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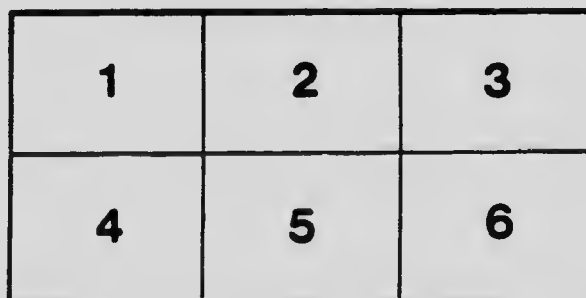
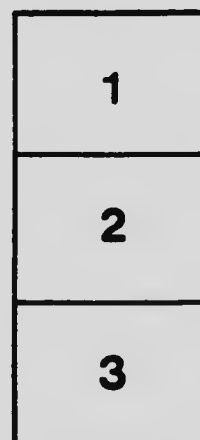
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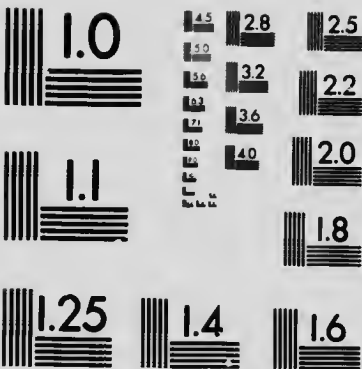
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**An Address before the Engineers'**  
**Club of Toronto**

**THE HONOURABLE WILLIAM RENWICK RIDDELL, L.H.D., etc.,**  
**Of Toronto, Justice, King's Bench Division, High Court of**  
**Justice for Ontario.**

# An Address before the Engineers' Club of Toronto.

(JANUARY 15th, 1912)

BY

THE HONOURABLE WILLIAM RENWICK RIDDELL,  
L.H.D., etc., OF TORONTO, JUSTICE, KING'S  
BENCH DIVISION, HIGH COURT OF  
JUSTICE FOR ONTARIO.

Mr. Chair and Gentlemen:

When I was asked to address the Engineers' Club of the City of Toronto, I gladly acceded to the request, not simply for the reason that I am by way of being an Engineer myself—for after I graduated in Arts many years ago—more than I like sometimes to think of—I remained two years longer in my college and took the degree of Bachelor of Science—I think the first time that the degree of Bachelor of Science was granted in Canada; and a great part of that post-graduate course leading to the degree of Bachelor of Science, could fairly be included in a course of Engineering. Therefore without any very great violence done to language, I might call you, "my brother Engineers"; and to most of you at least, though not to all probably, I could claim to be an elder brother.

Nor is it simply for social reasons that I am glad to be here; although it is a delight to meet gentlemen of your standing in a social way.

But it is mainly because I understand and appreciate and admire the work which you are doing for Canada and the world.

Engineering taken in its broad and general sense is nothing else than the science and art of rendering natural powers and materials beneficial to man. Anything which will yoke a power of nature and subjugate it to the will of nature's lord, anything which will take the raw material which nature furnishes and reduce it to the service of man, the latest product of nature and her best, may well come within the ambit of Engineering. Engineering in a word is simply the taking of the raw material and the powers of nature and putting them to the school of art.

For long (in the English-speaking world at least) in civil life, there were only the three professions for a gentleman or a gentleman's son; if he did not go into the Army or Navy, then (if he studied for anything) he studied for one of the three professions, Law, Medicine, Divinity—and perhaps the choice was very much in that order. And the ancient Universities which were the schools for and catered for the classes which filled the professions, drew their curricula accordingly. They taught, indeed, “the Humanities” by way of culture and general training; they added to that a little medicine, a little law, a little divinity.

No one who worked with the mighty powers of nature was thought worth considering. Friar Bacon, indeed, did so work, but he was a wizard; and he worked at it only during his spare hours anyway. The Engineer was not worth considering socially. Indeed, even at the present day the word “Engineer” connotes in the common mind not what it does to you and to me, a cultured gentleman of good education, probably graced with a University degree, but rather a grimy, greasy, horny-handed if clear-eyed driver of a locomotive engine.

Even in Germany, the very home of science, but the other day, the father of that Helmholtz who stood at the very head of German scientific men, hesitated before he would let his son enter a College of Engi-

neering—because, forsooth, Engineering was not the business or profession of a gentleman. Hermann Helmholtz, indeed, the man of science, wrote his brother Otto that the value of work depends not upon the material handled, whether in inorganic things or in mental products, but upon the amount of intellectual energy that is put into it and in whether the work is merely a bread earning industry or a matter of independent intellectual interest. And this very great man wholly approved of his brother attending the Industrial Institution in Berlin to become an Engineer, though this was sorely against the wishes of his father and teachers, troubled as they were with the thought of “base and mechanical” pursuits and full of the very common contempt felt by the “intellectuals” for low employments, “trade.”

Now things have changed. The enormous strides made by the physical sciences during the last century have had their effect. The Engineer has made his way. He has improved his status as he has become known for what he is, the master—the careful, skilful and accurate master and handler of what nature gives us. The wealth which has been produced by the ingenious inventions of the Engineer has had its effect. As his status is advanced, his business has become a profession.

The Engineer is now acknowledged to be, what he (speaking generally) always was or might be, a gentleman; and Engineering is a gentleman's profession. The newer Universities to-day acknowledge his position, they acknowledge his merits and recognize his wants; and they have laid down courses which help him in his chosen career. The older Universities, too, have seen that they must also, if they are to keep up with the times at all, provide for his needs and his tastes; and they also have for him courses, some of them of the very highest possible character and of the very greatest value.



And it has not been found that the Calculus is any less interesting or any less educative since it has been applied to everyday affairs and to practical matters than it was when it was simply "the higher mathematics" any more than Homer is the less interesting because he who reads the Iliad and the Odyssey knows more about the powers of nature than Homer could possibly know. When Sir John Herschel and Peacock and Babbage united in the effort which was ultimately successful to supersede at Cambridge the Newtonian notation by the notation of Leibnitz, to drive out the fluent and the fluxion, and to bring in the integral and the differential—or as it has been wittily put, to replace dot-age by  $\alpha$ -ism—they had in their mind not alone, or principally, the mental culture to be derived from the differential method, but rather the ease with which the Calculus could be applied to practical affairs by the Engineer, the practical mathematician, who would be trained in this method. For my own part, I look upon the Newtonian method and Newtonian terminology and notation as quite as valuable for mental training as any of the methods in which the Leibnitzian notation is taught or applied, and more valuable than two of them; the only one—but I shall not trench upon my friend Dr. Galbraith's realm. There is a good old Latin adage, *Ne sutor ultra crepidam*, "Let the shoemaker stick to his last"; and I shall not trouble you with any further dissertation on the Calculus.

The Engineer must needs be a mathematician. Now I do not mean by that, that he must pay much attention to or be versed in some of the higher branches of mathematics which one reaches only in an aeroplane, and which have nothing to do with everyday affairs. The non-Euclidean Geometry, the Engineer may safely neglect (I am speaking generally); he need not trouble himself with the speculations and investigations of Gauss, Lobatchewsky and Bolyai, Riemann, Cayley and Beltrami. For the Engineer—whatever space may be elsewhere—space is of such a

character as that the three angles of a triangle are always exactly equal to two right angles, no matter how large the triangle may be; space is never hyperbolic or elliptic.

The Engineer must be a computer and a calculator, a mathematician; and it is that accuracy which mathematical methods necessarily produce in the mind of him who uses them, which makes the Engineer the accurate, careful thinker which he is, if he is a true Engineer.

“Pretty near” is not near enough.

“A little more, and how much it is,  
A little less, and what worlds away.”

It is the “pretty near” which makes a Johnsto dam; it is the “pretty near” which made the Desjardins bridge near Hamilton; it is the “pretty near” which made the Reid building in London; it is the “near enough” which is killing and maiming Canadians day by day.

Accuracy is of such enormous advantage to, and has such an effect upon, the man in whose mind it has its resting place, that it might almost be called an end in itself.

No man can be accurate in Engineering unless he is a mathematician. Nothing in Engineering is known, can be accurately known, unless it can be expressed in mathematical language. But that is not all. Lord Kelvin was wont to say that although he could express a thought in mathematical language or even in a mathematical formula, he never knew that he had thoroughly grasped, that he was complete master of the idea, unless and until he could make a model or a machine which would exhibit his thought.

Now, that is what Engineers are doing every day. The Engineer reduces his thought into formulas, specifications, and develops that thought, the formula, the specification into concrete form, the building, the bridge, the machine, the mine. Therefore to

my mind the profession of Engineering is that which ought to give a man the most thorough knowledge and appreciation of what nature actually is.

I look upon it as one of the most interesting and valuable things in your life—something which you ought to value beyond all price—that in practising your profession, you are constantly exercising your intellect, giving yourselves intellectual pleasure, the only pleasure worth while for an intellectual being. I remember once a painter, a well-known painter, saying to me, “I think I am the luckiest man in the world. Here I am painting from morning to night, from Monday morning until Saturday night, and I paint on Sundays sometimes, too; I am doing what I would sooner do than anything else in the world. If I could be allowed to do it only by paying for it, I should be glad to pay for it; and here I am doing that very thing and people are paying *me* for doing it.”

The true Engineer ought to take a pleasure in his profession, and you are every day doing—true Engineers are every day and every hour doing—that which they would sooner do than anything else; and people are paying them for doing it. I myself from time to time work through the Calculus and some of its application to practical matters, but nobody pays me. Still if I could be allowed to do that only upon the payment of a fee I should gladly pay rather than be deprived of such an intellectual pleasure.

I know that you all have your Engineers' Handbook—I know you have Trautwine or Weare, Merriman or Molesworth, or whatever hand-book recommends itself to you; and it is well it is so. These handbooks and Engineers' Companions have formulas, results, tables, the product of careful investigation and of careful calculation; and you can't get along without them any more than a lawyer can get along without his authorities. But there are cases, and they often happen, in which the hand-book will fail; and no Engineer that is worthy the name,

whether his handbook is likely to fail or not, will ever make himself a slave to his handbook—to his Engineers' Handbook of tables and the like. No Engineer is worthy the name, as it seems to me, if he forgets the principles from which these formulas have been derived, if he forgets the methods by which these tables have been calculated.

I should not think much of an Engineer if he could not to-morrow sit down and work out for himself, calculate out for himself, a new table of logarithms which would correspond to the old one. Of course you don't often have occasion to call upon such knowledge as that, but it is knowledge of that kind you ought to have with you. You ought not to make yourselves the slaves of a business; then it becomes a trade. You belong to a liberal and a learned profession and you ought to continue to be learned.

I remember some years before I left the Bar, cross-examining a Railway Engineer; I asked him (not that I didn't know, I do ask you to believe) what a one degree curve was, and he promptly replied, "A one degree curve is a curve in which you make a set-off of half a degree." I said, "What does that mean?" And he ultimately elaborated to my unmathematical mind (because I had been Professor of Mathematics for only four years, and naturally might be expected to have forgotten) that in such a curve the angle between the tangent and the chord is half a degree. I said, "Where does the name 'one degree curve' come from?" "Oh, it is just called that." He didn't know that one degree at the centre had anything to do with the matter; and after he was told that in such a curve one degree at the centre was subtended by a chord (or more accurately an arc) of 100 feet—even although he was told that, he was doubtful about it; and anyway even if it was so, it had nothing to do whatever with the terminology; the one degree curve was so called because you set off half a degree—and that is all there was about it.

That kind of Engineer is not very common, but then he is not very uncommon. He is not very uncommon because people allow their minds to lie fallow in your profession as in mine, and in the profession of medicine and possibly in the profession of divinity—but that is a matter of which I know nothing.

It may be—no doubt it is—by reason of the fact that I am His Majesty's Justice and upon the Bench, that I am always led to consider when any profession is in my mind, what kind of evidence is to be expected from the members of that profession. The habit of careful and accurate use of scientific and accurate processes ought to and in most instances does operate upon the mind of the Engineer so to make him the very best of expert witnesses. He ought to be the very best of expert witnesses. An expert witness is one who is called not to speak to an objective fact which anybody could see or know who had eyes to see or ears to hear, but to an opinion which was formed in and by his own mind—to speak to an opinion not to an objective fact. The opinion of an Engineer should be formed as carefully as any fact should be determined—based upon hypotheses as well established as the existence or non-existence of some alleged fact which is brought in question.

In ninety-nine cases out of a hundred there is no real ground for difference of opinion in Engineers. In most instances the Engineer knows his hypotheses, knows upon what they are based and knows the conclusion at which he ought to arrive—and it is for that reason I daresay, that the Engineer is as a rule the very best of expert witnesses. Not very long ago addressing an Academy of Medicine—because, as your President has said, my sympathies are wide ranging; if I put in two years in Engineering, I also paid some attention to Medicine—I told the medical men that the position which they ought to occupy at the very head of expert witnesses, they did not

occupy, but they were very near the foot; the place which they ought to have had was occupied by the Engineer. That is my opinion formed from having a very great deal of experience with expert witnesses of all kinds.

Now expert witnesses and indeed Engineer witnesses are not all of that kind. Some Engineers do not bear out the expectation which one has a right to have concerning them; and Engineers even of high standing sometimes fail in that most important matter. Indeed it was of Sir Frederick Bramwell, the well-known consulting Civil Engineer and expert witness, that his brother, Lord Bramwell, an equally well-known lawyer and Judge in England, said, "There are three kinds of liar—the liar, the damned liar and my brother Fred." And it was said of George Biddle, the "Calculating Boy," who became a very celebrated Consulting Engineer, that if he were retained to give evidence before a Parliamentary Committee, the case of those retaining him was almost won. Engineers may be of the very highest standing in their profession, but if they are of such a character that they come within the category of liars, then they are no more deserving of respect than the ordinary "common or garden" liar that you can pick up anywhere on the streets.

I am thankful to say that in Ontario at least the Engineer is not often of the class, "My brother Fred"; nor, indeed, is he of the comparative class, the damned liar, or even of the positive class, the liar. I have found the evidence given by Engineers in most instances satisfactory. Sometimes, no doubt, a Mining Engineer has been able to find and report veins which the person who bought the mine on his report has not been able to find a trace of even with the microscope: sometimes, indeed, a Mining Engineer has been known to be unable to find veins which absolutely cried out to be noticed and which nobody with eyes could possibly pass over—but these are the exception.

You tell me that, of course, black sheep are to be found in every flock; and that is so: but there is no reason for the black sheep being looked upon with the same favour as the white sheep. Then, too, the black sheep of a profession have some regard for public opinion, especially for that of their brethren in the profession; and if the black sheep knew that a man who made a false report or who lied in the witness box alleging that his opinion was so and so, when it was—and he knew it—the reverse, if he knew that a person of that kind would be treated like the ordinary liar on the street or the ordinary perjurer who ought to be in Kingston, even the black sheep would “sit up and take notice” and probably would mend his ways.

Now, I am not going to preach to you. Preaching is the prerogative of two classes—one, the clergyman, and I have told you I know nothing about Theology; and the other is the old man, and I absolutely and positively refuse to be considered an old man. In my view, a person in his 60th year is just approaching the very best years of his life. So I shall not preach to you, but I do urge upon you to bear in mind a little what I have been saying. I am anxious that you, my brother Engineers, shall not lose that high place in the public estimation which you hold, that you shall be able to do for Canada, your country, and for the world at large that which Canada and the world in which you live have a right to call upon you for, that is, your very best—assuredly that you can only do if you are as accurate as your mathematics and as honourable as you are accurate.

President Gamble: Mr. Justice Riddell, I have great pleasure in returning you the thanks of this Club for your very instructive, interesting and scholarly address.

Mr. Justice Riddell: Mr. Chairman and Gentlemen,—I have just returned from the City of New

York in which I had the pleasure of addressing three audiences within the last few days; I had just time to get up to my house and make myself somewhat presentable to come and fulfil my engagement with you; I have not indeed even been at Osgoode Hall; I want to assure you that the opportunity of addressing this Club has given me more pleasure even than the opportunities afforded me by my American brethren (Canadians many of them were) of addressing these three societies in the City of New York. The Engineers' Club of Toronto may at any and all times call upon me as they desire, if they think I can do them any good in any way; because I look upon this club as being one of the most important of organizations and your work one of the very most important for Canada which we all love so well.



