

# The Role of Science Education

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What is the role of science education in a University like Dalhousie, and what kind of pre-college course gives the best preparation for science at the University?

There are many activities called scientific which are out of place in a university. We are trying, at Dalhousie, to help each young man and woman acquire a free, inquisitive mind, sound judgement, reliable intuitions, a lively imagination and, above all, the ability to distinguish truth from falsehood, right from wrong. To achieve this two things are necessary — first, to master the tools used in thinking, namely, language and logic, and then to use the tools in solving problems. The more fundamental and important the problems the better. Prob-

lems worthy of our best efforts are found every where—in history, philosophy, psychology, literature, government, science, etc.

An educated man finds time to consider carefully the major problems arising in all these subjects and has the skill to reach conclusions, personally satisfying for the moment, in several of them. This does not mean that each student should study all of these subjects in college. Rather, any of these subjects properly taught should develop such skills in the student that he can work at any other (in his spare time perhaps) with pleasure and profit. If Science teaching is to serve the ends outlined above it must confine itself to the task of seeking to understand the central principles govern-

ing the behaviour of nature (which have been clearly stated by the best minds) and endeavouring to discover new and more inclusive principles. The best science teachers are not trying to make their students into technicians who have mastered some specialized trick, but are trying to develop minds which can tackle difficult problems and solve them, which can apply known principles to elucidate phenomena which have never been studied, or perhaps even observed before. To be able to do this requires an apprenticeship which is long and arduous but exceedingly worthwhile. Perhaps it may not be out of place to remark that at Dalhousie at the present time there are about twenty students who, because of their

ability and energy, show promise of becoming real scientists. Many others are having a good look at the problems and methods of science but show no conspicuous skill in mastering them. However, such students, if they strive faithfully, are profitably employed. Honest work and faithful striving always develops character and power no matter how great or small the intrinsic talents of the individual may be.

The standard academic subjects provide excellent training at the pre-university level for a career in science. All students should have work that demands their best effort in English literature and composition, languages other than English, Mathematics, History, and Science. The prescribed curriculum is good.

The difficulty lies in persuading young people to work hard and master what is prescribed. It is a tragedy for a young person to reach the age of eighteen without having acquired a delight in reading and careful study. Much of what is done in college between the ages of 18 and 20 could have been done between the ages of 14 and 16, and is done during these years in other educational systems in other parts of the world. By 18, one could, with great pleasure and profit, have read one hundred good books (other than the ones required) in history, biography and literature.

The essential thing for growth is to exercise the intellect by attempting tasks which are almost impossible.

## Resisting The Pull of The Machine

by Alexander Farrell Arts III

The university is meant to be the freest of human institutions. Since no other can allow the individual as much liberty to describe the pattern of his daily life, the end of university studies brings him face to face with a whole new set of commitments and demands to which he adjusts in one of two ways.

When the spiritually alive university student graduates, he may become a cog in the wheel, allowing his soul to go dead in the din and tedium of all the spinning and turning which characterize society in the age of technology. He may, on the other hand, remain a centre of creative thought and independent will; and if he so remains, it hardly matters how modest the scale, for then he is not to be numbered among the dry and spiritless, already numerous enough, who constitute society's bleak mechanical and functional aspect.

How we approach this matter in North America, how we try to re-

sist the pull of the machine, is a subject being hashed over countless times. It is not my purpose here to attempt to add my two cents' worth. I should rather like to take the liberty of discussing the subject in its Teutonic context, since I had the privilege of living and studying in Germany for a time.

There is, however, more than a personal reason why I find a treatment of the theme in a German setting appropriate. As Germans have woven so much into the fabric of western ideas and values, and, on the other hand, have played a dominant role in the advance of technology, it is always pertinent to consider how the question of man and the machine is being treated in the land of Goethe and Beethoven, of Helmholtz and Roentgen.

Naturally, education faces the same dilemma in Germany as in North America. It is confronted with the monstrous demands thrust upon it by an urban, industrial society whose ideals are velocity,

efficiency and comfort. It is asked of a man how much and how well he can produce? What does he have on the ball?

That is one side of the picture. The other is the spiritual power of western civilization, great enough to enable the cultured to hold high the ideal of education for education's sake, to hold fast to the belief that education means to become someone rather than something.

The German university system, since the end of the "thousand-year Reich," has fought its way back to the ethical liberalism typified in the 19th century by Wilhelm von Humboldt, founder of the University of Berlin. The dangers to culture in a society shaped by technology are well recognized in Germany and the universities, bearing the great weight of their age-old traditions and ideals, are rallying to meet them.

Great emphasis is placed at a German university on the value of being mentally active beyond the point re-

quired by any definite and immediate outside obligation. The value is to the student himself, it is said, before it is to others or to society as a whole. In that way the student is given a chance to mature into someone who cannot simply be managed or indoctrinated by the organizer and the expert, those omnipresent functionaries of technological society. This is perhaps the most essential roadblock being thrown into the path of the machine to mastery over men.

Mental activity in such degree is not merely urged upon the German student, it is forced upon him by his very environment in the university. He is given the complete responsibility of choosing his own fields of study, of supplementing them at will, and, so long as he does not transgress them, of defining his own limits. There are no term exams hanging over his head, focusing his attention on an immediate academic goal and providing an artificial pattern for his study. There is no system to organize his work for him.

If the student fails to respond to this invitation to exercise and enrich his mind without restraint or deviation, there is nothing further the university can do, it is felt, to equip him for life in the machine age.

German universities assume, as do ours, the responsibility of providing intellectual leadership, of guaranteeing in society the continuing presence of an upper stratum of critical and independent minds. It is considered that the greater the extent of the individual's education, the greater his responsibility for himself and for others.

The social responsibility of the German universities is, however, incidental rather than central to their ideals, which are based solidly on the person. The notion that man exists for society is in every sense repugnant to the spirit of German academic life.

Consequently, German universities try not to let society prevail upon them with its egalitarian prejudices and its almost militant anti-idealism. Their entrance standards remain high and it seems quite unlikely that any pressure to lower them will succeed. The responsible German student who is conscious of his individuality and his own will, wants the university to help him widen his mental horizons. He wants to be capable of a greater self-fulfillment. It is only natural that the university expects him to have the capacity for such an expansion.



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## Who Pays for University Education?

(The Ubbsey)

Who pays today's university education?

Here are some of the latest figures from the Canada Year Book of 1956 pertaining to the year 1952-53. Government Grants, \$26,973 millions, 52.9%.

Student Fees, \$14,348 millions, 28.1%.

Endowments and Funds, \$2,981 millions, 5.9%.

Other sources, \$6,678 millions, 13.1%.

Total Expenditures of University Education, \$50,980 million.

98,000 students attended University that year. This amounts to a total expenditure of \$520 per student, of which \$143 was borne by the student.

The same year the federal revenue amounted to \$4.36 billion; the provinces received 1.46 billion, thus the total revenue of federal and provincial governments amounted to 5.82 billion dollars.

### LESS THAN 1%

The proportion of government grants to universities to total revenue was 0.47%; in other words less than one cent out of every dollar received by the government in

the form of revenue was spent on university education.

These figures cover only the cost of education which the educational institutes have to bear. But what about such incidentals as room and board, books, transportation, etc.

During the tuition year, these costs amount to a minimum of \$800. To this must be added the cost of living during the summer while the student has to make revenue which amounts at least to \$250. The total thus adds up to \$1200 per year, including tuition fees.

It does not matter whether the student lives at home or not; if he does, his parents have to bear the expense.

The student therefore contributes 76% of the costs of his education.

### COSTS BORNE BY STATE

Let's contrast this with the system the Soviet Union follows. A total of 2,365,000 students are attending universities; approximately 23 times the number of Canadian students. Since 1956, university education is free and the costs are borne by the State.

The total expenditures on education amounts to 23,023 billion rubles. The total state revenue is 66,743

billion rubles. Russia then spends over one third of its revenue on education.

### 5.6% ON EDUCATION

Canada on the other hand spends a total of \$325 million on education; the national revenue amounts to 5.82 billion dollars. We spend 5.6% of our revenue on education. (1953 figures, no later figures are available). The figures are somewhat higher (approximately 10%) if municipal taxes are included for high school financing.

In other words the Soviet Union is spending at least three times as much as Canada does in relation to the revenue.

But we are worried over not having enough scientists, engineers, teachers, and other trained personnel.

### LARGE SCALE AID SCHEME

It is conceded that an additional burden upon the Treasury would mean additional taxation, which should be avoided wherever possible. On the other hand it is suggested that a highly effective way to turn out more graduates lies in large scale student aid scheme.