John Richard GOODE – 顧達

Education ***Royal School of Mines, London University, U.K.*** Aug. 1960 to July 1963

B.Sc. (Chemical Engineering in Metallurgy), ARSM, P.Eng. (ON & NL), FCIM, FAusIMM, SME, MGAC

Rare Earth Project Listing

1967-1973 - Working for Rio Tinto Nuclear Products/Rio Algom, Elliot Lake, did trouble shooting and developed new recovery/refining processes in the Nordic Rare Earth (REE)/thorium production plant which used solvent extraction (SX) to process uranium plant barren solution.

1984-1986 – Completed testwork, plant design, cost studies, then commissioned, and provided short-term management of a SX plant to recover 150 t/a of yttrium oxide in a bulk REE product from Denison uranium plant barren solution, Elliot Lake. Plant was a joint venture between Denison, Molycorp, and Shin-Etsu.

1986 – Prepared design, capital and operating costs for a new REE separation circuit at Molycorp's Mountain Pass bastnaesite operation, California.

1990 – Managed design and costing studies for the recovery of REE and zirconium products from the Strange Lake deposit on the Quebec-Labrador border.

1991 – Studied proposed development of a high-scandium orebody in the Ukraine for Ashurst Technology.

1993-1994 – Working for AMR/Neo Materials, investigated and evaluated REE production/refining plants at Baotou, Zibo, Jiangyin and Yixing in China including analysis of process technology, capital and operating costs.

2000 – Reviewed experimental data and prepared design and costs for a niobium refinery and REE recovery plant as an addition to Niobec's proposed Oka niobium concentrator.

2006 – Managed testwork at SGS Lakefield on REE ore from Rare Element Resources' Bear Lodge, WY, deposit.

2008 to 2013 – Managed extensive testwork and metallurgical studies on Avalon Rare Metals' Nechalacho (Thor Lake) rare earth-zirconium-niobium in the Northwest Territory. Project includes flotation, hydrometallurgical processing of concentrate, and a REE separations plant. Also managed or provided input to engineering studies, capital and operating cost estimates, formal submissions, etc., and member of Technical Advisory Committee.

2008 to present – In the course of working on several Western rare earth projects, conducted an extensive study of Chinese literature; accumulation of a large number of technical papers and books; investigation and purchase of reagents from Chinese manufacturers; investigation of Chinese equipment; and by arranging testwork on Western rare earth ore in Chinese research establishments – all much facilitated by my wife 經天琳 (Evelyn King).

2011 to 2013 – Working for Hudson Resources Inc., organized beneficiation and hydrometallurgical testwork at four different laboratories to investigate REE recovery from the Sarfartoq deposit. Provided input to engineering and economic studies.

2012 to present – Provided and managed program of testwork, and supplied input to cost studies, for proposed Appia Energy project to recover U and REE from Elliot Lake area quartz-pebble conglomerate. Contributed to 43-101 PEA. Provided input to similar project for Pele Mountain.

2012 to present – Part of organizing committee for Canadian Institute of Mining and Metallurgy's Rare Earth Symposium and co-editor of proceedings in 2012, 2013, 2014 and 2016. Input included peer review of papers, and liaison with authors – many Chinese. Author or co-author of one paper in 2012, three in 2013, and four in 2014.

2012 to 2013 – Assisted legal team defending China's position on rare earths before WTO.

2012 to present – Working for Serra Verde in the development of a major ionic clay deposit in Brazil considering heap, in-situ, and agitation leaching and separation of high purity REE. Responsible for initial metallurgical testwork, pre-feasibility design, visits to potential partners and operating recovery operations and separation plants.

2013 to present – Assisting Quest Rare Minerals to optimize the flowsheet for the Strange Lake REE project in Quebec.

2014 to present – Working on testwork management and process selection for the recovery of REE from Pea Ridge iron ore tailings in Minnesota.

2014 to present – Evaluating process options for the Search Minerals Foxtrot REE deposit in Labrador.

Detailed Work History

J.R. Goode and Associates, Toronto, Canada Jan. 1998 to present

Rare Earths: Completed studies of recovery of niobium, tantalum, and rare earths for **Niocan Inc**. and for a project in China. Managed testwork on **Rare Element Resources**' Bear Lodge rare earth ore. Managed testwork and provided design input for **Avalon Rare Metal**'s Thor Lake project; for **Hudson**'s Sarfartoq project; for two Elliot Lake U-REE projects; for the Serra Verde ionic clay project in Brazil; for Quest's Strange Lake project; for the Pea Ridge project; and for Search Minerals Foxtrot deposit.

Uranium: From early 2006 to present, managed testwork, design studies and all other metallurgical aspects of **Aurora Energy's** proposed 10,000 t/d Michelin acid leach-RIP uranium project in Labrador. Since 2008, provided metallurgical input to **U3O8 Corp**'s several uranium developments in South America. Assisted **SRK** assess in-situ and hard rock uranium projects in the former Soviet Union.

Gold: For **Barrick Gold Corporation,** from 1998 to present, studied cyanide destruction at all Barrick mines; reviewed cyanide alternatives and cyanide recovery options; studied IX resin for gold recovery; assisted in SAG plant expansion and recovery improvements at Goldstrike; interpreted data from pilot heap bio-oxidation operation; studied sampling and accounting at Goldstrike; reviewed process options for Pascua Lama gold-copper ore as manager of a multi-company study team, and developed recovery algorithms. Part of team that reviewed options for Kalgoorlie Consolidated Gold Mines (KCGM) which uses CFB roasting and ultra-fine grinding for telluride/pyrite refractory concentrates; part of project team studying flotation and ultra-fine grinding flowsheet for Cowal ; reviewed options for Alto Chicama heap leach project in Peru; managed cyanide and Hunt Process testwork, and completed various studies on Buzwagi gold-copper deposit in Tanzania; managed roasting, POX, and other studies of refractory Jeronimo deposit in Chile. Provided on-site monitoring of an INTEC pilot plant leach of a refractory gold ore concentrate. Provided input to Donlin Creek gold project design and the Low Cost Country Sourcing project. Provided input to Goldstrike alkaline POX-thiosulphate-RIP project.

For **Placer Dome Inc.**, studied heap bio-oxidation for refractory ores and resin-in-pulp for gold recovery; evaluated proposed thiosulphate leach plant in Nevada; reviewed proposed Pueblo Viejo plant including POX processing; provided input to silver recovery enhancement programs; reviewed proposed development of Cerro Casale Cu-Au deposit in Chile. Acted as project metallurgist on the Donlin Creek gold project in Alaska and managed conventional and N2Tec flotation pilot plant testwork.

Corporate metallurgist for **Fronteer Development Group** including management of initial heap leach testwork on Long Canyon gold deposit, Nevada,.

Assisted **Brazmin** with testing of the Sao Jorge gold deposit in Brazil. Reviewed process selection, managed testwork, and reviewed engineering for **Gabriel Resources'** Rosia Montana gold project.

For **Crystallex,** supervised testwork on Las Cristinas project and provided input to feasibility study and detailed design. Managed flotation and BIOX/GEOCOAT tests and economic studies for the La Victoria bio-oxidation project and managed heap leach tests for the Salva La Patria project, Venezuela

Studied SART and Hannah IX plants for the Guanaco Cu-Au project in Chile for **Kinross Gold Inc.** Managed laboratory and cost studies of **Eldorado Gold**'s Kisladag gold heap leach project in Turkey and assisted in the evaluation of two refractory gold projects in China. Assisted **Golden Queen** with Soledad gold IX heap leach project.

Assisted WGM with Feasibility Study for **Goldcorp**'s Red Lake Mine and studied processing of refractory gold concentrate. Assisted WGM in study of **Argentina Gold**'s Veladero project in Argentina, **Greenstone Resources'** heap leach operations in Central America, **Kinross**'s Timmins gold properties, and options for PGM deposits at **Skaergaard, Duluth Complex**, and elsewhere.

Assisted Strathcona Mineral Services review the **Cerro Crucitas** and **Beta Vargas** gold projects in Costa Rica. Helped in due diligence of four major gold plants/heap leach operations in US and Brazil.

Reviewed **Riddarhyttan**'s Suurikuusikko gold bio-oxidation project in Finland. Managed testwork and studies of **Crew Gold**'s Nalunaq deposit in Greenland. Assisted **High River Gold** in design of Taparko project in Burkina Faso. Assisted **Intrepid Minerals'** with Casposo Ag-Au project in Argentina. For **Iamgold**, assessed proposed bio-oxidation plant in Ghana, reviewed metallurgy of properties in Tanzania and Botswana, managed process work on the Quimsacocha gold-copper project in Ecuador, reviewed bio-oxidation work and otherwise assisted with the Sadiola Deep Sulphides project in Mali.

Base metals: Reviewed metallurgy of the Mantua copper leach-CCD-SX-EW project for **Northern Orion Exploration Ltd.** and monitored pilot plant; for **Rio Algom Limited**, reviewed the Tenke Fungurume Cu-Co acid leach, SX-EW project in the Congo; managed a study of options for **INCO** Voisey's Bay Ni-Co-Cu ore. Assisted HGE with design of the **INTEC** copper recovery process.

Barrick Power Gold Corporation of China Limited, Beijing, China March 1994 to Dec.1997

President, Chief Representative, and Director. Responsible for exploration and assessment of gold and copper deposits in China. Work included the mobilization and direction of a team of Chinese and Canadian geologists and engineering companies; negotiation with Chinese authorities; and on-site review of deposits and mine/process operations throughout China.

Kilborn Inc., Toronto, Canada Sept. 1976 to March 1994

Vice President, Mining and Metallurgy, Director

Managed a team of mining and metallurgical engineers responsible for feasibility and Due Diligence studies, and the design and commissioning of refractory and conventional gold plants, base metal and uranium concentrators, and REE recovery and separation facilities.

Personally responsible for several programs of testwork, feasibility and due diligence studies, and the design and commissioning of gold, uranium, base metal, and rare-earth recovery plants. These included Noranda's Golden Giant mill, Hemlo; Falconbridge's Strathcona Large Flotation Cell program; Vaal Reefs East and South uranium plants, RSA; Denison's uranium and yttrium plants, Elliot Lake and other projects in the Americas, Africa, CIS, China, and the Middle East.

Ore Sorters (Canada) Ltd. (RTZ subsidiary), Peterborough, Canada Oct. 1973 to Oct. 1976

Executed testwork on radiometric and photometric ore sorting. Co-designed a new radiometric sorter, installed and commissioned a plant using two units at Schwartzwalder uranium mine in USA.

Rio Algom Mines Limited, Elliot Lake, Ontario Sept. 1967 to Oct. 1973

Responsible for problem solving and process improvements in uranium, thorium and rare earth plants in Elliot Lake, Canada and a uranium plant in Utah, US.

National Smelting Corporation (RTZ), Bristol, UK Sept. 1965 to Sept. 1967

Piloted vacuum de-zincing (VDZ) for the Imperial Smelting Lead-Zinc Furnace. Responsible for operation of a semi-production scale VDZ plant and associated cadmium distillation columns.

Falconbridge Nickel Mines Limited, Falconbridge, Canada Aug. 1963 to April 1965

Conducted in-plant studies of a production fluid bed roasting plant treating pyrrhotite concentrate to make iron oxide pellets and a nickel-copper precipitate.

Personal Details

Date and place of birth	1941-03-23, Kings Norton, UK
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Skills and Attributes

- Management of exploration, study, due-diligence, engineering design and production teams.
- Experience covering the laboratory investigation, design, engineering, commissioning, optimization, operation, and assessment of gold, PGM, base metal, uranium and rare earth operations.
- Conversant with economic evaluation of mining/mineral processing projects.
- Widely travelled and familiar with operating conditions in most areas of the world.
- Author or co-author of about forty papers; short course lecturer; co-organizer of COM 2012, 2013, 2014 and 2016 REE Symposia and co-editor of published proceedings
- Lecturer in mine project development at Ryerson University, Toronto
- P.Eng. (ON & NL), FCIM, FAusIMM, MGAC, PDAC, ARSM, CMP, AIME