

Atomic Energy Research by U.B.C. Scientists

By Walter Barss, B.A.'37, M.A.'39, Ph.D. (Purdue)



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Every U. B. C. Alumnus in the Chalk River Plant of Atomic Energy of Canada Limited could probably name a dozen or more fellow graduates among his associates at work and his neighbours in the nearby townsite of Deep River. Few

would guess that there are 42 U.B.C. graduates among the approximately 350 Scientists and Engineers in Canada's main centre for atomic energy research.

GRADUATE HEADS THEORETICAL PHYSICS BRANCH

Senior man of the U.B.C. group here is H. H. Clayton, B.A.'35, M.A.'37, Head of the Theoretical Physics Branch. This Branch is one of the most important in the whole project; first, for its fundamental studies of the theoretical aspects of nuclear Physics and, secondly, for the development of mathematical means for designing and predicting the behaviour of atomic reactors. Hank joined the Atomic Energy Project at Montreal ten years ago, after service in the Canadian Army Operations Research Group, and has been Head of the Branch since 1950. The Claytons, who returned recently from a holiday trip to the West Coast, have managed to turn Deep River's notoriously sandy soil into one of the finest gardens in town.

Specialising in the nuclear Physics work in the same Branch is T. D. Newton, B.A.'39, M.A.'41, Ph.D. (Princeton). Another ardent gardener, Ted writes a gardening column for the North Renfrew Times, the local weekly paper. Dr. F. G. Hess, B.A.'49, M.A.'51, Ph.D.'55, has been working on reactor calculations for a year and is leaving shortly for post-graduate studies at Cambridge.

LARGEST GROUP IN REACTOR PHYSICS BRANCH

Reactor Physics, which lies a step nearer to the practical application of atomic energy, has the largest number of U.B.C. graduates of any Branch.

R. M. Pearce, M.A.'48, Ph.D.'52, heads a group which uses an electronic analog computer to calculate the effects of changes in size, fuel arrangements or construction materials on the performance of proposed reactors. Also in this group is J. W.

Coburn, B.A.Sc.'56, who may be returning to U.B.C. for graduate studies this fall.

E. Critoph, B.A.Sc.'51, has been making calculations for NPD, the Nuclear Power Demonstration reactor, using "Ferut", the University of Toronto's electronic digital computer. NPD is the reactor which is to be built twenty miles farther up the Ottawa River by A.E.C.L. in co-operation with the Hydro-Electric Power Commission of Ontario and the Canadian General Electric Company.

R. H. Chow, B.A.'47, M.A.'49, Ph.D. (California), is studying neutron-conserving arrangements of reactor fuel, such as are used as "blankets" around some types of reactors, and conducting experiments with the NRX reactor to check his calculations. T. K. Alexander, B.A.'53, M.A.'55, is investigating the emission of gamma rays following neutron capture, in order to determine the probability of certain nuclear reactions.

W. M. Barss, B.A.'37, M.A.'39, Ph.D. (Purdue), until recently on loan to the Metallurgy Branch, has been studying the physical changes produced in reactor fuels by the intense radiation in a reactor and developing fuel elements which will not be adversely affected by these changes.

DEMAND FOR NUCLEAR ENGINEERS

The appearance of courses in Nuclear Engineering at several U.S. Universities indicates the importance of this new type of Engineering in the development of atomic power. At A.E.C.L. the Nuclear Engineering Branch works closely with Reactor Physics in testing experimental fuel assemblies and in designing reactors and reactor components. The fuel assemblies are tested in the first Canadian reactor, ZEEP (Zero Energy Experimental Pile), and in the NRX reactor which, nine years after its



Don Stewart, center, pauses with J. L. Gray, A.E.C.L. Vice-President, Administration and Operations, and S. Patuck, of the Tata Institute of Fundamental Research, Bombay, on arrival at the Bombay airport. (Date, January 18; Temperature, 85° F.!)

construction, still provides unsurpassed facilities for the testing of large fuel elements. Some of the elements being tested are for the NPD reactor, others for the NRU reactor which will soon provide still better facilities for nuclear tests.

In the Nuclear Engineering Branch are J. F. Palmer, B.A.Sc.'53, M.A. (Queen's), who works on special monitoring devices for the detection of failures in fuel elements, and Professor W. A. Wolfe, B.A., B.A.Sc.'37, of the U.B.C. Department of Mechanical Engineering, who has been working here during the summer on the design of reactors.

In the Engineering Design Branch, J. A. Cramb, B.A.Sc.'56, has joined the staff this year and C. A. (Cy) Crawford, B.A.Sc.'51, has become Head of a new section for Nuclear Service Design. A year or two ago, Cy spent his summer holiday prospecting in one of Ontario's new Uranium mining areas: the holiday paid off very well.

T. G. Church, B.A.Sc.'38, is Administrative Assistant to the Director of the Division of Reactor Research and Development, which includes both the Reactor Physics and Nuclear Engineering Branches.

NEW LABORATORIES FOR PHYSICAL METALLURGY

The Metallurgy Building, which has four U.B.C. Alumni on its roster, was opened early last year. It provides laboratory facilities for casting and heat-treating metals and alloys, and for the physical and metallographic examination of reactor fuels and structural materials.

L. G. Bell, B.A.'54, M.A.'55, is working on the physical properties of



(1) Henry Clayton, Head of the Theoretical Physics Branch, discusses a calculation with Gene Hess and Ted Newton, right.

(2) Mike Pearce, left, describes to John Coburn and Gene Critoph, right, some results obtained from the Reactor Physics Branch electronic analog computer.

(3) Tom Church, right, shows Tom Alexander, Dick Chow and Walter Barss the plans for the building to house a new "swimming pool" reactor. NRU reactor building is in background.

Uranium alloys, while G. R. Piercy, B.A.Sc.'51, M.A.'52, Ph.D. (Birmingham) is studying the effects of irradiation on metals. G. V. Kidson, B.A.'52, M.A.'53, has been investigating diffusion in metals, and will soon be going on exchange for two years to the British Atomic Energy Research Establishment at Harwell.

The only one in the group to start as a Metallurgist, A. S. Bain, B.A.Sc.'50, is now in charge of the "cave" in which irradiated materials much too radioactive for normal handling may be manipulated by remote control while being observed through two-foot-thick windows of special shielding glass.

WORLD TRAVEL FOR ATOMIC ENERGY

The recently-appointed Head of Reactor Operations, who is responsible for the operation of the NRX and NRU reactors at Chalk River, is D. D. Stewart, B.A.'40, M.A. (Toronto). Don has just returned from a round-the-world trip in connection with Canada's gift of a nuclear reactor to India under the Colombo Plan. D. C. Milley, B.A.'53, M.A.'55, is in the Reactor Safeguards Branch, of which Don was previously the Head.

The NRX Reactor Branch has four U.B.C. engineers engaged in supervising reactor operation: H. B. Hilton, B.A.Sc.'46, G. R. A. Howey, B.A.Sc.'49, M.A.Sc.'51, H. E. Smyth, B.A.Sc.'50, and M. Koyanagi, B.A.Sc.'55. These men are in charge of the crews that keep the reactor running day and night to produce radioactive isotopes, test fuel elements and supply radiation for Chemistry and Physics experiments.

Two groups which work closely with the reactor Branches are the Radiation Hazards Control Branch and the Production, Planning and Control Section. J. M. White, B.A.Sc.'51, as Head of the Reactors and Decontamination Section of the R.H.C. Branch, works on the important task of detecting and preventing the spread of harmful radioactive contamination. S. Mathews, B.A.Sc.'54, is engaged in technical liaison between the reactor Branches and the suppliers of different types of fuel elements.

"HOT" CHEMISTRY

On the far side, so to speak, of reactor operation are studies of safe and efficient methods for processing used reactor fuels and disposing of radioactive waste materials from the processing plants. At Chalk River these studies are divided between the Chemical Engineering and Development Chemistry Branches.

I. W. Allam, B.A.Sc.'53, and W. W. Morgan, B.A.'54, are Chemists working on fuel processing, a problem noted for the intense radioactivity and chemical inhomogeneity of the materials to be handled. E. Yatabe, B.A.Sc.'38, M.A.Sc.'39, known as "John" to his friends here, is a Chemical Engineer working on the design of equipment for the recovery of



(1) Operating remote control manipulation in Metallurgy Building "cave", Al Bain explains radiation shielding problem to Bob Piercy, right, and Geoff Kidson.

(2) Development Chemists and Chemical Engineers inspect process equipment in Chemical Engineering Building. From left: Woody Erlebach, Ivor Allam, Bill Morgan, Don Whittle, Bill Bourns and John Yatabe.

(3) Bob Robertson, seated, discusses high temperature irradiation tests with Chemists and Reactor Supervisors. From left, standing: Bill McFadden, Matsuo Koyanagi, Bill Boyd and Harry Smith.

Uranium from the dissolved fuel elements.

W. T. Bourns, B.A.Sc.'49, and W. E. Erlebach, B.A.Sc.'51, M.A.Sc.'53, are Chemical Engineers studying waste disposal, a problem which will become ever more urgent as the number and power of nuclear reactors increases. Don J. Whittle, a 1956 graduate in Chemical Engineering, is conducting heat-transfer experiments this summer before returning to University for further studies.

As a result of his many experiments on the corrosion of fuel elements, R. F. S. Robertson, B.A.'39, M.A.'48, Ph.D. (Illinois) is as well known around the NRX reactor as in the Chemistry laboratories. Bob has been working for years on the chemical effects of radiation and is an expert in this field. A. W. Boyd, B.A.'45, M.A.'47, Ph.D. (California) is also working in radiation Chemistry.

G. Zotov, B.A.'38, M.A.'40, in charge of the busy spectro-graphic laboratory, is seeking to improve the reproducibility of spectral intensities by developing new ways of handling the solutions submitted for analysis.

PURE RESEARCH

The work done by the Research Chemists and Physicists, who have been attracted here by the special facilities of a research reactor, is as important as the work of the "Applied" Researchers and Engineers. It helps to maintain high professional standards and stimulate new ideas, many of which later become of practical importance.

In Research Chemistry, R. W. A. Attree, B.A.'45, M.A.'47, Ph.D. (Princeton), has been studying radiation effects in both pure crystals and crystals containing impurity "activators". Mrs. J. C. D. Milton, née Gwen Shaw, B.A.'47, M.A. (California), has been investigating the yield of some isotopes produced in the fission of Uranium. W. H. McFadden, B.A.'49, M.A.'51, Ph.D. (Utah), has been observing the chemical "fate" of the newly-formed atoms produced by nuclear reactions.

In General Physics, G. A. Bartholomew, B.A.'43, M.A.'44, Ph.D. (McGill), has become an authority on the

radiative capture of neutrons, having investigated the resulting gamma spectra for nearly all the elements. B. N. Brockhouse, B.A.'47, M.A., Ph.D. (Toronto), is using neutron spectrometry to study the characteristics of crystalline structures associated with the magnetic properties of metals and their compounds.

G. Jones, B.A.'53, M.A.'55, has joined the Electronics Branch which develops much of the specialised electronic equipment required for research in both Chemistry and Physics.

R. E. Bell, B.A.'39, M.A.'41, Ph.D. (McGill), has been stationed in Montreal to use the McGill University cyclotron as a supplement to the particle accelerators available at Chalk River for studies of the high-energy aspects of nuclear Physics.

WELL-ROUNDED REPRESENTATION

Returning once more to nuclear Physics and its investigations of the properties of atomic nuclei, including those properties which make fission and the development of nuclear power possible, we have completed a circular tour of most of the Chalk River project. Like a holiday trip to visit a number of relatives, it has brought most sharply to our attention the places in which our fellow graduates happen to be — but, with forty-two people fairly uniformly distributed around the Project, this has given quite a complete picture of what is going on here.

Without making a detailed comparison of the types of training offered at U.B.C. and the requirements of a complex organisation like A.E.C.L., it is interesting to note that only one Alumnus, L. A. Fingarson, a 1955 Commerce graduate, is employed here in a purely administrative capacity. The others are distributed as follows: 20 graduates in Physics and Engineering Physics, 15 Engineers (including Chemical Engineers) and 6 Chemists.

No effort has been made to tally up the number of Alumnae in Deep River. That will have to be left as a job for the secretary — if and when somebody organises a Deep River Branch of the U.B.C. Alumni Association.

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