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SCIENCE IN THE PEACE

By RAYMOND BOYER

Science and the Citizen

Since the dropping of the first A-bomb, the public has been bombarded with much radio-active prose on the subject, most of it pure speculation. Will mankind wipe itself out? Will we be able to turn Arctic blizzards into warm breezes? Will coal and oil become obsolete as sources of power? Will the next war be won in a dav? And so on . . .

Without wishing to pour cold water on the atom or on the many serious questions its harnessing has raised, we would suggest that the above questions are not the basic ones facing us on the threshold of the atomic age.

Scientists aren't miracle workers. Atomic fission, like other scientific discoveries, was the result of the hard, factual, precise, realistic, enquiring approach — the scientific approach; and the scientists knew that their findings were inevitable. The miracle lies rather in the teamwork on a gigantic scale and in the prodigal use of public funds which gave us the know-how in triple-quick time. We might well ask ourselves: would we as peace-time citizens have willingly voted the needed funds if the exigencies of war had not taken the decision out of our hands? Now that the war is over, that question will still face us. The paths of science lead to a new world of wonder and limitless opportunity. Are we willing to pay our passage?

This article confronts us with our relative indifference in the past to scientific research. It tells us what continued indifference can mean to us in terms of loss of life, comfort and happiness. It takes the scientist out of the witch-doctor realm and shows his day-to-day relationship with industry, with government, and with plain you and me. Although speculation on the future may appeal to many, it is these last points that will make the most useful discussion.

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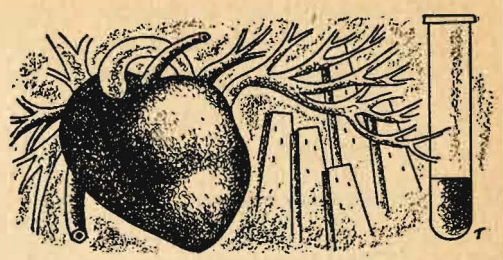
Science in the Peace



By Raymond Boyer

THE fury of atomic energy has at last been released. But the devastating impact of the atomic bomb has resulted in more than the physical destruction of Japanese cities. Many people, including even some of the bomb's originators themselves, have been stunned at the power that has been let loose and are fearful of what it may mean to civilization. The Sunday supplements have already hinted at the possibility of universal suicide. Throughout the United Nations, people are thankful that the solution of atomic secrets fell first to us and not to our enemies.

For decades the study of atomic energy and radio-active materials progressed leisurely, hastened first in one country then in another with bits of fresh knowledge — scarcely ever seeming to touch on the life of the man in the street. What, then, enabled this branch of science — nuclear physics — to take such a big leap forward during the latter years of the war to the point where cool learned theory exploded into blistering reality over the cities of Japan?

Before answering this question, let us take some other examples of scientific research and development that are more familiar to us because less shrouded in secrecy.

Healing . . .

Every Canadian remembers the date 1929 as the end of the plenties of the 20's and the beginning of the plunge into depression. In that year a few scientists in Britain — notably Alexander Fleming — separated from a blue-green mold the golden grains which have come to be known as penicillin. As everyone knows by now, penicillin is the only agent we have to combat certain virulent infections and by far the *safest* agent we have to combat infections of all sorts. The startling

properties of this new drug were observed in 1929, or even earlier, yet mass-production of it was not begun until 1943.

. . . *and Killing*

Every Canadian also remembers the date 1939 as the end of formal peace and the beginning of war. In that year a few scientists in Switzerland recognized the possibilities of DDT as an insecticide. Here too the results are startling; DDT not only kills insects and pests of all sorts with great efficiency, but it is a synthetic material and this means that its supply is virtually unlimited. Up till now the most efficient insecticides were available only in small quantities because they had to be extracted from comparatively rare flowers and roots; but DDT is made in a pot in much the same way as, for instance, shoe polish is produced. This means that for the first time in history we are able to launch a full-scale attack on those two scourges of mankind: typhus and malaria.

Mass production of both penicillin and DDT was begun in 1943. Both achieve supremely desirable results for human beings. Why then was DDT made available within five years of its recognition as an insecticide whereas penicillin production was not begun until fifteen years after its discovery?

Was it because the Swiss scientists were more alert than the British? No, since in each case large-scale development was done by other people in the United States. Was it because information on penicillin was withheld? No, since all experimental findings were published in scientific journals from the beginning. Nor does it explain anything to say that penicillin was developed because it is essential to the war, since it is clear that its desirability and significance would have been equally great in peacetime.

Scientists Mobilized

The real reason why DDT was brought to use in so much less time than was penicillin is that since 1939 scientists have been mobilized to meet their country's needs and their work has been co-ordinated to an extent never known before. This is even more true of the eleventh hour spurt in the development of atomic energy, where scientists were mobilized not only nationally, but on an unprecedented *inter*national scale.

In the emergency, the governments of all nations in the struggle mobilized their scientists, put the problems of the war before them and urged them to great new efforts in fields hitherto neglected or left entirely untouched. These scientists were given not just problems to solve: they were given facilities, money, equipment and time. They were given inspiration and they were given assurance that valid results would quickly be put to use. Under these conditions, the work of the scientists was co-ordinated and organized — just as the work of producing munitions and tanks and ships was organized.

Throughout the war period, whenever a particular scientific objective seemed to be worth achieving — whether some new material, new information or new technique — it was possible to create whole laboratories and put them to work. This meant, for example, that from the moment the wartime potentialities of atomic energy were first realized, it was possible to initiate work on the problems involved in its mass-production and application. On the other hand, although the potentialities of penicillin were clearly recognized in 1929 or earlier, and the experiments were published and available to everyone, the necessary organizations did not then exist and the necessary funds did not *seem* to exist for pressing forward the development of this important discovery.

Science's War Effort

The record does not stop with the examples mentioned. As a direct result of the scientific and technical war effort we have today more efficient engines for planes and cars and ships; better fuels and lubricants to service those engines; more precision instruments of all kinds, but especially in the field of radio communication and radio direction finding; improved metallurgical processes resulting in new and better metals and alloys; many more synthetic materials of all sorts, such as rubber and plastics; a wider application of products obtained from coal, wood, air and sea-water. This partial list represents what planned science has accomplished in the last few years.

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How Was It Done?

These results were obtained by co-operation in a vast national, and to some extent international, enterprise involving on the one hand the industrial plants and on the other hand government agencies.

In Canada, the National Research Council set up committees to co-ordinate scientific activity in every field relating to the war effort. The personnel of these committees consists of representatives of the government, private industry, the armed services and the universities.

Of course, there were many factors favouring the organization of these groups in wartime which had not existed in peacetime. The national emergency forced us to use our limited scientific resources, both human and natural, to the best possible advantage. It meant that we could retain our scientists in Canada and, through such agencies as the Wartime Bureau of Technical Personnel, place them in the positions where they could do most good. The important thing is that this was the first time these groups had met regularly to discuss scientific problems and make plans for their solution.

How did such groups function? First the scientists presented the results of their research and if the armed services were interested in some new material or process and thought it might be useful, then the manufacturer produced a small batch in a pilot plant. By this method a small amount was made available for trials by the services. At later meetings the services reported on the new material in the field or at sea or in the air. If they felt it had been successful, the manufacturer began large-scale production based upon the knowledge and experience gained in the pilot plant. By then the scientists would probably be suggesting some other improvement or innovation and so it went. The important point is that each group brought a different kind of knowledge to the solution of problems in the national interest.

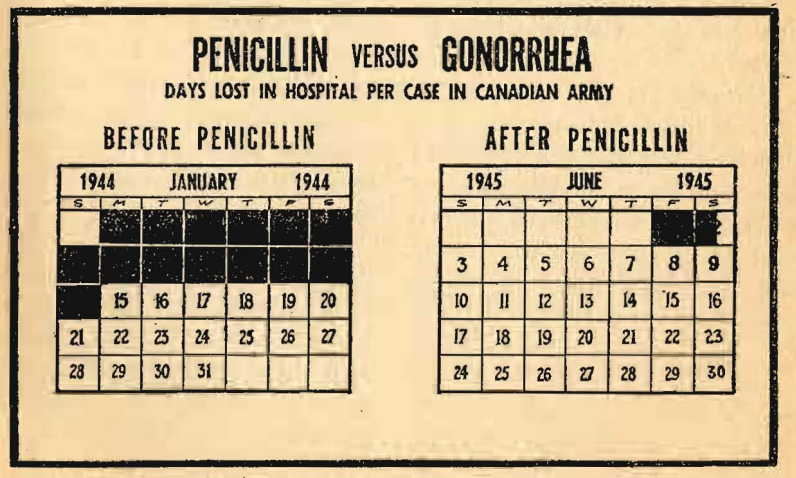
Rugged Individualism Kaput!

In this way scientists have learned to work in large groups. At the beginning of the century it was possible for a rugged individualist like Edison to design and produce the electric light bulb in his own kitchen working with odds and ends of equipment. But scientific knowledge is piling up at such a greatly increased rate today that no one person can hope to keep pace. Just as the development of aerial warfare made individual dog-fights obsolete, so the lone-wolf investigator has been hopelessly outdated. No one person invented the atomic bomb, nor radar, nor the B-29 Superfort. All of these precision instruments, for that is what they are, required for their successful development the combined skill of thousands of scientific personnel working together, each group benefitting from the knowledge of the others.

Science for Human Welfare

At the moment in Canada we have the organizations and the funds required for planned science. We have mobilized for war and, incidentally, we have obtained results useful in peacetime as well. Surely then it now is to our advantage to do the same when *all* the results will be useful. The investment in terms of money is enormous but it yields handsome profits in terms of human welfare.

Canada is not alone in facing this decision. Our allies, Britain, the Soviet Union and the United States, all have been using the same method as ourselves during the war. What are they planning for science now?



What Other Countries Are Doing

In Britain a Chief Scientific Advisor has been appointed to maintain close touch with Britain's vast building program. In this way, scientific problems arising out of construction can be dealt with on the basis of expert technical opinion. If the answer cannot be given from existing knowledge, experiments to find it can be undertaken without delay. Thus does Britain continue her long-standing program of building research — a field in which Canada has remained stationary.

The same thing is happening in Britain's coal industry. Coal is Britain's only source of power and must be conserved. British scientists are surveying coal reserves and are planning to use present collieries more efficiently and to open new ones on a scientific basis.

A British Opinion...

The following opinion was expressed in an address delivered by Sir Stafford Cripps, former Minister of Aircraft Production, to the Conference on Planning of Science called by the Association of Scientific Workers and held in London in 1944:

"*The problem of the utilization of the scientists in the war effort is one that has been the subject of a great deal of discussion in this country, though there is in reality no difference in the principles that should be applied in time of war and in time of peace. Whether it be for the purpose of winning victory in war or for the purpose of winning decent standards of living in time of peace, we should equally desire to utilize the highest degree of scientific knowledge throughout our industries.*"

In the USSR the Academy of Sciences has worked out a plan for research in the post-war period even more comprehensive than were the State plans of the pre-war period.

... and an American One

In the United States the late President Roosevelt expressed concern over the future of science in a letter addressed to Dr. Vannever Bush, Director of the Office of Scientific Research and Development and the scientist in charge of the development of the atomic bomb. The letter is dated November 20, 1944 and was later released to the press. The following are extracts:

"The Office of Scientific Research and Development . . . represents a unique experiment of teamwork and co-operation in co-ordinating scientific research and in applying existing scientific knowledge to the solution of the technical problems paramount in war . . .

"There is, however, no reason why the lessons to be found in this experiment cannot be profitably employed in time of peace. The information, the techniques and the research experience developed by the Office of Scientific Research and Development and by the thousands of scientists in the universities and in private industry should be used in the days of peace ahead for the improvement of the national health, the creation of new enterprises bringing new jobs, and the betterment of the national standard of living. It is with that objective in mind that I would like to have your recommendations on the following four major points:

"First: What can be done, consistent with military security, and with the prior approval of the military authorities, to make known to the world as soon as possible the contributions which have been made during our war effort to scientific knowledge?

"The diffusion of such knowledge should help us stimulate new enterprises, provide jobs for our returning service men and other workers and make possible great strides for the improvement of the national well-being.

"Second: With particular reference to the war of science against disease, what can be done now to organize a program for continuing in the future the work which has been done in medicine and related sciences?

"The fact that the annual deaths in this country from one or

two diseases alone are far in excess of the total number of lives lost by us in battle during this war should make us conscious of the duty we owe future generations.

"Third: What can the government do now and in the future to aid research activities by public organizations? The proper roles of public and of private research, and their interrelation, should be carefully considered.

"Fourth: Can an effective program be proposed for discovering and developing scientific talent in American youth so that the continuing future of scientific research in this country may be assured on a level comparable to what has been done during the war?

"New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness and drive with which we have waged this war we can create a fuller and more fruitful employment and a fuller and more fruitful life."

(Signed) *Franklin D. Roosevelt.*

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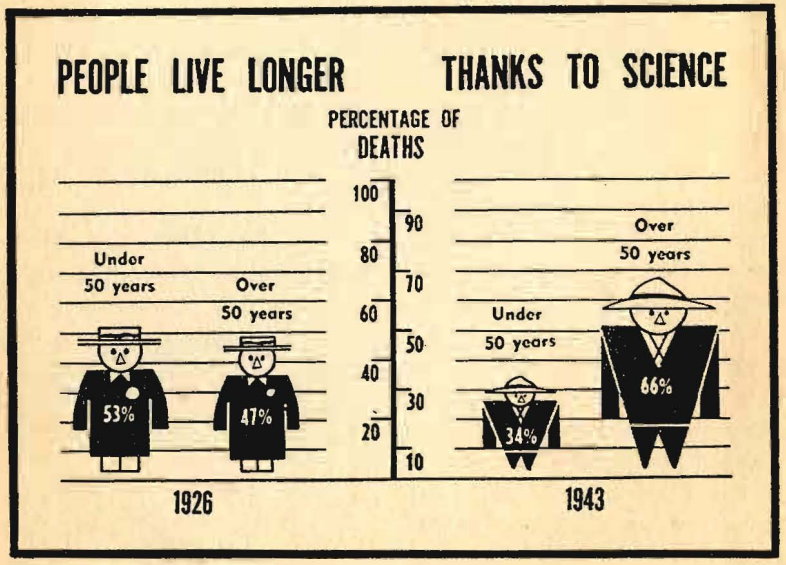


Civvy Street NEWS
No. 19 October, 1945

WHAT'S AHEAD FOR TECHNICAL PERSONNEL?

CANADIAN scientists have hit their stride in this war. They've become head-line news for their researches in radar and the atomic bomb. What's less familiar, but perhaps more important, is the vital work they did in the war industries and the army. Canada's huge industrial expansion which made her No. 4 producer among the United Nations, demanded a small army of men trained in every branch of science from agronomists to zoologists with chemists, engineers, and physicists thrown in between. They ran the laboratories that guided our war production (1939-44) of

Chemicals, explosive and filling	$ 492 million
Aircraft	1,151 "
Mechanical transport	1,582 "
Instruments and signals	479 "
Other products	6,302 "
GRAND TOTAL	$10,006 million

About 8,000 of these "technical personnel" entered the armed forces, where most of them made use of their civilian training. The following corps of the army used over 3,500: artillery, CREME, engineers and signals. The Navy and Air Force accounted for 2,500 more, all in some technical appointment. The balance, about 2,000, chose any job between infantry Joe and Air Vice Marshal.

Some of these scientists landed up in the Operational Research Sections of the RCAF, where the equipment and operational methods of the Air Force were put through scientific tests. Now that the shooting's stopped, we can mention some of the problems that worried the boys in the back room and that were tackled by Operational Research — how to use radar equipment as a blind bombing aid against Germany; counter measures against the Buzz bomb; how to increase efficiency of aircraft attacks against U-Boats.

So essential was the need to coordinate the supply of engineers

(*Continued on page 4*)

REHAB ROUNDUP

New Housing Finance Corporation

The Minister of Finance will shortly propose to Parliament that a new corporation be formed, to be known as Central Mortgage and Housing Corporation. It will act for the Minister in the operation of the National Housing Act and will deal with private loan and mortgage companies engaging in housing projects.

Mr. Ilsley will also recommend amendments to the N.H.A. to provide more public money for loans and guarantees on rental housing.

Are You a Farmer?

Employment on a farm means a speedy release from the Armed Services. Agricultural Labour Survey Committees have been set up in each of the thirteen mobilization divisions, under the Department of Labour. Since July 1 of this year, the Committees have reviewed more than 5,000 applications for the release of farm workers. While the Committees deal mainly with farm workers, they also advise on the release of men for logging, fishing and food processing plants.

Money in Our Pockets

War service gratuities to Canadian Army ex-service men awarded up to August 31, 1945, total $51,439,719. During August, 15,870 gratuity applications were passed, and cash involved amounted to $10,200,524. Clothing allowances totalled $2,094,643 and Rehabilitation grants of $740,411 were paid.

Sure But Slow

20,051 bodies were discharged from the armed services for the week ending September 29. By services, the total is broken down as follows: Navy, 2,356; Army, 9,783; Air Force, 7,912.

A Seniority Clause for Vets

Seniority rights for veterans are one of the issues under consideration in the Windsor strike. The United Automobile Workers' contracts now in process of negotiation provide that any worker discharged from the armed forces shall be credited with full seniority from the day of his enlistment, even though he had not been previously employed.

How to Keep Flying

A group of ex-RCAF pilots have banded together to form Air Services Ltd., a company which will operate a public land and water airport to be constructed at Boucherville, Quebec. These enterprising veterans aim to capitalize on their years of air training and instruction. They will provide Montreal citizens with facilities for private flying and instruction, aerial taxi, and fly-yourself services in addition to complete aircraft sales and maintenance departments.

Gratuities Continue in the Navy

War Service Gratuities and other post-discharge benefits will continue until March 31, 1946, for personnel based in Canada who stay in the Navy. Those based outside the Western Hemisphere on August 31, 1945, will continue to receive the benefits beyond the cut-off date providing they are still serving overseas.

1,000 Vets for University

More than 1,000 veterans at D.D.4 were interviewed and approved for university courses by personnel counsellors of the Department of Veterans Affairs during September. This is about five times the number passed during August and about one quarter of the total counselled on all subjects.

Post-mortem on Discharges

Less than one-third of the fighting forces released to civilian life are actually hunting for employment, figures released on September 19 reveal.

In July there were 23,845 pre-discharge interviews by officers of the Department of Veterans Affairs at release centres . . . a sharp increase over the June total of 15,754. Only 32.4% of those interviewed are in quest of employment. Nearly half the veterans have jobs, farms or businesses to which they are returning, and about one veteran in seven has a new job available. 12.4% of the July dischargees sought further educational training. Less than 3% chose farms or farming, while 7% were undecided as to their future.

Heigh-ho to the Northland

An item of interest to servicemen: One of the heaviest demands for labour is in the logging industry, which suffered heavily during the war from the man-power shortage. As of September, there were vacancies for 23,000 bushmen, of whom 8,000 were required in Quebec and 7,000 in Ontario. Other fields wide-open to the job hunter are the mines of Northern Ontario and Quebec and the construction trades in any city or town across the Dominion.

Partnerships for Veterans

Veterans may now use their re-establishment credit to assist them in the purchase of a partnership in a business already operating, or as a capital investment in a new partnership, providing the veterans intend to participate actively in such business. The partnership is not limited to any particular number of veterans and all the partners need not be ex-service men or women.

Commonwealth Airmen for Canada

The British Commonwealth air training plan, designed for war, will bring Canada new citizens in peace.

Canadian immigration officials in London say that many of the thousands of United Kingdom airmen sent to Canada for training want to return. If they have sufficient resources of their own, or the sponsorship of relatives or others in Canada prepared to be responsible for their maintenance, there is nothing to prevent them going as soon as shipping is available. The new Labour Government of the United Kingdom has not set forth its policy on emigration, but any policy will depend on the attitude of the Dominions. A main consideration will be the need of men and women to rebuild Britain after the war.

Book on Naval Trade Ratings

The Navy has prepared a new 259-page book on naval trade ratings. This explains exhaustively what each type of tradesman in the navy has learned and just what civilian job is related to his trade. The book, originally prepared for Naval counsellors, will be widely circulated to employers to help them understand the significance of naval rates and with the hope that many ex-naval personnel will thus be accepted for jobs that will utilize their naval training and experience.

Home Army Discharge Leave

Canadian Home Army men, who previously did not qualify for pre-discharge leave, will now get seven days' leave just prior to leaving the service. This leave has been granted to provide time for discharge procedure and to enable the soldier to give unhurried consideration to his rehabilitation plans. All personnel serving in Canada are eligible except those discharged for misconduct.

KNOW YOUR REHAB RIGHTS:

FREE MEDICAL TREATMENT • CLOTHING ALLOWANCES • REHABILITATION GRANT • REINSTATEMENT IN JOBS
RE-ESTABLISHMENT CREDIT • A HOME OUTSIDE TOWN • FARMING OPPORTUNITIES • VOCATIONAL TRAINING
UNIVERSITY TRAINING • MAINTENANCE GRANTS

How do they work? How do they affect YOUR future? They are all part of Canada's Rehabilitation Program, designed to help you on the road ahead. Keep informed. Send in your questions to Editor, Civvy Street News, Canadian Information Service, Ottawa.

and scientists with the needs of industry and the armed forces that the government set up the War-time Bureau of Technical Personnel under the Department of Labour. The Bureau is now providing the following services to veterans with technical training:

(1) An outline of the simple formalities involved in returning to civilian employment;

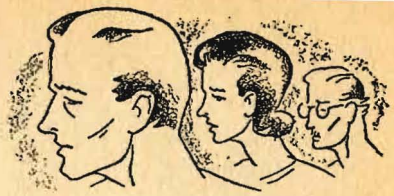
(2) Information of a general nature about employment possibilities in various fields of engineering and science;

(3) Access, if desired, to a list of specific openings of particular interest to, or specifically reserved for, technical persons who are returning to civil life after serving in uniform.

The Bureau has some interesting figures about the future of these scientists in uniform. About 1,000 have already returned to civilian life. The proportion returning to previous positions is about one-third. The balance have located new posts, with the assistance of the Bureau, in firms which are faced with the problem of re-building their engineering and scientific staffs. From April 1, 1944 to September 30, 1945 the Bureau issued 804 permits for the employment of veterans in technical jobs.

What are the prospects for those veteran scientists who are coming back? The Bureau gives several reasons for optimism. On September 30, 1945 there were 1,070 technical positions open, many of which will be filled by returning vets. During the war there was a grave shortage of scientific personnel, particularly in low priority industries. These empty positions will absorb a large number of returning specialists. But we must depend chiefly on the reconversion and expansion of industry, on the backlog of construction projects and on a greater use of scientific technique, if we are to use to a maximum the skill of our scientific workers, both in and out of uniform. As citizens we must strive for full employment in an expanding economy, if we are to have full employment for scientists.

What Canadians Can Do



What is our position here in Canada on the post-war planning of science? Before the war we were woefully far behind. According to the figures tabled in the House of Commons by the Minister of Trade and Commerce we spent annually on scientific research, both public and private, only 29 cents per capita while Britain spent 80 cents, the U.S.A. $1.80 and the USSR $2.40.

At present, however, the situation is much improved and Canada has emerged from the war with great scientific prestige. Dean C. J. MacKenzie, President of the National Research Council, recognizes this and referred to research as a "national necessity" in a speech delivered last Autumn. There is no doubt that we can maintain this prestige since we have ourselves created it. But *will* we maintain it? That depends on us; it depends only on whether the majority of Canadians want to.

If we want to maintain our present high level of scientific achievement we will have to continue our existing organizations, improving and expanding them as we learn by experience the most effective and harmonious methods of co-operation.

We will have to increase our present facilities and equipment, renewing and perfecting them continually as improvements are made available.

We Need Our Scientists

Just as important as these is the question of personnel. There has always been a steady flow of science graduates trained in Canadian Universities towards the more attractive opportunities existing in the United States. As a result, in the early days of the war, Canada was faced with a critical shortage of scientists and our universities were requested to train science students as quickly as possible. This was done, and recent graduates have stayed in Canada because of the emergency. But as we reconvert to peace and as restrictions on emigration are

removed, offers to Canadians will certainly be varied and attractive and we will keep our scientists in Canada only if they wish to remain. Can we offer them the encouragement and opportunities for research? Can we give them the incentive to remain in Canada? Can we give them confidence that their work will bear fruit and that the results will not be lost or forgotten?

Salaries and Facilities

Adequate remuneration for both industrial and academic scientists is undoubtedly the most urgent and important item. The Dominion government took an important step when by Order-in-Council in 1944 it recognized the principle of collective bargaining for professionals, thereby opening the way for scientists to negotiate with their employers for increased salaries and better working conditions.

But high salaries by themselves are not sufficient. Scientific personnel require facilities. Here, too, we will have to match offers from outside our borders. We need more buildings with well-designed laboratories, modern equipment and plentiful materials of all kinds.

Training of Talent

Consistent with these requirements we must provide for the training of more and more scientific personnel. Gifted young Canadians must be helped to finish school and continue to university through a network of scholarships reaching into every corner of the nation. Workers in war-plants and in industry generally who have shown aptitude for skilled work must be encouraged to improve their skills and be given an opportunity to further their technical education through trade-schools and technical schools.

The Department of Veterans Affairs has already laid the foundation for this type of training insofar as veterans are concerned. The plan can be broadened through other agencies to include civilians. In such a program there is no room for discrimination. Obstacles to advancement in science based on sex, race, creed, colour or insufficient means must be removed so that competence and merit alone shall determine promotion.

Science Makes Jobs

All this will require a great deal of money, but it is available. In the last five years Canada has achieved a high level of economic development in virtue of industrial production. Post-war planned science will stimulate production and thereby create wealth. Relating to this point, the Honourable Brooke Claxton, Minister of National Health and Welfare, recently stated "*It can't be said often enough that the only ultimate source of wealth is production.*"

The Ministry of Reconstruction also recognizes the vital part science plays in industry. A section of its recent White Paper on *Employment and Income* (see page 15 of this pamphlet) relates the question of post-war scientific research directly to the future employment and income of the Canadian people.

So we need a comprehensive *plan* for science; a plan generously financed by both the government and private industry; a plan in which each scientist plays a part; a plan understood and supported by all Canadians. Ultimately it depends on each of us. The extent to which Canadians will benefit from science in the post-

war world is largely influenced by social factors beyond the control of scientists as a group.

Science and the Citizen

Up till now only a fraction of the potential benefits of science have been realized; the war has shown that if we have the will to do it we can make and apply scientific discoveries with a speed and completeness unthinkable five years ago. What has been done during the war can be done equally well during the peace if enough of us agree that it must be done. This is where the scientist and the citizen can work together. The scientist knows what is physically possible and what is impossible; but only the citizen can furnish him with the tools to translate that knowledge into reality.

September 1, 1945.

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THE AUTHOR: Raymond Boyer was born in Montreal. He took his Ph.D. in Chemistry at McGill University, after which he did post-doctorate work at Harvard, at the University of Vienna, and at the Sorbonne in Paris. Since 1940, Dr. Boyer has been engaged in war research on explosives at McGill University, taking part in the extra-mural program of the National Research Council, and is one of the group of Canadian scientists who developed the explosive RDX in Canada. He is National Chairman of the Canadian Association of Scientific Workers.

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CANADIAN AFFAIRS is published by the Canadian Information Service (formerly the Wartime Information Board) for use as discussion material in the Canadian Armed Forces. It is distributed to civilian groups through the Canadian Council of Education for Citizenship. Articles should be regarded as expressing the views of the individual Canadians who write them; these are not necessarily the views of the Defence Departments, the Canadian Information Service, or any other Government Authority. Material may be reprinted for education purposes, with or without acknowledgment.

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CANADIAN AFFAIRS is produced as ammunition for good fighters and good citizens. Both know what they fought for and what they want from victory. These pamphlets are designed for *discussion*. If they are not being discussed, they are being misused. Reading them by yourself is all right; but nothing takes the place of chewing over facts and ideas in open discussion. Use questions on pages 16 to 19 to plan a group discussion.

Extract from White Paper on Employment and Income

Scientific and Industrial Research

The Government attaches the greatest importance to the expansion of scientific research in Dominion and other government laboratories, in the universities and within industry. In the past, Canadian industry and government have been far too dependent on sources outside the country for the results of research and there has been too little dissemination of technical knowledge. Scientific research has yielded during the war results of the greatest immediate and future significance. Applied to the problems of Canadian industry and resources, equal research effort can contribute enormously to the future employment and income of the Canadian people.

The Government proposes to continue and expand after the war the work of the National Research Council and co-ordinate it more closely and effectively with the research work of the universities, other government laboratories, and industry. By co-operative endeavour, the whole technical level of Canadian industry, both primary and secondary, must be raised.

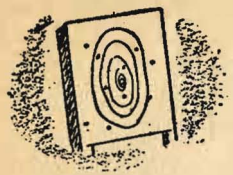
In the immediate future, few, if any, research facilities can be released from war work. Through the medium of the Department of Reconstruction, however, definite steps have been taken:

(1) to establish and operate a technical and scientific information service to make technical knowledge and the results of research available to industry, and particularly small industry, throughout Canada;

(2) to arrange, wherever men and facilities are available, for research designed to assist special industrial and development projects;

(3) to establish co-operation and co-ordination in long-term research programs.

To encourage the expansion of research by private industry, Parliament has made generous fiscal provisions for charging as current expenses or writing off over a period of years against taxable income all expenditure and investment made in research facilities.



Questions for Discussion

Keep Your Eye on the Target

We use science in everything we do — well, almost everything — from scrambling an omelet to aiming a rifle. Because of its endless variety, a science discussion can be scrambled or aimed. Let's aim ours at the target, *Planning Science*, by using the group's common interests in science. What are they?

First make use of your group's war experience. Many members of the armed forces have used scientific instruments, the rifle, wireless, or plane. All of them know how science was used in the war. They have a lot of facts to contribute.

Second make the group members think as citizens. Your group is concerned with (A) *Jobs* (B) *Living Standards* (C) *Keeping the Peace.* Science affects all three depending on (1) What science discovers for us (2) How we use discoveries. (3) What we could make science do. Have your group combine A123, B123, C123, for example:

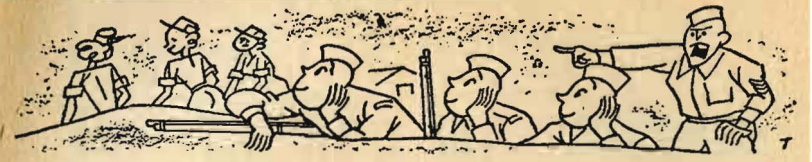
B. Health for Canada

1. What has science developed for better health?
2. Do we use these developments fully? If not, why?
3. What diseases need blitzing by science? How about planning the blitz? A national health scheme might cover medical research, facilities, and services. Discuss the idea.

TOSS IN THE ATOMIC BOMB

There are many approaches to the target; here's one. The bomb that blasted Japan is still shaking us, so use it first. Fit it into the knowledge and interests of your group. We all have our own ideas about weapons, strategy and winning a war. Let's bring them up to date with a few questions. How has the atomic bomb changed modern warfare? Where do tanks, battleships, B29's and slit trenches fit in? What becomes of the infantryman, the pilot and the sailor? How can cities be defended against the bomb?

Can nations survive another war in which a main weapon would be rocket-carried atomic bombs?



THEN TRY TO NEUTRALIZE IT

A British scientist said: "Any nation can make an atomic bomb in five years." Why is this possible? Why did the Allies beat the Axis to the bomb? In five years the world's security may be blasted by any would-be Hitler who cares to push a button. How can we prevent this? It is suggested that the Security Council of the United Nations control atomic energy development. Is international control necessary? Should the security council wield that control?

WHAT'S NEW ABOUT THE BOMB?

Just as new as the atomic bomb itself, is the new way it was discovered and made. The bomb is the result of a two billion dollar *plan* that used the combined efforts of scientific, industrial and military organizations, including hundreds of scientists. Why was the job tackled in this way? An operations order is a plan. Since the D-Day Invasion and the bomb were both planned, what features have they in common? How do these projects differ from pre-war ones—in size . . . expenditure . . . international cooperation . . . government initiative . . . results? Tell the group how science was organized in Canada during the war.

PLANNING PEACE OFFENSIVES

We see how war offensives must be planned. What about peace offensives? According to an American scientist, the first eleven days of the Normandy invasion took an average of 300 American soldiers a day. Cancer took an average of 400 American lives on each of these days. Yet his country spent yearly on Cancer research a little less than the receipts of one major football game. Do you think Cancer is as great an enemy as Fascism? Could we attack it on the same scale? How? Why haven't we done so before? Can you think of other problems as important as Cancer?

MINEFIELDS AHEAD

We've seen what science could do during the war. Why didn't science work as well before the war? Now that's a jack-pot question, to which there is no simple answer. But it will be asked, for many things about Canadian society have worked better in war than in peace. Industry, employment and food consumption and distribution are some. For one thing, the incentive for using science seems to be more urgent in war-time. Victory rather than cost is the major consideration. What is the incentive in peacetime?

Consider the statement of Lord Stamp: "Unless most scientific discoveries happen to come within the scope of the profit motive, and it is worth someone's while to supply them to the community . . . nothing happens — the potential never becomes actual." In any case there has been a time lag between inventions and their application. A study of inventions introduced in the 1920's shows an average of 33 years between the patents and their commercial exploitation. Many factors affect this situation. Here are some worth discussing: 1. Cost of introducing new methods. 2. Losses through premature scrapping of equipment. 3. Risks involved in such investments. 4. Patent restrictions. 5. Absence of national goals and policies for using new techniques.

What are some other factors? How might these factors be modified for a fuller application of scientific developments?

SCIENCE CREATES NEW JOBS

Electricity has changed the face of the world, giving us new and better ways for living. Millions of men and women have jobs today because a small number of scientists created the enormous electrical industries that gave them work. Name ten mass-employment industries that didn't exist in 1920. What scientific discoveries made them possible? What jobs did they create? Compare houses and cars. If a Ford car were made by hand, the way a house is today, it would cost about $17,000. Scientific mass production puts tens of millions of low-priced cars on the market and employs whole armies of people. What about a new industry that would make a million factory-made houses every year, fully equipped with heating and electrical systems? Scientists say such mass production houses could sell for less than $500 a room. This would put many of Canada's 150,000 home builders out of work. But temporarily. Science always makes far more jobs than it eliminates. How many new jobs would be created by such an industry? How would it affect seasonal fluctuation in the building-trades? What new skills would be needed? How many new houses are needed in Canada? What part of your budget usually goes towards rent? How might such an industry raise our living standards?

A PROGRAM FOR SCIENCE

It's a bad habit to read material to a discussion group, but President Roosevelt's letter in this article will be listened to. Read it loudly and well for it deals with what we were fighting for. The President's questions must finally be answered by government legislation if science is to serve in peace as it did in war. To what extent are these questions answered in existing or proposed legislation in Canada? (Refer to White Paper . . . Page 15).

WE THE PEOPLE...

In a discussion, the last five minutes is the pay-off. We may decide that science did a good job in the war—and should continue to do so in the peace. So what? Just this! It depends on *us*. Government legislation and expenditure for a National Science Program depends on whether the majority of Canadians want it. If the group recognizes Canada's need for such a program, will it ask and vote for it? O.K. Break Off.

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What to Read

(For those who can reach a library)

MODERN CHEMISTS AND THEIR WORK: Borth, C.
The New Home Library, 192, New York, 410 pp.

YOUR WORLD TOMORROW: Cooley, D. G.
Essential Books, 1944, New York, 252 pp.

THE SOCIAL RELATIONS OF SCIENCE: Crowther, J. G.
MacMillan Co., 1941, London, 665 pp.

KAISER WAKES THE DOCTORS: De Kruif, Paul.
Harcourt, Brace and Co., 1944, New York, 158 pp.

ROCKETS: Ley, W.
The Viking Press, 1944, New York, 287 pp.

THE FRIENDLY ARCTIC: Stefansson, Vilhjalmur.
MacMillan Co., 1943, New York, 812 pp.

A SHORT HISTORY OF SCIENCE: Tyler and Bigelow.
MacMillan Co., 1939, New York, 512 pp.

Ask your unit educational officer for "Directed Reading Course" on Science.