Dr. Frank Forward was a highly respected metallurgist, prominent in the Canadian engineering world and an influential figure in the development of UBC's international reputation for excellence in metallurgy. He was Head of the Department of Metallurgical Engineering (now Materials Engineering) at UBC for 19 years from 1945 to 1964. The building which houses much of the Department's activities is named after him.

His main contribution to metallurgy was developing and applying pressure leaching processes for the recovery of metals. In his systems, the spent solutions could be recycled, which at the time, was environmentally innovative. His processes were and are used in industry worldwide.

Biography:

Born: Ottawa, Ontario, 1902
Deceased: Vancouver, British Columbia, 1972

B.A.Sc. in Chemical Engineering, University of Toronto	1924
Honorary D.Sc., University of British Columbia	1965
Member, Department of Metallurgical Engineering, University of British Columbia	1935 – 1964
Department Head, Department of Metallurgical Engineering, University of British Columbia	1945 – 1964
Director, Scientific Secretariat Privy Council Office, Ottawa	1964 – 1967
Director of Research, Canadian Uranium Research Foundation	1960 – 1964

AWARDS

INCO Medal, Canadian Institute of Mining and Metallurgy	1955
LEONARD Medal, Engineering Institute of Canada	1955
McCharles Prize, University of Toronto	1955
Mining World Achievement Award (Denver)	1959
John Scott Award, Philadelphia City Trust	1960
Gold Medal, Institute of Mining and Metallurgy (Great Britain)	1962
R. S. Jane Memorial Lecture Award, Chemical Institute of Canada	1962
Warren Lecture, University of Minnesota	1963
Engineering Alumni Medal, University of Toronto	1963
James Douglas Gold Medal Award	1965
Platinum Medal, American Institute of Mining and Metallurgical Engineering	1966
Alcan Award, Canadian Institute of Mining and Metallurgy	1966
Golden Plate Award, American Academy of Achievement	1967

FELLOW

Metallurgical Society American Institute of Mining and Metallurgy

PRESIDENT

Association of Professional Engineers of British Columbia	1948
Dominion Council Association of Professional Engineers	1948 – 1949
Canadian Institute of Mining and Metallurgy	1965

Some of the processes developed by Frank Forward are described below:

NICKEL

Pressure leaching was first applied to nickel sulphide concentrates. The concentrates are leached in ammonia solutions in a pressure vessel using compressed air. The oxygen in the air reacts with the sulphide minerals to produce a solution of nickel (ammine) sulphate. This solution is purified and then reduced with hydrogen under pressure producing pure nickel powder. This process was first adopted by Sherritt Gordon in Alberta in the early 1950's and is still in use in 1998. It is also currently being used in Western Australia by Western Mining and in South Africa by Impala Platinum, as well as elsewhere.

URANIUM

The processing of pitchblende ores for the recovery of uranium is of major importance to the nuclear industry. Canada is a leading producer of uranium for this industry. Frank Forward developed a pressure leaching process which successfully produced uranium from pitchblende. In the process sodium carbonate solutions leach uranium, by oxidizing the pitchblende with oxygen under pressure. Uranium is then precipitated from these solutions as sodium urinate (yellow cake). The process was used exclusively by Eldorado Refining in Saskatchewan, for a number of years.

ZINC

The current pressure leaching process for zinc dates back to Frank Forward's invention of the leaching of zinc in 1952. When the process was developed, the leaching reaction was too slow to make the process economically viable. This was overcome twenty years later and now the pressure leach process is rapidly replacing the standard zinc roast leach process. New plants have been built based on the pressure leach process.

TUNGSTEN

In recovering tungsten from scheelite ores, the ores were leached in ethylene glycol near 100°C at negative pressures. Tungsten leached into the ethylene glycol and was later recovered by adding water to the liquid. The water converted the tungsten to insoluble tungstic oxide which was then recovered from the liquid. The tungstic oxide was reduced with hydrogen to tungsten powder. The tungsten powder was then sintered and drawn into wire for lamp filaments. This leaching process was not adopted industrially.

TIN

Frank Forward showed that tin metal would leach under pressure in an oxygen atmosphere at low temperatures, where oxidation was confined to the divalent state of tin. This enabled a process to be invented in which tin could be removed from tin plate. Tin could therefore be recovered from scrap tin cans. No commercial plant was built to take advantage of this recovery process.