaticæ can be found in the neighborhood of the city, or in the cultivated parts of the country. The forest districts must be visited to procure them. Should the Board deem it advisable, I will visit some of the nearest forests and endeavour to procure such a supply as the districts may afford. No collection of Cryptogams, except one from Prof. Macoun many years ago, has ever been presented to the College, and none has been made by students.

The expense for maps mentioned above \$15.00.

Expenses for next year's work:—

Three (3) Botanical microscopes with accessories, \$30.....	\$90 00
20 additional maps	5 00
Expenses for collecting Cryptogams	25 00

JAMES FOWLER,

Professor.

ANIMAL BIOLOGY.

The attendance in *Junior Zoology* numbered 19; in *Honor Zoology*, 11; in *Histology*, 53; in *Junior Physiology*, 34; in *Senior Physiology*, 30.

The Histology and Physiology classes included both arts and medical students, the course being the same this year for both, viz., the Physiology and Histology of vertebrates with special reference to mammals.

In the Junior class there was the usual brief outline of the morpho-

logy of the whole animal kingdom, followed by an equally brief outline of vertebrate physiology.

The principle on which I endeavored to carry on my work was that the study of the forms of animals, or morphology, should precede or accompany the study of their functions or physiology.

In the case of arts students the principle was easily applied; but in the case of medical students, the lack of an elementary knowledge of morphology and of the principles of physics formed a serious difficulty in the way of good teaching.

A good beginning has been made in providing for practical instruction in Histology. There are now 24 microscopes in the Laboratory, 10 of which, with one of the best freezing microtomes in the market, were purchased last autumn at a cost of \$265. There was also bought at the same time two high power lenses (objectives) by Leitz, for doing work in Bacteriology, which, with the one presented by Dr. Clark, of Rockwood, are worth \$100. We have also one of Zeiss's best Camerae Lucidae, a stage micrometer and eye-piece micrometer.

For practical instruction in Physiology there were imported from Britain in December instruments adapted for experiments on the force and frequency of the *Pulse* and the Heart, on the circulation of the blood, on the effects of electricity on muscle and nerve, and I am every day expecting the arrival of apparatus for recording the phenomena of circulation and respiration. The total cost of this apparatus will probably reach \$400. It includes Du Bois Raymond's inductorium, electric keys and commutators, muscle forceps, revolving drum, railway myograph, tambours, cardiograph, sphygmograph, time-marker, metronome, electrodes, muscle lever, chronograph, etc.

Next Session, thanks to Professor Dupuis, I shall have a lantern which I shall use extensively in teaching Morphology, Physiology and Histology. The instrument is Professor Dupuis', and an equally good one would cost the college \$50. The gas cylinders are to cost \$35, and the gas force pump about \$40 or \$50—the exact sum cannot be stated. It is being made at the Locomotive Works from plans drawn by Professor Dupuis, who will have to make the most delicate parts himself, viz., the *valves*. Professor Marshall will pay for the gas force pump out of his apparatus fund. A dark room should be fitted up in the Science building, in which lantern slides could be made, as they are very expensive if we have to buy them. It should not cost over \$12 to partition it off and fit with the shelves. A lantern screen will cost \$5 or \$6.

I beg leave to make the following recommendations:

1. The whole work of my department be transferred to the Medical building. This will include the transfer of museum specimens, maps, apparatus, and books of reference.
2. That the sum of \$50 be appropriated for the purchase of museum bottles and specimens.
3. That nine large microscopes, and four dissecting microscopes be

purchased for the Laboratory. Professor Fowler tells me that he will need these which I borrowed from him last winter. Cost \$300.

4. That a further supply of dissecting dishes be placed in the Laboratory at a cost of \$10 or \$12.

5. That a number of models and additional apparatus for teaching Morphology and Physiology be bought in Germany or France. A few pieces could be made here in part by a carpenter and in part by myself. Cost of what is pressing, \$200.

6. That an annual fee of \$2 per student be charged for the use of microscopes, reagents, and drawing books, in both Dr. Anglin's class and mine.

As to the room now used for Histoigy, Pathology and Museum combined, the floor should be raised, and separate tables placed opposite each window ; the central part of the room should then be seated with benches, as in all other class rooms so that the room could be used for lecture purposes ; but these improvements may wait until more pressing needs are supplied.

ARCHIBALD P. KNIGHT,

Professor.

LIBRARIAN'S REPORT.

During the past year 1,002 volumes have been added to the Library. Of these, 267 vols. represent a generous donation from the well-known publisher, Mr. F. A. Brockhaus, of Leipzig, Germany. I was able to arrange about the selection of them while in Leipzig last summer. Of the others, 158 vols. were presented by various governments, scientific societies, publishers and private persons, among whom the publishing firm of Messrs. Macmillan & Co., and the Rev. S. Mylne, of Smith's Falls, deserve special mention.

The remainder, 576 vols. were purchased.

The total receipts for the past year amounted to \$1,840.91, made up as follows :

Balance from last year	\$ 110 96
Regular receipts from the Treasurer	1,290 00
Special fund obtained by the Principal	380 00
Refund of overcharges in Customs duty	59 95

Total expenditure for the past year	\$1,840 91
	1,698 49

Balance on hand	\$142 42
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Within the past year the new shelving has been placed in the library, and paid for out of Mrs. Acheson's bequest. Though it does

not improve the appearance of the room, yet the book accommodation is more than doubled, and, at any future time, the shelving may be easily removed to another building.

The Principal has provided a book-case for the students' consulting room. This has been filled with dictionaries, encyclopaedias and other works of reference to which the students have access, and of which they constantly avail themselves.

In addition to these, and other books placed in class bookcases, the students use the general library to the extent of about four hundred volumes per month.

As it became impossible for me to attend to the work of giving out and taking in books, in addition to the regular work in my department and to the other library duties, the Nicholls scholarship, value \$100, was awarded to a student taking a post-graduate course, on condition of his assisting the Librarian. Mr. John A. Sinclair, M.A., held the scholarship during the past session and, with the assistance of Mr. Ikehara,—whose time was paid for by Mr. Hugh Macleunan, Montreal,—attended to giving out and taking in books.

As the work of my special department, Political Science, is rapidly increasing, I hope that, at no distant time, the Trustees may be able to relieve me of the position of Librarian. The duties of the Librarian are also growing with the growth of the University.

ADAM SHORTT, *Librarian.*

Facsimiles of Manuscripts in European Archives Relating to America, 1773-1783.
B. F. Stevens, London.

This is a very unique and remarkable publication, relating to the most critical period in the history of North America. The exceptional character of the work, beyond the value of the records themselves, lies in the unquestionable accuracy of the reproductions. In these sheets we have not only the words of the original documents but the very handwriting with all the incidental elements of alteration and erasure. As material for historical research they are perfect. The period from 1773 to 1783 covers most of the short time during which the United States and Canada were connected with the same British government. Many of the documents reproduced relate directly to Canada, and most of the others have an important bearing on her history. The entire collection, most of which is already issued, will contain facsimile reproductions of about 3,000 documents. The cost of the complete series will be \$500,—not a high price when we consider the necessary expense of such an undertaking. This sum, however, puts the work beyond the reach of our modest library allowance. An act equally generous and public spirited, on the part of some one interested in the history of Canada, and with means sufficient, would place within the reach of our professors and students this store-house of original material from which many may draw supplies, and yet none the less be left for their successors.

EXTRACTS FROM LETTERS RECEIVED BY THE
MANAGING EDITOR.

The following extracts are an indication of the manner in which the QUARTERLY has been received. Our list of subscribers is already of respectable dimensions, and steadily growing.

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I am not a Queen's man, but I am a Canadian and glad to do anything to help take away the disgrace marking our higher journalism. Put me on your list, the enclosed to pay for the privilege."

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PUBLISHED JULY, OCTOBER, JANUARY AND APRIL,

UNDER THE AUSPICES OF ALUMNI AND FRIENDS OF QUEEN'S UNIVERSITY, KINGSTON, CANADA.

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