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It will be greatly to the advantage of the GAZETTE for Students to patronize our advertizers.

VIEWED from a speculative or purely ideal standpoint, the question as to the advantage which is desirable from a general College course admits of but one answer. Nobody disputes the abstract proposition that a good education fits a man better for that 'complete living' of which philosophers talk; that it opens up to him a new and purer sphere of enjoyment; that it gives him a wider range of thought and higher standards by which to measure his conduct. No doubt also your college bred men will, by reason of his education, prove a better citizen. He will be more likely to give a hearty support to great public reforms which may be mooted; for knowledge is *radical* in its mental bias, while ignorance is *Conservative*. When election day comes around he will probably poll a more intelligent vote than the average elector. He will likewise be a better member of the body social; he will have a high idea of law and order; he will do something to break up that class or

sectional feeling—the modern caste system—which is so prejudicial to the well being of society as a whole.

But to accomplish these ideal objects the colleges ought to educate men for all the higher class occupations of life—and by the term 'higher class' we mean all such occupations as are not menial in their nature. In this respect it must be admitted that the result of collegiate work in this country (as in most new countries) has been eminently unsatisfactory. Our colleges have so far been little else than training schools for the "great professions," for the teaching profession and for other species of high-class intellectual work. We are compelled to admit that she has done little or nothing for those occupations upon which depend the material prosperity and advancement of the country.

This state of affairs surely demands the consideration of every advocate of higher education. We must sooner or later face the question, whether the ordinary effect of a college course is that the young man has thereby conceived a contempt for everything but professional or higher class intellectual work; whether he has grown so puffed up from having acquired a little store of knowledge that he disdains to work for his living. If this be so, and we submit the tendency is unmistakably in this direction, if the usual effect of a college course is to make the youth who takes it contemptuous of those great pursuits upon which the material well-being of this country depends, then the value of that course must be considered as decidedly doubtful. What in our opinion is required to-day is a new view of the relation between education and the commonplace business of life. It is only natural that education should make our youth dissatisfied with menial occupations. You will never get an educated man to dig drains at so much per rod, or to do the work of groom at so many shillings per week. That is quite right; we do not quarrel with higher education because it gives a man a higher idea of his own worth, because it opens up new spheres to rising ambition; for just therein lies its grand value. But we do quarrel with higher education because at the present time in this country it points out only a few of the many roads that rising ambition might take. We find fault with it because it has encouraged few or almost none of our young men to engage in those active occupations which increase the wealth and material prosperity of the nation.

PROFESSOR ELLIOTT of Harvard, referred in a recent address to the relations between Radcliffe College, as the Harvard "Annex" is henceforth to be called, and the university. He said that "we have learned in the last twenty-five years that young women are quite as capable of the higher studies as young men," and pointed out that although there had never been any official connection with Harvard, the Annex had never had any teachers who were not Harvard professors or instructors, and its students had always had the same examination papers as Harvard students. There were two reasons why the governing boards of the university had refused to give the women college degrees outright. One was that the business of the university is constantly increasing and is already a load upon the board of overseers and the corporation; and the other that the institution cannot at present, offer women all the advantages that are now offered men, and that "until the university can give with assurance a degree with its privileges to all alike, we cannot undertake to give it at all." The present relation he said "is a long step forward, and it leaves the way open, very wide open, for further steps when the time comes." Thus Radcliffe College has apparently only to wait in patience, and it will before long be admitted to full standing, as one of the departments of Harvard University.

THE vexed question of the right of the University of Cambridge to arrest and imprison persons not members of the University, is to be decided soon in the negative. According to the *New York Evening Post*, the dons and the municipal authorities have agreed upon a bill to be introduced at an early date in Parliament, by which part of the charter of Elizabeth is to be repealed, and the jurisdiction of the University officers is to be limited to members of the University, over whom the proctors will still have the power of police-constables, for the maintenance of discipline. The power of revoking theatrical licenses is to be vested in the County Council, and of revoking licenses for other public entertainments in the licensing justices, both of which powers have hitherto been in the hands of the University authorities.

AMONG THE PHYSICISTS.

WE were descending from the GAZETTE'S sanctum in a brown study as to how copy was to be found for the next issue, when a gleam of light from the Physical Laboratory suggested the possibility of finding material there. We knocked therefore at the door—the timid knock characteristic of the newspaper reporter. After some waiting the door was opened by Kittelson, who bade us come in, but straightway disappeared behind a black curtain, through whose meshes the light of an oil lamp was vainly endeavouring to escape. Obviously he did not welcome us. So seeing Wood and Long at the other side of the room and uncurtained, we made for them. We had taken but three steps, however, when "Please wait a moment" from Wood, who was energetically stirring a pot of hot oil, checked our advance. He stared a while, his eye fixed upon a thermometer, when he ejaculated "Read!" "Forty-eight point six," said Long in response. "Two hundred and ten point three" returned Wood. "And zero?" "As before." The entry of these mysterious numbers in a book seemed to relieve the tension, and they welcomed us with apologies for their apparent rudeness. They had feared we might have knives or keys in our pockets, or hob-nails in our boots, any or all of which might have vitiated the reading of their galvanometer. We admitted that their fears had been well grounded; but asked why they attached so much importance to a hob-nail when they were within three feet of a hot-water radiator. We were told in reply with lawyer-like precision—(1) that the radiator even if of iron, was stationary, and would thus have no deleterious effect unless its temperature should change; (2) that as its temperature might change in the course of a series of observations, it was constructed wholly of brass, and (3) that for the same reason all the hot-water apparatus within thirty feet of them, upstairs and down, was of the same material. So susceptible was their apparatus to ferruginous influences, that on one occasion an ironical remark made about it by Kittelson, on the other side of the Laboratory in the middle of one of their readings, had put the reading out. Such an effect, was of course, capable of psychological explanation. But self-respect compelled them to regard it, as at any rate, possibly physical in its nature.

On inspection, we found this very susceptible instrument consisted of nothing more than a coil of wire with a small magnet hanging inside it. Small things as well as small people you see are apt to be sensitive. A mirror was attached to the magnet, and a beam of light from a lamp, after passing through a spectacle-glass, was reflected by the mirror to a paper-scale. It was the position of the spot of light thus produced on the

scale that Long was carefully observing. He was enthusiastic in his appreciation of the beauty of its motion. As the oil was heated, it would slowly creep farther and farther from the centre of the scale, and when "contact" was broken for determining "zero," it would dart towards the centre, oscillate for a little about it, and finally settle down to rest. We were reminded by it of a peculiar kind of evening entertainment very popular in Japan or some such far away country. Just as we sit for hours having our ears tickled with music, a Jap audience (if we may use the term in this connection) will sit watching spots of light moving on a white screen, with harmonic motions of varying complexity and form. Here would thus seem to be some foundation for Long's enthusiasm. In fact it has been exhibited by greater men than he, as we found when he recited to us the following verses from Clark Maxwell's "Lectures to Women:"—

"The lamp-light falls on blackened walls,
And streams through narrow perforations,
The long beam trails o'er pasteboard scales,
With slow-decaying oscillations.
Flow, current, flow, set the quick light spot flying,
Flow, current, answer light spot, flashing, quivering, dying."

"O look! how queer! how thin and clear,
And thinner, clearer, sharper growing!
The gliding fire! with central wire
The fine degrees distinctly showing.
Swing, magnet, swing, advancing and receding,
Swing magnet! Answer dearest, what's your final reading?"

"O love! you fail to read the scale
Correct to tenths of a division,
To mirror heaven those eyes were given
And not for methods of precision.
Break contact, break, set the free light-spot flying.
Break contact, rest thee magnet, swinging, creeping, dying."

Long hastened to say that the main object of their experiments was not the delicious excitement produced by observation of the light spot, but the determination of the thermo-electrical relations of certain metals, two of which were in circuit with their galvanometer. How that was done, he and Wood explained to us very clearly. Unfortunately we did not make short-hand notes and it is no longer very clear. But that they were successful was apparent from the "beautiful parabolic curve," which, as they shewed us, their observations gave when "platted." Why there should be a parabolic relation between the temperature of the "junction" in the oil-pot, and the motion of the light spot, we could not guess. Nor do we believe that the experimenters knew. On our enquiring they answered loftily that their first business was to determine empirically what the relation was, and only when they had done that would they set themselves to account for it.

But the oil was cooling; and at a gentle hint from Wood we entered a dark room, in which we found Legrand and Placing-

ham at work—or at play, with a Magic Lantern. On a white wall was a large image of a vertical tube, with one end dipping beneath the surface of a liquid. The liquid had risen to a height of two or three feet in the tube; and while Placingham was measuring this height, Legrand was seeing to the adjustment of the tube itself in the Lantern, and observing the temperature of the liquid.

It appears that some doubt has arisen in scientific circles as to the effect which the addition of certain acids to water has on its "surface tension." We looked puzzled at this term, but were told that it was closely connected with the phenomena of the soap-bubble, in which department we had, by a curious coincidence, made some experiments ourselves. At the surface of a liquid, we were told, a liquid film is always formed which has somehow a desire, or a tendency at least, to make itself as small as possible. In the case of the sheet of soapy water of which the soap-bubble consists, it compels the sheet to take the spherical form, that being the form of smallest area consistent with the enclosure of the air inside it. When a tube of very small bore has an end dipped in a watery liquid, the film inside the tube becomes covered, and in its efforts to straighten itself it runs up the tube, hand over hand as it were, the liquid following it, until becoming exhausted it comes to rest. The stronger the film the higher will it be able to climb, or rather the greater will be the weight of liquid which it can pull after it. And thus Legrand and Placingham were engaged in measuring the heights to which water, and water mixed with acids, would rise in the tube; and they were afterwards to find the weights per cubic inch of these liquids. Their main difficulty was in measuring the heights. Well-equipped laboratories have micrometer arrangements for the purpose. But our governors believe in the steeple-chase method of education. They consider the inherent difficulties of scientific research insufficient for educational purposes, and put hurdles and pit-falls in the student's way. Thus instead of providing micrometers for the above purpose, they supply nothing but a yard-stick, a weapon of great utility for many purposes, but of little use for measuring a length accurately to the thousandth of an inch. Our experimenters had got over their difficulty by attaching their tube to a glass scale, (one etched by Dr. H. A. Bayne, by the way) and throwing a magnified image of tube and scale on a white wall. The yard stick being applied to the image, the inevitable error in the result is diminished as many times as the image is greater than the tube itself. They are thus able to measure with considerable accuracy the height to which different liquids rise in their tubes; and when they have made a sufficient number of observations, will doubtless be able to draw valuable conclusions.

While these experiments are most interesting, they do not seem to have the same stimulating effect on the literary faculty as the quivering motion of the light spot. At least neither Placingham nor Legrand had met with verses suggested by them. One would have thought that any physicist, who had seen the little film climb the narrow tube, dragging after it a lengthening column of liquid, become exhausted, prop its knees against the sides of the tube and hold in for dear life until he could make his measurement, must, had he any poetry in him, or even only any common gratitude, burst out into eulogistic song. Possibly the heroism of the climb has not hitherto been revealed so clearly as by Legrand and Placingham on their Laboratory wall; and we feel sure that at no distant date we shall be able to present our readers with a new version of "Excelsior" by these ardent experimenters.

Mr. O. N. Trent to whom we now turned, was engaged in more prosaic work. No bobbing lights or wall pictures for him. Being an engineering student he was experimenting on the strength and elastic properties of materials. He had just finished an investigation of the longitudinal elasticity of india-rubber, and shewed us his "curves." They gave clear proof that up to a certain limit the extension of an india-rubber cylinder was proportional to the stretching weight (the *rit tensio sic vis* of Hooke) and that up to a higher limit the extension was proportional to the quotient of the weight by the section of the cylinder. At present he was at the "gallows," not expiating any misdemeanour, as would seem to be implied in the name which the physicists facetiously give to their bracket arrangement for suspending wires, but verifying the laws of tension. He was determining for this purpose to the two-hundredth part of a second, the time of oscillation of a heavy body suspended by a wire, and finding out how it depended upon the length and thickness of the wire. We were glad to note that for the determination of the lengths and thicknesses, he was provided with more refined means of measurement than a mere yard-stick, and were especially interested in the little instrument by which he was able to find the diameter of a wire to the thousandth of an inch.

Leaving Trent to count his oscillations, we found Kittelson at leisure, but in a very bad humour. His work had been interrupted at a critical point by the feuds of the Freshmen and Sophomores. "Look at that light spot" he said. "It ought to be at rest." We looked and found it dancing to and fro, and up and down, in a manner so engaging as to have charmed the appreciative heart of a Clerk Maxwell, though it filled our friend with indignation only. "It was all right until the Freshies came out of their class. They obviously met some Sophs in the corridor and are engaged in a tussle. You see, my gal. "(another

pleasantry of the physicists,—we need hardly say galvanometer was meant) rests on a stone shelf built into the wall of the Lab.; and a tussle in the corridor shakes the wall and sets my light-spot dancing. I expected this, having once upon a time been Fresh myself, and I tried to get my measurement finished before the ringing of the bell. But there was not time and now my last half-hour's work must be repeated." He would obviously have been glad to suspend the offending combatants from Mr. Trent's gallows, and subject them to a combination of longitudinal and torsional strains.

We expressed our sympathy but were secretly rather pleased at the interruption. For Kettelson was thus set at liberty to satisfy our curiosity. He was measuring the electrical resistance of a mixture of two solutions as a step in an investigation of the relation of the resistance of the mixture to that of its constituents. The investigation was interesting, we were told, as being likely to throw light on the state of salts in solution, and thus in the constitution of liquids generally. He explained to us the mysteries of the Wheatstone's Bridge method of measuring resistance, the difficulty of applying it to solutions, and the device he was employing to overcome that difficulty. The greater part of the session had been spent in testing and improving his method, and he was only now getting to work at measurements. Hence the value of every half hour, and hence also his righteous indignation at the thoughtless muscularity of the 1st and 2nd year men.

The prettiest part of his work to our uninitiated minds was the determination of the quantity of salt in his solutions. They were colourless, and he had in a graduated tube another colourless liquid. Taking a measured quantity of his solution, he allowed the liquid from the graduated tube to flow slowly into it, stirring the mixture with a glass rod. After a while a red colour appeared. Then he added enough of his solution to destroy the colour, and finally let liquid from the graduated tube flow very slowly drop by drop, into the mixture until the red colour again appeared when the flow was promptly stopped. Then reading off from the graduated tube the amount of liquid which he had used, and knowing the quantity of his solution which had been mixed with it, or was able to find out the percentage of salt his solution contained. "Exactly?" we asked. "Of course not," K. said, "but accurately to the fourth," (I think it was.) "significant figure." And then he explained to us that neatness is unattainable even in a world from which Freshmen and Sophomores are excluded, but that an experimenter always aims at attaining as high a degree of accuracy as is requisite for his purpose, and at knowing the degree of accuracy to which he has attained.

Here Kittelson glanced at his light spot which was again at rest, the hatchet having been temporarily buried outside. So we thanked the physicists for their courtesy and bade them adieu, Lang reciting for our benefit an appropriate stanza from Maxwell's ode on Tyndall :

"Here let me pause. These transient facts,
These fugitive impressions
Must be transformedly mental acts,
To permanent possessions.
Then summon up your grasp of mind,
Your fancy scientific,
That sights and sounds with thought combined,
May be of truth prolific."

PROGRESS AND POVERTY.

II.

HENRY GEORGE'S general problem is exemplified in the "everywhere recognized" fact, that wages tend to a minimum which will give but a bare living. The attempts made by so many economists to prove that this is a necessary outcome of the relation of capital and labor, show that they believe in it. Yet there are many who deny its truth. They point to England and say that there at least, for the last half century, wages have steadily increased. But there are too many other circumstances to be taken into account in the case of England, so that without a knowledge of their influence on wages, we could pass no judgment on their general tendency to a minimum. I need only mention the impetus given to trade and to manufactures of all kinds by the adoption of free trade, emigration, minor laws, etc. The United States on the other hand show a steady decrease in wages for the last few decades, in almost all lines of work. This of course may be partly due to the trade policy of that country, but yet this country would be the best instance of what the general tendency would be under the existing state of society. Admitting then, that wages do tend to a minimum which will give only a bare living, shall we accept the general explanation of this phenomenon, that a certain amount of capital is set apart as a wages fund, and that the wages must necessarily depend on the number of labourers. This is too absurd to be repeated. Why must the capitalist pocket his thousands while the labourer is to be satisfied with a mere existence, and that itself is allowed him with the air of charity? Is not the success of the undertaking due as much to his exertions, as to the accumulation of capital on the part of the other? And is it not right that a fair share of the profits should be his? George's refutation of this theory is, I think, final; but in his eagerness to confute it, he goes too far in the opposite direction, when he maintains that neither the wages nor the maintenance of labor

depends in the least upon capital. This he attempts to prove by reference to the primitive state of society.—Society in its most highly developed form, he claims, is but an elaboration of society in its rudest beginnings; and that principles, obvious in the simpler relations of men are merely disguised, and not abrogated or reversed by the more intricate relations that result from the division of labour, and the use of complex tools and methods. If Mr. George has a right to this promise, we cannot dispute his conclusion. But surely the laws which held sway in a primitive state of society are not sufficient—yea, are even injurious in a complex state. The principles of justice, honesty and personal rights, if they do exist apart from society, may be claimed to be unchangeable but not the commercial ones. It is folly to separate capital and labour, and to point out where the function of the one ends, and the other begins. It is not a question of which is antecedent in time, but what under the existing circumstances must be their relations.

It is folly to say that wages are never paid out of capital; that labourers are not sustained by it; that it does not often supply the material for labour to work on, and that it does not limit industry. To avoid the admission of these patent facts, he cunningly defines capital as wealth used for the procurement of more wealth, as distinguished from wealth used for the direct satisfaction of desire. Does this definition mean anything more than that capital is wealth, used for the procurement of more wealth, as distinguished from what nature gives us in our primitive state, to work with until we can get some capital laid by? But are not the plough of the farmer, and the needle of the seamstress—which he admits to be capital—used for the direct satisfaction of desires? We see the object of Mr. George in this line of criticism. He wishes to show that since wages do not depend on capital, the condition of the poor cannot be remedied by increasing capital, by the restriction of the number of labourers, or the efficiency of their work; and thus he paves the way for some other panacea for all their ills. According to his theory, each labourer creates the funds from which his wages are drawn, and as the labour becomes more and more remunerative, the greater the number of labourers; as their numbers increase, their wages should also increase. It is manifest injustice then, if as time goes on, wages tend to decrease.

It should not be forgotten, in justice to the capitalist, that owing to keen competition, it is more difficult for him to realize as much on his capital now, than it was when fewer competitors were in the field; but he should see to it that all the loss should not fall on the labourer.

In his refutation of the Malthusian theory, we cannot but agree with him. The theory was based on the relation of the increase of population, and means of subsistence during a few

years of depression in England; and because true of these, hence it must be true of all time, and in every circumstances. To illustrate in the words of Henry George:—

“It begins with the assumption that population tends to increase in a geometrical ratio, while subsistence can at best be made to increase only in arithmetical ratio—an assumption just as valid, and no more so, than it would be from the fact that a puppy doubled the length of his tail while he added so many pounds to his weight; to assert a geometric progression of tail, and an arithmetical progression of weight. And the inference from the assumption is just such as Swift, in satire, might have credited to the savans of a previously dogless island, who by bringing these ratios together, might deduce the very “striking consequence,” that by the time the dog grew to the weight of fifty pounds his tail would be over a mile long and extremely difficult to wag; and hence recommend the prudential check of a bondage as the only alternative to the positive check of constant amputations.” But not by ridicule alone, but by facts does he show the untenableness of this theory; and history proves its opposite to be true. This then is not the desired remedy.

HIGHER EDUCATION AND TECHNICAL EDUCATION IN FRANCE.*

THIS is the title of a book which has been issued under the auspices of the *Comité de Patronage des Etudiants Etrangers*, for the information of students in other countries who may be desirous of prosecuting their studies in the admirably equipped institutions of learning in the French Republic. The Comité is a society with headquarters in Paris, and branches in various educational centers, whose object is to receive foreign students, provide information as to studies, expenses of living, &c., and to render their sojourn in France as profitable and agreeable as possible. The book itself is an admirable compilation and condensation of facts about the higher educational institutions of the republic, showing in Part I. exactly what facilities for study are afforded by the more important educational centres of the metropolis and the provinces; and in Part 2, what facilities are afforded throughout France for the study of the various departments of knowledge.

The higher educational institutions of France have in recent years been undergoing not only a very rapid growth, but also a very extending organic development. Before the Revolution

*L'enseignement Supérieur et l'enseignement technique en France, par Paul Melon, Paris: Armand Colin et Cie. 1893.

they consisted of 22 universities which, however, through the opposition which they offered to progress, had fallen into the utmost discredit, Francis I. for example, having found it necessary to establish in Paris the *Collège de France*, independent of the university, in order to make provision for new subjects of study. In 1789, public opinion demanded either their reformation or their suppression. Grand schemes were proposed for the founding of a vast Encyclopædic Educational Institute in their place. But the development of such an Institute required time, and after a discussion extending over some years, the policy was adopted of founding independent special schools, each devoted to some one department of knowledge or practice, and having complete liberty to grow as the requirements of the time might suggest. Natural Science was entrusted to the Museum, and Astronomy to the Bureau des Longitudes. The Conservatoire des Arts et Metiers was founded for the study of Applied Science, as well as such institutions as the School of Living or Recital Languages, the Polytechnic School, and the Normal School. The higher educational policy having been thus settled, subsequent governments followed it also. The Consulate founded new special schools of law and medicine. The empire which restored under the name of Faculties of Science and of Letters, the old Faculties of Arts, did not depart from the policy of the Convention. The Bourbon Monarchy in 1821, organized the *E'cole des Chartes*, that of 1830, founded new faculties in the provinces, and the Empire created the *E'cole pratique des Hautes E'tudes*.

As time went on, however, the disadvantages of independent special schools became more and more apparent. Independent and isolated bodies were found to lack the attractive power inherent in a larger central organization. Departments of knowledge which did not come within the domain of existing schools, and which were not of sufficient importance to have schools specially organized for them were neglected. And the broad culture which springs from the study of other subjects besides the one selected for the students life work, was found to be difficult of attainment. Accordingly for the last 20 years there has existed a movement towards combining the independent schools in different centres into organically connected groups. The movement has taken place by a series of steps carried out by successive governments, but all in the same direction, until now the Faculties and many of the schools in different important centres are so organically connected as to form universities in all but the name.

Side by side with this local centralising of the independent school and faculties there has been developed an increased appreciation of their work, resulting in an enormously increased expenditure on them, both on the part of the state and the

municipalities. Thus Caen and Grenoble, cities of about the same size as Halifax, the capitals of departments having about the same population as Nova Scotia, have expended on their Faculties \$180,000 and \$144,000, respectfully. In 14 years the state and the municipalities together have devoted \$23,000,000 to extraordinary expenditure on higher education, while the ordinary annual expenditure during the same time has trebled, being now \$2,280,000—these sums not including what has been expended in the great special schools of Paris. The number of new professorships, lectureships and tutorships which have been founded is 540; and libraries, laboratories, and illustrated collections of all kinds have been largely extended.

The facilities for study afforded by the various schools and colleges of Paris are enormous, and cannot even be outlined in a short article. It will be more interesting to our readers if we give a short sketch of the facilities afforded by cities of about the same size as Halifax,—such as Montfeller, Besançon, Caen, Grenoble, and Poitiers. All have Faculties of Law, Science and Letters, and Schools of Medicine, the combined Professoriate in the case of Poitiers, which is a smaller city than Halifax, and the capital of a smaller district than Nova Scotia, reaching the number of 45. In all there is extensive provision of facilities for practical work and original investigation, laboratories being provided in all in Physics, Chemistry, Zoology, and Botany, Anatomy, &c., and in several cases in Geology, Mineralogy, Physiology, &c., as well. All possess collections, in some cases rich collections, illustrating the various departments of Natural History, and some have Archæological and Art collections as well. They possess Botanic gardens without exception. The University Libraries range from 17,000 up to 150,000 volumes, the average being 51,000—and in all cases there are municipal and other libraries open to students, which in most cases are much larger than the University Libraries. Besides the above schools there are in some of these cities Agricultural Schools, and Experiment Stations, Schools of Music and Schools of Art.

In the French Universities and Faculties the classes are open without fee and without preliminary examination, both to natives and foreigners, and the University degrees are open to all without respect to nationality. To become a candidate for a degree, however, or to enter the special schools of Paris, a foreign student must satisfy the authorities that he has undergone a preparatory training, equivalent to that implied in the French degree of Bachelor, and certain fees are exacted of all candidates for degrees.

We have culled a few facts from M. Melon's book. Those who are interested from any point of view in the Higher Education, will find in it a perfect mine of information.

THE NARROWNESS OF THE BROAD, AND THE LITTLENESSE
OF THE GREAT.

THE head of my article is a paradox, but in human history it has often been verified. We have seen it exemplified in our own time; and the story of the past establishes the truth of it, as well as the fact of heroism. Did we want a text of Scripture to confirm it, we might refer to Isaiah, when he tells us to "Cease from man, whose breath is in his nostrils: for wherein is he to be accounted of?" Or we might take the words of the Hebrew Poet, "Put not your trust in princes, nor in the Son of Man, in whom there is no help. His breath goeth forth, he returneth to his earth; in that very day his thoughts perish." On the ground of man being but "ashes and dust," we might reasonably expect his breadth of mind to be narrow, and his greatness to be, at its highest, but little.

Men of genius, I fear we often forget, are not an exclusively modern production. The early days of our race, although unscientific, and innocent of most of what have been called modern improvements, were not unfruitful in broad and great minds. Let these great hearts and broad intellects had their narrownesses and their littlenesses. Hercules was at once a Titan and a worm. Merlin was a prince among wizards, and a paragon of slaves. Abraham was the Friend of God, and Heir of all our mighty Christendom; but none the less was he the thrall of the Egyptian king, and the husband of Keturah. Solomon was wisest among the wise, and foolishest among the foolish. Mahomet was the Prophet of God, and, in a sense, the prophet of His Adversary.

In more recent times, the same feature of narrowness and littleness has been observable in some of our greatest writers and thinkers. The case of Bacon, "the greatest, wisest, meanest of mankind," will occur to us at once. A man capable of great purposes, endowed with profound reflective powers, a mind easily at home in the society of large and entangled thoughts; a man with invention, with refined and delicate sensibilities; a man of exquisite taste and faultless judgment,—yet a man deficient in the moral sense—a dishonest man—a pilferer.

And then perhaps some of us will remember how busy Scandal has been with the sacred, almost mythical, and well nigh canonized memory of Bacon's contemporary, our greatest poet, William Shakespeare. With a mind as broad as the mysterious life of man, high and aspiring as the eternal azure, deep and penetrating as the abyss; a heart like a well of tears, and anon wetting over with sunshine and pearls of laughter:—Even this great personality, it would seem, has had to show that "the house was builded of the earth"; and even while it lived

and soared was also under the chemical law of affinity and the physical law of gravity. There is far too much of humor in his works—humour, that is, regarded as it has been defined as, "a sympathy with the under side." The humour too often grovels. So that to my mind while Shakespeare is great and perhaps the greatest, as an artist, as a builder of the lofty rhyme, he is not as great a *man* as some people would fain have us believe. While many of the traditions concerning his youth and his manhood, reflecting no credit upon his character, may be untrue; yet doubtless in his works we have his mind's likeness. And in this mirror are there not some distorted, warped and stunted human lineaments?

We might pursue this enquiry through the range of our literature since Shakespeare's day, and we would find that the word *narrow* or *little* would apply in some sense or other to most or all of them. We would certainly find it true of Dryden—of Pope—even of Addison.

And when we have come down to our own century, to the days of Goethe, of Carlyle, of Macaulay, of Ruskin, of Victor Hugo, and Herbert Spencer, what we have heretofore found true of the great and the mighty in human affairs, is not the less true of the giants who have been abroad in these last days. It will be observed that our own age has had no dearth of the heroic human element. Perhaps no superior age has the world ever had in this respect. Yet the unheroic in our heroes has also survived. Macaulay could be noble, but he could also be very small. Goethe has a halo of glory around his head, but no girdle of righteousness and faithfulness, like Christ, about his loins. Carlyle, also, with all his integrity, with all his scorn of simulacrum, with all his deification of honesty, and honour, and truth—does it not sometimes appear from his remains as if he had been *two-faced* a little, as so many of us are? And, not to speak of the many things that pain us in his biography, was he not in some senses, with all his real breadth of intellect and sympathy, essentially narrow? He failed to see wherein he, and such writers as Hugo, and even Mill, were in the end aiming at the same goal. Carlyle's ideal of human government was the strong-minded, strong-hearted, strong-handed, right-loving and right-acting king. With such a king, doubtless—and such ideal form of kingly government, had been deemed feasible by such writers as Hugo, no quarrel would have occurred. Such government would have been thrice welcome to the better class of writers among the encyclopedists, and those who imbibed their principles. But such government, doubtless, they thought visionary. They had never seen it realized in France. Louis XIV did not realize it, neither did Louis XV; much less did Louis XVI. Under such government and such governors, what could be advocated but revolution? Of course

Carlyle recognized the need of revolution in this case; but he had no toleration for the "Liberty, Fraternity, Equality," which such a writer as Hugo thought could only come to the human race through such a revolution and the republicanism which followed in its wake. These two great men, great intellects and great hearts, were really eagerly in quest of the same thing:—and what applies to Carlyle in his attitude to Hugo, applies equally well to Ruskin—they were in quest of the best interests of men; they were speculating as to the best kind of government under which peoples might breathe freely and live nobly; and what in the end would have satisfied the one, would have satisfied the other: yet they were on each side too narrow to see anything good in the cause of the opposite party. Ruskin and Carlyle denounce Hugo—and the latter, as we know, from a sonnet of Tennyson's to him, cared as little for England and the opinion of these Englishmen.

From what has been said in this article, the writer hopes that no one will conclude that he has no esteem or affection for what are called great men, or men of genius. Quite the contrary is the truth. It was his aim entirely to set forth the unheroic side of their heroism. This side has been often neglected; and the neglect proves fatal to little lives who have their own destinies to curve as best they can, and are in danger on the one hand, considering their own narrowness and littleness, of despairing of ever reaching anything noble; or on the other of taking some one or two of these men as an ideal and inspiration. There is only one life that it is safe so to take—and that life was more than man's.

College Notes.

PROF. FALCONER addressed the college Y. M. C. A. on the 4th inst. His subject was "The claims of the Ministry."

* * *

SOME of our professors are inclined to be tardy. We can excuse this, but we would like to be notified when the professor does not intend to appear at all.

* * *

WE understand the Plug Alley, Pine Hill game, is off for the year and the Pluggers claim the championship, their clerical brethren refusing to come up to time.

* * *

SOME of the students in Philosophy purpose organizing a Philosophical Club. Subjects will be selected for study during the summer, and the club will meet for the reading of papers and discussions during the session. This is as it should be. We understand that no one can become a member who is not willing to devote time and thought to the subject.

THE gymnasium classes are better attended this year than ever before. No doubt this is due to the hour at which they are held. Still they are not nearly as large as they should be, and never will till our gymnasium is greatly improved.

* * *

THE Glee Club is doing good work under the efficient leadership of Mr. Gatwood. The average attendance is about 24. At the last business meeting of the club, it was decided to give concerts at Truro and New Glasgow about the last of March. Come boys, now turn out to practice, and follow the example of the faithful Secretary, who is always at his post. We hope this venture of the club will be a success financially and otherwise, and that Dalhousie may have no need to be ashamed of her embryo musicians. Some of the Haligonians are already asking if we are not going to give a concert in Halifax too. What is the answer?

* * *

THE entertainment of the second year netted some twenty-five dollars. This sum added to a donation from the friends of the college who has so generously supplied the library with periodicals this year, has been expended in the purchase of standard works in literature and criticism for the De Mille Press, J. A. Symonds's "History of the Renaissance," which we have long needed; DeKoe's Prose Works, Pater's "Appreciations" and "Imaginary Portraits," Lang's delightful book "The Library," Lubbock's "Pleasures of Life," Holbein's "Dance of Death," Holmes' "Breakfast Table Series," Stedman's invaluable "Victorian Poets," Lowell's "Prose Essays;" in all twenty-nine volumes have been added to our shelves. If we could only do so much every year!

* * *

NOVA SCOTIA is at present undergoing the excitement of an election contest, and among the candidates who have been selected, we notice quite a number of Dalhousie men, viz:—Dr. Bethune in Victoria; E. C. Gregory, L. L. B., in Antigonish; E. M. Macdonald, I. L. B., and Wm. Cameron, in Pictou; in Colchester, A. E. Dickie, M. A., carries the flag for his party, and from the Cornwallis Valley come good reports of the orator, Wickwire. Guysboro', too, has not slighted Dalhousie, but has nominated Whitman, B. A., L. L. B., and Messrs. Sinclair and MacKinnon, who have taken partial courses in Dalhousie. Last, but not least, comes C. H. Cahan, B. A., L. L. B., the leader of Her Majesty's loyal opposition, and late representative of Shelburne.

* * *

VICTORY AND DEFEAT.—On Friday evening, 23rd Feb., our hockey team met the Wanderers for the first time this year, beating them by a score of 1 to 0. Pyke, Pickering, and Murray played a good game for Dalhousie, while Clarke and Henry did some fine rushing for the Wanderers.

Again on Friday, 2nd inst., we met them, but victory was not our lot. Their previous defeat had set the Wanderers to work, and they brought out against us the best team they could muster. During the first part of the game the ball was mostly in the Wanderer's territory, and a goal was scored by R. Murray. Then one of our best players and a Wanderer got in a dispute, which resulted in both of them being sent off the ice by the umpire. From this time the Wanderers had the

advantage, and in the second half had the puck around our goal most of the time, but owing to the quickness of Harding, our goal keeper, they were only able to get it through once. At the end of the second half the score stood 1 to 1, and it was decided to play on until one side should score; the Wanderers were the first to score, thus defeating us by a score of 2 to 1. Probably this is the last game of the winter, and our team is to be congratulated on the good work it has done, considering it had only two of last year's players on. It is to be hoped that the Athletic Club will give the team some financial support next year, as the players have to go to considerable expense to get a suitable place to practice in, and thus are unable to get well prepared for matches. Next year we will be able to get up a first and second team, and all they will require in order to gain the championship—as in football—will be plenty of practice.

* * *

THE Philomathic Society has been devoting its attention to Tennyson, lately. On Feb. 22nd, a meeting was held and the following papers were read:—

“Life of Tennyson,” by Miss Jennie Ross; “Tennyson's Idylls,” by Melville Grant; “Plato's and Tennyson's Ideals of Women Contrasted,” by Miss McPhee. The last paper aroused an interesting discussion of woman's rights, in which Arthur, Smith, Yorston, and McArthur took part.

On March 8th, Dr. MacMechan gave a lecture before the Society on “Hallam and In Memoriam.” He showed how Tennyson's whole work was influenced by Hallam's friendship, and how In Memoriam was directly caused by it. After the lecture a vote of thanks was passed and tendered to Dr. MacMechan. The officers for next year were also elected at this meeting. They are as follows:—

President — D. A. FRASER; Vice-Presidents — D. A. FRASER, J. STERLING, W. M. SEDGEWICK, G. SUTHERLAND; Sec'y-Treasurer—A. H. FOSTER; Executive Committee — MISS B. MACDONALD, G. ARTHUR, W. H. SMITH.

Dallusiensia.

FRESHMAN C—K (who is used to a country general store, in Knight's Book Room):—“Say, Mister, what do you charge for five cents worth of Salt-petre.”

FRESHMAN (at Ticket-office of Rink):—“Any discount to minister's sons?”

SAME Freshman (in Rink):—“Are you a good skater, Miss R——?”

Miss R——. “No, I'm sorry, I'm not.”

Freshman,—“O that's all right; I'll get some one else who is!”

SCENE I, (Scrimmage).—Self-Effacing Freshman (to Soph): “You may bounce me, but please do not touch my dear friend, Mr. R—b—s—n. There is something the matter with his heart.”

Scene II, (Spring Garden Road end Vicinity). Time.—Any day between 12 and 1 o'clock. Mr. R—b—ns—n may be seen walking slowly and painfully, supported by—a cane? No! Hallowed associations? No! guess again. Give it up? Better go and see for yourself.

PROF. OF CLASSICS.—“Where do you find that word Mr. M—rr—s—n?”
Mr. M—rr—s—n.—“Oh! that word is understood.”
Prof.—“Now, never mind understanding anything.”

WE have been lucky enough to secure a contribution from the Ladies' College for this issue, in the form of a poem, which sets forth the peculiar virtues of each of the well-known Friday callers. Freedom from all the trammels of convention characterizes this effusion. The dear authoress has used—perhaps some mean detractors will say, *abused*—a metre of her “own invention,” as the White Knight said. And why shouldn't she fix a standard for herself? The gentle reader will, without doubt, after a perusal of the poem, think the authoress justified in her bold departure from recognized models:—

There is a student who comes to our College,
His head is small, but full of knowledge;
He has a mustache very yellow,
But oh! his mouth is sweet and mellow
With tobacco.

Then we have our steady caller,
One limb you'll find to be much smaller;
For there are two girls who pull his leg, or
His name would never be McG——r.

A Freshman with a heart in pain,
Does call on us quite often;
His girl says as his name's McL——n,
Her heart to him does greatly soften.

But once he called upon another,
Whom we have spoken of before;
To whom J—k is more than a brother,
So Mac was kicked out of the door.

Next we come upon our Daisy,
So you'll know his name is B—l;
He for Ella is quite crazy,
But he will never go to—Heaven.

Cheeky Tupto you will find
Always calls upon his cousin,
He thinks he can,—but in his mind,—
Count his true loves by the dozen,
But he is away off.

For when he heads our grim procession,
As we waddle from the church;
If our thoughts to deeds we'd give expression,
With mud his face we'd gladly smirch.

Little Duggie is the shyest
Of the lads we ever met;
Oh! my love for thee I dyest,
But indoors I'll never get.

For I love thee at the distance,
When in church I see thee smile;
But when “Eddy” lends assistance,
It does always raise my bile.

POLITICAL BRIEFS.

A. GLADSTONE CUMMINGS will be tried under the Controverted Elections Act, for pairing off with two grits.

W. PROHIBITION MCKAY is busily engaged constructing a new government, and has wagered six cents on the results of the elections.

W. D. ROSS thinks the "land of potatoes" ought, with judicious handling, to return two Tories.

W. S. GRAY counts on plumpers from New Lairg. He says Hopewell is solid for Prohibition.

W. DEAL FORREST is enthusiastic over the Preston vote. He thinks that only the lately-deceived Jehu will oppose the straight Liberal ticket. He, the Jehu, is after road-money.

THE Prof. was in the lecture room,
The students sitting round,
Except the lecture going on
There wasn't any sound.

The lecture it was rather slow,
At least it wasn't fast ;
The lecturer was dwelling on
The dim and misty past.

There came a sound from out the wall,
A weird, mysterious noise ;
It gave poor Archie such a scare,
He lost his equipoise.

He thought of nitro-glycerine,
Of dynamite and bombs ;
With hair on end he looked just like
The maniac from the tombs.

And while he did investigate
The locus of the noise ;
The ladies in the front seat shrieked,
Eke likewise too the boys.

Behind the radiator he
Did thrust his daring hand ;
His look was fierce, like unto his
Who chased the German Band.

He pulled the infernal engine out,
His knees began to knock ;
He stared—he looked—he stared again,
It was an old tin clock !

S. POET.

Personals.

G. K. BUTLER has been called home by the serious illness of his father.

D. M. SOLOAN, B. A., of '88, is distinguishing himself as a *litterateur*. In addition to the enormous duties of the principalship of the New Glasgow Academy, he finds time to contribute articles to the 'Youth's Companion,' Toronto 'Week' and other leading papers. In the 'Week' of the 16th ult, there is a story entitled "The Ghost of the Mendoza," from his pen.

A letter from D. M. Robinson, '93, to one of the students says, that of the five teachers employed in the High School, Vancouver, B. C., four are graduates of Dalhousie : J. C. Shaw, '87, G. E. Robinson, '86, J. K. Henry, '89, and Alex. Robinson, '86. D. M. is teaching in the same town. We are expecting great things of the youth of Vancouver.

Law Department.

IN another page of this issue we give the results of the sessional law examinations. This year, to a degree much beyond previous years, is the class sheet an indication of the standing of the class. Sometimes we see a hard working man of excellent ability falling far below his fellows on account of a mere slip in the examination ; but this year, except in the case of two or three students who had the misfortune to be ill during, or just previous to examinations, we find the painstaking industrious men with *classes* far in advance of their competitors. To say that the contest was a severe one, and that the examination was rigid in the extreme, is to put the facts mildly, and several papers might be pointed out in which not only the whole ground gone over during the term was covered by the exam., but questions were asked on points never thought of in class. Such papers are hard on the man who tries to make a pass by a month's *plugging* of notes, but are great incentives to broad mindedness and wide reading, which are necessary to the full understanding of any subject, particularly a law subject. In reviewing the lists we rejoice with those that rejoice, and sigh in sympathy with those who mourn, and trust that the effect may be beneficial not only to those who got better marks than they really are deserving of, but equally so to those who are deserving of better things than the examiners thought the papers would warrant.

THE superiority of the English Bench over the Colonial is striking enough in all respects. We naturally expect such superiority. The present is but child of the past ; the English judicial mind of to-day is the evolved product of centuries. It has kept pace with the progress of English letters and English sciences—yea, has even exceeded the progress of the latter, for it is universally admitted that if there is one characteristic which distinguishes the English people from all other peoples, it is their genius for law and government.

In no respect is that superiority so striking as in respect of the *culture* which is so markedly characteristic of the English judges, and so sadly lacking in our Colonial. And here we submit the difference is greater than need be. After reading a judgment of the House of Lords, or of the English Court of Appeal, one turns away with a good deal of *taedium* from the judgments of our Federal and Provincial Courts of Appeal. In case of the latter the 'labor and delay of the file' is conspicuously absent. There is an absence of lucidity, of clear and

logical sequence of thought, which is often very trying to the reader. Our provincial judges, especially, make no pretence of giving anything like literary form and completeness to their judgments. Not infrequently one meets a judgment in our reports which runs on exactly like a pleading, beginning nowhere in particular, ending nowhere in particular; with 'ands,' 'buts,' 'whereases,' and present principles *ad. infinitum*. Over this formless and chaotic mass the spirit of the reader has to brood long and patiently before anything like *Cosmos* of idea arises before his mind. In short our judges lack the culture which is the pride and ornament of the English Bench.

By way of example quite recently, one of our judges in delivering his decision made use of an expression like the following: "The corporation *stands exactly in the shoes of the creditors.*" If the language of a judgment is to be criticized like any other composition, we should have to say that such a metaphor was essentially vulgar and betrayed a positive dearth of literary taste. We can easily imagine the surprise with which we should regard such an expression if it fell from the lips of one of the English appeal judges.

* * * * *

It is not to be wondered at that our lawyers are anglo-maniacs—even beyond the example of the ultra-loyal; that they regard the English judiciary with a feeling somewhat akin to superstitious veneration. The Colonial lawyer still drinks and must long continue to drink at the English fountain. It is still for him the sole abiding source of legal truth. To the student the decisions of the English House of Lords, or to speak more accurately, of the judicial committee of that body, rank with Holy Writ. They have the merit of possessing, for the time being at least, complete finality. There we have stored the classics of English law in which the student delights to revel. Then we see displayed as nowhere else the grand characteristics of the English people—their capacity for law (which is but a step removed from government.) England may well boast of her mighty empire, and her world-wide commerce; of her grand statesmen and her mighty men of letters; but one cannot help thinking that after all her most just boast and pride is in her famous judges.

THE NAMES OF THOSE WHO WERE SUCCESSFUL IN PASSING THE LAW SCHOOL EXAMINATIONS.

The result of the law school examinations were posted Feb. 28th as below:

PARTNERSHIP.

Class I.—D. K. Grant, Keffler, Outhit, Fullerton.

Class II.—Hewson, Robertson, Girroir, Hill, McLean, Vickery, Macdonald, McIlreith, Lovett, Crosby, Graham, Borden, Shaw, Payzant, Copp, Irving.

Passed.—Tremaine, Gillis, Finlayson, Barnstead, T. M. Fraser, McLeod

CONSTITUTIONAL HISTORY.

Class I.—Wood, Inman, Snyder.

Class II.—McVicar, Ross, M. D. Grant, Ternan, McKay, Scott, Loggie.

Passed.—Aikin, Wordman, McCart, Wood.

SHIPPING.

Class I.—McDonald, Keffler, Payzant, Robertson, Graham.

Class II.—Hill, Hewson, Borden, Barnstead, Finlayson.

Passed.—McLeod, Irving, Copp.

CONFLICT OF LAWS.

Class I.—D. K. Grant, Vickery, Fullerton, Lovett, McDonald, Crowe, Outhit.

Class II.—Keffler, Gillis, Girroir, Barnstead, Tremaine, Grosby, King.

Passed.—McIlreith, Finlayson, McLean, Shaw, McLeod.

CONTRACTS.

Class I.—Bigelow, H. Ross, Inman, Scott, Loggie.

Class II.—Ternan, Murray, Wood.

Passed.—McKay, McVicar, Mosely, Snyder, Woodaman.

BILLS AND NOTES.

Class I.—D. K. Grant, Graham, Outhit, Fullerton, Lovett, Borden.

Class II.—Gerrior, Barnstead, Crosby, Hewson, A. F. McDonald, Vickery, Hill, Keffler, Robertson, Tremaine, Gillis, Irving.

Passed.—Copp, Crowe, Finlayson, T. M. Fraser, Gillis, Hill, McIlreith, McLean, Payzant, Shaw.

EQUITY.

Class I.—D. K. Grant, Lovitt, Crosby, Fullerton, Girroir, Hewson.

Class II.—Graham, Robertson, Barnstead, A. F. McDonald, King, Vickery, Irving, McLean, Tremaine, Finlayson, Keffler.

Passed.—Borden, Gopp, T. M. Fraser, Gillis, Hill, McIlreith, McLeod, Outhit, Payzant, Shaw.

CRIMES.

Class I.—Bigelow, Wood, Ross, Ternan, Graham, Inman.

Class II.—McVicar, Crowe, McKay.

Passed.—Scott, Aiken, Loggie, Hood, Snyder, McCart, Woodaman.

CONSTITUTIONAL LAW.

Class I.—Grant, Murray, Vickery, King, Lovitt, Fullerton, Bigelow, Tremaine, Gillis.

Class II.—Crowe, McLean, Girroir, Outhit, McIlreith.

Passed.—Crosby.

INTERNATIONAL LAW.

Class I.—Graham, Hewson, Borden.

Class II.—McDonald, Robertson.

Passed.—Irving, Copp, Hill, Payzant.

REAL PROPERTY.

Class I.—Wood, H. Ross, McKay, McVicar, Ternan, Keffler, Bigelow.

Class II.—Scott, Barnstead, McCart, Snyder, Murray, Finlayson, McLeod.

Passed.—Inman, Hood, Loggie, Macrae, Woodaman.

TORTS.

Class I.—(alphabetical) Barnstead, Finlayson, Inman, Keffler, Loggie, McCart, McKay, McLean, McVicar, Macrae, Ross, Scott, Synder, Ternan, Wood.

Passed.—Woodaman.

Medical Department.

WE have received a few items intended for Medical Briefs column, unaccompanied, however, by the name of the contributor. We must respectfully remind our esteemed correspondent that the journalistic rule upon this subject is as unalterable as the laws of the Medes and Persians. All articles must be accompanied with the author's name, not necessarily for publication, but as an evidence of good faith. Our esteemed contributor, will readily see that while this rule applies indifferently to all contributions, it should be especially observed in the case of Medical Briefs. Anonymous correspondence has but one destination—the waste basket.

IMMUNITY.

PAPER READ BY DR. HATTIE AT STUDENTS' MEDICAL SOCIETY.

Mr. Chairman, Ladies and Gentlemen:—

The subject upon which I have chosen to prepare a short paper for your affliction this evening is not that stated upon your programme cards. It is an even more ambitious topic—one which has ever interested our profession, but to which an extraordinary amount of attention is now being paid. I wish to present to you a brief resume of the principle work which has, up to the present, been reported in the study of *Immunity*. And although this entails a certain amount of discussion of the phenomenon known as Phagocytosis, yet the part which the leucocytes play in the fight against disease is not universally regarded as being of such importance as that of certain other vital processes, to which I will devote a large share of my time this evening.

Were the audience which I now have the honor to address, composed wholly of those versed in the lore of the bacteriologists, the presentation of my subject would be a matter of relative simplicity. It is not possible to avoid altogether allusion to the bacteria, so these must be defined before any progress can be made. Bacteria, then, are exceedingly small vegetable organisms, so small that they can be seen only by the aid of a powerful microscope. They exist everywhere in countless numbers. The vast majority of them, so far as we know, are innocuous. In fact many of them probably play a role actually favorable to our existence. But there are certain forms which, under favorable conditions, are capable of producing

disease. These are the pathogenic bacteria, and are those that particularly influence our attention. Gaining access to the system, they multiply therein at an astonishingly rapid rate, drawing from it the nourishment they require, and charging it with the effete product of their metabolism. It is to such effete products that bacteria owe their malefic action. Various spoken of as ptomaines, leucomaines, albumoses, toxines, &c., &c., they are characterized by their intensely poisonous properties. No snake poison compares in virulence with the toxin formed by such a bacterium as that which causes tetanus.

The majority, if not all, of the infectious diseases are due to bacteria—the bacterium of each disease having peculiarities of form and function distinguishing it from that of any other disease, but all agreeing in that they produce disease by introducing into the system poisons elaborated in their small bodies. Toxic matters excreted by different bacteria, may present little difference in their chemical composition, and yet their physiological action may produce such widely varying results, as is indicated in the symptomatology of the disease diphtheria on the one hand, and that of tuberculosis on the other.

By immunity we mean the possession of some mysterious vital force which enables the tissues to successfully resist the action of bacterial poisons. The subject is a very baffling one, even with our advanced knowledge, and to those who lived prior to what I might call the bacteriologic age, it was perfectly insoluble. Is it not a strange thing that an individual after having had an attack of measles, or of smallpox, or of scarlatina, is rarely subjected to another attack? And is it not a strange thing that many people, though frequently exposed to infection, go through life without a touch by the contagious diseases? Such people are said to be immune, and the trend of much of the work which is being done along bacteriologic lines to-day, is towards the discovery of the means by which nature develops in the animal organism this antagonism to disease. The event of this research will be to establish the prevention of disease, which we have all been taught is better than the cure. Much has been learned respecting this intricate and extremely important subject, and although our knowledge is as yet crude, I feel no necessity for an apology in bringing it to your attention.

Immunity is natural or acquired. The natural immunity is that possessed by certain favored individuals, who may subject themselves to every likelihood of contagion, and yet escape disease. It is this natural immunity which interests us chiefly, and into which we will inquire to-night. But the acquired immunity which has been provided by honored men of medicine against certain maladies must be considered as highly deserv-

ing of notice, not alone on account of its great practical importance, but also because it throws a certain dim light upon the question of natural immunity. The induced form of immunity which Jenner has given us against smallpox, has robbed that frightful disease of much of its terror, and has materially contributed towards the reduction of its former prevalence to its present rarity. Pasteur's preventative inoculation against rabies is another brilliant example of an acquired immunity. And his inoculation of sheep against anthrax, further illustrates the possibilities of inducing an artificial immunity to disease in animals which are not naturally immune. The fact that medical science has successfully produced the necessary means for so altering the system as to render it more or less completely insusceptible to these diseases, makes us enthusiastic in our belief that further study will, sooner or later, enable us to furnish protective measures against the whole list of ills to which flesh is heir. This may not occur until about the time that men take to beating their swords into plough-shares, and their spears into pruning-hooks, but we are none the less behooved to do what we can to hasten a consummation so devoutly to be wished for.

Of the several doctrines which have been promulgated as explanatory of the condition of immunity, there are a few which are worthy of attention.

The first theory is that of Chaveau, and is known as the "retention hypothesis." This accounts for the immunity that is frequently seen in animals that have passed through an attack of infection against a subsequent outbreak of the same malady, and likewise the immunity that has been produced artificially, by attributing it to some bacterial product, that has been retained in the tissues of those animals, and that, by its presence, prevents the development of the same organisms when they subsequently gain access to the body. This theory was quickly proved untenable and consequently was short lived.

Directly contrary to this theory was one advanced by Pasteur—the "exhaustion hypothesis." This set forth, in effect, that "the resistance frequently afforded by the tissues to an attack of infection, was due rather to an abstraction from the tissues, by the organisms that were concerned in the primary attack, of a something that is necessary to the growth of the organism, should it gain entrance to the body at any subsequent time" (Abbott.) This hypothesis, too, proved unsatisfactory and was soon abandoned.

Another, and a very ingenious doctrine, which has also been abandoned, was that of Sternberg. I quote his own words:—"Protoplasm is the essential living portion of animal and vegetable tissues; but as our microscopical analysis of the tissues has not gone beyond the cells of which they are composed, and is not likely to reveal to us the complicated molecular

structure of the protoplasm, upon which, possibly, the properties under consideration depend, it will be best, for the present, to limit ourselves to a consideration of the living cells of the body. These cells are the direct descendants of the pre-existent cells, and may all be traced back to the sperm-cell, and the germ-cell of the parents. Now the view which I am endeavoring to elucidate is, that during the non-fatal attack of one of the specific diseases, the cellular elements implicated, which do not succumb to the destructive influence of the poison, acquire a tolerance to this poison which is transmissible to their progeny, and which is the reason of the exemption which the individual enjoys from future attacks of the same disease. * * * * The tolerance to narcotics (opium and tobacco), and to corrosive poisons (arsenic), which results from a gradual increase of dose, may be cited as an example of acquired tolerance by living protoplasm to poisons, which at the outset, would have been fatal in much smaller doses."

These three theories, as I have said, are not now regarded as tenable, and I merely bring them to your attention. It is useless to spend time in their discussion, so we will pass on to the study of some more modern theories, which are at present engaging the attention of the workers in this branch of medicine. And first of all we will take up the question of *Phagocytosis*.

In 1881, in a paper read before the American Association for the Advancement of Science, Sternberg said: "It has occurred to me that possibly the white corpuscles may have the office of picking up and digesting bacterial organisms, which by any means find their way into the blood. The propensity exhibited by the leucocytes for picking up inorganic granules is well known, and that they may be able not only to pick up, but to assimilate and so dispose of the bacteria which come in their way, does not seem to me very improbable, in view of the fact that amœbae (which resemble them so closely) feed upon bacteria and similiar organisms."

Previously to this (in a work published in 1878), Koch had mentioned having noticed the presence of bacteria in the white blood cells, but instead of attributing to the blood cells any destructive power over the bacteria, he seemed to think that the bacteria actually multiplied in the corpuscles.

Although to some extent anticipated by these two authorities, it is to Elias Metschnikoff, that is due the honor of first bringing to the public attention, in tangible form, the doctrine now known as "Phagocytosis." The theory was published by Metschnikoff in 1884.

This acute observer, while watching under the microscope a species of water-flea, which was subject to a disease caused by a fungus, was surprised to see that the entrance of this fungus into

the body, was quickly followed by a rapid accumulation of white blood cells in the part attacked. This is, of course, a part of every process of inflammation, but peculiar to the condition he was now watching, was an actual consumption of the fungus cells by the white blood cells. Slowly a blood cell appeared to send out its pseudopods, and to embrace and finally engulf the fungus cell, which then became rapidly degenerated, and could be seen dead and broken up within the corpuscle.

Continuing his observations, Metschnikoff was able to note that whenever a sufficient number of leucocytes collected to prevent the fungus from obtaining a foothold, that the fungus was eventually overcome and the flea recovered. If however, the fungi were relatively in considerable excess, they obtained the upper hand, and general infection resulted, with the ultimate death of the flea.

This was the stimulus for further research, and the outcome of his studies was his doctrine of Phagocytosis—the principle of which, briefly stated, is that the wandering cells of the animal organism, the leucocytes, possess the property of taking up, rendering inert, and digesting micro-organisms with which they may come in contact in the tissues.

The leucocytes which are so capable of acting, Metschnikoff designated as phagocytes. Leucocytes include lymphocytes, macrophages and microphages—of which the first is not a phagocyte. Phagocytes again are classed as *fixed* (endothelial cells) and *free* (leucocytes).

Many objections have been urged against this theory, and animated discussions are being carried on by its supporters and opponents. It receives greatest credence from French, and to a lesser extent from English authorities. An influential portion of English investigators, however, and the majority of American and German bacteriologists, do not regard Metschnikoff's theory as explanatory of the condition of immunity. Some claim that the phagocytes never attack living bacteria, but that they only act as scavengers, which remove the bacteria which have been overcome by the anti-biotic action of some or other tissue juice. Others claim that the bacteria destroy the phagocytes instead of the inverse, while still others hold that when a very virulent species of organism attacks a part, the phagocytes discreetly remain at a distance. So that when Metschnikoff likens the phagocyte to a policeman who stands guard ready to resist any invader, Burdon-Sanderson presses the simile further, and asserts that the phagocyte also contrives to be at a safe distance from a very dangerous situation.

While Metschnikoff and his followers looked upon the leucocytes as being the active agents in warding off disease, others regarded the blood-serum as containing the principle which prevents, under usual conditions, bacterial development

within the animal body. Normal blood-serum has undoubtedly marked bactericidal power, which is, however, lost after exposure to a temperature of 55° C. for an hour. This germicidal power is also lost by dilution to any extent with distilled water, although the addition of five, or even ten times its volume of physiologic salt solution (.7% sol. Na Cl), does not destroy this property. Buchner's "reactive change" theory is, in brief, that the presence of bacteria or bacterial products, stimulates the cells of the tissues to the elimination of a protective substance, into the composition of which, Buchner thinks, the salts of the serum must enter. This protective substance need not of necessity be antagonistic to the life of the organisms themselves, but in some cases must be looked upon more as an antidote to their poisonous products. The Klemperers have made a special study of such a protective material in connection with pneumonia, and say:—"The energy of the substance which has the power of producing immunity, varies considerably under differing conditions—being much augmented by being subjected to a slight increase of temperature (41° 42° C) for three or four days." This substance, however, the Klemperers think, does not itself afford immunity, but acts on the tissues of the animal treated with it to produce another body, which is the protective agent—that is, it produces a "reactive change" in the tissues, which results in the production of immunity. They explain that the crisis seen in pneumonia in human beings, occurs at the moment when the poisonous products, which are manufactured by the bacteria located in the lungs, are present in amounts sufficient to induce in the tissues the reactive change that results in the production of the antidotal substance that has the power of rendering the poison inert. Buchner considers that it requires a first attack of any disease, to establish in the integral cells of the body, this reactive change to the poison of such disease, but once it is established it persists, and enables the cells to react quickly and thus defend themselves more effectually against a subsequent inroad by the same organism.

One of the recentest and a particularly valuable contribution towards the solution of the subject, is that presented by Vaughan at the meeting of the Pan-American Medical Congress, in September last. I would like to bring his whole paper before you, but this is of course out of the question, and a few quotations must suffice. Vaughan believes that it is the nucleins which are to be credited with the production of immunity, and that ordinarily, the nucleins develop their protective function as the result of the altered cell activity which comes with adult life. But his own words are much better than any expression which I could give to his ideas:—

"The natural immunity which is peculiar to the individual, usually comes with adult life. The young are susceptible to a given disease, but adults of the same species lose this susceptibility, and become immune. The young rat is susceptible to anthrax, while the adult is

naturally immune, but can be rendered susceptible by exhaustive exercise. The child is highly susceptible to scarlet fever and diphtheria, while the adult, though not wholly immune to those diseases, loses very much in susceptibility, and is likely to become infected only when greatly reduced in vitality, or after prolonged and aggravated exposure to the poison. The only reasonable explanation of this immunity is, that it is inherent in the parent cell, and comes on as naturally as do the changes in form and voice at puberty, or the growth of the beard in early manhood. The evolution of the condition of immunity in these cases, is due to the natural development of the functional activity of certain cells of the body. The cause of the difference in the effect of the anthrax bacillus on the young rat, and that of the same germ on the adult rat, exists in the rat and not in the bacillus. A child and an adult are exposed to the Löffler bacillus from the same source, the former becomes infected, the latter does not—the germ is the same, but in the development that converts the child into the adult, the resistance with which the germ must contend has been strengthened. The immunity that comes with adult life must be due to altered cell activity.”

The result of such altered cell activity, in Vaughan's opinion, is the production by the cells of a something which either antagonizes germ-life or neutralizes the poisonous products of the germ. In study of the possible origin and composition of this something, Vaughan considered that an enquiry into artificial immunity would be helpful, and reviewing the work which has thus far been done, he found that the induction of such artificial immunity may be by one of three methods:—

“1.—By an attack of the disease ending in recovery. Until the discovery of Jenner, this was the only known cause of immunity, and even at present it is supposed, as far as man is concerned, the most potent cause. However, we now know that the period of time through which immunity thus obtained holds good, has been over-estimated. A man may have small-pox the second time, provided several years have elapsed since the first attack, and provided the second exposure brings him in contact with a highly virulent form of the infection, or the exposure continues through an unusually long period, or happens at a time when the health is much reduced from any cause. Moreover, the period of immunity conferred by an attack of some of the infectious diseases is so short that many have questioned its existence.

It is true, I believe, that the more grave and virulent the disease may be, the greater and more persistent is the immunity that follows. I mention this in order to call attention to the fact that there is a quantitative relation between cause and effect, in the production of immunity. Please bear in mind that in this method of inducing immunity, the substance of the germ itself is introduced into the body.

2.—By vaccination with a modified and less virulent form of the infection, or by the introduction of at first a very small number of the virulent germs, and successive inoculations with larger numbers.

The successful inoculation against chicken cholera and anthrax, made by Pasteur, consists in vaccination with a modified germ, and the valuable investigations of Emmerich and his students, in immunizing certain animals to swine erysipelas, have demonstrated the results that may be obtained by employing the virulent germ, first in small numbers

and then gradually increasing the dose. Again it may be observed that the germs themselves are introduced into the body. And again, it is also true that the more potent the cause, the greater and more persistent the effect.

The immunity that follows inoculation with a germ of full virulence is more marked, and extends through a longer period than that which is induced by a vaccine.

3.—By one or more treatments with sterilized cultures of the germs. Immunity against the germs of typhoid fever, cholera, diphtheria, tetanus, hog-cholera and several other diseases, has been secured by one or more treatments with sterilized cultures of these. An interesting question arises in this connection:—What constituent of the sterilized culture is it that confers immunity? All will agree that it is not due to the ptomaines that are present in some of the cultures. Another important class of substances present in these sterilized cultures, contains the so-called toxalbumins, and to these we may possibly look for the cause of the immunity. I think we can answer the question as to which constituent of sterilized cultures gives immunity, with considerable confidence if we recognize the following facts:—

Marked artificial immunity to an infectious disease, has not been obtained except by the introduction into the animal of the germ substance, either enclosed in the cell wall or in solution.

Sterilized cultures contain the germ substance in one or both of these forms.

The same immunizing substance exists in the bodies of bacteria grown on solid media, and killed by the action of chloroform.

The same immunizing effects, varying however in degree, are obtained with the bodies of dead bacteria morphologically intact or in solution, with living bacteria modified and reduced in virulence, and with very small numbers of the virulent germ.

With these demonstrated facts before us, I am ready to believe that the immunizing substance is a constituent of the bacterial cell itself, and as each kind of germ has its own peculiar poison (which in small doses confers immunity), this poison cannot come from the cell wall, nor is it really a split product of the germ's action; but it is the essential characteristic part of the cell, that part which gives to the germ its distinctive properties. I believe it is the nuclein.

The three methods of inducing immunity which we have mentioned, reduce themselves to one and the same principle, *i. e.*, the introduction of germ nuclein into the body.

The immunity that results from an attack of the disease is caused by the introduction of germs living and more or less virulent. That which comes from vaccination is due to the introduction of germs living, but modified and reduced in virulence, or administered in small quantity. That which is secured by one or more treatments with sterilized cultures is secured by the introduction of germ nuclein, so modified that it is no longer capable of reproducing itself.”

Prof. Vaughan's conclusion, then, is that artificially produced immunity is due to the entrance into the body of nucleins from bacterial cells. Now nucleins exist in cells generally, and if a bacterial nuclein is capable of exerting an immunizing effect, that of other cells should possess a similar property. Acting on this assumption he prepared nucleins from yeast, from the testicle, from the thyroid gland, from

eggs, from the brain, and from the spleen. All of these he found to be possessed of marked bactericidal effects, and it is to the presence of soluble nucleins in the blood-serum that he attributes the germicidal effects of the serum. He claims to have found nuclein in solution in blood-serum, and believes it to have passed into solution from the cells, but whether from a breaking down of the cells, or to an unusually active secretion on their part, he has not yet been able to determine.

The nucleins are found to be not only germicidal but also toxicidal—that is, they not only kill bacteria, but in addition they destroy the poisonous properties of the bacterial secretions.

Quoting again from Vaughan:—"There must be three factors in the production of immunity in an animal naturally susceptible. First there must be an inciting or immunizing substance introduced into the body. * * * This substance has the property of so stimulating the activity of certain organs in the animal, that these organs produce and supply to the blood an antidote to the substance introduced. Secondly, the organs whose activity is stimulated by these immunizing agents are those, such as the spleen, thyroid gland, and bone marrow, which manufacture nucleins. Thirdly, the antidotal substance is a nuclein. The kind and amount of nuclein formed will depend upon the nature of the inciting agent, and the condition of the organ or organs acted upon."

This states the matter so clearly and so concisely, that any comment I could make would only serve to complicate an exceedingly plain presentment of what appear to be facts.

I regret that lack of time has prevented a more careful arrangement of my subject, and especially that I have been unable to do justice to the excellent work of Prof. Vaughan. I have endeavored to set before you in very condensed shape, the results of the work of some of the best students in this complicated department of medicine. You will see that much has been done, but there is much yet to do, and the field is broad enough to admit many workers. Possibly some out of those I now address may 'ere long, be honored investigators of the principles underlying immunity.

As will be seen by the list of acknowledgments, quite a number of subscribers have responded to the appeal of the Financial Editor, but there is a large number yet who have not done so. Our expenses are larger than usual this year, and we want and expect all our subscribers to help us. We hope that we will not have to mention this again.

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